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THE VALUATION OF PUBLIC SERVICE CORPORATION PROPERTY.[1]

By Henry Earle Riggs, M. Am. Soc. C. E.

With Discussion by Messrs. F. Lavis, Charles H. Higgins, S. D. Newton, William V. Polleys, C. P. Howard, J. E. Willoughby, Henry C. Adams, Carl C. Witt, R. A. Thompson, Charles H. Ledlie, William G. Raymond, W. H. Williams, P. E. Green, E. Kuichling, Richard T. Dana, George T. Hammond, Leonard Metcalf, Charles Hansel, J. Martin Schreiber, Clinton S. Burns, Halbert P. Gillette, Arthur L. Adams, C. D. Purdon, A. Mordecai, W. B. Ruggles, and Henry Earle Riggs.

Introductory.

The industrial and economic development of the past two decades has opened many new lines of special work in the Profession of Engineering, none of which is more difficult and complicated or of greater ultimate value to the public at large than that of the appraisal or valuation of the property owned and operated by public service corporations; and none of the fields of engineering specialization requires greater care or calls for more skill, experience, integrity, or sound judgment.

The individual engineer, or commission of engineers, entering upon an appraisal of large magnitude, particularly one including properties of more than one company, will find conditions varying in every one, and each property presenting new, complex, and confusing elements of value to pass upon and determine.

Prior to 1900 there had been few calls on engineers for large appraisals, and the literature descriptive of engineering effort along this line was practically nothing. Since 1900 many extensive appraisals have been undertaken by States, by railroad and banking corporations, and by cities; certain well-defined lines of practice have been developed; many differing opinions as to certain methods and principles have been brought out; and enough has been added to the printed literature to enable one to compare methods of work and to fix with reasonable certainty upon some as correct, and to discard others as improper. 2

There are so many complex factors entering into the problem of valuation, so many widely different plans have been presented, and there are so many thinking men who have opposed and do honestly and sincerely oppose any form of valuation, that a most thorough study of the subject should be made. It should be examined from all angles, and every possibility of danger from legislation regarding it should be weighed with utmost care.

The question of railroad valuation, involving as it does the largest industry of the nation, naturally takes first place in such a discussion, but so many of the general principles of railroad valuation are applicable to the appraisement of corporate property, so many arguments have been advanced by engineers and others, and so many judgments of the Courts have been rendered in connection with water-works and gas-works valuations, that it is not desirable to limit this discussion wholly to the problem of railroad valuations.

The reasons for requiring that valuations be made may be broadly divided into two general classes:

First.—As a Matter of Public Interest.—The public, and particularly the investing public, requires valuations in order to guard against unworthy and dishonest corporation securities, to be assured that corporations are bearing their legitimate and proper share of the burden of taxation, and to furnish a proper basis for fixing equitable and just rates for the services rendered by the corporation.

Under this class would come all appraisals made for information to be used as a basis for legislation relative to:

(*a*) *Taxation of Corporations.*—Such were the valuations in Michigan and Wisconsin.

(*b*) *Rate Regulation.*—This was the reason which prompted the work in Minnesota and Nebraska.

(*c*) *Limitation of Capitalization.*—The regulation of issue of stocks and bonds was the purpose of the Texas valuation.

(*d*) *Fixing a Price for Sale.*—Many of the water-works and electric light valuations were made in order to determine a fair price to be paid for the property at the expiration of the franchise. 3

(*e*) *The General Information of the Public.*—To be used in connection with the fixing of terms for franchise renewals, etc., etc.

Second.—As a Matter of Corporation Necessity or Expediency.—Valuations are made in order to guide large investors, to secure a safe and up-to-date basis on which to negotiate a sale, a purchase, or a reorganization of the property, or a consolidation with other like properties, and to secure justice to honestly administered corporations.

The great majority of appraisals under this head have been in accordance with some other methods than those adopted in the State valuations. It is not intended in this paper to engage in any argument as to the various purposes of appraisals, or even to urge the necessity or desirability of a general appraisal of properties. An absolutely accurate and correct statement of the cost of reproduction of all the physical properties of the railroads of the country, a correct statement of the actual capital needed to reproduce these properties as they exist, and, along with this, a statement of the actual physical depreciation, would be a document of vital interest.

This paper is confined to a discussion of the methods which should be used in arriving at a correct figure of cost of reproduction and depreciation—it does not take up questions involving the propriety of those figures when reached. The propriety or legality of using such figures as a basis for an assessed valuation, as a basis for rate-making (rate-making being an art in itself involving complications as great as those encountered in valuation), or any arguments as to the justice or injustice of legislation restricting issues of stocks or bonds, will be conceded no place in this paper. It is assumed that all these questions would have been taken up and a satisfactory answer reached before a valuation could have been ordered.

The different elements of value in property, the relations of this property to the public, the method of determining the worth of these elements of value which have been adopted in the past by men engaged on valuation work, a comparison of these methods, a discussion of the objections that have been made to them, and a presentation, not only of the writer's views as to proper methods, but those in which he disagrees with usages adopted by others—these define the scope of this paper. 4

No matter what particular end is to be served by a valuation, the commission engaged upon it will be asked to furnish a fair value, perhaps with reasonable limitations in the instructions, perhaps with a general and indefinite instruction to find the value. They will encounter, among other difficulties:

First.—The fact that human machines are not exact duplicates, and that allowance must be made for a large measure of error, on account of the personal equation of the men engaged on the work, as individual errors of judgment are frequent on any work of magnitude. This personal element must be corrected by uniformity of method, by constant checking, and, as far as possible, by subordination of personality to system.

Second.—The fact that human selfishness is a dominant quality—the railroad manager who opposes methods which he believes will increase values in an appraisal for taxation, or who, on the other hand, uses every possible argument to increase values if the work be as a basis for rate-making or for restriction of bond issues, or the State official who is desirous of using original cost on a valuation to be used for rate-making in order to keep the valuation down to a minimum, and the politician who depends on an unenlightened public opinion to create sufficient outcry to influence the work to his advantage—are all actuated by a perfectly human wish to attain ends which seem to them desirable, and are but typical of men who will endeavor to influence every appraisal.

In view of these considerations, it is a question whether results are not frequently affected by the knowledge of their intended use, and whether a system which will entirely remove such causes of error can be applied to the work.

If an engineer, or a commission of engineers, is directed to examine a certain property and report the true cost of reproduction, depreciation, or present value, taking into account all facts connected therewith, the final figures should not differ, whether the report is to be used as a basis for reorganization, sale to another corporation, or is to be used by a State legislature as a basis for formulating a rate bill, or as a basis for a value for taxation. The result secured is a necessary preliminary on which depends the accuracy, fairness, and justice of the other work which is to follow. This is an engineering work, a statement of certain physical property, the estimated cost of reproducing it new, less the estimated depreciation, and, beyond the differencei due to personal judgment, these figures may not vary. 5

The word "value" is in common use, and yet, in the minds of many people, its exact meaning is vague. It is true that the "value" of a property is an unstable figure, subject to fluctuations due to natural or artificial causes, and that a material change in value may occur suddenly, but the "value" of any given property on any given date is, or should be, from an engineering standpoint, a definite sum which may not be varied or changed to suit the whim or will of the people for whom the work is done.

In all the subsequent discussion of values and methods of obtaining values, it is assumed that, unless specifically limited to a

determination of cost of reproduction and depreciation, a valuation commission should be governed by the following rules:

1.—No account may be taken of the purpose for which the resultant figure of value is to be used; and the result should not vary, no matter what that purpose may be.

2.—The resultant figure should be the honest judgment of the men composing the commission, as to the actual cost of reproduction, present physical value, or "fair value," and should be ascertained by a systematic and scientific method which takes into account all the facts concerning the property, its physical value, its strategic location, its operating revenues and expenses, and its franchises, rights, competition, opposition, and all other tangible or intangible elements which would affect values. The method of valuation should be such as to minimize or entirely eliminate all differences due to errors of personal judgment.

3.—All properties being appraised are considered as operating properties. One which is dead, inert, and not in use, cannot be considered as coming under such a discussion as this, and such properties are not treated in this paper. The term "going concern" is not used in connection with the physical property, any element of value implied by the term, over and above the "overhead charges," being treated as an intangible or non-physical element of value.

In stating this position, the writer is aware that it is a difficult matter indeed to get away from the fact that some specific purpose—taxation, for example—is the definite end in view in every valuation, and that, instinctively, men engaged on the appraisal will find themselves modifying their figures to meet some real or fancied condition which they conceive might arise, or to prevent some injustice which they believe might be done. Every subordinate employee needs to be watched, every man in charge must watch himself, or he will find himself unwittingly, almost instinctively, coloring his results by some old prejudice of his early years of employment, or some loyalty to his own ideas of governmental or economic policy. The writer has noted this in every appraisal on which he has been engaged, and calls particular attention to it as the first difficulty which must be overcome in the organization of the force for a large appraisal.

In the following pages all complications which might arise from the purpose of the appraisement are considered as eliminated, and the possibility of erroneous conclusions being reached by reason of the personal factor (while recognized as being ever present) will not be specially emphasized.

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1. Presented at the meeting of January 4th, 1911.

In reference to questions of value, the engineering commission must hear, consider, and reconcile arguments advanced by adverse and often hostile interests. On the one side stand the corporations, with large financial interests involved, often with an excessive amount of stock and bonds issued on the property, the existence of which issues the corporation wishes to justify, and, whether properly capitalized or not, the management being imbued with the perfectly human desire to defend corporate interests from attack of any kind; on the other side is public opinion, often unreasonable, often misinformed, and frequently prejudiced.

It appears necessary, therefore, to consider briefly the relation which these interests bear to one another, to study the causes which have led to mutual misunderstandings, and to note the proper relations which should, if possible, be established and maintained between the people and those corporations organized to perform certain of the functions of the State.

A public service or quasi-public corporation is a corporation which is operating under the terms of rights, grants, or franchises given by the public, either to this particular corporation direct or granted by statute to a class of corporations. 7

The property of the corporation is used to render certain services to the public, with the expectation of financial gain.

It is not material whether the grant be a franchise permitting a water-works company to use the streets and alleys of a city for its mains, and the service be the pumping of water for domestic service and fire protection, or whether the grant be the statutory rights of corporate existence and eminent domain, and the service rendered be the transportation of freight and passengers; the general principle is the same; the company has secured from the people certain rights which enable it to do business, and the people are directly benefited by the services rendered by the company. The increased comfort of living makes for the growth of the city; the increased transportation facilities build and develop the country traversed by the railroad; and this growth and development, not only operate to the advantage of the people, but also to that of the company in the way of increased business and increased revenues.

The capital required to build and develop these properties was furnished in the hope of, and with the expectation of, a proper financial reward. It has frequently happened that such properties have been built years in advance of sufficient development to support the enterprise, built, in fact, without expectation of immediate returns, and long periods of time have often elapsed before any profit has been secured.

It has also frequently happened that corporations have been aided to a very large extent by public funds, by the voting of aid bonds, by the donation of large tracts of land, by payment for certain service at such rates as would largely relieve the company from loss in operation, by the remission of taxes, or by the direct donation of funds.

The company is clearly entitled to earn a reasonable profit on the actual capital invested, in addition to the legitimate cost of operation, payment of taxes, and sinking funds to cover depreciation and obsolescence.

The public is clearly entitled to good service at the lowest rates that will permit the company to earn its reasonable profit and expenses. Increases in tonnage, population, and consequent net earnings of the corporation should entitle the public to a benefit in reduced charges for service, when the increased earning is of a permanent character. 8

The general tendency of the Courts has been to treat a franchise as a contract, and to be governed closely by the language and evident intent of the makers, but to safeguard the rights of the public to the fullest extent consistent with justice.

A franchise requires specific performance of specific acts. Nothing will be assumed or implied. The Courts recognize that the investors are entitled to reasonable returns, and that the public is entitled to fair rates.

In the case of Los Angeles Water Company *vs.* City of Los Angeles (103 U. S., 711), the United States Courts held that at the expiration of a 30-year franchise, which provided that the city was to pay for the value of all improvements, when the city failed to agree upon, tender, or pay such value, so long as the company complied with the terms of the contract, and until the city terminated it by making or tendering payment, the passage of an ordinance by the city fixing rates was void.

In the case of Weatherly *vs.* Capital City Water Company (Ala. 22 So., 140), the Alabama Courts held that the acceptance of a franchise involved a grave responsibility, and that the company could not stop furnishing water and fire protection, even if the work was done at a loss.

In the case of Myer *vs.* Brown (65 Cal., 589), the Court said:

"It is well occasionally to recall the fact that there is no more reason to permit a municipal government to repudiate its obligations entered into for value, than to permit an individual to do so. Good faith and fair dealing should be exacted of one equally with the other."

Judge Brewer, in the Kansas City Water-Works case (62 Fed. Rep., 853), said:

"All contracts involving property rights and obligations, between municipalities and individuals, must be presumed to be based upon and to recognize the ordinary laws of business transactions."

In 1903 the Maine Supreme Court issued a set of instructions to appraisers appointed to fix values of certain properties. The Court set forth its views as follows:

"Summarized, these elemental principles are, the right of the company to derive a fair income based upon the fair value of the property at the time it is being used for the public, taking into account the cost of maintenance and depreciation and the current operating expenses, and the right of the public to demand that the rates shall be no higher than the services are worth to them, not in the aggregate, but as individuals." 9

The Supreme Court of the United States has again and again given its views, which may be summarized as follows:

"It cannot be said that a corporation is entitled, as of right, without reference to the interests of the public, to realize a given per cent. upon its capital stock. When a question arises whether the legislature has exceeded its constitutional powers in prescribing rates to be charged by a corporation controlling a public highway, stockholders are not the only persons whose rights and interests are to be considered. The rights of the public are not to be ignored.

"The public cannot properly be subjected to unreasonable rates in order simply that stockholders may earn dividends. The legislature has the authority in every case, where its power has not been restrained by contract, to proceed upon the ground that the public may not rightfully be required to submit to unreasonable exactions for the use of a public highway established and maintained under legislative authority." (164 U. S., 578.)

"It is not to be inferred that the power of limitation or regulation is itself without limit. This power to regulate is not a power to destroy, and limitation is not the equivalent of confiscation. Under pretense of regulating fares and freights the State cannot require a railroad corporation to carry persons or property without reward, neither can it do that which in law amounts to the taking of private property for public use without just compensation. * * *" (116 U. S., 307.)

In the case of Smyth *vs.* Ames (169 U. S., 466), the Court said:

"If a railroad corporation has bonded its property for an amount that exceeds its fair value, or if its capitalization is largely fictitious, it may not impose upon the public the burden of such increased rates as may be required for the purpose of realizing profits upon such excessive valuation or fictitious capitalizations; and the apparent value of the property and franchises used by the corporations, as represented by its stocks, bonds and obligations, is not alone to be considered when determining the rates that may reasonably be charged. * * *

"We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public.

"What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth." 10

The relations between the corporations and the public that they serve have been clearly defined by the Courts, as the foregoing quotations show.

That the mutual relations existing between the management of the corporations and the public are far from what they should be, there can be no doubt. On the one hand, the great mass of the voting public is uninformed as to actual revenues, disbursements, and operations of the corporations, as to whether their income is unreasonably large, or whether they are struggling to exist. The sums of money involved in the dealings of the corporations are so stupendous in comparison with the amounts used in an ordinary private business—even in one of considerable magnitude—that the majority of the public cannot comprehend them. The published statistics are in such form that only the careful student of affairs can understand or analyze them, and but few of the public officials who receive them

are able to read the reports of the properties and comprehend them. As a consequence, the corporation, as a political issue, has been the subject of jest, gibe, and cartoon; there has not been an intelligent public discussion of available reports and statistics, and it may be said that, generally, the mass of the public has come to class all corporations as grasping, overbearing, and unjust, and to consider them all as exceedingly prosperous. This has been taken advantage of by politicians for their own selfish ends, and has led to sundry legislation, some of which has been unreasonable and unjust to the corporations, and much of which is aimed at real abuses that never ought to have existed.

The reasonableness of a rate depends, not alone on the amount of capital invested, but on the volume of traffic, the density of population, the actual cost of service, and many other elements. Rate legislation has been attempted without full investigation. Acts have been passed compelling the establishment of stations and terminals, the improvement of roadway and structures, the purchase of new equipment, the installation of safety appliances and block signals, and many other requirements have been made, some (but by no means all) of which are unreasonable and burdensome. Nearly one-half the States of the Union have by law required a 2-cent, or 2½-cent, passenger fare, regardless of density of population, amount of traffic, or other considerations which might render such rates unreasonable. The regulation of the carriers, by legislature, by railroad commissions, by State officials, and by Courts, the addition of burdens of expense, and the cutting off of revenue, all give considerable ground for the opposition of the carriers to anything that looks like hostile legislation, and compels the student of affairs to admit that there is justice in the claim of the managements, that there is grave danger, not only of seriously crippling many roads, but of so impairing the credit of the railroads as a class that it will be increasingly difficult to secure capital to provide for the necessary extensions and development of the transportation facilities of the country.

On the other hand, perfect frankness compels the admission that the state of public opinion which compelled the passage of these laws has been caused largely by the corporation officials themselves. There is probably no more loyal body of men in America to-day than the officials and employees of railroads. Their loyalty, however, is all to "our company." They enter its service as boys or young men; they grow up to the full strength of manhood working for its good; they take little or no part in public affairs; they have no time for the study of public questions. Their friends are almost exclusively among their own associates in the service of the road, and their development is along the lines of their own special work in the service. As a body of honest, honorable, and worthy men, absolutely loyal to their employers, they have few equals; but it is doubtful if any equal number of men, of equal intelligence, have as limited a knowledge of the fundamental truths of government, or knowledge so colored by bias. It is also doubtful whether any equal number of men have in their ranks so few who bear an active part in the duties and activities of citizenship, or who exercise large influence on their neighbors.

While the foregoing statement is believed to be absolutely true, it will not do to pass over the notable exceptions. Such men as James J. Hill, F. Am. Soc. C. E., M. E. Ingalls, and others of the higher officials, who have taken an active part in public affairs, have had commanding influence. Theirs has been the sound policy, as the property in their hands has not suffered. The short-sighted policy which, in December, 1909, induced the management of one road to compel all its employees holding municipal offices to resign, is bound to react and create hostile feeling on the part of the public.

The entire trend of a training in railway service is to fill a man with prejudice against all things that undertake to regulate or control the corporations, and often goes so far as to enable him to do, willingly and as a matter of right, things which with a broader view of the interest of the whole community he would not agree with at all. The result of this intensive training is that the railway service has in it thousands of men who become impatient with any effort to regulate or control; who permit their irritation to show; and who, by their own attitude, create unnecessary hostility. F. A. Delano, M. Am. Soc. C. E., President of the Wabash, in an address[2] at Hannibal, Mo., on March 25th, 1909, said:

"In ordinary manufacturing or commercial undertakings, every man has his own notions about the conduct of his business, and does not want to be interfered with, or dictated to by people who know less about his business than he does himself. Now, while it may be argued in the case of public service corporations that the people who have put their money into these enterprises, have done it with their eyes open and with full knowledge that they were subject to governmental regulation and control, there is nothing in that argument which makes public interference any more palatable to the man or group of men who are interfered with."

This address well expresses the spirit of the railway managers and employees toward all forms of investigation, and the complete lack of understanding, on the part of these managers, of the legal and moral relations which they bear to the communities which they serve. It is extremely unfortunate that railway and corporation people have not taken the public fully into their confidence, and fully and freely given out correct information as to the operation and depreciation of their properties; also, it is unfortunate that, when a corporation official does feel a grievance, he permits himself to make a partisan speech, or write an unwise article for publication. Much hostility is traceable to foolish, undiplomatic sayings or writings of corporation managers (which are often but half quoted), or to equally foolish speeches or newspaper editorials in opposition to the corporations, which are taken seriously by the managers. Whatever may be the cause, there is a regrettable hostility, and, on the part of the corporation officials, there is an apparent unwillingness to admit right motives to anyone advancing theories regarding corporate regulation and control, due largely to the training and atmosphere surrounding the corporate service.

The public has a large bill of particulars, one of which is the promotion of wildcat companies, such, for instance, as the "New York and Chicago Air Line" project which, only a year or so ago, drew from $2,000,000 to $3,000,000 from the people in a limited territory. These people were "investing" in railway stocks. A Federal control of the issue of stocks and bonds would have prevented this and hundreds of like swindles. Any move to secure such a law has always been opposed by the management of large and legitimately operated corporations, under the impression that they are about to be persecuted, and, naturally, the victim classes these corporations with the alleged one that secured his money.

The issue of stocks and bonds far in excess of any possible cost or value of railroad, street railroad, and other properties, and the making of large personal fortunes by the promoters, are matters of such frequent occurrence that it is difficult, indeed, to dismiss them with a mere denial. There is hardly a community of any size which has not had its example of "consolidation," "combine," or "merger," which has resulted in the issue of excessive securities; and there is hardly a citizen of any intelligence who has not either seen or had experience with some form of corporation promotion carried on strictly within the law, but which, nevertheless, in plain language, was a swindle. These, to say nothing of some gigantic deals involving millions, will sooner or later compel some form of regulation of the issues of stocks and bonds. In the last analysis, it is the money of the people, the hundreds of thousands of small investors, depositors in banks, and owners of life insurance, whose money goes into corporation securities, and, until the officers of the great railroads co-operate in securing such forms of control of stock and bond issues as will make impossible the purely speculative "wildcat" corporations, and thus safeguard minor corporations, as to furnish at least reasonable security to those whose money is invested, all forms of corporation security must be under suspicion with the public, and the agitation for control must continue.

It is not, as Mr. Delano says, a case of put your money in with your eyes wide open; it is an effort on the part of the people to safeguard this form of corporate security in such a way that it can be treated as any other form of sound investment. It should not be necessary to require that all investors in corporate securities be financial experts. It is the writer's opinion, based on his observation and professional practice, that the railroads are not generally open to charges of over-capitalization. While there are flagrant instances, the chief culprits are among other classes of corporations. If such be the fact, it would seem that the interests of the great railway corporations would be in no wise jeopardized by sane and reasonable control.

The theory of taxation is that every one shall bear his proportionate burden of the cost of maintaining the government.

Regardless of any opinions that may be held as to the propriety of the methods adopted in the Interstate Commerce Commission's commercial valuation of railroad properties, it will be conceded that the results gave a set of figures for all the States of the Union, secured by a uniform method of computation and distribution. Table 1, which is a compilation from Tables 1 to 11 of Bulletin 21, shows clearly why, in certain States, corporate taxation is a live issue, and if (as suggested by Mr. Williams in his article, elsewhere referred to) amendment of the Constitutions of some of the States is necessary, it is safe to assume that the condition of inequality shown by this table is such as to compel these changes.

It is needless to cite further instances; enough has been said to indicate:

First.—That the corporations and the public have such intimate business relations that a blow at either must necessarily injure the other seriously;

Second.—That the Courts have defined quite clearly the legal relation existing between the two interests;

Third.—That there is lacking a proper spirit of mutual confidence, and the two interests at the present time are generally hostile;

Fourth.—That there have been errors and abuses on the part of both corporations and public; and

Fifth.—That capital invested in corporations is, and should be, the money of the people, and should be safeguarded so as to prevent its loss by manipulation, and insure a fair return.

TABLE 1.—Comparison of Assessed Valuation and Commercial Value of Railway Properties.

State or territory.	Miles of single	Commercial value: June	VALUATION FOR	Ratio of assessed

	track.	30th, 1904.	ASSESSMENT.		to commercial valuation: Percentage.
			Year.	Amount.	
Alabama	4,669.35	$150,211,000	1905	$53,926,026	35.9
Arkansas	4,126.44	124,626,000	1904	34,709,623	27.8
California	6,262.54	350,694,000	1904	92,378,550	26.3
Colorado	4,976.24	198,261,000	1903	49,492,135	25.0
Connecticut	1,017.72	105,369,000	1904	120,493,648	114.4
Florida	3,555.84	80,467,000	1904	21,817,478	27.1
Georgia	6,304.72	156,603,000	1903	63,105,810	40.3
Idaho	1,461.53	91,877,000	1904	10,115,378	11.0
Illinois	11,622.74	805,057,000	1904	425,709,055	63.8
Indiana	6,917.85	375,541,000	1904	165,863,367	44.2
Iowa	9,859.23	344,847,000	1904	57,535,160	16.7
Kansas	8,811.43	356,356,000	1904	60,093,534	16.9
Kentucky	3,253.00	155,772,000	1904	77,658,040	49.9
Louisiana	3,898.74	123,401,000	1904	29,044,195	28.9
Michigan	8,660.29	277,597,000	1904	196,795,000	70.9
Minnesota	7,811.04	466,734,000			
Mississippi	3,480.25	107,884,000	1902	29,847,640	27.7
Missouri	7,711.05	309,768,000	1903	97,916,869	31.6
Montana	3,267.10	196,209,000	1904	36,759,827	18.7
Nebraska	5,820.88	263,170,000	1904	46,082,853	18.5
Nevada	986.56	43,745,000	1904	13,778,049	31.5
New Hampshire	1,275.97	79,786,000	1904	22,625,000	28.3
New Jersey	2,277.85	333,568,000	1904	231,655,525	69.5
New York	8,297.29	898,222,000	1903	229,582,064	25.6
North Carolina	4,075.00	113,146,000	1904	69,480,974	61.4
North Dakota	3,190.77	689,797,000	1904	133,858,945	19.4
Oklahoma	2,611.03	78,668,000	1905	11,936,317	15.2
Pennsylvania	11,023.24	1,420,680,000			
Rhode Island	211.89	25,719,000	1904	15,832,003	61.6
South Carolina	3,175.28	75,500,000	1903	29,467,716	39.0
South Dakota	3,047.14	49,646,000	1904	14,354,930	28.9
Tennessee	3,480.83	131,166,000	1903	58,536,566	46.6
Texas	11,848.03	237,718,000	1904	95,209,785	40.0
Utah	1,779.69	90,325,000	1904	20,682,461	22.9
Vermont	1,063.25	37,311,000	1902	27,344,020	73.3
Virginia	3,932.33	211,315,000	1904	63,269,623	37.7
West Virginia	2,836.83	201,799,000	1904	28,771,358	14.2
Washington	3,355.83	182,837,000	1904	26,066,949	14.3
Wisconsin	7,048.76	284,510,000	1904	218,024,900	76.6
Wyoming	1,247.70	100,307,000	1904	7,498,232	7.5
Arizona	1,751.35	68,356,000	1904	6,667,349	9.7
District of Columbia	32.00	5,578,000	1904	2,486,024	44.6
New Mexico	2,504.66	8,640,000	1904	8,511,538	9.9
Total, U.S.A.	213,932.13	11,244,852,000			

In concluding this subject, it may not be amiss to quote the language of the Supreme Court in the Knoxville Water Case (212 U. S., 1), as follows:

"Regulation of public service corporations, which perform their duties under conditions of necessary monopoly, will occur with greater and greater frequency as time goes on. It is a delicate and dangerous function, and ought to be exercised with a keen sense of justice on the part of the regulating body, met by a frank disclosure on the part of the company to be regulated. The Courts ought not to bear the whole burden of saving property from confiscation, though they will not be found wanting when the proof is clear.

"The legislatures and subordinate bodies to whom the legislative power has been delegated ought to do their part. Our social system rests largely upon the sanctity of private property, and that State or community which seeks to invade it will soon discover the error, in the disaster that follows. The slight gain to the consumer, which he would obtain from a reduction in the rates charged by Public Service Corporations, is as nothing compared with his share in the ruin which would be brought about by denying to private property its just reward, thus unsettling values and destroying confidence. On the other hand, the companies to be regulated will find it to their lasting interest to furnish freely the information upon which a just regulation can be based."

2. *Railroad Age Gazette*, April 16th, 1909, p. 857.

Explanation of Terms.

In order that there may be no doubt as to the exact meaning of the terms used throughout this paper, a few definitions or explanations are submitted:

Appraisal, or Valuation.—These words are used interchangeably, and refer to the engineering work of determining the present worth of both physical and intangible properties of corporations.

Cost of Reproduction.—This expression refers to the estimate of cost of reproducing the physical properties as they exist on the date of the appraisal, all elements entering into the cost being considered as new and not affected by the elements of depreciation or obsolescence.

Cost, or Original Cost.—These terms refer to the actual amount of money paid for the property, either when it was originally constructed, or in its condition at the time of appraisal, the latter case being the original cost plus the cost of additions and betterments, less abandoned, replaced, or worn-out property. This figure ought to be represented by the "book cost," but it is not often that "book cost" and "actual cost" are the same.

Present Value, or Present Physical Value.[3]—These terms are used in describing the physical property as reproduced after it is affected by all elements of depreciation or appreciation. The use of the word "value" in this expression is unfortunate, as it may lead to some confusion. It must be kept clearly in mind that, where this term is used, it refers only to physical property as depreciated, and is in no case intended to refer to the final or "fair value" of the property.

Non-physical, or Intangible, Value.—These terms are used to represent those elements, entering into the final worth of the property as a business concern, which arise out of the operation of the property and are not attachable to the physical property. 17

All the foregoing terms have to do with the determination of the elements which enter into the final value.

What is "value"? In defining the exact meaning of this term, as applied to the property of a public service corporation, many elements must be taken into account. Standard authorities give many definitions of "value," none of which appears to meet fully the requirements of the term as used herein. Before considering the elements which enter into the value of corporation property, or attempting to determine the methods to be used in fixing proper figures of worth for each of these elements, it is proper and necessary to obtain a clear definition of "value," the thing sought to be ascertained by the inquiry.

The term, "commercial value," has been considered in place of "value," but is not used because it is held to be more properly applicable to the selling or exchanging value of fractional interests in the property, and the methods of computing the commercial value of securities which are in common use cannot be adopted in an engineering valuation. The Standard Dictionary definition of "commercial value" is:

"The source of commercial value, according to different schools of economists, is (1) the degree of want felt for a commodity as shown in the relation of supply and demand, (2) the amount of labor embodied in it, or (3) the cost of reproduction. Practically, commercial value is that for which a thing can be sold or exchanged at a given time and place."

The definition given by Professor Adams is:

"The estimate placed upon the worth of a property, regarded as a business proposition."

Both these definitions are in a measure involved, and the writer considers that the term, "Commercial Value," is too narrow and restricted to be properly used.

As a definition of that estimate of worth which an engineering commission should report as the result of a complete appraisal, the writer submits the following:

The value of a property is its estimated worth at a given time, measured in money, taking into account all the elements which add to its usefulness or desirability as a business or profit-earning proposition. 18

There are two classes of elements entering into the final value:

(1) The "Physical Property" Element of Value.—This consists of those things which are visible and tangible, capable of being inventoried, their cost of reproduction determined, their depreciation measured, and without which the property would be unable to produce the commodity on the sale of which income depends. This physical property is considered as an operating entity, and not as collateral of inert and partly worn-out equipment, and, being so considered, carries, as part of the physical value, those costs and charges which are an inseparable part of the cost of construction but do not appear in the inventory of the completed property.

(2) The "Non-Physical" or "Intangible" Elements of Value.—These are those things which, added to or taken from the worth of the physical property, make up the value, and include whatever accrues to the property by reason of its operation, or by reason of grants, contract rights, competition, or location, which at the time of appraisal affect favorably or unfavorably the worth of the property.

The worth of the physical property is primarily that on which the value of the whole property rests.

While it is clear that the worth of the physical property, being the cost of reproduction less depreciation, is not necessarily the value of the property, it is equally clear that the physical worth must bear some very definite relation to value, and the writer is strongly of the conviction that this relation is such that "value" cannot be ascertained without a determination of physical worth. The physical property element represents the investment on which a fair return is to be earned, and in most cases an appraisal is necessary for the determination of the amount of money actually invested. As illustration of the fact that "physical value" and "value" are not the same, the case of two railroads actually existing and in operation between two cities in Michigan may be cited.

Road "A" occupies a narrow valley through high and abrupt hills. Its alignment is fair for hilly country; its maximum grade is 1 per cent. It has a number of bridges, all short and low. Its cost of reproduction might reasonably be placed at $28,000 per mile. A mining town at one end ships a heavy tonnage down grade to a lake port at the other.

Road "B" was constructed several years later, and, being barred from the only valley, built a line across the hills, involving heavy grading, very long and high steel trestles, a longer line, maximum grades of 2%, and a heavy climb from the mining town to the summit before starting to drop to the lake. The cost of construction was more than double that of Line "A," and the tonnage which can be hauled in either direction is but a small fraction of that which can be hauled with the same power by Road "A." A reasonable figure for cost of reproduction may be given as $60,000 per mile.[4] 19

Here is clearly a case where the older, less expensively built road has a value as an earning proposition far in excess of that of the new road. The rate on commodities does not affect the relative difference. A higher rate, while permitting Road "B" to live, greatly adds to the value of Road "A," while the latter can operate at a profit on rates which would not permit Road "B" to pay expenses.

This example indicates the existence of non-physical values, not only positive in the case of Road "A," but also negative as to Road "B."

Many properties have been built in the United States, representing large investments of capital, which are not, and some of which can never be, profitable business investments. In all such the physical valuation will exceed the final value where the property is considered as an operating concern, and a negative factor to cover improper location, uneconomical design, ill-advised investment, or whatever the trouble may be, should be applied.

The physical property is that which enables the corporation to do business. Without physical property it could not produce the commodity which it sells. The amount of money actually invested in acquiring that physical property represents the measure of capital on which it is morally entitled to earn interest and profit; and, in the stage of promoting and financing the enterprise, all hope of earnings is based on the amount of money required to construct the property. These considerations lead the writer to contend that the true method of valuing a corporate property is first to determine the cost of reproduction of the property and its depreciation, and modify this figure by any applicable positive or negative non-physical elements of value.

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3. The term "present value," as used in this paper, should not be confounded with its use by bankers or accountants, or with the present worth of a sum of money due at some future time. 20

4. In this case, traffic as to Line "B" is limited, and as it is feasible to double-track Line "A" at less cost than Line "B," no advantage can be assigned to Line "B" on account of development of future business.

The State Legislature of Michigan, at the session of 1899, passed an act creating a Board of State Tax Commissioners and outlining and prescribing their duties. This act authorized the board to "inquire into and ascertain the value of the property of corporations paying specific taxes under any of the laws of this State."

The object of this valuation was to determine the rate at which the corporations were paying taxes, to the end that necessary laws should be passed so that all taxable properties in the State might be taxed uniformly.

On September 1st, 1900, the Board of Tax Commissioners appointed Professor Mortimer E. Cooley Appraiser of Properties. Immediately thereafter the general organization was mapped out along the following lines of division of labor and responsibility:

1.—Administration.—All matters of general policy in regard to the conduct of the work, all matters relating to negotiations and conferences with officials of corporations, all transactions with the State Tax Commission, the Governor, or the Board of State Auditors, and the entire direction of all relations with the public through newspapers and other channels, were retained by the appraiser, who was the final arbiter on all matters referred to him regarding the details of the work.

2.—Civil Engineering.—The appraisal of all property which in the course of construction would fall under the supervision of the civil engineering department of a road, including land, roadway, bridges, and structures, was in charge of the writer.

3.—Mechanical Engineering.—The appraisal of all motive power, rolling stock, and property which in the course of construction would fall under the supervision of the mechanical engineer, including power and electric plants, shop tools and machinery, water stations, etc., was in charge of Mr. Theodore H. Hinchman, Jr., of Detroit, Mich.

In the matter of the final assembling of figures, computation of percentage values, and compilation of final results, Mr. Hinchman and the writer worked together with joint general supervision.

4.—Telegraphs.—The inspection and appraisal of all telegraph properties was under charge of Mr. William S. Conant, of Detroit, Mich.

5.—Telephones.—The appraisal of all telephone properties was directed by Mr. William J. Rice, of New York. 21

6.—Vessel Properties.—All vessels belonging to companies whose property was involved by the appraisal were inspected and appraised by Herbert C. Sadler, Professor of Naval Architecture and Marine Engineering at the University of Michigan.

In the following narrative, no special mention is made of the work executed under the direction of Messrs. Conant, Rice, and Sadler, because they really had charge of independent appraisals which were conducted on lines similar to those adopted in the railroad appraisal, and their methods were not different from those of the latter; hence any description of their work would be in a large measure repetition. This omission is in no wise to be construed as any reflection on the importance or high character of their work.

The organization as just outlined, while necessarily touching and overlapping at points, was generally defined so clearly that there was no duplication of work. Each head of department was responsible for the work of his special division, and directed the laying out and execution of the work done by his men.

The first task, after deciding on the general organization, was to determine the general methods to be adopted and the manner of getting the necessary detailed information. The magnitude of the work was appalling. There were seventy-eight different incorporated companies, owning some 10,000 miles of railroad, scattered over 54,000 sq. miles of territory. In addition, there were a number of small unincorporated railroads, telegraph, telephone, plank road, and other corporations, many of which had no records, no complete inventory, and no department organized so that the information could be readily secured. It was determined:

(1) To make or secure a complete detailed inventory of every piece or parcel of property belonging to each company;

(2) To examine each separate thing, place on it an estimate of cost of reproduction and depreciation;

(3) To prepare, as a basis for the final figure of value, an estimate of the present value, being the cost of reproduction less the depreciation.

Having determined on a detailed physical inventory and appraisal, the next step was to outline the work so as to secure absolute uniformity. The difficulties which confronted the appraiser at this period were many, chief among which were: 22

(a) *Lack of Complete Understanding on the Part of the State Officials.*—The Governor and Board of Tax Commissioners rendered every possible assistance, but the Board of State Auditors was not at first fully committed to the work, and the uncertainty as to whether or not bills would be paid, delayed seriously the employment of men and the full commencement of work for 3 or 4 weeks after the first organization was made.

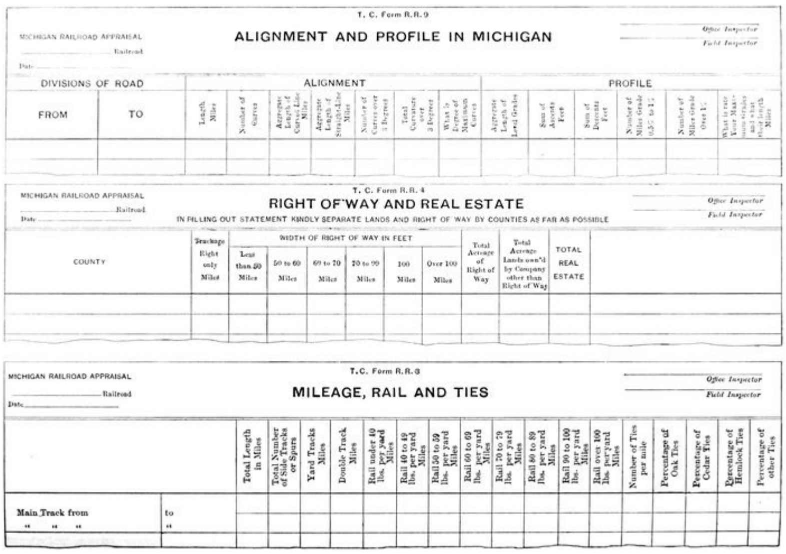
(b) *The Attitude of the Railroad Corporation Managers.*—While this was not actively hostile, it was a serious cause of delay, as they could not foresee what effect the work might have on the interests in their charge, and, while not refusing access to their records, they delayed and held back information; in fact, a long time elapsed before all the companies opened their records to the appraiser and his staff.

(c) *The Confused Condition of the Records.* Many small corporations had absolutely nothing in the way of records of buildings, bridges, land, or other properties. Others had very complete records in certain departments and very imperfect ones in others; still others had records which had every appearance of being complete, but they were not up-to-date.

Facing an appraisal of this magnitude, with a time limit of only 4 months for the entire work, with delays at the outset which seriously hampered the organization for 2 or 3 weeks, the appraiser was compelled to occupy this time in preparing the blank forms to be used on the work, and in conducting correspondence with the men who were to make up the working force, investigating their references, etc.

The blank forms, Figs. 1 to 10, were the result of a series of conferences between the members of the staff. By this time it was quite evident that no great amount of help could be hoped for from the corporations. Had it been possible to secure access to the records of such railroad companies as the Michigan Central or the Lake Shore and Michigan Southern before the final drafts of the forms were prepared, the writer believes that several might have been simplified and many improvements could have been made. However, this was not possible, and the forms were prepared and printed before access to any railroad office had been granted.

23


T. C. Form R.R. 9

MICHIGAN RAILROAD APPRAISAL

______ Railroad

Date ______

ALIGNMENT AND PROFILE IN MICHIGAN

______ Office Inspector

______ Field Inspector

DIVISIONS OF ROAD		ALIGNMENT							PROFILE					
FROM	TO	Length Miles	Number of Curves	Aggregate Length of Curved Line Miles	Aggregate Length of Straight-Line Miles	Number of Curves over 3 Degrees	Total Curvature over 3 Degrees	What is Degree of Maximum Curves	Aggregate Length of Level Grades	Sum of Ascents Feet	Sum of Descents Feet	Number of Miles Grade [illegible]	Number of Miles Grade Over 1%	What is rate Your Maximum Grades and what their length Miles

T. C. Form R.R. 4

MICHIGAN RAILROAD APPRAISAL

______ Railroad

Date ______

RIGHT OF WAY AND REAL ESTATE

IN FILLING OUT STATEMENT KINDLY SEPARATE LANDS AND RIGHT OF WAY BY COUNTIES AS FAR AS POSSIBLE

______ Office Inspector

______ Field Inspector

COUNTY	Trackage Right only Miles	WIDTH OF RIGHT OF WAY IN FEET						Total Acreage of Right of Way	Total Acreage Lands own'd by Company other than Right of Way	TOTAL REAL ESTATE	
		Less than 50 Miles	50 to 60 Miles	60 to 70 Miles	70 to 99 Miles	100 Miles	Over 100 Miles				

T.C. Form R.R. 3

MICHIGAN RAILROAD APPRAISAL

______ Railroad

Date ______

MILEAGE, RAIL AND TIES

______ Office Inspector

______ Field Inspector

		Total Length in Miles	Total Number of Side Tracks or Spurs	Yard Tracks Miles	Double Track Miles	Rail under 40 lbs. per yard Miles	Rail 40 to 49 lbs. per yard Miles	Rail 50 to 59 lbs. per yard Miles	Rail 60 to 69 lbs. per yard Miles	Rail 70 to 79 lbs. per yard Miles	Rail 80 to 89 lbs. per yard Miles	Rail 90 to 100 lbs. per yard Miles	Rail over 100 lbs. per yard Miles	Number of Ties per mile	Percentage of Oak Ties	Percentage of Cedar Ties	Percentage of Hemlock Ties	Percentage of other Ties
Main Track from	to																	
" " "	"																	

Fig. 1.

24

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. ..

INTERLOCKING PLANTS IN MICHIGAN

__________ Railroad

Date__________

Include all Electric Crossings having full Interlockers.

__________ *Office Inspector*

__________ *Field Inspector*

LOCATION	Crossing with	Style of Machine	Wheel or Lever	Connections, Pipe or Cable	Number of Levers or Wheels			By Whom Erected	Date Put in Service	Proportion of Cost Paid by this Co.	Proportion of Maintenance Paid by this Co.	
					Working	Space	Total					

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 8

STATEMENT OF CROSSING PROTECTION IN MICHIGAN

__________ Railroad

Date__________

__________ *Office Inspector*

__________ *Field Inspector*

DIVISIONS OF ROAD		Total Numbers Unprotected Grade Crossings	Number Grade Crossings Protected by Alarm Bells What Device is Used	Number Grade Crossings Protected by Gates. What Device is Used	Total Number of Highway Under Crossings	Total Number of Highway Over Crossings	Total Number of Unprotected Electric Railway Crossings	Number of Electric Railway Crossings Protected by Derailer without Signals on Steam R.R.	Number of Electric Railway Crossings Protected by Derailer with Signals on Steam R.R.	What Proportion do You Pay of Installation or Maintenance of Electric Railway Crossings	
From	To										

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 1

ENGINE HOUSES AND TURN TABLES

__________ Railroad

Date__________

__________ *Office Inspector*

__________ *Field Inspector*

LOCATION	ENGINE HOUSES						TURN TABLES					
	Kind of Structure	No. Stalls	No. Pits	Pit Dimensions Feet	When Built		Length Feet	KIND OF TABLE	Foundation	CURBING	When Built	

Fig. 2.

25

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 2

FIELD INSPECTION REPORT

__________ Railroad

Date__________

Between __________ *and* __________ *Miles* ______ *Number of Tracks* __________ *Ties, C. to C.* __________

Highest schedule passenger train ______ *miles per hour, Freight* ______ *miles per hour.* __________ *Inspector*

MILE	GRADE		TIES		RAIL		BALLAST		FENCE		FROGS AND SWITCHES			CROSSINGS		DRAINAGE	ALIGNMENT	REMARKS
	Yardage	Classification	Kind	Condition	Weight	Condition	Kind	Condition	Kind	Condition	Number	Kind	Condition	Number	Condition			

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 7

BRIDGES

__________ Railroad

Date__________

Include all wooden, steel or combination trusses, all girders and I beams spans - if solid floor and ballast please so state.

__________ *Office Inspector*

__________ *Field Inspector*

Bridge Number	LOCATION	NAME OF STREAM	FOUNDATION					SUPERSTRUCTURE										Date Built
			Frame or Pile Abutments	Stone or Concrete Abutments	PIERS	Approx. Cu. Ft. Masonry Piers and Abutments	Number of Ft. Bridge Seat to Water	Number of Spans	KIND	Length out to out	Specification for Loading Required	No. Panels	No., Size and Kind of Stringers	Size and Kind of Beams	How Supported	Size of Ties	

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 17

DRAW BRIDGES

__________ Railroad

Date__________

In this table furnish data as to draw span and pivot piers only - other spans in other bridge record.

__________ *Office Inspector*

__________ *Field Inspector*

Bridge No.	LOCATION	Name of Stream	Date of Erection	FOUNDATION					SUPERSTRUCTURE					
				Material	Size	Approx. Cubic Feet Masonry	Height Above Water	Approx. Depth Footings Below Water	Length Draw	Kind of Span	Material	SPECIFICATION FOR LOADING	What kind of Power used for swinging	Kind of Turn Tables

Fig. 3.

26

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 10

CULVERTS

__________ Railroad

Date__________

__________ *Office Inspector*

__________ *Field Inspector*

DIVISION		Total Number Stone Box Culverts	Total Number Wooden Box Culverts	Total Number Wooden Open Culverts	18 in or smaller Iron Pipe		24 inch Iron Pipe		30 inch Iron Pipe		36 inch Iron Pipe		48 inch Iron Pipe		60 inch Iron Pipe		Iron Pipe over 60 inch			Total No. Sewer Pipe Culverts under 24 inch	Total No. Sewer Pipe Culverts 24 inch and over	Total No. Pit Cattle Guards	Total No. Surface Cattle Guards
From	To				No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Approx. No. Feet of Pipe	No. of Lines	Size	Approx. No. Feet of Pipe				

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 11

ARCHES

__________ Railroad

Date__________

__________ *Office Inspector*

__________ *Field Inspector*

	Bridge No.	LOCATION	STREAM	Date Built	Length of Span	Length of Arch in feet Face to Face	Height Feet	Approx. No. Cubic Feet Masonry	KIND OF ARCH	KIND OF MATERIAL			
THIS SPACE FOR BINDING													

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 29

CAR FERRY TERMINALS

__________ Railroad

Date__________

__________ *Office Inspector*

__________ *Field Inspector*

GENERAL DESCRIPTION									QUANTITIES					VALUES		REMARKS
Items	Owner	Used by	Location	Date Built	Type	No. Tracks	Dimensions	Struc. Steel Iron and Mech. furnished by	Iron and Steel Pounds	Bolts and Nails Pounds	Piles lin. feet Kind	Lumber feet b.m. Kind	Excavation Fill, Dredging, Cu. Yds.	Estimated Cost		

Fig. 4.

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 20

Railroad

Date

COAL CHUTES

Office Inspector

Field Inspector

LOCATION	Length of Trestle	Kind of Trestle	Foundations	Size of Building	Number of Pockets	Capacity of Pockets	Date Built	Name of Builder	If Hoisting or Conveying Machine in use, State What Kind	

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 19

Railroad

Date

WATER STATIONS

State whether Power is Steam, Gasoline, Wind Gravity, or Hydraulic Ram

Office Inspector

Field Inspector

LOCATION	Source of Water Supply	PUMP			BOILER			PUMP HOUSE				TANK				Length and Size of Suction and Discharge	
		Kind	Size		Kind	Size		Kind	Size		Date Built	Size	Capacity Gallons	Foundations	Date Built		

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 28

Railroad

Date

ORE DOCKS

Office Inspector

Field Inspector

	GENERAL DESCRIPTION										QUANTITIES				VALUES		REMARKS
	ITEM	Owned and Used by	Location	Date Built	Type	DIMENSIONS					Rods, Bolts, Iron, Pounds	Piles Lin. Feet Kind	Lumber Feet B.M. Kind	Fill and Dredging	Estimated Cost		
						No. Piers	Cap. Tons	Hgt. Water to C.L. Hps.	Hgt. Water to Deck	Width	Lgth of Chutes							

Fig. 5.

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 15

Railroad

Date

STOCK YARDS

Office Inspector

Field Inspector

LOCATION	Number of Pens	Size of Yards Feet	Date of Completion		WELLS				
					Depth Feet	Diameter			

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 14

Railroad

Date

TRACK AND STOCK SCALES

Office Inspector

Field Inspector

LOCATION	NAME OF SCALES	Capacity Tons	Length	Date Built				

Fig. 6.

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 13

Railroad

Date

STATEMENT OF MISCELLANEOUS BUILDINGS

Include in this report all shops, warehouses, car houses, watchmen's shanties, flagmen's buildings, elevators, general office buildings and all other structures not specifically asked for in other reports.

Office Inspector

Field Inspector

LOCATION	DESCRIPTION OF BUILDING	SIZE	Kind of Bldg., Brick, Stone or Frame	Date of Completion		

MICHIGAN RAILROAD APPRAISAL

T.C. Form R.R. 12

Railroad

Date

STATION BUILDINGS

Office Inspector

Field Inspector

LOCATION STATIONS	DESCRIPTION OF BUILDING	SIZE	Kind of Bldg., Brick, Stone or Frame	Date of Completion		

Fig. 7.

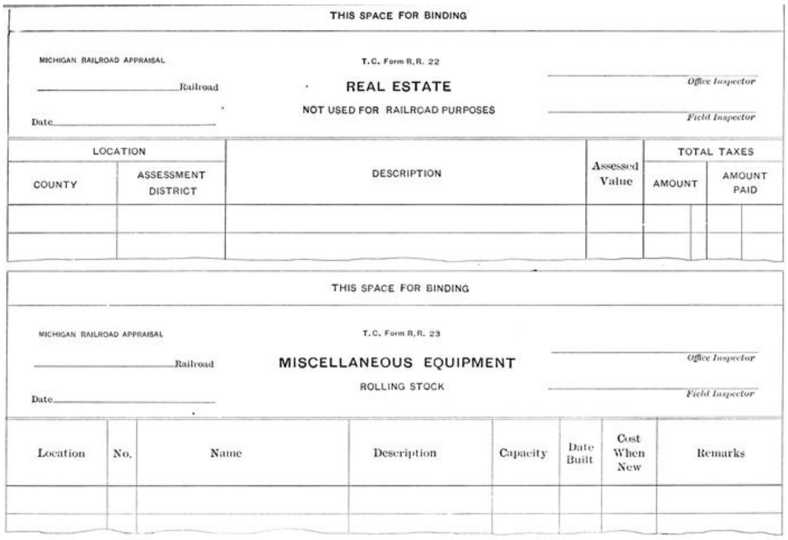

THIS SPACE FOR BINDING
MICHIGAN RAILROAD APPRAISAL
T.C. Form R.R. 22
Railroad
REAL ESTATE
NOT USED FOR RAILROAD PURPOSES
Office Inspector
Field Inspector
Date
LOCATION
COUNTY
ASSESSMENT DISTRICT
DESCRIPTION
Assessed Value
TOTAL TAXES
AMOUNT
AMOUNT PAID
THIS SPACE FOR BINDING
MICHIGAN RAILROAD APPRAISAL
T.C. Form R.R. 23
Railroad
MISCELLANEOUS EQUIPMENT
ROLLING STOCK
Office Inspector
Field Inspector
Date
Location
No.
Name
Description
Capacity
Date Built
Cost When New
Remarks

Fig. 8. 30

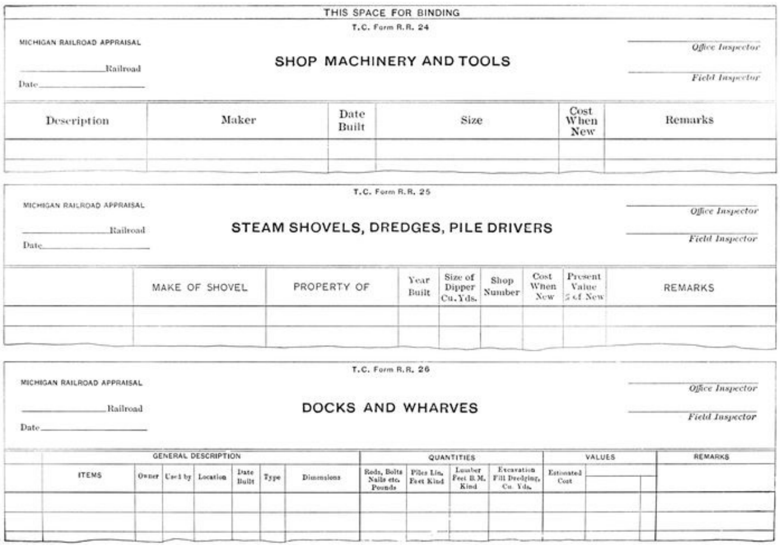

THIS SPACE FOR BINDING
T.C. Form R.R. 24
MICHIGAN RAILROAD APPRAISAL
Railroad
Date
SHOP MACHINERY AND TOOLS
Office Inspector
Field Inspector
Description
Maker
Date Built
Size
Cost When New
Remarks
T.C. Form R.R. 25
MICHIGAN RAILROAD APPRAISAL
Railroad
Date
STEAM SHOVELS, DREDGES, PILE DRIVERS
Office Inspector
Field Inspector
MAKE OF SHOVEL
PROPERTY OF
Year Built
Size of Dipper Cu. Yds.
Shop Number
Cost When New
Present Value % of New
REMARKS
T.C. Form R.R. 26
MICHIGAN RAILROAD APPRAISAL
Railroad
Date
DOCKS AND WHARVES
Office Inspector
Field Inspector
GENERAL DESCRIPTION
QUANTITIES
VALUES
REMARKS
ITEMS
Owner
Used by
Location
Date Built
Type
Dimensions
Rods, Bolts Nails etc. Pounds
Piles Lin. Feet Kind
Lumber Feet B.M. Kind
Excavation Fill Dredging, Cu. Yds.
Estimated Cost

Fig. 9. 31

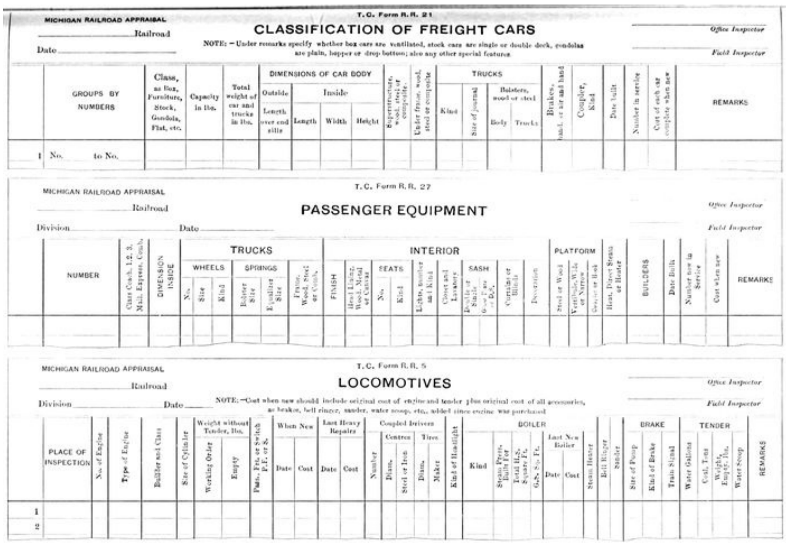

MICHIGAN RAILROAD APPRAISAL
T.C. Form R.R. 21
Railroad
Date
CLASSIFICATION OF FREIGHT CARS
NOTE:—Under remarks specify whether box cars are ventilated, stock cars are single or double deck, gondolas are plain, hopper or drop bottom; also any other special features
Office Inspector
Field Inspector
GROUPS BY NUMBERS
Class, as Box, Furniture, Stock, Gondola, Flat, etc.
Capacity in lbs.
Total weight of car and trucks in lbs.
DIMENSIONS OF CAR BODY
Outside
Length over end sills
Inside
Length
Width
Height
Superstructure, wood, steel or composite
Under frame, wood, steel or composite
TRUCKS
Kind
Size of journal
Bolsters, wood or steel
Body
Trucks
Brakes, hand, or air and hand
Coupler, Kind
Date built
Number in service
Cost of each car complete when new
REMARKS
1 No. to No.
MICHIGAN RAILROAD APPRAISAL
T.C. Form R.R. 27
Railroad
PASSENGER EQUIPMENT
Division
Date
Office Inspector
Field Inspector
NUMBER
DIMENSION INSIDE
TRUCKS
WHEELS
No.
Size
Kind
SPRINGS
Bolster Size
Equalizer Size
Frame, Wood, Steel or Comb.
INTERIOR
FINISH
SEATS
No.
Kind
Closet and Lavatory
SASH
Curtains or Blinds
Decoration
PLATFORM
Steel or Wood
Vestibule, Wide or Narrow
Coupler or Hook
Heat, Direct Steam or Heater
BUILDERS
Date Built
Number now in Service
Cost when new
REMARKS
MICHIGAN RAILROAD APPRAISAL
T.C. Form R.R. 5
Railroad
LOCOMOTIVES
Division
Date
NOTE:—Cost when new should include original cost of engine and tender plus original cost of all accessories, as brakes, bell ringer, sander, water scoop, etc., added since engine was purchased
Office Inspector
Field Inspector
PLACE OF INSPECTION
No. of Engine
Type of Engine
Builder and Class
Size of Cylinder
Weight without Tender, lbs.
Working Order
Empty
When New
Date
Cost
Last Heavy Repairs
Date
Cost
Coupled Drivers
Number
Centres
Diam.
Steel or Iron
Tires
Diam.
Maker
Kind of Headlight
BOILER
Kind
Last New Boiler
Date
Cost
Steam Heater
Bell Ringer
Sander
BRAKE
Size of Pump
Kind of Brake
Train Signal
TENDER
Water Gallons
Coal, Tons
Water Scoop
REMARKS
1
2

Fig. 10. 32

That a few changes were made in 1904 was to have been expected; that these forms were almost in their entirety made a basis for the similar work of the Wisconsin appraiser, some three years later, was in the nature of a high compliment and goes far toward answering the criticisms of this part of the work, generally to the effect that the forms call for much more information than could possibly be used, and that they show lack of care in arrangement. 33

It may be said here, properly, that the uncertainty as to the final attitude of the companies made it essential that the appraiser prepare, if need be, to make his inventory by personal inspection in the field. Indeed, this was done in the case of several roads, and, while most of the companies finally accorded every courtesy, either giving the appraiser access to their records, or furnishing the information desired, it is not probable that the shortness of the time limit would have enabled the appraiser to secure any sort of result had a modified plan been adopted.

The law provided no requirement that the companies should furnish any information. In order to secure the data, it would have been necessary to employ a large number of men, and this would have been such a serious expense to the companies that refusal to comply would probably have followed such a request. Many of the companies had no men in their service able to prepare the required data; and, finally, eight or ten men after having worked in the files of companies owning reasonably full records, were much better able to take off the desired data intelligently from the records of other companies than men unfamiliar with the needs of the appraiser and with no prior experience. Then, too, the work secured was that of one body of technical men, all experienced in different phases of railway work, and thus was uniform and consistent. Had seventy-five or eighty different men or sets of men prepared these inventories, there would

certainly have been a great variation in their worth and reliability.

It must be kept clearly in mind that lack of time was the main feature which kept the appraiser from considering any such plan of co-operation with the railroads as was adopted later in Wisconsin and Minnesota, and that no distrust of the railroads, or lack of desire to co-operate, had anything to do with the appraiser's decision to use the method which was adopted.

Shortly after the preparation of the blanks, access was granted to the records of the Ann Arbor Railroad, and almost immediately thereafter several other companies opened their files to the appraiser; the State Board of Auditors determined to pay the bills, as approved by the appraiser; and the initial difficulties were so far removed that it was possible to carry out, without any further delays, the plan of organization which had been perfected. 34

The personnel of the staff was considered to be of the greatest importance, and, in the selection of men, the requirements desired were: experience in the construction and operation of railroads, thorough technical training, high standing in the Profession, as shown by membership in the American Societies of Civil or Mechanical Engineers, or of other Societies of high standing, and high moral character. Politics, residence in the State, or local influence, had absolutely no weight in the selection of any of the men. In a number of cases men were secured who had for some years occupied the position of Chief Engineer of important lines. In a very large number of cases men who were engaged on this work have since its completion held the position of Chief or Principal Assistant Engineer of important railroads, and practically all of them returned to railway service. Dozens of these men are well known, and their work deserves that full credit should be given to each, but it is impossible to do so within the limits of this paper.

The minor positions, such as assistants in the field and in the computing and compiling rooms, were assigned to younger men, generally with some railroad experience, and in many cases they were graduates of technical schools, Cornell, Yale, Rensselaer, Michigan, Ohio State, and other schools having representatives.

The writer believes that no more harmonious or loyal organization was ever gathered together before, or has been since. Men who had held Chief Engineer-ships trudged miles in the wilds of Michigan on foot, inspecting and inventorying property, and came into the office and worked long hours at the computing tables with the utmost cheerfulness and *camaraderie*. There was complete harmony, absolute loyalty, and as perfect a spirit of unselfish devotion to the work as the writer has ever seen in any organization.

The fact that such a staff of engineers, of wide experience in railroad construction and maintenance, had been assembled, made it feasible to carry out a plan of the appraiser which proved to be of great value. At frequent intervals, during the progress of the work, conferences were held which were attended by all the heads of departments and by many of the older and more experienced engineers. Matters of policy, details, general principles, and rules and methods for conducting the appraisal, were fully discussed, and stenographic records were made of the discussion and conclusions. These conferences covered practically every question that arose; they were of such a nature as to draw out the opinions of the men fully and freely; and their effect was to eliminate the error due to individual judgment, and harmonize and unify the methods and results of the appraisal. 35

Special emphasis has been laid on the organization of the staff, because the criticism has been made that this work was lacking in care, was hurriedly done, and was unreliable. The work must be judged by its results, but the criticism that it did not receive proper care is absolutely unjustified in fact. The men engaged were of the highest type of experienced, technically educated, and highly qualified engineers; they entered the work unreservedly, and gave the best there was in them. The Michigan appraisal was not a one-man job; it was the work of many men, and all are entitled to credit.

That some men in an organization such as this, gathered from all over the United States, should prove to be lacking, and should fail to hold their place with their fellows, was to have been expected. That the number of such men should not exceed half a dozen was remarkable. In fact, almost every such case was found when the first notes were returned to the office, and in only two or three instances was it necessary to send a second man to do work which had been once covered. In several cases men were sent over certain sections which had been inspected by some one else, with a view of getting an idea of the personal judgment of the different men, but in such cases the results were astonishingly close, and created the greatest confidence in the figures of depreciation which were being received.

Looking back on this work, after the lapse of 10 years, after having fully reviewed it twice, and examined all records, after having heard the men engaged on it testify in court, and knowing the record of these men since the completion of the work, the writer believes himself fully justified in stating that, no matter what opinion may be held as to the accuracy, reliability, or value of the result, no charge of carelessness, neglect, undue haste, or lack of consideration can be sustained as against the staff. 36

To strengthen the work further, to eliminate the element of personal error, to guard against the danger of dulled perceptions due to constant application to the work, and to forestall, if possible, every point of objection to methods, a Board of Review was chosen by Appraiser Cooley to whom were referred:

(*a*) The methods of inventory and valuation, as determined by the staff;

(*b*) All points on which special discussion or difference of opinion were noted in the working conferences;

(*c*) Questions as to elements of value in the physical property which were in themselves not tangible or capable of inventory; and finally,

(*d*) The results of the whole work.

The members of this board were chosen on account of pre-eminent standing in the Profession, and on account of experience and prominence in railway engineering. The board was composed of four men, as follows:

Chairman, Octave Chanute, Past-President, Am. Soc. C. E., former Consulting Engineer, Atchison, Topeka, and Santa Fe Railway, but at the time not engaged in active railway work.

George W. Vaughn, M. Am. Soc. C. E., Engineer in charge of Track Elevation in Chicago.

Charles E. Greene, M. Am. Soc. C. E., Dean of the School of Engineering, University of Michigan.

Charles Hansel, M. Am. Soc. C. E., former Engineer, Wabash Railroad, former Chief Engineer, Illinois Railway and Warehouse Commission, and at that time General Manager of the National Switch and Signal Company.

These gentlemen were not engaged in any detailed work on the appraisal; they came to the work for one week each month with minds entirely clear of all confusion raised by issues of detail, and were thus enabled to pass as a court upon all matters laid before them. Their association was of inestimable value in giving confidence to the members of the staff. The many years of railway service of Messrs. Chanute and Vaughn, and their unquestioned ability in that special field of engineering, gave the stamp of finality to points decided by them. The special knowledge of Mr. Hansel in the field of signal engineering, and his known ability as an expert in organization and administration, were of the greatest value. The service of Professor Greene was that of the analyst and logician; his clear and judicial mind enabled him to formulate the final arguments in many cases under consideration. 37

The writer wishes to make it perfectly clear that he has not attempted to minimize the work of Professor Cooley by stating the exact relation of the many engineers on the staff to this work, but to bring out and emphasize the fact that no one man, or no two or three men, were responsible for any single part, but that the whole represents the best efforts of sixty or seventy experienced men working to secure a fair, honest, unprejudiced, engineering estimate along such lines as would eliminate, as far as possible, all errors of individual judgment.

It has never been claimed for the work that it was perfect, or that it was entirely free from errors. It has been and is claimed for it that it probably represents as close and conservative an estimate of cost of reproduction and depreciation as it would be possible for any set of men to make under the conditions then existing.

Professor Cooley was in constant touch with the work, knew its every detail, passed upon and approved every rule and order, presided at every conference, and nothing more than his activity, optimism, and constant watchful care and tireless energy kept the force at work day and night and brought about the prompt completion of the details. His recognized high standing, his remarkable ability as an executive and organizer, and his powers of diplomacy, more than anything else, brought about the final acquiescence of the railroad managers and kept up the confidence of the State authorities; his personality pervades the entire work. After giving all due credit to the staff, and they were entitled to much credit, the real honor must go to Professor Cooley. It was his conception, his plan, and the brunt of the battle was his.

The preliminaries of the organization having been completed, and the forms prepared, a portion of the working force was brought on the ground, and the work was actively commenced. It was subdivided into four parts: 38

(*1*) Office inspection, or inventory;

(*2*) Field inspection;

(*3*) Computation;

(*4*) Compilation for the permanent record.

The men chosen as field inspectors were old and experienced railroad engineers. As far as possible, they were assigned for a short period to office inspection, then they were sent into the field, after which they worked at the computation of values; so that each man was engaged on many different phases of the work, and handled the notes of many of his fellows, and no one man made up one complete appraisal, except as specially noted.

Making the Inventories.—Office inspection, or the preparation of inventories, was assigned to parties usually of one or two experienced men with from two to four younger engineers as assistants in the computing-room. These men went to the general offices of the railroad companies and made a complete examination of maps, profiles, bridge and building records, records of motive power, rolling stock, etc. In short, they prepared, as far as it was possible to do so, a complete inventory of every building, structure, or piece of property owned by the road; they took off complete abstracts of real estate and right-of-way records; they noted principal yards and terminals, and secured maps of such as were most complex, or furnished lists of such maps and records as were most essential for the field men, and they made as complete a report as possible of the corporate history of the road and the general condition of its engineering records. No effort whatever was made to examine or audit the financial books of any company, or to secure from such books any data as to cost of property; the work was entirely limited to the listing of physical property.

Most of the railroad companies co-operated, and gave access to their records; one or two filled in the forms; a number had practically no records, and only one or two companies withheld information. Requests for blue prints of large yards and terminals, and of plans of standard structures were generally granted cheerfully, and, although there was no such spirit of co-operation as was shown later by the Wisconsin roads, much labor was saved by the data furnished.

The result of the office inspection was the filing of inventories, which were generally quite complete, the securing of maps and plans, the gathering of data as to prevailing prices of labor and material, and the securing of some very valuable cost data as to special structures and classes of structures. All inventories were made up for roads, or for divisions of roads, with each class of property listed separately, for example, station buildings, interlocking plants, bridges, etc., so that, if necessary, any special class of inspection might be assigned to one man, while to others could be assigned the remainder of the work on that particular road or division. 39

Office Inspection as a Check on Field Work.—The office inspection furnished many valuable data for checking the judgment of the field men. For example, the number of cubic yards of excavation and embankment on probably the greater part of the mileage had to be secured by the field inspectors, either because the records had not been kept or the changes of line and grade had been so extensive as to destroy their reliability. Every field inspector, therefore, made his own estimate of the yardage of pay earth. The office inspection reports, however, gave reliable data (from profiles or original contract estimate files) of the actual yardage on possibly 2000 or 3000 miles of line, so widely scattered that it constituted a check on the work of a majority of the field men.

This work of office inspection disclosed the following points, which will be practically common to all large valuation jobs:

(*a*) There was no uniformity of method in the keeping of records of permanent way and structures;

(*b*) There was a vast amount of carelessness in keeping records up to date, even on the larger roads;

(*c*) The smaller roads, not only had little or nothing in the way of records, but had in many cases no department with employees qualified to make or keep such records;

(*d*) The purchase of new equipment, the construction of new buildings and bridges, and the destruction, sale, or removal of old property, create a condition of continuous change which is seldom recorded by either operating or accounting officials, and makes book inventories derived from the roads of very doubtful value for use in an appraisal.

Field Inspection.—The decision had been reached, after careful discussion, not to permit the field inspectors to place a money value on any structure, but to examine it, make a full description of it in all particulars, and assign to it a percentage which should represent the present value, or the depreciation from a similar new structure rated at 100 per cent. 40

The field inspectors were furnished with the records of the office inspection covering the district assigned. They were given notebooks, tape lines, and various blanks for reporting progress and recording original estimates in the field. Provision was made for inspection by the field men, either by the use of hand-cars, gasoline inspection cars, or velocipede cars, although, with one or two of the roads, no satisfactory arrangement could be made, and the men were compelled to go on foot. A careful inspection of every structure was made. If any correction to the office inspection record was necessary, it was made; if the structure was new, it was carefully measured and described, and everything noted which would be of service in estimating its value. Side-tracks were measured, and the weight and type of rail noted. All culverts and bridges were examined, described, and their condition noted. Estimates were made of excavation and embankment, clearing and grubbing, etc. (based on the standing timber at the time of the examination), and careful estimates were made of classifications of material. The records of the field inspector generally contained only the description and the percentage, but, occasionally, when apparently valuable information as to cost of any particular structure was available it was noted, as was special information of local matters affecting the value of any part of the work.

It was the plan (carried out with but few exceptions) to complete the record with the field inspector so that from his notes a full and accurate descriptive inventory might be made. There were a few exceptions to the general method of field inspection work as outlined, which were:

Special Work on the Chicago and Northwestern Railway.—The Chicago and Northwestern Railway had no records of any sort, all construction papers having been destroyed by fire. This company organized and placed in the field four complete engineering parties, each under one of its own engineers, and with each party was sent one field inspector. The line was carefully surveyed and cross-sectioned, and complete records of every building and structure were made, side-tracks were measured, and data taken for rail and ballast charts, etc. All work was done in the presence of the field inspector, and he was given copies of all notes. He placed his own percentage of depreciation on everything. The estimates, made up independently by the Chicago and Northwestern engineers and the appraisal staff, using in the latter case the same unit prices as applied elsewhere in the Upper Peninsula, varied less than 2 per cent. 41

Special Valuations.—Certain special structures, such as ore docks and ore and coal handling machinery, were of such a character as to require expert appraisal. These were examined in the field, appraised, and valued by G. H. Hutchinson, M. Am. Soc. C. E., whose special training and experience in such work had qualified him perhaps better than any other man. Interlocking and signaling plants were specially appraised by the late Elliot F. Moore, who for 10 years had been Engineer of the Michigan Railroad Commission, and whose intimate personal knowledge of almost every plant in the State specially qualified him for this work.

Some of the bridges were of such a character as to require expert knowledge, and this inspection was assigned to William Dunbar Jenkins, M. Am. Soc. C. E., a man of ripe experience and sound judgment. The larger and more elaborate station buildings were examined and appraised, and values finally placed by Mr. F. G. Susemihl, Chief Architect of the Michigan Central System, whose special work in railway buildings made him thoroughly familiar with these values.

Work equipment and special equipment were appraised by Mr. G. L. Lewis, who had been connected with the Marion Steam Shovel Company for many years.

Except for these special assignments, all the field inspection was handled in accordance with the appraiser's plan.

As stated previously, in only two or three cases was it necessary to re-inspect, and, while several sections were intentionally gone over a second time, without letting the field inspector know who had done the work previously, or what his percentages had been, the result of all these checks was to justify the figures in the earlier inspection and to strengthen confidence in the work.

The field inspection of the Mechanical Department involved examining and placing a percentage value on each locomotive, passenger car, and piece of special equipment, and on all shop machinery. Inasmuch as several points of special interest are involved in this inspection, it will be discussed at more length in the section of the paper relating to the methods of work of the Mechanical Department. 42

Computation.—After the completion of the field inspection, all notes were placed in the hands of the computing force. This organization consisted of two classes of men, engineers brought in from field inspection, and younger engineers. All computations were made independently by two men, and all work was checked carefully.

Every man in the computing room was furnished a large bound blank-book, in which he was required to make all his notes and

computations, no figures of any sort being made on loose paper. The name of each man was placed on his notebook, and each set of field and office inspection notes worked upon by him was signed with his initials. It was easy to trace the work of every man, and in the subsequent trial of the Tax Cases, every man in the service returned, and, not only testified as to his office and field inspection, but was able to turn to and identify all the computations made by him, and produce his original figures and memoranda.

Very soon it became evident that such a volume of reports, notebooks, memoranda, maps, plans, pamphlets, and other data was being accumulated that, unless a special system was developed for filing and handling in the office, the confusion would be serious and costly.

Filing in Office.—The system of filing and record keeping had the merit of being simple and inexpensive. There was borne in mind, in devising this plan, the necessity of keeping all papers connected with one division of any road together, the need for reducing to a minimum the labor of filing and indexing, the constant use of papers, and their frequent withdrawal from the files, making it necessary that they could be at once located when they were not in the files.

The vault in the appraisers' office was arranged so that large manilla envelopes, each of sufficient size to hold all the reports, notes, maps, etc., of each road or division, could be filed vertically. Each road was given a number; if there were several divisions, each division was given a letter, as "15-*A*," "15-*B*," etc., and each division was filed separately.

Every report, book, map, or other paper was stamped with its road or division number and letter, and given a sheet number. In this manner every paper was identified, and could be at once placed. A record was kept in a book, describing every paper filed in each envelope. 43

In issuing papers for work, the entire file was taken and kept together at all times.

One man had charge of the filing and recording, and no one else was permitted to enter the vault. When a file was withdrawn, a receipt was taken, and was put in the place of this file; and when the papers were restored to the vault the receipt was destroyed.

The system proved adequate, and was much less cumbersome than a more elaborate system of card indexing of separate papers could possibly have been.

The net result of office and field inspection had been an inventory based on the railroad records, checked by a man in the field, with a percentage representing the field inspector's judgment as to depreciation, together with a considerable number of special data as to original cost, etc. It was now necessary to place figures of estimated cost of reproduction and depreciation in terms of money.

The State of Michigan is made up of two peninsulas, widely separated, with radically different conditions prevailing as to certain items of the cost of construction.

Computation Tables.—This appraisal involved seventy-eight incorporated and forty-seven unincorporated railroads. It was necessary to adopt such a system as would apply uniform methods and prices to all like property. Accordingly, the field inspectors were assembled, and, after conference, it was determined to prepare a set of tables, covering all classes of railway construction, material, and structures, values being computed for 100% value, and for each 10% depreciation. These tables covered different weights, sizes, and types of structures and material, and were all computed on the basis of the agreed estimated cost.

Unit Prices.—The unit prices were the result of a most careful study and discussion. For many items, such as clearing, grubbing, earthwork, masonry, etc., the price was fixed by agreement during the discussion at a figure which represented the fair average cost of this particular item during the 5-year period preceding the appraisal.

For rails and rail structures, an average price was secured from market quotations for a period of 10 years, a price was determined as the value of scrap, and the percentage of depreciation was applied to the wearing value of the rail. The unit price was $28; the agreed scrap value was $12, leaving $16 as the wearing value of the rail. If an inspector reported rail at 90%, or at 30%, this percentage was taken from the $16 wearing value and to this was added the scrap value. The tables were arranged so that, for any weight of rail and any percentage, the cost of reproduction and the present value could be taken from the tables in dollars per mile. The same was true of bolts, spikes, angle-bars, fish-plates, and frogs and switches. 44

In the case of material such as ties, where no scrap value could be attached, the percentage was applied directly to the first cost.

In the case of bridges, the tables gave weights per foot and per span for various lengths, types of structures, and loadings, and only the cost of reproduction was estimated.

Estimated costs per cubic foot were deduced for buildings of various standard railroad types and per square foot for depot platforms. These figures were obtained by reducing to this basis the cost of a large number of buildings of known cost, by comparison with data obtained from railroad companies and from a number of engineers who had kept such records, and by consultation with architects. These building tables did not apply to the more elaborate and costly structures, all of which were appraised specially.

Ballasting, track laying, and surfacing were divided into three and four classes, in order to cover the different general types of railroads, and prices per mile were fixed. On Upper Peninsula roads ballasting was estimated at a higher price than on Lower Peninsula roads, while ties and timber construction were estimated at a lower figure.

In addition to these prices, secured by averaging several years' quotations, or by agreement of experienced construction engineers, many valuable figures were obtained from manufacturers of locomotives, cars, mechanical equipment, and bridges; and in several cases access was given to the mechanical cost data of the larger roads. Specifications for locomotives, cars, and shop tools were sent out to builders with a request that they give average prices for a period of years.

From all this mass of data the unit prices for the valuation were determined. For locomotives, values were plotted for engines of different weights, in order to establish a curve, and curves representing deterioration, scrap value, and major repairs were also plotted, so as to ascertain diagrammatically the value of an engine of given weight and stated condition. 45

The tables and diagrams proved of incalculable benefit in reducing the work, and in securing that absolute uniformity of method necessary to give the appraisal standing.

It may not be amiss to state here that in such a work no set of unit prices could possibly be adopted which would not work some apparent injustice. A number of Michigan lumber roads were of the cheapest possible type of construction, and any unit price applied to ties or timber, which would be at all reasonable for such roads as the Michigan Central, Grand Rapids and Indiana, Pere Marquette, and others, would be far in excess of the actual money paid out by these little roads. A few individual instances of such apparent discrepancy were cause of complaint and criticism, but, on analysis, very generally, these did not appear to be anything but a disagreement with book values, in which ties cut off the right of way were treated as having no cost; or in some similar item certain local conditions may have made the first cost so low as to amount to a donation of property. Conceding the propriety of the objections, the reason for making the appraisal was to furnish information on which the legislature might determine whether the State should go from a specific to an ad valorem basis, and in view of this purpose the objections became unimportant, as they applied to but a few miles of road.

Classification.—All work of computation was classified in strict accordance with the Interstate Commerce Commission's classification of construction accounts, to which were added one or two classifications not recognized by that Commission, and final summaries were returned on sheets similar to those illustrated by Figs. 1 to 10.

In computing, the staff made use of all data of every nature which was before them, checked the judgment of the field inspector wherever any reliable data were furnished, took into account age, special notes, or costs, and, in case of any serious discrepancy in his percentage, reported to the head of the department for either a re-inspection or for a conference with the appraiser and inspector. In this department every possible safeguard was thrown around the work to insure its absolute mathematical correctness, and to guard against errors in the personal equation. 46

Compilation.—After the calculations were checked and completed they passed to the compilers, who arranged and classified them, and prepared the form of the final report. This consisted of a detailed list of every piece of property and every structure, with a short description and specification, and a statement of estimated cost of reproduction and present value. The division is made by roads, by divisions of roads, and by counties. This was done after the completion of all other work, and the disbanding of the organization, a small force being retained by the State to compile and put in permanent form all the papers of the appraisal. This work was done under the direction of Messrs. James Walker and O. C. Le Suer in consultation with Professor Cooley.

The final compilations were typewritten on large sheets and bound, and constitute the final record of the physical valuation. After the completion of the 1900 appraisal, all papers connected with the work of the computing office were arranged in proper order and bound.

The Civil Engineering section dealt wholly with fixed property located entirely within the State; and the work offered no special difficulties in the way of assignment of values. It is true that, when the question of terminal values was under discussion, the Wisconsin and Michigan Railroad offered a very pretty example, in that the revenue-producing half of its mileage lay in Michigan, while its shops, yards, docks, and car ferries, comprising the great bulk of its physical property, were in Wisconsin. This instance merely emphasized the fact that no State valuation of an interstate property can settle finally and definitely all the questions that arise.

Assignment of Value to States.—The Mechanical Department was compelled to handle the valuation of moving property, and to assign values as between the States on such a basis as would be fair to all parties. The Courts have been inclined to view the distribution of values between territorial units on the track-mileage basis as being a fair one. The study of the problem in Michigan indicates that while 47
this method, perhaps, is just in most cases, it will not hold in all. Assignment was made upon several bases, as follows:

(*a*) Main-line mileage;

(*b*) Total track-mileage;

(*c*) Car- and locomotive-mileage of equipment operating in Michigan;

(*d*) Car- and locomotive-mileage, entire equipment;

(*e*) Freight-car mileage of the entire system.

The results secured by these different methods show, in many cases, very little difference; all are close, and no injustice is worked by any method, while, in other cases, the figures are widely divergent.

The Lake Shore and Michigan Southern Railway owns a high-class main line between Chicago and Buffalo, and for part of the way there are two lines several miles apart; the entire line is double-tracked, and there is much third track. None of this line is located in Michigan, except some 80 miles of single-track main line of the Michigan Division between Toledo and Elkhart. The company, however, has several hundred miles of branch line in Michigan, which comprises most of the branch-line mileage of its system. These lines, generally, are far inferior to its main line.

Any apportionment of its equipment between States on the basis of either line-mileage, total track-mileage, or locomotive- and equipment-mileage of total equipment will result in the assignment to Michigan of a value far in excess of a proper or fair amount. An apportionment of locomotive and passenger-car equipment on the basis of equipment-mileage or equipment operating in the State, and for freight cars on the basis of car-mileage of total equipment, was found to be most fair.

In making the assignment of values, this study was made for all interstate roads, and such basis used as was apparently most fair in each case, the department making a special effort not to assign to Michigan undue values or those which could not be sustained.

Freight Car Inspection.—One of the most perplexing problems which was faced by the Mechanical Department was the proper and satisfactory inspection and valuation of freight equipment. The freight cars owned by the companies were scattered over the United States and Canada, and the inspection of any considerable percentage of those owned by any company was, of course, an impossibility. The fact that these cars had been purchased in series, so that there were considerable numbers in a group, all of the same age, and built 48
according to the same specifications, made possible a valuation by groups. The acceptance, however, of any arbitrary percentage of depreciation by years, or the acceptance of the rules of depreciation of the Master Car Builders Association, without making independent investigation with a view of establishing the correctness of the rule, appeared to be unwise.

The several companies submitted carefully prepared statements of equipment. These statements were compared with the equipment register and the reports to the Commissioner of Railroads. The prices used were those of the rules of interchange of the Master Car Builders Association wherever applicable.

Prices were furnished by the leading manufacturers, and in many cases were secured from the books of the railroad company.

In order to determine the condition of the equipment, the inspectors of the department personally examined 32,000 freight cars in Michigan and adjoining States. Their reports were separated, classified, and analyzed by groups, with the result that the inspection fully confirmed and justified the use of the rule for depreciation of the Master Car Builders Association, which was therefore applied. In the 1902 appraisal this rule was accepted without any inspection or further study of the problem.

The criticism of this part of the work by the appraiser of the State of Washington is wholly unjustified, as the work was necessary in order to qualify in Court and defend the rule adopted, and the actual cost of the work was small.

Locomotives.—The inventory of locomotive equipment was secured from the companies, and checked against reports and the equipment register. Personal inspection was made of every locomotive in the State, then a complete description was prepared, and the percentage of depreciation assigned. Curves of depreciation had been computed and plotted, and the figures of the inspectors were compared carefully with the curve in order to eliminate possible errors.

Vessels.—Professor Sadler's appraisal of vessels involved a personal examination of every vessel. This survey included:

(*a*) The hull of the vessel and general equipment;

(*b*) The machinery and boilers.

An independent estimate of the cost of reproduction and depreciation was made, and, wherever possible, this was checked by 49
comparison with the detailed original cost. In case of material difference, various shipbuilders were consulted, and independent estimates of cost were secured. In every case these latter estimates were confirmatory of the estimated cost of reproduction, which figures were used throughout the appraisal.

Overhead Charges.

There are certain expenses connected inseparably with the construction of any public work, which, on the completion of that work, are not capable of physical identification, but which, nevertheless, belong to and must be a part of the cost of the physical property. These expenses are legitimate; and, as long as the property is operated, a very large part, if not all, of the entire expense remains in the present value of the property as a "going concern."

Appraiser Cooley and his staff took up the discussion of these items and disposed of those which were carried into the valuation by the placing of a percentage. These items are:

Engineering.—This covered all the cost of preliminary and location surveys, design, and supervision of construction of the work, and all expenses connected therewith. This was covered by a charge of 4% of the cost of reproducing the permanent way and structure, but not the equipment.

Legal Expense.—This item is inseparable from the construction work, and was fixed at one-half of 1% of the cost of the same items as affected by the engineering charge.

Organization Expense.—This covered the cost of promotion, financing, and general supervision of construction, together with general office expense. These items were covered by an application of 1½% of the cost of the above items.

Interest.—This item is intended to cover interest on money during the period of construction. The length of time taken to build would, of course, be variable. It was assumed that 3% on the entire cost of construction and equipment would be conservative, and this figure was used.

Discount on Bonds.—This was not included, for the reason that it was considered, not as a proper capital charge, but rather as an adjustment of the interest rate to the existing market condition, and as chargeable to interest account and not capital.

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The discussion among members of the staff indicated such a wide range of opinion as to the proper percentages to apply, that the final determination of the rates was passed upon by the Board of Review. There can be no question as to the propriety of these items as proper elements in the first cost of construction of a new railroad. On the theory that the cost of reproduction of the physical property should include every item of expense which would enter into the cost of reproducing the property as it existed on the date of the appraisal, they are proper terms to include in the appraisal. As to whether the fixed rates were high enough in every case, is an open question.

The Charge of Ten Per Cent. for Contingencies.—Perhaps no single feature of the Michigan appraisal of physical property has been so generally criticised as the charge of 10% of the entire estimated cost, including all the percentage charges, to cover "contingencies."

At the time the first appraisal was made, the writer was not at all satisfied that such an item, in such amount, should be included. The reasons advanced were so strong that it was done, and the writer's subsequent work has fully convinced him that it was proper and justifiable, because:

(*a*) The conditions under which this particular inventory and appraisal were made, as to time and lack of co-operation of the companies, made it practically certain that some items of value were missed in the appraisal, such as station and miscellaneous equipment, frogs, switches, track structures, buildings owned by the companies and occupied by others, etc.

(*b*) That there were many and large elements of physical cost not ascertainable by a physical inspection, such as deep foundations, many thousands of yards of earth in swamps and sink holes (a very general condition of roads in the Southern Peninsula), concealed classification due to growth of grass or washing of banks, and many other cases of work actually done, invisible after a lapse of years. The writer knows of many such instances on property which was in his charge many years ago; in several cases there were expenditures of from 0,000 to $50,000 which are now entirely invisible to an engineer passing over the line.

(*c*) The failure on the part of railroad companies to keep anything like a complete history of construction operations, and the changes of operating officials from year to year, cause the loss of record of practically all the expense due to extra hazard and risk which the construction engineer provides for by his "contingencies."

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(*d*) The inclusion in operating expense, every year, of sums which are properly construction, and which, if added to unit prices of construction work, would cause the cry that such unit prices were too high. For instance, the appraisal estimate on earth was 17 cents per cu. yd., with no allowance for overhaul. Very much of the grade in the State had actual costs far in excess of this figure, and practically every road spends a large sum annually for the first four or five years, which is charged to operation but is in reality a part of the cost of completing the roadbed.

(*e*) No account was taken of appreciation of any of the elements entering into a road. There is no doubt that roadbed, for example, does appreciate, due to ballasting and track work. These items go far toward accounting for the contingencies item on an old road such as the Michigan Central.

(*f*) There is a considerable amount of cost, which cannot be taken out of capital, where facilities are abandoned or line or grade changed. These changes are common to all growing roads; they are due to the demands for greater traffic; they are necessary to the welfare of the community served; they are often made at points where no charge of defective design will apply. They might be termed expenses due to the development of the State, and, in the development of the railroad business, they were absolutely necessary for its present standard of efficiency. They are incapable of exact and definite determination, and must of necessity be included as contingent expenses.

In the case of a new road, where the exact cost is ascertainable, the records have been fully kept, the original plans are on file, and the history is fresh in the minds of the officials, it will be readily admitted that a charge for contingencies in large amount would not be justifiable; but, in the case of the Michigan Central Railroad, a line more than 50 years old, which has changed, rebuilt, and added largely to its property; in the case of the Pere Marquette Railroad, made up of the union of a dozen lesser properties, without any complete history; in the case of dozens of little lines, without maps, profiles, or records, some such allowance is fully justified and proper.

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The experience of the writer, in the years that have passed since these appraisals, leads him to the opinion that the difficulty of estimating values on an old property are such that in many cases an appraiser might add, with perfect propriety, even more than 10% for the contingency item.

In computing overhead charges, no allowance was made for working capital, and no addition to the physical valuation was made to cover any such element as "going concern" value.

Right-of-Way Values.

Land values were the subject of a great deal of discussion during the appraisal of 1900, but subsequent investigations as to actual railroad purchases resulted in quite radical changes in some of the figures in the later valuations. In view of the fact that many criticisms of these values have been made by railway attorneys, special emphasis is here given to the subject. The conclusions reached in Michigan in 1902 agree so closely with the conclusions of Taylor in Wisconsin and Morgan in Minnesota that it is thought advisable to give a rather full account of the methods used in both appraisals, and the line of reasoning which brought about the changes made in 1902.

The 1900 appraisals methods were as follows: Work in Detroit, Grand Rapids, Saginaw, Bay City, and some other large cities was assigned to special appraisers, who visited the cities, examined critically all the property, conferred with leading real estate men and experts in values, and placed an estimate per acre or per square foot. This part of the work was done with great care, and was substantially unchanged in the later appraisals.

In all other land valuations, in cities and villages, and country right of way, a personal examination was out of the question without making a very large and expensive addition to the staff, as the field engineers generally were not familiar with realty values, and could not take the time to make the large number of inquiries. The appraiser did not see his way clear to organize a special department, therefore the matter was turned over to a sub-department of the Civil Engineering Section, the work of which may be briefly outlined, as follows: 53

Lands were classified as:

(*1*) Farm land,

(*2*) Barren land,

(*3*) Villages having a population of less than 500,

(*4*) Villages from 500 to 3,000,

(*5*) Cities having less than 10,000,

(*6*) Cities having more than 10,000.

The percentage of waste land was fixed as a result of interviews with roadmasters, superintendents, and other officials and employees of the roads, by reports from field inspectors and others.

Letters of inquiry were sent to real estate men and bankers in every county in the State (some 500 being communicated with), as to land values in the town or county of each. The responses, which were numerous and indicated considerable care in preparation, were classified, and on these data, supplemented by as much personal inspection as it was possible for a few men to give in a limited time, the values of the various classes of land were determined by a system of averages. The naked land values were then taken, and to them were added, as follows:

South of a line east and west through Saginaw, 125% plus a fixed charge varying from $8.50 per acre downward was added to the so-called naked land values for farm land. No waste land values were considered in this district. North of this east and west line: Farm land, 100% and a fixed charge of $3 per acre and upward; waste land, 200% plus a fixed charge of $3 per acre; for all village lands, 125% plus $8.50, fixed charge; for all city lands, 100% plus $8.50, fixed charge.

The fixed charges were intended to cover the expense of acquiring abstracts, recording deeds, etc. Slightly different figures were made for the Upper Peninsula.

The result of this work was a set of very low figures in many counties, the average price per acre hardly reaching the going price of improved farm lands. There was so little time to review these figures after they were in shape that they were used in 1900, although the appraiser was convinced that they were generally too low.

In the appraisal of 1902 a very careful study of real estate values was made. The offices of Registers of Deeds in ten or twelve counties 54 were visited, a careful abstract of all railway transfers for a period of 10 years was taken off, the acreage determined, the average price per acre for different classes of land computed, and then a very careful study of transfers of adjacent improved and unimproved lands was made. As a result, material increases were made in the farm land values, waste land values were eliminated, the 1900 valuation, made by special appraisers in large cities, was practically unchanged, while very radical changes in the way of equalization of values of lands in villages and small cities were made.

Inasmuch as the 1902 valuation was at issue in the Courts, the writer believes he is justified in discussing at some length the deduction of the staff on the conclusion of the 1902 preliminary studies, which led to the final adoption of the new figures.

One would fall into error if country values for farm purposes were conflicted with country values for railroad purposes. There is, undoubtedly, a close relationship between the two classes of values; this the writer has endeavored to discover, and it is indicated in Tables 2 to 6. The use to which land is put can and does change its value. Farm land in a certain township may be worth $50 per acre for farming, but the discovery of oil would affect values, as far as oil purposes are concerned. The presence of a vein of coal would give a distinct value for mining purposes. Farm prices would not govern values for any special use, such as oil drilling, mining, or railroad operation.

In the case of city business property, farm prices cannot be applied, as the use to which the land is put and the buildings placed on it give it a greatly increased earning power, and hence increased value. Thus, with a railroad right of way, the continuity of the strip of land, the severance of lands crossed by it, the greater earning power it derives from the construction placed on it, in short, the uses to which it is put, give it a value far in excess of adjoining lands. An excellent proof of this is found in the fact that many thousands of miles of right of way have been bought by promoters and either sold to a company, which built the lines, or used in financing the road. In no case has the selling price been based on farm values.

It is not contended that railroad land values do not bear a direct relation to land values for other purposes, as those things which tend to increase general values usually make the construction of a railroad profitable, and the better and more fully developed the country, the 55 greater is the need for transportation facilities and the higher the prices of land for all purposes. This is shown in the figures submitted herewith.

For purposes of appraisal, therefore, in 1902 the average value, as derived from the 1900 appraisal, was taken, and, by comparison with actual purchases, an attempt was made to ascertain the relation existing between the appraisal figures of 1900 and the usual purchase price for railroad properties, as determined by actual transfers. In making these figures the appraiser was forced to the following conclusions:

(*1*) That the naked land value is not a proper one to use in country lands, but that the going value of country lands with all improvements should be used as a basis for computing the added increment due to railway use;

(*2*) That a classification of farm land and waste land should not be made, except as a basis for arriving at the relative differences in quality of land in different sections of a county;

(*3*) That the added value for railroad purposes is due to the three elements:

(*a*) Continuity,

(*b*) Severance or damages,

(*c*) Changed earning power,

all of which the farmer or owner has cognizance of in making his price;

(*4*) That in making up land values, account should be taken of:

(*a*) The cost of acquiring the land, or expense,

(*b*) The cost of the land itself.

The reasons are:

I.—In making a price on a 40-acre farm, the owner does not make two prices, one on land and one on improvements. He arrives at a flat price per acre for the entire farm, and usually asks more per acre for a part than the whole. A man who valued his land at $100 per acre, with improvements, would hardly sell 5 acres from a corner of his land, even for residence purposes, at naked land prices.

The 1900 appraisal was based on naked land prices, as estimated by a number of citizens of each county, and this flat rate was used in making figures for the so-called "Market Value of Right-of-Way." It is fair to assume that a railroad company can purchase large tracts of 56 land for gravel pits, or a narrow strip adjoining and widening its existing right of way, at about market prices, as the elements of severance, abutting damages, etc., are absent. Prices for this class of land ought to be, and usually are, lower than those paid for a new right of way.

TABLE 2.—Country Land.—Additional Strip for Widening Right of Way, Gravel Pits, Etc.

County.	Description: Road and purpose.	Average per acre, 1900 appraisal.	Average per acre, transfer.
Jackson	Michigan Central. Widening right of way	$84.47	$156.08
Kalamazoo	Michigan Central. Additional right of way near Augusta	89.41	140.00
Kalamazoo	Grand Trunk Western. Additional strip for double tracking	94.59	120.50
Cass	Michigan Central. Gravel pit	84.97	94.15
Cass	Grand Trunk Western. Additional strip for double-tracking	71.79	203.53
Berrien	Michigan Central. Additional right of way	109.40	113.66
Washtenaw	Michigan Central. Additional right of way	49.35	130.68
Washtenaw	Ann Arbor. Additional right of way	88.60	116.12
Ionia	Pere Marquette. Gravel pit	77.50	125.00

Actual purchases are averaged from recent transfers, and represent consideration paid owners, but not cost of acquiring.

The 1900 appraisal averages show country land after fixed charges and percentages are added.

The tables given herewith are summarized from a very large mass of information introduced as evidence in a suit of Michigan Central Railroad *et al. vs.* Powers (The Michigan Tax Cases), and are selected as average examples of conditions throughout the Southern Peninsula.

It is evident from the figures in Table 2 that no such naked land values as those used in 1900 were considered by the farmers in placing values on their lands, as the sales covered in that table do not involve any large element of damages. All transfers are of a strip a rod or more in width adjoining an existing right of way.

II.—It is true that in some sections of Michigan there are large tracts of barren or low-priced land. In 1900 barren land prices were used, and were much lower than farm land; in the poorer parts of the State large percentages of barren land were used. This fact brought the average per acre of country land, as applied in the appraisal, very low in many of the counties, and justified the appraiser in using the average country price of 1900 as the base price for a re-valuation. Generally, the 1900 appraisal averages for country lands were fair indices of the difference in actual value in different parts of the State.

In the 1900 appraisal, the Michigan Central was credited with having, in Jackson County, 309.1 acres of farm land (naked value, $38, 57
average rate $93.30), and 34.35 acres of barren land at $5 per acre. The field inspectors reported that part of the district between Parma and Albion, in the vicinity of Bath Mills, was waste or barren land. The Jackson and Battle Creek Traction Company parallels and adjoins the Michigan Central Railroad right of way from Parma to Bath Mills. An investigation of records of deeds showed that they bought 25.02 acres of land in this district at $65.79 per acre, and that the average price of all their land in the county was $239.52 per acre.

While there was a marked difference in the rates of different grades of country land, no one would be justified in putting any land south of a line drawn from Saginaw to Muskegon at prices as low as $2 to $10 per acre. An average based on the 1900 classification of lands would probably eliminate all waste land classifications, without doing any injustice.

TABLE 3.—Average Values per Acre of Country Lands, of the 1900 Appraisal, of the Jackson, Lansing and Saginaw Railroad, After All the Percentages and Fixed Charges were Added.

County.	Price.
Jackson	$75.71
Ingham	74.90
Clinton	42.38
Shiawassee	67.18
Saginaw	40.80
Bay	38.69
Arenac	32.47
Ogemaw	8.69
Roscommon	10.74
Crawford	8.41
Otsego	15.62
Montmorency	12.38
Cheboygan	17.13

Table 3 illustrates quite clearly the extremely low figures applied in many counties in the 1900 appraisal, and also represents quite well the relative difference in value in the different counties.

That the 1900 rate varies about as the purchase price, is shown by the fact that the Pere Marquette Railroad built a line in Montcalm County, buying 155.3 acres at an average price of $135.19 per acre, while the 1900 appraisal showed an average of $29 on the 918 acres appraised. The purchase price was 4.66 times the 1900 appraisal.

In Calhoun County, the Grand Trunk Railroad bought 63.2 acres at $491.13 per acre, while the 1900 appraisal was $61.44 on all the country land in the county, or only one-eighth of the actual purchase price.

III.—There can be no doubt that a railroad right of way costs much more than an equal acreage of farm lands. The writer has always 58
been inclined to hold the view that an ordinary right of way through good farming country would cost from two to three times farm prices, no matter how much care is used in the acquisition of the land. In recent years the price of right of way has been greatly increased. The Newton and Northwestern Railroad right of way, in Iowa, cost $267 per acre, on a line 80 miles long. This is nearly all country land, about 1 mile in the outskirts of Boone (population 12,000), and about ½ mile in Newton (population 6,500), being the only city land to increase the average. The Rock Island System and the Chicago Great Western paid higher country prices in the same territory. This line is in such country as Southern Michigan, and land is held at from $65 to $100 per acre.

The Toledo Urban and Interurban right of way, in Lucas County, Ohio, was bought by the writer in 1901 at an average net price of $329.21 per acre. The average assessed valuation is $55 per acre. The going value of farm lands will range from $100 to $225; probably a fair average is $135 per acre. The prices paid by Michigan railroads are fully sustained by these personal experiences.

The figures in Table 4 show that the actual average price paid for new right of way is greater than the average of the 1900 appraisal, after the 125% and fixed charges are added, by from 230 to 726 per cent.

The argument that a change of line costs more than a new line is not sustained by Table 4. In Jackson County, the Michigan Central Railroad changed its line at an average cost of $165.67 per acre. The Jackson and Battle Creek, a new line, parallel with and adjoining the Michigan Central, paid $239.53; the Jackson and Suburban, a new electric line, paid $293.34, and the "Ypsi-Ann" Electric paid $393.74. All the new lines in Monroe County are higher than any changes of line in similar country. The Ann Arbor change in Washtenaw County, located by the writer, is at one point 3 miles from the old right of way, and only at the two ends of the 7-mile line does it run on farms owned by parties crossed by the old road; therefore, to all intents and purposes, it is a new line.

The naked land values used in 1900, being clearly too low, were of no use and were dropped. The so-called market price of right of way as given in 1900 was misleading.

TABLE 4.—Comparison of Country Land Values. 59

The actual purchases are averaged from recent transfers, and represent consideration paid to land owners, but not the cost of acquiring.

The 1900 appraisal averages show all country land after fixed charges and percentages were added, per rule of 1900.

County.	Railroad.	1900 Appraisal, average per acre.	Railroad.	Actual transfer, average per acre.
Jackson	Michigan Central. Air Line Michigan Central.	$71.36 88.47	Michigan Central Air Line. New Line Jackson and Battle Creek. Average entire county	$165.67 239.53

	Michigan Central. Waste land	5.00	Jackson and Battle Creek. Wasteland	65.79
	Michigan Central. First-class farm	93.30	Jackson and Battle Creek. First-class farm	298.51
	Jackson, Lansing and Saginaw. Average country values	75.72	Jackson and Suburban.	293.34
			Detroit, Ypsilanti and Ann Arbor	393.74
Monroe	Flint and Pere Marquette.	93.30	Flint and Pere Marquette. Monroe to Toledo	215.21
	Michigan Central.	93.30	Toledo and Monroe. Electric	461.13
	Lake Shore and Michigan Southern.	93.30	Detroit and Toledo Shore Line. (Duffy)	214.38
			Detroit and Toledo Shore Line. (Burt)	262.49
Kalamazoo	Michigan Central.	89.41	Michigan Central. Kalamazoo to Mattawan	236.22
Van Buren	Michigan Central.	66.54	Michigan Central. Kalamazoo to Mattawan	196.00
Cass	Michigan Central.	84.97	Michigan Central. Cut-off near Pokagon	260.61
	Michigan Central. Wasteland	10.00	Michigan Central. Waste on cut-off	60.00
Genesee	Grand Trunk Western.	98.10	Grand Trunk Western. Improved line	337.56
Genesee	Pere Marquette.	80.81	Flint and Pere Marquette. Change of line	234.00
Montcalm	Pere Marquette.	29.00	Pere Marquette-Greenville-Stanton.	135.81
Calhoun	Grand Trunk Western.	61.44	Grand Trunk Western. Change of line west of Battle Creek	491.13
Calhoun	Michigan Central.	74.38	Jackson and Battle Creek. Electric	218.74
Tuscoia	Michigan Central.	60.75	Michigan Central. Caro-Owendale	73.04
St. Clair	Pere Marquette.	43.18	Rapid. Anchorville-Marine City	287.05
Washtenaw	Ann Arbor.	38.60	Ann Arbor. Change of line near Ann Arbor	285.50
Ionia	Pere Marquette.	77.50	Pere Marquette. Lowell-Belding	112.30
Manistee	Ann Arbor.	25.40	Ann Arbor. Change line near Harlan	47.33
Osceola	Pere Marquette.	40.03	Pere Marquette. Change line near Evart	57.93

Having shown that there is an increase in cost of railroad over farm land, the question arises: Is it legitimate? If it is a proper item of cost, has it a place in the present value column?

In building a new railroad, engineers prepare their estimates of cost, including grading, rail and fastenings, ties, bridges, and, among other items, right of way. Their clients provide funds to build the line, and furnish, among other items, cash for the right of way. The right-of-way account in no wise differs from that of any other item of physical cost. The right of way, with all its hold-ups, items for damages, court costs, legal expenses, bills for personal services and expenses in securing it, abstracts and recording of deeds, is just as much an element of physical cost as the rails. The cost of acquiring the right of way is as proper an element as charges for inspecting the rails, freight charges on them, the loading and unloading, or any other charges that enter into the cost of rails delivered to the track-laying contractor. 60

Should the cost of reproduction of right of way be carried to the present value column? Clearly, yes. If a road is unfortunate enough to buy its rails when they are at a price of $60 per ton, the full price is charged to capital account; and when the line is sold to some large corporation, no reduction is made, even though the price of rails be much less at the time, but the selling price is based on the construction account as a whole.

The same is true of the right of way. In no case which has come under the writer's notice has a new company, or a set of promoters disposing of a new line or a new right of way, ever consented to deal except on the basis of construction account, plus promoters' profit. The cost of a right of way is increased on account of continuity. A farmer is justified in increasing his price per acre by reason of the fact that the road must have a continuous line, regardless of how it affects the individual. He must rearrange his fields, replant his orchard, change his fences, ditches, and tile lines, and re-adjust his entire property to accommodate the necessity of the road. He must also take into account severance or damages. He is compelled to cross the line at an inconvenient place, open and close two gates in every lane or at every crossing, drive his cattle back and forth to water, haul his produce over a short heavy grade across the track, and he must not interfere with the railroad. He is in constant danger of loss of property from fire or from accident, and he is in personal danger every time he passes from his own land on one side of the railroad to his own land on the other side. Every one who has bought right of way knows these arguments, and is aware that the farmer knows them and charges extra on account of them. 61

The law provides that, in condemnation, the jury shall take into account two elements, the value of the land, and damages. The railroad pays them, and very promptly charges the entire cost to the right-of-way account. No one will question the propriety of the farmer taking them into account in fixing his price. The value of continuity to the railroad can hardly be measured in dollars and cents.

A fair illustration of continuity may be found in coal lands. A promoter will secure option on a large acreage. As long as his holdings are disconnected and widely separated they are of no more value than adjoining lands, but let him close options on a large block of land all in one body, and immediately he can add from 100 to 200% to the value of his land for mining purposes. This added percentage is due to continuity.

The conditions surrounding the purchase of railway lands in Michigan have changed materially in the past few years. In a new country, without means of transportation, land values are low, and, in order to open new markets, land owners can afford to donate the right of way. Undoubtedly, a very large percentage of the total right of way on the older lines was either donated or bought at very low prices. As a community grows and develops, acquires new industries, and receives new improvements, property values increase; and, along with a general appreciation of other values, those of railroad property must increase. It would certainly be true that the present value of the site of the Majestic Building, in Detroit, is not the same as it was in 1850; the argument that its actual cost in 1850 was, say, $200, would not be any justification for such a value to-day. Equally is it true that the value of property owned by the Michigan Central Railroad is not to be measured by the price paid for it 50 years ago. The greater business, and the larger income derived from that business, make the Detroit of to-day a much more valuable terminal for the road than the Detroit of 50 years ago.

The same argument will apply to any city which has grown up after the construction of railroads. The original right of way was farm land and may have been a donation, but the change from farm to city certainly increases the value of the railroad land just in proportion as the surrounding land increases.

The same reasoning is properly applicable to lands which decrease in value. Where a railroad buys right of way to gain access to valuable timber lands, and, after the removal of the timber, the land is too poor to support a population, the present value should depreciate in the same ratio as the surrounding land, and immediately on its abandonment as a right of way it would cease to have a railroad value. 62

In an appraisal, it appears to be fair to base the cost of reproduction on the cost of building a new line on the location of the road under appraisal, all other means of transportation remaining as they are to-day, so as to secure as nearly as possible the conditions that would be encountered by a new company building a new line on this location.

The argument was made in 1900, and reiterated frequently, that railroad companies secure many donations. It may safely be said that, in a developed country, such as in the south half of the Lower Peninsula, the donations are of little account. Few donations were found in an examination of records of deeds covering 10 years; and in some cases the conditions were so burdensome that it may be said that the gift land was the most expensive. A condition for a cattle-pass costing from $400 to $600, a side-track costing from $1 to $1.50 per ft., and other like specifications are found; and in many deeds where a liberal consideration is named conditions which add greatly to the cost are not infrequent.

The recent new lines in Southern Michigan secured but few donations, although all considerations of $1 and other good and valuable considerations were classed as donations unless the contrary was susceptible of proof. In the case of the Ann Arbor Railroad, in Washtenaw County, the $1 consideration represents a higher price than the average, this being known by the writer, as he bought it. The same is true of the Detroit and Toledo Shore Line, in Monroe County. In making an appraisal, no deductions should be made for donations, if there are any, as the fact that land is donated does not indicate absence of value; nor should an addition be made to the appraisal value on account of the fact that a road has been held up and compelled to pay exorbitant prices in certain localities.

In some counties the base values of land in villages and small towns were given at ridiculously low prices in 1900; some are as low as

from $50 to $100 per acre in towns of from 1,000 to 3,000 population. When one stops to consider that a lot 4 by 8 rods contains ⅕ acre, and that such lots in a town of considerable size range from $50 to $300 each, it is readily seen that from $250 to $1,500 per acre are not excessive figures. The figures for an adjoining county were often very high, and village values were put up to substantially full value. The result of adding percentages in 1900 was to magnify discrepancies, and little villages of from 200 to 500 population in one county were appraised at a higher rate than towns of from 2,000 to 5,000 in the next. 63

In 1902 the appraiser undertook to equalize all such discrepancies, and found that no hard-and-fast rule would apply. A comparison of village values, as determined by actual purchase, with the 1900 appraisal, is given in Table 5.

The 1900 appraisal for city lands, outside of Detroit and Grand Rapids, was generally very conservative or low. In some cases the figures were extremely low.

TABLE 5.—Average Price per Acre for Village Land.

Actual purchases are averaged from recent transfers. The 1900 appraisal averages are averages of prices as applied after all percentages and fixed charges are added.

County.	Name of road.	Name of village.	Appraisal, 1900. Average per acre.	Actual transfer. Average per acre.
Jackson	Michigan Central	Parma	$177.25	$1,166.65
Van Buren	Michigan Central	Mattawan	571.00	2,439.04
Tuscola	Michigan Central	Caro	571.00	733.42
Oakland	Pere Marquette	Clyde	346.00	333.00
Oakland	Pere Marquette	Milford	571.00	1,136.37
Genesee	Pere Marquette	Grand Blanc	121.00	327.87
Kent	Pere Marquette	Lowell	571.00	1,552.26
Ionia	Pere Marquette	Belding	1,000.00	967.77
Washtenaw	Michigan Central	Dexter	571.00	718.75
Washtenaw	Michigan Central	Delphi	233.50	2,383.34
Cass	Grand Trunk Western	Cassopolis	458.50	1,600.00
Cass	Grand Trunk Western	Edwardsburg	222.25	466.67

The conclusion reached by the appraiser in 1902 was that, for railroad purposes, right of way is worth what it costs to produce it. It would be just as consistent to claim that a railroad has a misfortune in having a river to cross, and that no value should be placed on the bridge which spans it, as to claim that right of way, which costs three times farm-land values, should not be valued at a higher figure than farm land.

TABLE 6.—Comparison of Valuation Figures with Actual Considerations—Comparison of Immediately Adjoining Properties, Grand Rapids, Michigan. 64

The prices are per square foot or per acre.

Location.	Size of lots.	Michigan Central appraisal.	Pere Marquette appraisal.	Actual transfer.
	ft. deep	per sq. ft.	per sq. ft.	
Fulton to Island Street	50 by 100		$2.00	$1.40
Island to Oakes Street	50 by 100		2.00	1.22
Oakes to Cherry Street			2.00	1.33
Cherry Street Frontage	130 deep	$1.23	1.23	
Cherry to Williams Street	50 by 130			1.55
Williams Street Frontage	130 deep	0.92	0.54	
Williams to Bartlett Street				0.76
Bartlett Street Frontage	130 deep	0.77	0.46	
Bartlett to Goodrich Street				0.625
Goodrich Street Frontage	130 deep	0.62	0.38	
Goodrich Street to Wealthy Avenue				0.395
Prescott to First Street		0.25		0.54
First to Second Street		0.25		0.16
		per acre.	per acre.	
Land on Hall Street		1,500	1,359	3.75
North side of Hall Street			1,000	per acre.
Hall to Stevens Street		1,500	800	1,351.11
On Crofton Street		400		400.00

The problem of an appraiser is to determine, with the best evidence at hand, what land is fairly worth for railroad purposes at the time of appraisal. He must take into account the railway-purpose increment, if he is consistent in his appraisal.

Non-Physical Values.

The foregoing narrative account of the general field and office handling of the Michigan appraisal of physical property, while not touching on matters of principle of valuation, except as to land values, is submitted as describing briefly the machinery of the appraisal. A number of very important issues were raised which have to do with the theory of valuation. These are worthy of discussion at length, in the subsequent consideration of the method of determination of a fair value, but are not here referred to. Within any short limits it is impossible to give a comprehensive description in detail of all the work of the Michigan appraisal. Several articles descriptive of this work have been written, giving quite full extracts from the various sets of rules which were promulgated, and describing some phases of the work in much more detail than is here attempted. 65

The physical valuation, as represented by two figures—the cost of reproduction of the physical property, and its present value—was submitted to the Board of State Tax Commissioners as the work of Professor Cooley, and in most of the literature descriptive of it, it has been termed the "Cooley Appraisal."

After the completion of Professor Cooley's work, his figures were submitted to Professor Henry C. Adams, who had been making a study of the income accounts of the various companies, and to whom had been assigned the duty of determining the non-physical or franchise values of the properties.

Professor Adams has described[5] very fully the plan adopted for this work, and this plan has been commented on so fully that any lengthy description is deemed unnecessary. It appears to be perfectly proper, however, to correct certain misstatements regarding this work.

When it was first determined to make the appraisal, Professor Cooley—not Professor Adams—was requested to take charge. The assignment to Professor Adams of the non-physical valuation was made after the physical valuation was well under way.

The use of a negative or subtractive non-physical value was considered, and advised by Professor Adams. The work was not undertaken with a view of "increasing the assessments," but to put the Tax Commission in possession of a figure which would represent the business value of the property as well as the physical value.

Professor Adams held that the non-physical element of value was not a simple commercial element, but included:

The franchise {to be a corporation, / to use public property,

The possession of traffic not exposed to competition,

The possession of traffic through connections,

The benefit of economies due to density of traffic,

The value due to organization and vitality of industries served.

He also held that, as nothing visible or tangible gave support to this value, it must be determined on the basis of information secured from the income accounts of the company.

Without going into any complete description of Professor Adams' method, it may be said that he made an analysis of the income accounts, and, after providing for operating expenses and taxes, he deducted, as an annuity properly chargeable to capital, a certain percentage of the appraised value of the physical properties. Any remainder was capitalized to give the true value of the immaterial element, or the business value. 66

In the rates of capitalization and annuity used in 1902, there were certain changes, making them differ from those used in 1900, and certain changes in the detail of analysis of income accounts and methods of determining the rates of interest which are entirely immaterial to the present narrative. The work was of great importance as being the first exposition of this method of obtaining non-physical values. It was a fair, logical, and business-like attempt to determine those elements which give a well-designed, economically-built, or advantageously-located property a greater value as a money-earning concern than the actual capital invested, or than the actual value remaining in its physical property.

It will be seen that, in the case of a property in which the surplus earnings depend on excessive rates for service, it will fail as a method of determining a value for use as a basis of rate-making; and it fails, in the form in which it was used in 1900 and 1902, to bring out those negative or subtractive elements which may be determined from the income accounts, in the case of properties which do not earn a fair return on the investment. This, however, was due to the fact that the taxation laws of Michigan made no provision for any reduction of value because property was idle or non-productive, and any such deduction in the case of corporation property would place it on a different basis from other property. Professor Adams and his associates, therefore, applied only positive values, where any such were found, although advocating the use of negative values.

The writer has seen no criticism of Professor Adams' work which is not apparently incited by, either the direct interest of corporations in lowering valuations for taxation, or by an effort to confuse the subject of valuation so as to discredit the work in the eyes of taxing authorities. Any person competent to discuss the matter, who has given Professor Adams' method careful thought, will be forced to the conclusion that this was a long step in the direction of the final solution of these important and perplexing elements of value.

67

Based on the valuation of 1900, the Board of State Tax Commissioners was enabled to comply with the statute in reporting to the Legislature. New laws were passed, sundry suits were brought, and, finally, the case of the Michigan Central Railroad *vs.* Perry F. Powers, Auditor-General, and a number of other cases in behalf of other roads, were brought to trial before the United States Court for the Western District of Michigan.

This Michigan Central case was a suit to restrain the collection of taxes based on the new assessment, the railroads claiming that their property was assessed at full value, while general properties of the State were assessed at a considerably lower percentage than full value. This suit was essentially a valuation of the railroad properties as of April, 1902. This work was done along the same line as the former valuation, by a portion of the same staff. The old work was brought down to date, and certain special studies were made, which resulted in a change of right-of-way valuation, as has been related.

In the trial of the case of Michigan Central Railroad *vs.* Powers, the two valuations were fully testified to by all the men engaged, and the record relative to the appraisal fills several volumes.

Subsequently, in 1906, Professor Cooley was engaged by the Attorney-General, and, re-assembling the staff, brought the work down to date as of April, 1906.

There has been no permanent force engaged on the work in Michigan, and the re-appraisals have only been made as actual necessity demanded.

Market Value of Stocks and Bonds.—During the progress of the appraisal of 1900 an independent force of men was engaged in studying the market values of stocks and bonds of Michigan roads with a view to securing information on every possible line that would aid the appraiser in reaching proper conclusions, or enable him to check his figures. These figures were used only as a check, and no report of the details of this work was submitted.

Error in Published Reports as to Michigan Work.—In several articles descriptive of the Michigan work, one quite serious misstatement of fact has inadvertently been made. The writer is not quite sure how or where the wrong impression originated, but it has been noted in several articles and editorials.

Substantially, all accounts are similar to that of Professor Taylor,[6] which is: 68

"In looking over the notes and results of the work done in Michigan, it was noticed that Mr. Cooley's engineers, car-men and other experts went over the property of each railway company and enumerated and valued the same, and then the railway company generally had its own men perform the same work in order to check up the appraisal made by the State authorities. Thus, this expensive work was unnecessarily duplicated."

Undoubtedly this statement was made in good faith, and has gained currency by not having been corrected, but it is not the fact.

The Chicago and Northwestern Railway took immediate steps to make surveys and secure data, as has been described, and made a complete appraisal, using the Michigan forms. The result of this appraisal was:

Chicago and Northwestern, present value	$8,551,530
State appraisal, present value	8,281,090

In this case the railroad had no records, and the work was of value to them, not only as a check on the work of the State, but also as giving them complete records of permanent way. It was not done independently of, and after, the State work, but was organized so that the field work of both railroad company and State was done at the same time.

No other complete work of valuation was done by the railroad companies. During the trial of the cases, no contrary or different valuations were set up. No special attack was made on the work, except to select here and there some specific example of a building which was appraised at a higher figure than cost, perhaps half a dozen in all, and to introduce expert evidence, particularly on land and right-of-way values. Aside from the money expended on the litigation, there were no expenditures by the roads in checking up the work. On the contrary, a number of managers, at their own expense, had typewritten copies of the final report as to their own lines made, in order to file in their records.

It is a fact that only one of the seventy-eight roads made a complete appraisal, covering 387.8 miles of main line, and none of the other roads or mileage went to any considerable expense.

The Cost of the Work.—No complete statement of the total cost of the work of valuation in Michigan has ever been issued as a public document. The cost of the work, including salaries of appraiser, engineers, assistants, clerks, all expenses of the Board of Review, all expenses connected with Professor Adams' non-physical appraisal, also all office rent, stationery, supplies, telegraph, telephone, and railroad expenses, printing and binding—in short every dollar chargeable to the Michigan railroad appraisal of 1900—footed up to $70,604.21. 69

The exact mileage of roads in the State was:

Main track	7,082.35	miles.
Second track	164.83	"
Branches	730.92	"
Spurs and sidings	2,904.70	"
Total	10,882.80	miles.
Average cost per main-line mile		$9.97
" " " total-track "		6.50

The exact figures of cost of the subsequent work of appraisal, or the costs of the litigation, are not available to the writer. In a general way, it may be said that the cost to the State of the railroad tax cases was not far from $75,000, and that the expenses of the second and third appraisals were less than $50,000, so that, to date, the entire cost to the State of Michigan is less than $200,000 for the three appraisals and the litigation growing out of them.

Some information as to details of costs may not be out of place. All employees were paid a salary and required to provide their own subsistence. Salaries ranged from $250 to $500 per month for experienced men, from $125 to $250 for men with only a few years of experience, and from $75 to $125 for assistants and clerks.

All traveling expenses (except hotel and subsistence) were paid, the State issuing mileage books to all employees, and receiving a complete check on the movements of every man through the mileage bureau. The telegraph and long-distance telephone were used almost exclusively in communication between the office and the men in the field, all bills being paid by the State. All expenses of inspection by hand-car, velocipede-car, etc., were paid by the State, except as the roadmasters made trips with the inspectors.

The unvarying policy of the appraiser was to reimburse the companies for all extra expenses incurred on account of the work, and to accept no transportation or favors from any company. 70

TABLE 7.—Grand Summary of Railroad Appraisal of 1900 as to Seventy-eight Incorporated Railroads.

Physical Appraisal.

Item No.	Subject.	Cost of reproduction.	Present value.
1	Engineering, 4% on items 2 to 25, inclusive, and on item 33	$5,386,772	$5,386,772
2	Right of way and station grounds	27,745,313	27,745,313
3	Real estate	863,337	863,337
4	Grading	21,699,995	21,693,024
5	Tunnels	1,148,070	1,093,445
6	Bridges, trestles, and culverts	8,027,119	6,337,819
7	Ties (cross- and switch-ties)	11,139,924	6,148,748
8	Rails	28,703,012	21,865,994
9	Track fastenings	3,845,030	2,987,982
10	Frogs, switches, and crossings	1,469,781	1,040,120
11	Ballast	3,723,558	3,723,558

12	Track laying and surfacing		6,555,638	6,400,972
13	Fencing		2,763,595	1,627,790
14	Crossings, cattle guards, and signs		607,542	428,474
15	Interlocking and signal apparatus		501,883	448,686
16	Telegraph (30) telephones		258,985	134,797
17	Station buildings and fixtures		4,108,736	3,111,103
18	Shops, round-houses, and turn-tables		2,157,228	1,467,569
19	Shop machinery and tools		1,107,910	882,634
20	Water stations		725,670	522,135
21	Fuel stations		303,289	201,461
22	Grain elevators		1,336,794	1,609,043
23	Warehouses		258,646	183,910
24	Docks and wharfs		5,531,919	3,831,934
25	Miscellaneous structures		1,234,345	856,253
26	Locomotives		9,021,517	5,092,053
27	Passenger equipment		3,197,473	2,277,271
28	Freight equipment		19,734,240	13,690,587
29	Miscellaneous equipment		702,940	423,689
31	Ferries and steamships		1,725,000	1,095,500
32	Electric plants		93,061	89,898
33	Terminals. Included in Items 1 to 32			
34	Legal expenses, 0.5% on items 2 to 25, inclusive, and on item 33		673,349	673,349
35	Interest, 3% on items 1 to 34, inclusive		5,290,549	5,290,549
36	Miscellaneous expenses	Organization, 1.5% on items 1 to 34, inclusive	2,645,277	2,645,277
		Contingencies, 10% on items 1 to 34, inclusive	18,428,759	15,127,110
	Total Cost of Construction and Equipment.		$202,716,262	$166,398,156
37	Stores and supplies		1,474,829	1,474,829
	Average per main-line mile		28,263	23,495
	" " total-track mile		18,627	15,290
	Total Value of Non-Physical Element (H. C. Adams)			35,814,043

The Result of the Michigan Work.—Any undertaking must be judged by its results. The Attorney-General's report for 1906, on pages 21 and 23, states:

"These cases are among the most important in the history of the State. They constitute the last step in subjecting railroad property in Michigan to taxation on the same basis and at the same rate as other property is taxed, and secure practical uniformity and equality of taxation between railroad and other property.

"As a result of these cases the various railroad corporations paid in taxes $4,787,478.15, and as penalty thereon $1,158,321.18, a total amount of $5,945,799.43 for the years 1902, 1903 and 1904. The 1905 tax being paid soon after the decision of the Supreme Court, nothing was paid under the former law (specific tax on earnings) and, of course, there was no penalty on the 1905 taxes as they were paid before May 1, 1906."

In short, the roads are paying to the State of Michigan an average of $1,595,826.05 more per year than they paid under the old law, and to date the State has received about $10,750,000 more from taxes than it would have received under the old specific tax law.

Railroad development in Michigan has received no appreciable check, and notwithstanding a 2-cent fare and the bearing of an equal burden of taxation, the properties are maintained, and improvements, double-tracking and betterment of general standards fully keep pace with similar work in other States.

Of course, it must be recognized that other forces besides the appraisal helped to bring this about. The appraisal of 1900 furnished the information. Public opinion compelled the passage of the needed laws, and the magnificent legal work of Attorneys-General Blair and Bird, Congressman Townsend, and Judge Knappen, and their associates, loyally supported by Professors Cooley and Adams and the appraisal staff, were all factors in securing the decision of the Supreme Court of the United States.

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5. Bulletin 21, U. S. Bureau of the Census, p. 78.

6. Bulletin 21, U. S. Bureau of the Census.

Authority for the Work.—In 1893 the Legislature of Texas enacted what is known as the Stock and Bond Law, which was designed to control and limit the total amount of stocks and bonds that may be issued on any railroad property to the "reasonable value of said railroad property." This law further provides that:

"It shall be the duty of the Railroad Commission to ascertain, and in writing report to the Secretary of State, the value of each railroad in this State including all its franchises, appurtenances and property."

The work of valuation in Texas antedates that in Michigan, and offers some interesting opportunities for comparison of methods under somewhat similar conditions, as far as the existing roads were concerned. The work being in the hands of a permanent commission with very broad powers, it has been possible to secure from recently built roads very full and specific data as to construction, but with these later valuations and with the current work of the department, this paper will not deal. 72

The Commission of Texas interpreted the law to mean the estimated cost of reproducing or duplicating the properties at the date of valuation, allowing current market prices for all material and fair valuations on all real property.

Method of Physical Appraisal.—The Commission duly appointed engineers to make these valuations. The railroads of the State were unfavorably disposed toward the work, and were inclined to withhold information.

The Texas staff encountered the difficulty due to destruction or loss of construction records, maps, and profiles. They had for their guidance only the profiles, filed under a prior law, and were thus compelled to depend wholly on original field work to secure their data. From a paper by R. A. Thompson, M. Am. Soc. C. E.,[7] the following description is taken:

"They [the engineers] with the profiles ... in hand, made a detailed inspection of the railroads on the ground. The quantities of excavation and embankment, where the actual quantities could not be obtained, were estimated approximately from the profiles, using the center heights of the cross-sections. The classification of the materials in excavation was determined by inspection. Where original plans and estimates of cost of the bridges, buildings and structures of all kinds could not be obtained from the records of the railroads, their value was estimated from measurements taken on the ground. The extent and acreage of the right of way, the depot and terminal grounds, were determined by actual measurement, or from maps furnished by railroads, or from city and county tax records.

"After an examination of a railroad had been made by the engineers of the Commission, its valuation was prepared on estimate sheets. Upon sheets marked Estimate Sheet A ... were recorded the values of the right of way and depot grounds, roadbed, track, bridges, structures and way building for each mile, the value of ten miles being recorded on each sheet.... On these sheets space was provided for the units and prices, and columns for carrying out the values for each mile and the totals. 73

"The value of all rolling stock and equipment, and the value of such properties as were properly applicable and chargeable to the entire railroad, were recorded on a separate estimate sheet, only one sheet being used for a railroad."

It thus appears that the general methods of securing the data and making the field examination were quite similar to those adopted on the Michigan work. The classification of items on the sheets is rather more full than on the Michigan summary sheets, but apparently not so completely in detail as the final compilation of work. In general, however, the physical items included are complete in both cases. The form in which the results are finally put up is radically different.

The following points of variations from the practices of the Michigan appraisal are noted:

(*a*) The unit prices were current market prices.

(*b*) The value applied to right of way and real estate used for railway purposes was in accordance with the current market value of other property immediately adjoining, disregarding donations or property acquired at less than value.

(*c*) No deduction was made on account of depreciation, as it was considered that all structures must be maintained in first-class, serviceable value, and renewed when necessary, and no allowance was made for appreciation of roadbed.

(*d*) No allowance was made for franchise values of any kind, except track rights in streets.

(*e*) No allowance was made for contingencies, except as made in prices or quantities.

Their practice was in accord with the Michigan appraisal, in allowing from 5 to 6% to cover legal and engineering expenses and superintendence, and from 5 to 6% to cover interest during construction.

The Result of the Texas Work.—The object sought in Texas was to secure a capitalization in harmony with the actual investment in the physical property; in short, to "squeeze out water."

Of course, all stock and bond issues outstanding in 1894 are still in existence, except as a few roads have been sold out or re-organized. No new issues of stock or bonds may be made on roads in excess of the valuation. Consequently, new roads are limited to issues of bonds not far from $15,000 per mile. The effect is shown by Table 8, from the Railroad Commission's Report. 74

TABLE 8.—MILES OF RAILWAY IN OPERATION IN TEXAS, 1894 TO 1908, WITH OUTSTANDING STOCKS AND BONDS.

On June 30th.	Miles of railway in operation.	Stocks outstanding, per mile.	Bonds outstanding, per mile.	Total stock and bonds outstanding, per mile.
1894	9,154	$15,076	$25,726	$40,802
1895	9,291	14,874	25,420	40,294
1896	9,437	14,647	25,302	39,949
1897	9,484	14,320	24,793	39,113
1898	9,540	14,205	24,036	38,241
1899	9,702	13,997	23,562	37,559
1900	9,867	13,724	23,202	36,926
1901	10,154	12,922	22,649	35,571
1902	10,617	12,388	21,779	34,167
1903	11,029	11,971	21,464	33,435
1904	11,495			32,400
1905	11,662			33,418
1906	12,056			32,886
1907	12,577			32,142
1908	12,830			32,305

Total reduction, up to 1903, of stock per mile	$3,105
" " " " " " bonds " "	4,262
Total stock and bonds	$7,367

E. L. Corthell, M. Am. Soc. C. E., speaking of results secured by the Texas law, says[8]:

"The law, and generally its just operation, has cured many unmitigated and notorious evils. Not only has the public in Texas been benefited, but also the investor in railroad securities from the outside of the State. The people of Texas now have just and uniform rates of transportation, and the investor knows what he is purchasing, and may be reasonably sure of a return on his investment."

Mr. Thompson says[9]:

"Another significant fact is that only a short time before the Stock and Bond Law became effective about 39% of the railroads in Texas were in the hands of receivers. To-day there is not a mile, of the 11,300 miles in Texas, in the hands of receivers, and, with a few unimportant exceptions, no railroad has been in the hands of receivers since the law went into effect. The fact is that there has been no piece of legislation, in this or any other State of the Union during the past decade, which has been so fruitful of results and beneficent in its action, alike to the railroads and the people."

7. *Transactions.* Am. Soc. C. E., Vol. LII. p. 328. 75

8. *Transactions.* Am. Soc. C. E., Vol. LII. p. 346.

9. *Ibid.*, p. 364.

The State of Wisconsin made a valuation of railroad properties of the State as of June 30th, 1903, the work being under the direction of W. D. Taylor, M. Am. Soc. C. E. The plan adopted, the methods of work, and the general result of independent studies conducted by Professor Taylor have been described so fully in various technical papers and reports elsewhere listed, that a very brief statement of points of difference between the Michigan and Wisconsin works appears to be all that is necessary here.

Professor Taylor associated with him for consultation Professor Cooley, of Michigan, made a careful study of methods used in earlier appraisals, used the Michigan blank forms as a basis for the preparation of his own, and thoroughly outlined his general plan and the scope of the information desired before actually organizing his staff or commencing work.

In connection with the earlier stages of the work, conferences were held with the officials of the principal railways of the State, and developed a thorough understanding and plans for co-operation between the appraiser and the roads. As a result of these conferences, each large railway company of the State, acting through its heads of departments, made an inventory and appraisal of its own property in the State, using therefor the forms and blanks prepared by the appraiser. At the same time, the appraiser organized a considerably smaller force than was used in Michigan, made his own office and field inspection, and secured data to complete the appraisal on the small roads, in which their own engineering or operating departments were not organized so as to do the work according to plan.

The work turned out by the large roads was then checked by this force, the various points in which they were out of harmony were checked and unified, a number of hearings were held, certain portions of the work were checked over by the appraisers' men, sundry changes in quantity and price were made, and finally, when the work was compiled and put in shape for presentation, the appraiser had reason to believe that he had secured a result which was reasonably free from error, and one in which the railroads had co-operated to such an extent that no charge of prejudice or unfairness would lie.

It is noted that the average cost of reproduction and the present value per mile in Wisconsin are higher than in Michigan, which is probably as it should be, as Michigan has a less mileage of high-class main trunk line road than Wisconsin. 76

In general, the two appraisals were very similar. The determination of unit prices, the placing of depreciation, the apportionment of locomotives, freight, and passenger equipment, and other rolling stock, the use of the Interstate Commerce Commission's construction classification, the application of percentage values for engineering, interest during construction, administration, legal expenses, and contingencies (this latter fixed at 5.5%), all were along lines similar to those developed in Michigan.

The work of the Wisconsin appraisal was carried on at the same time as the second Michigan appraisal. The investigations made by Mr. Van Ranst Pond and the writer, as to the actual sale prices of right of way, fully discussed heretofore, were conducted at the same time as Professor Taylor's work in Wisconsin was being done, and neither party had any knowledge of the work of the other. The prior discussion relative to this phase of the Michigan valuation is practically a revision of a memorandum submitted by the writer to the Attorney-General in January, 1904. The tables are abstracted from much more extensive ones which, supported by the evidence of Registers of Deeds of some ten counties of Michigan, are part of the record of evidence in Michigan Central Railroad *vs.* Powers. It is, therefore, not only of great interest, but great value, as supporting Professor Cooley's right-of-way valuations, to note the following extract[10] from Professor Taylor's discussion of the paper by Mr. R. A. Thompson on the Texas railroad valuations:

"In the Wisconsin appraisal, the method followed for valuing the right of way and terminal lands was about as given below. Parts of the right of way of some of the larger systems are estimated at higher ratios than this, but in such cases the roads themselves fixed the right-of-way value.

"The market value for other purposes of the right of way and terminal lands was judged to be the same as that of contiguous property.

"In farming lands, small towns, and suburban and residence property, the right-of-way value was taken to be 250% of the market value for other purposes.

"In city property, the right-of-way value was taken to be 133% of the market value for other purposes, where the land was owned in strips of 100 ft. width or less, and 110% of the market value for other purposes, where the land was owned in blocks, or in widths greater than 100 ft." 77

No effort whatever was made in the Wisconsin valuation to determine any non-physical or intangible values, the report covering only cost of reproduction and present value of the physical properties.

The Wisconsin work is noteworthy as the first appraisal in which the hearty co-operation of the railroads was secured from the outset. In Michigan the roads at the inception viewed the work with distrust, but by the completion were in hearty sympathy with the efforts of the appraiser to use just and honorable methods, and the managements extended every courtesy in the way of access to records for verification purposes.

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10. *Transactions*, Am Soc. C. E., Vol. LII. p. 359.

The valuation of railway properties in the State of Minnesota was undertaken with a view to establishing a basis for rate-making. The work was in charge of Mr. Dwight C. Morgan, Engineer of the Railroad and Warehouse Commission of the State, whose full and complete report is a very valuable addition to the literature of valuation practice. This work was undertaken after the completion of that in Michigan and Wisconsin, and advantage was taken of the experiences of the appraisers in these two States. The Wisconsin plan of co-operation with the railroads was adopted, and each company scheduled and appraised its own lines.

The "cost of reproduction," and "present value of physical properties" were the two sets of figures shown in the final results.

Unit prices were fixed on the basis of current prices in 1905, in preference to an average of 5 or 10 years.

Apportionment of locomotives and rolling stock was made on an engine- and car-mileage basis. The organization of an office force was undertaken, and special study was made of the subjects of unit prices and the various local conditions surrounding the different properties, checking of quantities of earthwork, rails, etc., and preparing to harmonize and unify the estimates as they should be received from the railroads.

The greatest difference between this work and that in the other States was the fact that the field inspection, instead of being made by many men, was made by Appraiser Morgan, accompanied by two assistants, inspection being made in a special train, which was paid for by the State. 78

The detailed reports of the railroad companies were completed and in the hands of the appraiser, maps and profiles of the road were prepared and available, the train was run at slow speed, and many stops were made for examination of bridges, culverts, and structures. About 100 miles per day were covered, but this did not include the larger terminals of St. Paul, Minneapolis, and Duluth, which were given many days.

In the preparation of final summaries, percentage values were placed as follows:

Engineering, superintendence, and legal	4½ per cent.
Contingencies	5 " "
Interest, time of construction varying according to mileage from 1 to 8 years	4 " "

In addition to these three items, the item of "adaptation and solidification of roadbed" was given a large place, being, for all the roads of the State, $11,743,007.15. This feature was novel to this class of valuation, and it is to be regretted that, in his report, the appraiser did not narrate more fully the detailed methods by which he arrived at his resultant figure.

Land Valuation.—The vexed question of a proper value to give to lands owned by a railway company, was treated by Appraiser Morgan in a different way than it had been in Wisconsin or Michigan. A number of special agents were appointed, who made an exhaustive study of the transfers and assessed values throughout the State. The discussion of this subject in Mr. Morgan's report is exhaustive, and of great interest. The conclusions are quoted. It is regretted that the discussion of methods of valuation can only be given in brief form.

"Careful and full consideration of all information made available for establishing the value of the right of way owned and used by the railway companies for railway purposes, led to the conclusion that in the state at large exclusive of the three terminals of St. Paul, Minneapolis and Duluth, a multiple of three (3) applied to the true value or normal value of lands, as obtained from the transfers, would in general satisfy the conditions.

"During the period referred to, the railway companies paid for the property acquired by them, over and above its normal value, an amount sufficient to justify the use of the following multiples: St. Paul, one and three-fourths (1¾); Minneapolis, one and three-fifths (1⅗), and Duluth, one and one-fourth (1¼), which when applied to the normal value of the lands as established from contiguous and surrounding property, formed the basis for measuring the cost of reproducing the existing terminals of the railway companies." 79

In the final compilation of results, two sets of schedules were rendered:

(*a*) Those which gave the land values with added increment,

(*b*) Those which omitted the increment.

The cost of the engineering work was about $70,000; this covered 7,596.4 miles of main track, 427.4 miles of second track, and 2,414 miles of side-track, or a total of 10,437.8 miles of all tracks. As yet there has been no decision by the Courts on the Minnesota rate cases.

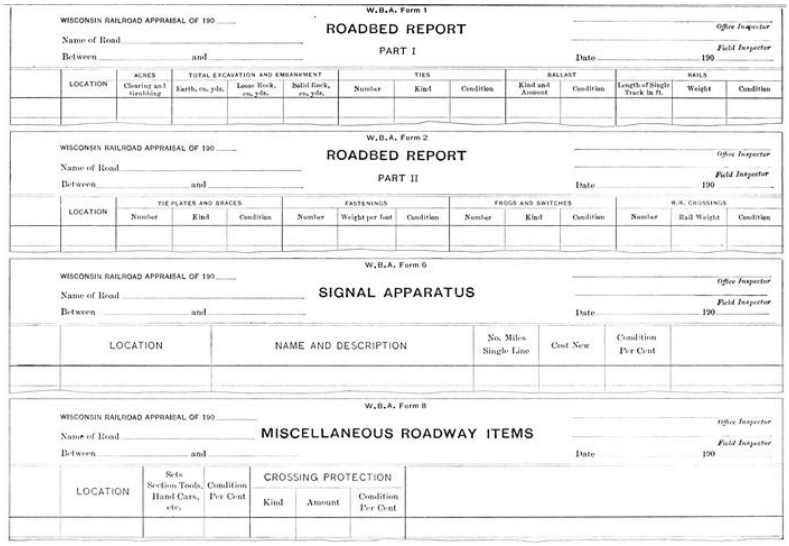
Forms Used in the Compilation of Information.—The forms used in the Michigan appraisal have been described and fully illustrated. They were all printed on 8½ by 11-in. sheets.

The Wisconsin appraisal used the Michigan forms as a basis, twenty of them being practically identical with the corresponding Michigan forms. The forms shown by Figs. 11 to 21 are materially different from those used in Michigan.

The forms used in Minnesota in 1906 were based on those of Michigan and Wisconsin, and were printed on 14 by 18½-in. sheets. They were remodeled and elaborated to such an extent, however, that the writer believes himself justified in submitting reproductions of the entire set, as representing the most complete form for inventory yet used on any of the State appraisals.

The appraiser in Nebraska in 1909, and Mr. Hansel in New Jersey in 1910, have both returned to the 8½ by 11-in. sheets, and, while both clearly followed earlier precedent in general, both have modified the details to suit the requirements in their respective States.

The State of Washington, through its Railroad Commissioners, made an appraisal of railroad properties within its borders, the work being under the direction of Halbert P. Gillette, M. Am. Soc. C. E.



W.B.A. Form 1

WISCONSIN RAILROAD APPRAISAL OF 190

ROADBED REPORT

PART I

Name of Road

Between and

Office Inspector

Field Inspector

Date 190

LOCATION	ACRES Clearing and Grubbing	TOTAL EXCAVATION AND EMBANKMENT Earth, cu. yds.	Loose Rock, cu. yds.	Solid Rock, cu. yds.	TIES Number	Kind	Condition	BALLAST Kind and Amount	Condition	RAILS Length of Single Track in ft.	Weight	Condition

W.B.A. Form 2

WISCONSIN RAILROAD APPRAISAL OF 190

ROADBED REPORT

PART II

Name of Road

Between and

Office Inspector

Field Inspector

Date 190

LOCATION	TIE PLATES AND BRACES Number	Kind	Condition	FASTENINGS Number	Weight per foot	Condition	FROGS AND SWITCHES Number	Kind	Condition	R.R. CROSSINGS Number	Rail Weight	Condition

W.B.A. Form 6

WISCONSIN RAILROAD APPRAISAL OF 190

SIGNAL APPARATUS

Name of Road

Between and

Office Inspector

Field Inspector

Date 190

LOCATION	NAME AND DESCRIPTION	No. Miles Single Line	Cost New	Condition Per Cent	

W.B.A. Form 8

WISCONSIN RAILROAD APPRAISAL OF 190

MISCELLANEOUS ROADWAY ITEMS

Name of Road

Between and

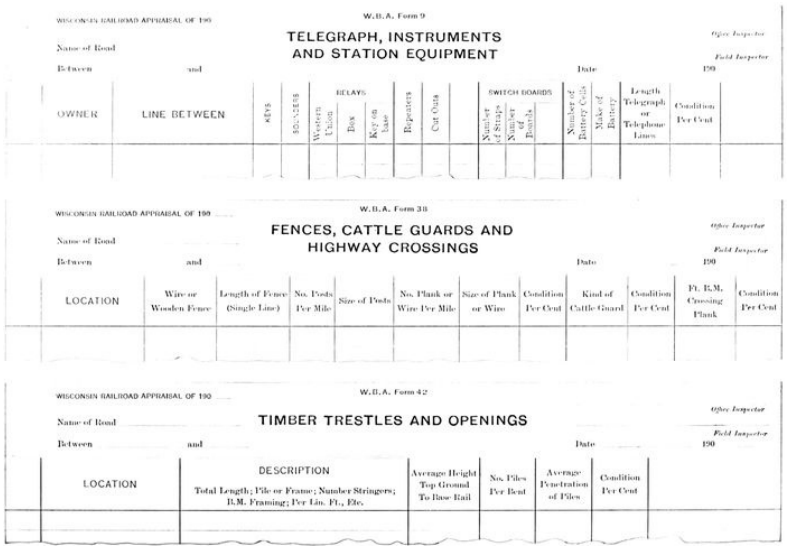
Office Inspector

Field Inspector

Date 190

LOCATION	Sets Section Tools, Hand Cars, etc.	Condition Per Cent	CROSSING PROTECTION Kind	Amount	Condition Per Cent	

FIG. 11.



W.B.A. Form 9

WISCONSIN RAILROAD APPRAISAL OF 190

TELEGRAPH, INSTRUMENTS AND STATION EQUIPMENT

Name of Road

Between and

Office Inspector

Field Inspector

Date 190

OWNER	LINE BETWEEN	KEYS	SOUNDERS	RELAYS Western Union	Box	Keys on Line	Repeaters	Cut Outs	SWITCH BOARDS Number of Strips	Number of Points	Number of Primary Cells	Make of Battery	Length Telegraph or Telephone Lines	Condition Per Cent	

W.B.A. Form 38

WISCONSIN RAILROAD APPRAISAL OF 190

FENCES, CATTLE GUARDS AND HIGHWAY CROSSINGS

Name of Road

Between and

Office Inspector

Field Inspector

Date 190

LOCATION	Wire or Wooden Fence	Length of Fence (Single Line)	No. Posts Per Mile	Size of Posts	No. Plank or Wire Per Mile	Size of Plank or Wire	Condition Per Cent	Kind of Cattle Guard	Condition Per Cent	Ft. B.M. Crossing Plank	Condition Per Cent

W.B.A. Form 42

WISCONSIN RAILROAD APPRAISAL OF 190

TIMBER TRESTLES AND OPENINGS

Name of Road

Between and

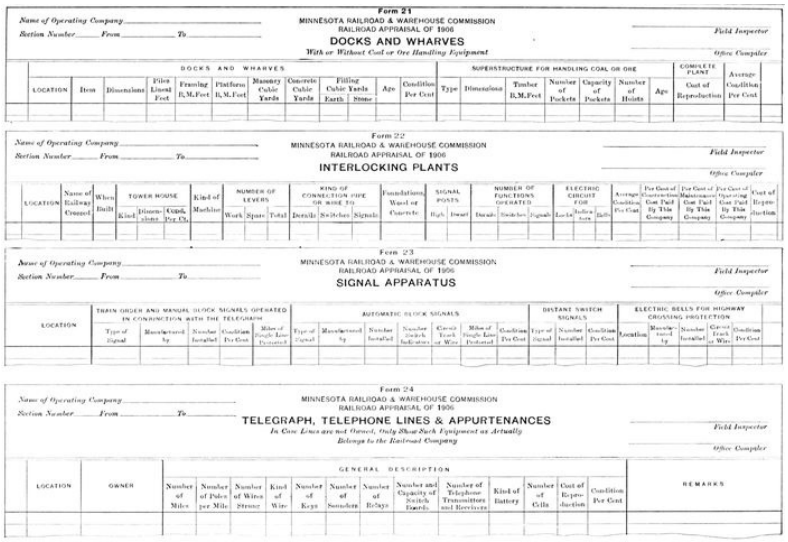
Office Inspector

Field Inspector

Date 190

LOCATION	DESCRIPTION Total Length; Pile or Frame; Number Stringers; B.M. Framing; Per Lin. Ft., Etc.	Average Height Top Ground To Base Rail	No. Piles Per Bent	Average Penetration of Piles	Condition Per Cent	

FIG. 12.



Form 21

MINNESOTA RAILROAD & WAREHOUSE COMMISSION

RAILROAD APPRAISAL OF 1906

DOCKS AND WHARVES

With or Without Coal or Ore Handling Equipment

Name of Operating Company

Section Number From To

Field Inspector

Office Compiler

LOCATION	Item	Dimensions	DOCKS AND WHARVES Piles Lineal Feet	Framing B.M.Feet	Platform B.M.Feet	Masonry Cubic Yards	Concrete Cubic Yards	Filling Cubic Yards Earth	Filling Cubic Yards Stone	Age	Condition Per Cent	SUPERSTRUCTURE FOR HANDLING COAL OR ORE Type	Dimensions	Timber B.M.Feet	Number of Pockets	Capacity of Pockets	Number of Hoists	Age	COMPLETE PLANT Cost of Reproduction	Average Condition Per Cent

Form 22

MINNESOTA RAILROAD & WAREHOUSE COMMISSION

RAILROAD APPRAISAL OF 1906

INTERLOCKING PLANTS

Name of Operating Company

Section Number From To

Field Inspector

Office Compiler

LOCATION	Name of Railway Council	When Built	TOWER HOUSE Kind	Dimensions	Cubic Contents	Kind of Machine	NUMBER OF LEVERS Working	Spare	Total	KIND OF CONNECTION PIPE OR WIRE TO Derails	Switches	Signals	Foundations Wood or Concrete	SIGNAL POSTS Right	Dwarf	NUMBER OF FUNCTIONS OPERATED Derails	Switches	Signals	ELECTRIC CIRCUIT FOR Locks	Switch Locks	Bells	Average Condition Per Cent	Per Cent of Construction Cost Paid By This Company	Per Cent of Maintenance Cost Paid By This Company	Per Cent of Operating Cost Paid By This Company	Cost of Reproduction

Form 23

MINNESOTA RAILROAD & WAREHOUSE COMMISSION

RAILROAD APPRAISAL OF 1906

SIGNAL APPARATUS

Name of Operating Company

Section Number From To

Field Inspector

Office Compiler

LOCATION	TRAIN ORDER AND MANUAL BLOCK SIGNALS OPERATED IN CONNECTION WITH THE TELEGRAPH Type of Signal	Manufactured by	Number Installed	Condition Per Cent	Miles of Single Line Protected	AUTOMATIC BLOCK SIGNALS Type of Signal	Manufactured by	Number Installed	Number Switch Indicators	Circuit Track or Wire	Miles of Single Line Protected	Condition Per Cent	DISTANT SWITCH SIGNALS Type of Signal	Number Installed	Condition Per Cent	ELECTRIC BELLS FOR HIGHWAY CROSSING PROTECTION Location	Manufactured by	Number Installed	Circuit Track or Wire	Condition Per Cent

Form 24

MINNESOTA RAILROAD & WAREHOUSE COMMISSION

RAILROAD APPRAISAL OF 1906

TELEGRAPH, TELEPHONE LINES & APPURTENANCES

In One Lines are not Owned, Only Such Such Equipment as Actually Belongs to the Railroad Company

Name of Operating Company

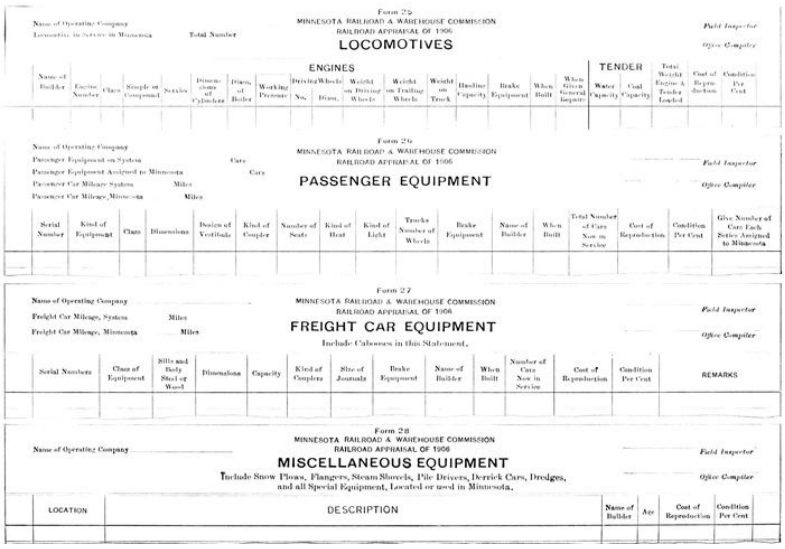
Section Number From To

Field Inspector

Office Compiler

LOCATION	OWNER	GENERAL DESCRIPTION Number of Miles	Number of Poles per Mile	Number of Wires Strung	Kind of Wire	Number of Keys	Number of Sounders	Number of Relays	Number and Capacity of Switch Boards	Number of Telephone Transmitters and Receivers	Kind of Battery	Number of Cells	Cost of Reproduction	Condition Per Cent	REMARKS

FIG. 13.



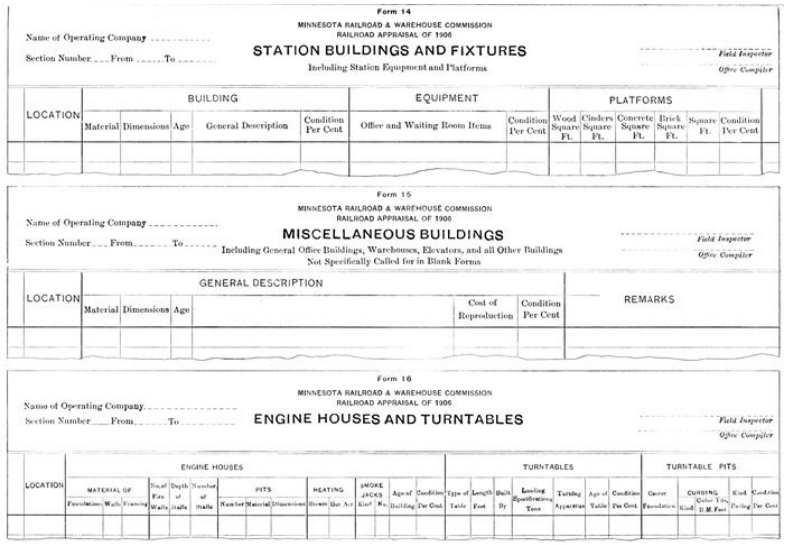
Form 25
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
LOCOMOTIVES
Name of Operating Company
Locomotive in Service in Minnesota
Total Number
Field Inspector
Office Compiler
ENGINES
TENDER
Name of Builder | Engine Number | Class | Simple or Compound | Service | Dimensions of Cylinders | Diam. of Boiler | Working Pressure | Driving Wheels No. | Driving Wheels Diam. | Weight on Driving Wheels | Weight on Trailing Wheels | Weight on Truck | Hauling Capacity | Brake Equipment | When Built | When Given General Repairs | Water Capacity | Coal Capacity | Total Weight Engine & Tender Loaded | Cost of Reproduction | Condition Per Cent

Form 26
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
PASSENGER EQUIPMENT
Name of Operating Company
Passenger Equipment on System — Cars
Passenger Equipment Assigned to Minnesota — Cars
Passenger Car Mileage System — Miles
Passenger Car Mileage, Minnesota — Miles
Field Inspector
Office Compiler
Serial Number | Kind of Equipment | Class | Dimensions | Design of Vestibule | Kind of Coupler | Number of Seats | Kind of Heat | Kind of Light | Trucks Number of Wheels | Brake Equipment | Name of Builder | When Built | Total Number of Cars Now in Service | Cost of Reproduction | Condition Per Cent | Give Number of Cars Each Series Assigned to Minnesota

Form 27
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
FREIGHT CAR EQUIPMENT
Include Cabooses in this Statement.
Name of Operating Company
Freight Car Mileage, System — Miles
Freight Car Mileage, Minnesota — Miles
Field Inspector
Office Compiler
Serial Numbers | Class of Equipment | Bills and Body Sheathed Wood | Dimensions | Capacity | Kind of Couplers | Size of Journals | Brake Equipment | Name of Builder | When Built | Number of Cars Now in Service | Cost of Reproduction | Condition Per Cent | REMARKS

Form 28
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
MISCELLANEOUS EQUIPMENT
Include Snow Plows, Flangers, Steam Shovels, Pile Drivers, Derrick Cars, Dredges, and all Special Equipment, Located or used in Minnesota.
Name of Operating Company
Field Inspector
Office Compiler
LOCATION | DESCRIPTION | Name of Builder | Age | Cost of Reproduction | Condition Per Cent

Fig. 14.

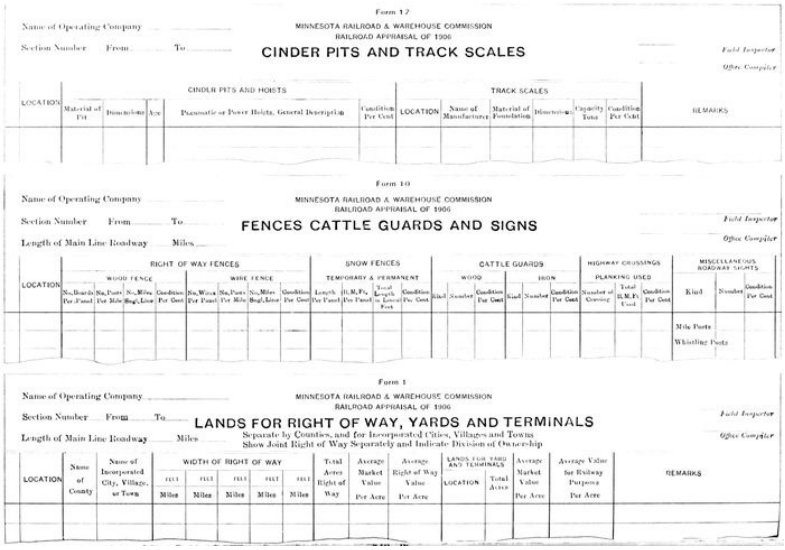


Form 14
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
STATION BUILDINGS AND FIXTURES
Including Station Equipment and Platforms
Name of Operating Company
Section Number ___ From ___ To ___
Field Inspector
Office Compiler
LOCATION | BUILDING: Material | Dimensions | Age | General Description | Condition Per Cent | EQUIPMENT: Office and Waiting Room Items | Condition Per Cent | PLATFORMS: Wood Square Ft. | Cinders Square Ft. | Concrete Square Ft. | Brick Square Ft. | Square Ft. | Condition Per Cent

Form 15
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
MISCELLANEOUS BUILDINGS
Including General Office Buildings, Warehouses, Elevators, and all Other Buildings Not Specifically Called for in Blank Forms
Name of Operating Company
Section Number ___ From ___ To ___
Field Inspector
Office Compiler
LOCATION | GENERAL DESCRIPTION: Material | Dimensions | Age | Cost of Reproduction | Condition Per Cent | REMARKS

Form 16
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
ENGINE HOUSES AND TURNTABLES
Name of Operating Company
Section Number ___ From ___ To ___
Field Inspector
Office Compiler
LOCATION | ENGINE HOUSES: Material of Foundations, Walls, Framing | No. of Fire Walls | Depth of Walls | Number of Stalls | Pits: Number, Material, Dimensions | Heating: Steam, Hot Air | Smoke Jacks: Kind, No. | Age of Building | Condition Per Cent | TURNTABLES: Type of Table | Length Feet | Built By | Leading Specifications Turn | Turning Apparatus | Age of Table | Condition Per Cent | TURNTABLE PITS: Center Foundation | Curbing: Kind, Cubic Yds., B.M. Feet | Kind Facing | Condition Per Cent

Fig. 15.



Form 17
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
CINDER PITS AND TRACK SCALES
Name of Operating Company
Section Number From To
Field Inspector
Office Compiler
LOCATION | CINDER PITS AND HOISTS: Material of Pit | Dimensions | Acre | Pneumatic or Power Hoists, General Description | Condition Per Cent | TRACK SCALES: LOCATION | Name of Manufacturer | Material of Foundation | Dimensions | Capacity Tons | Condition Per Cent | REMARKS

Form 10
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
FENCES CATTLE GUARDS AND SIGNS
Name of Operating Company
Section Number From To
Length of Main Line Roadway Miles
Field Inspector
Office Compiler
LOCATION | RIGHT OF WAY FENCES: WOOD FENCE: No. Boards Per Panel | No. Posts Per Mile | No. Miles Reg. Line | Condition Per Cent | WIRE FENCE: No. Wires Per Panel | No. Posts Per Mile | No. Miles Reg. Line | Condition Per Cent | SNOW FENCES: TEMPORARY & PERMANENT: Length Per Panel | B.M. Ft. Per Panel | Total Length in Lineal Feet | Condition Per Cent | CATTLE GUARDS: WOOD: Kind | Number | Condition Per Cent | IRON: Kind | Number | Condition Per Cent | HIGHWAY CROSSINGS: PLANKING USED: Number of Crossing | Total B.M. Ft. Used | Condition Per Cent | MISCELLANEOUS ROADWAY SIGHTS: Kind | Number | Condition Per Cent
Mile Posts
Whistling Posts

Form 1
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906
LANDS FOR RIGHT OF WAY, YARDS AND TERMINALS
Separate by Counties, and for Incorporated Cities, Villages and Towns
Show Joint Right of Way Separately and Indicate Division of Ownership
Name of Operating Company
Section Number From To
Length of Main Line Roadway Miles
Field Inspector
Office Compiler
LOCATION | Name of County | Name of Incorporated City, Village, or Town | WIDTH OF RIGHT OF WAY: FEET / Miles | Total Acres Right of Way | Average Market Value Per Acre | Average Right of Way Value Per Acre | LANDS FOR YARDS AND TERMINALS: LOCATION | Total Acres | Average Market Value Per Acre | Average Value for Railway Purposes Per Acre | REMARKS

Fig. 16.

Form 18

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

STEAM & ELECTRIC POWER PLANTS—GAS PLANTS

Include all Shafting, Belting, Motors, Etc., Operated from Central Plant

Field Inspector _____
Office Compiler _____

LOCATION	Kind of Plant	GENERAL DESCRIPTION							
		POWER BUILDING					POWER EQUIPMENT	Cost of Production	Condition Per Cent
		Material	Dimensions	Age	Cost of Production	Condition Per Cent			

Form 19

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

GENERAL REPAIR SHOPS

Field Inspector _____
Office Compiler _____

LOCATION	MOTIVE POWER AND REPAIR SHOP						
	Dimensions	MATERIAL USED FOR			Age Years	General Description and Purposes for Which Each Building is Used	Cost of Reproduction	Condition Per Cent
		Foundations	Walls	Frame				

Form 20

Name of Operating Company _____
Section Number ____ From ____ To ____
Located at _____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

SHOP MACHINERY AND TOOLS

Separate by Buildings in Which They are Located
Shafting, Belting, Motors, Etc., to be Included on Form No. 18 Power Plants

Field Inspector _____
Office Compiler _____

MACHINES WITH ACCOMPANYING TOOLS					MACHINES WITH ACCOMPANYING TOOLS					MACHINES WITH ACCOMPANYING TOOLS					REMARKS
Name of Machine	Name of Maker	Age	Cost of Reproduction	Condition Per Cent	Name of Machine	Name of Maker	Age	Cost of Reproduction	Condition Per Cent	Name of Machine	Name of Maker	Age	Cost of Reproduction	Condition Per Cent	

Fig. 17.

Form 7

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

PILE BRIDGES AND TIMBER TRESTLES

Include Timber Overhead Highway Bridges Erected at Expense of Railway Company

Field Inspector _____
Office Compiler _____

LOCATION	GENERAL DESCRIPTION				PILES			CAPS			FRAMED BENTS			SUPERSTRUCTURE FOR PILE OR FRAMED BENTS									Structure Average Condition Per Cent
														STRINGERS			TIES			GUARD RAILS			
	Bridge Number	Total Length	Average Height	Number of Spans	Kind of Timber	Number of Piles Per Bent	Total Lineal Feet Piling	Kind of Timber	Dimensions	Number of Caps	Kind of Timber	Dimensions	B.M. Feet Including Bills and Caps	Kind of Timber	Dimensions	No. per Span	Kind of Timber	Dimensions	Number of Ties	Kind of Timber	Dimensions	Lineal Feet	

Form 8

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

CULVERTS

Include all Arch, Box, Cast Iron or Vitrified Pipe Culverts Stone, Concrete, or Wood

Field Inspector _____
Office Compiler _____

LOCATION	Culvert Number	Design	Material	Dimensions	MASONRY		Concrete Cubic Yards	PAVING		Timber B.M. Feet	Age	Condition Per Cent	REMARKS
					Class	Cubic Yards		Material	Cubic Yards				

Form 9

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

TRACK AND BRIDGE TOOLS

Field Inspector _____
Office Compiler _____

LOCATION	TRACK TOOLS ASSIGNED TO SECTIONS					BRIDGE TOOLS ASSIGNED REGULAR CREWS					NOTE:- In Space Below, List Kind and Number of Tools in use by Average Section and Bridge Crew, Covering General Track and Bridge Work
	Number of Section	HAND CARS		TOOLS		LOCATION	HAND CARS		TOOLS		
		Number	Condition Per Cent	Number of Sets	Condition Per Cent		Number	Condition Per Cent	Number of Sets	Condition Per Cent	

Fig. 18.

Form 11

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

STOCK YARDS AND APPURTENANCES

Field Inspector _____
Office Compiler _____

LOCATION	YARDS						PAVING		WATER SUPPLY AND POWER								STOCK SCALES			
	Number of Pens	Dimensions	Number of Gates	Sheds and Dimensions	Age	Condition Per Cent	Kind	Square Feet	WELLS		Other Means of Supply and Description	Pumps	WIND MILLS		Other Power Used, and Description	Cond. Per Cent	Kind	Capacity Tons	Dimensions of Platform	Cond. Per Cent
									Diameter	Depth			Size Wheel	Tower, Kind and Height						

Form 12

Name of Operating Company _____
Section Number ____ From ____ To ____

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

WATER STATIONS

Field Inspector _____
Office Compiler _____

LOCATION	Source Supply If Well, Give Diameter and Depth	PUMP HOUSE				POWER									PUMPS										WATER TANKS			WATER CRANES			
		Material	Dimensions	Age	Condition Per Cent	BOILERS			GAS ENGINES			WIND MILLS			Kind	Diameter of Cylinder	Condition Per Cent	SUCTION PIPE		DISCHARGE PIPE				Diameter	Capacity Gals.	Tower, Kind and Height	Condition Per Cent	Plate Column	Condition Per Cent	SUPPLY PIPE	
						Horizontal Vertical	Diameter	Cond. Per Cent	Kind	H.P.	Cond. Per Cent	Kind	Tower, Kind and Height	Diameter	Cond. Per Cent				Diameter	Length	Diameter	Length	Cond. Per Cent							Diameter	Length	Cond. Per Cent

Form 13

Name of Operating Company _____
Section Number ____ From ____ To ____

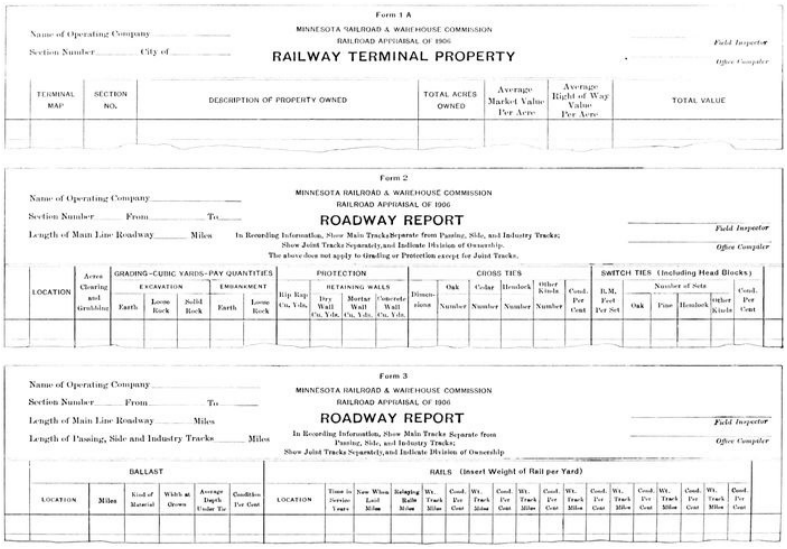
MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

COAL STATIONS

Field Inspector _____
Office Compiler _____

LOCATION	Type Chute or Crane	GENERAL DESCRIPTION OF BUILDING						APPROACH			SPECIAL APPLIANCES FOR HOISTING AND CONVEYING	
		Kind of Foundation	Dimensions of Building	Number of Pockets	Total Capacity Tons	Age of Building	Condition Per Cent	Design	Length	Condition Per Cent	General Description	Condition Per Cent

Fig. 19.



Form 1 A

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ City of _____

RAILWAY TERMINAL PROPERTY

Field Inspector
Office Compiler

TERMINAL MAP	SECTION NO.	DESCRIPTION OF PROPERTY OWNED	TOTAL ACRES OWNED	Average Market Value Per Acre	Average Right of Way Value Per Acre	TOTAL VALUE

Form 2

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ From _____ To _____
Length of Main Line Roadway _____ Miles

ROADWAY REPORT

In Recording Information, Show Main Tracks Separate from Passing, Side, and Industry Tracks; Show Joint Tracks Separately, and Indicate Division of Ownership.
The above does not apply to Grading or Protection except for Joint Tracks.

Field Inspector
Office Compiler

LOCATION	Acres Clearing and Grubbing	GRADING—CUBIC YARDS—PAY QUANTITIES: EXCAVATION Earth	EXCAVATION Loose Rock	EXCAVATION Solid Rock	EMBANKMENT Earth	EMBANKMENT Loose Rock	PROTECTION: Rip Rap Cu. Yds.	RETAINING WALLS: Dry Wall Cu. Yds.	RETAINING WALLS: Mortar Wall Cu. Yds.	RETAINING WALLS: Concrete Wall Cu. Yds.	CROSS TIES: Dimensions	Oak Number	Cedar Number	Hemlock Number	Other Kinds Number	Cond. Per Cent	SWITCH TIES (Including Head Blocks): B.M. Feet Per Set	Number of Sets: Oak	Pine	Hemlock	Other Kinds	Cond. Per Cent

Form 3

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ From _____ To _____
Length of Main Line Roadway _____ Miles
Length of Passing, Side and Industry Tracks _____ Miles

ROADWAY REPORT

In Recording Information, Show Main Tracks Separate from Passing, Side, and Industry Tracks; Show Joint Tracks Separately, and Indicate Division of Ownership

Field Inspector
Office Compiler

BALLAST: LOCATION	Miles	Kind of Material	Width at Grade	Average Depth Under Ties	Condition Per Cent	RAILS (Insert Weight of Rail per Yard): LOCATION	Time in Service Years	Year When Laid Miles	Relaying Rails Miles	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent	Wt. Track Miles	Cond. Per Cent

FIG. 20.

Form 4

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ From _____ To _____
Length of Main Line Roadway _____ Miles
Length of Passing, Side, and Industry Tracks _____ Miles

ROADWAY REPORT

In Recording Information, Show Main Tracks Separate from Passing, Side, and Industry Tracks; Show Joint Tracks Separately, and Indicate Division of Ownership.

Field Inspector
Office Compiler

LOCATION	Weight of Rail	TRACK FASTENINGS: ANGLE BARS No. of Pairs	ANGLE BARS Weight Per Pair	ANGLE BARS No. Bolts Per Joint	ANGLE BARS Cond. Per Cent	Weight of Rail	FISH PLATES No. of Pairs	FISH PLATES Weight Per Pair	FISH PLATES No. Bolts Per Joint	FISH PLATES Cond. Per Cent	BOLTS Size	BOLTS No. Kegs 200 lbs. Used	BOLTS Cond. Per Cent	NUT LOCKS Kind	NUT LOCKS Size	NUT LOCKS No.	NUT LOCKS Weight Per 1000	NUT LOCKS Cond. Per Cent	SPIKES No. Kegs 200 lbs. Used	SPIKES Cond. Per Cent	THE PLATES Kind	THE PLATES No.	THE PLATES Weight Each	THE PLATES Cond. Per Cent	RAIL BRACES Kind	RAIL BRACES No.	RAIL BRACES Weight Each	RAIL BRACES Cond. Per Cent

Form 5

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ From _____ To _____
Length of Main Line Roadway _____ Miles
Length of Passing, Side, and Industry Tracks _____ Miles

ROADWAY REPORT

In Recording Information, Show Main Tracks Separate from Passing, Side, and Industry Tracks; Show Joint Tracks Separately, and Indicate Division of Ownership.

Field Inspector
Office Compiler

LOCATION	SPLIT SWITCHES: Complete Including Connecting Rod: Wt. Rail	SPLIT SWITCHES: No.	SPLIT SWITCHES: Cond. Per Cent	STUB SWITCHES: Complete Including Connecting Rod: Wt. Rail	STUB SWITCHES: No.	STUB SWITCHES: Cond. Per Cent	SWITCH STANDS: Kind	SWITCH STANDS: No.	SWITCH STANDS: Cond. Per Cent	SWITCH LAMPS: Kind	SWITCH LAMPS: No.	SWITCH LAMPS: Cond. Per Cent	RIGID FROGS: Wt. Rail	RIGID FROGS: LENGTH IN FEET	RIGID FROGS: Total No. of Each Kind	RIGID FROGS: Condition Per Cent	SPRING RAIL FROGS: Wt. Rail	SPRING RAIL FROGS: LENGTH IN FEET	SPRING RAIL FROGS: Total No. of Each Length	SPRING RAIL FROGS: Condition Per Cent	GUARD RAILS: Wt. Rail	GUARD RAILS: LENGTH IN FEET	GUARD RAILS: Total No.	GUARD RAILS: Condition Per Cent	RAILROAD CROSSINGS: Wt. Rail	RAILROAD CROSSINGS: Name of Railway Crossed	RAILROAD CROSSINGS: Cost Paid by This Co.	RAILROAD CROSSINGS: Cost Paid by Other Co.	RAILROAD CROSSINGS: Cost Paid by Both Cos.	RAILROAD CROSSINGS: Cond. Per Cent

Form 6

MINNESOTA RAILROAD & WAREHOUSE COMMISSION
RAILROAD APPRAISAL OF 1906

Name of Operating Company _____
Section Number _____ From _____ To _____

BRIDGES

Truss, Plate Girder, I Beam and Draw Spans.
Indicate Power Used for Operating Draw Spans.

Field Inspector
Office Compiler

LOCATION	Bridge Number	SUB-STRUCTURE: PILES Kind of Timber	PILES Total Lineal Feet	FRAMED TIMBER Kind of Timber	FRAMED TIMBER B.M. Feet	MASONRY Cubic Yards	CONCRETE Cubic Yards	Cubic Yards	Average Height of Piers & Abutments	Age	Average Cond. Per Cent	SUPER-STRUCTURE: No. of Spans	Total Length of Bridge	Design of Bridge	Superstructure for Live Load	Total Weight to Travel on Bridge	Age	Cond. Per Cent	BRIDGE TIES: Kind of Timber	No. of Ties	Dimensions	GUARD RAILS: Kind of Timber	Dimensions	Lineal Feet	Average Cond. Per Cent

FIG. 21.

From Mr. Gillette's report,[11] supplemented by information furnished by Henry L. Gray, Assoc. M. Am. Soc. C. E., Engineer of the Railroad Commission of Washington, the following general statement as to methods is gleaned:

The plan involved, not only a determination of cost of reproduction and present value, but also original cost.

The appraiser was unable to adopt the methods followed in Wisconsin and Minnesota, in so far as they accepted the inventory of the railroads, but made his own examinations of records. The railroads of the State denied that they had any information whatever that would be of value to the Commission.

The records of the Engineering Department were examined. The records of the Accounting Department were analyzed, various annual reports were examined and a corporate history of the road prepared.

Special forms for securing information were not prepared, and no rules, or definite order of procedure to be used for all roads alike, were adopted.

It is somewhat difficult to determine from the appraiser's report just what part of it covers actual work done, and what part is theory developed from the work, but presumably maps were prepared and profiles secured which represented the original conditions of construction.

The field inspection was made on hand-cars or on foot, each field inspector being furnished with the plans, profiles, etc.

The same conditions existed in Washington as elsewhere, that is, certain records were not kept up, and were found to be inaccurate and unreliable, and, as a result, the appraiser reported the condition to be such as "to cause much unnecessary work subsequently in checking."

A percentage of depreciation was not placed in the field, but was determined by "mortality tables," or by ascertaining the probable years of structure life, then determining from the age of the particular structure under consideration its percentage of depreciation, a method by no means new. It is not stated that any attempt was made to compare these tables with the rules of the Master Car Builders Association for valuing equipment, and no field inspection of equipment was made. The prevailing prices of materials formed the basis for estimating the cost of reproduction.

The value of motive power and rolling stock was apportioned among the States on the basis of engine- and car-mileage.

The land values were fixed by the Railroad Commission sitting as a court; real estate men from the large cities, real estate experts brought by the railway companies, and others testified; and, based on this testimony, the value was determined by the Commission in the same manner as in a condemnation case. Three right-of-way experts, all of whom had had experience in purchasing right of way for roads, were in the regular employ of the Commission, and details as to present values were referred to them.

The chief point of difference between this work and that of the other States apparently was the effort to ascertain first cost of the properties plus additions. This was done by an examination of the accounts of the railway companies.

The result of the Washington work, as far as rate-making is concerned, is indeterminate, as the United States Courts have held that the Commission may not fix freight rates. The Supreme Court of the State has held that they could. The Supreme Court has also held that the Tax Commission should accept the findings of the Railroad Commission for the purpose of taxation, with the result, as stated by Mr. Gray, that more than $1,250,000 more was received last year than during any prior year from railroad taxes.

The report of the Washington appraiser differs widely from that for other States in that it is diffuse and does not present the methods clearly and systematically; it is difficult, indeed, to trace what was actually done. The writer is loath to criticize, but this report is such as to suggest comment on a number of points.

1.—Throughout the report very great stress is laid on the cost of making the appraisal. Such an undertaking as an appraisal of corporation property should be done thoroughly or left alone. It matters not whether the work of Professor Cooley or Professor Taylor cost $5 a mile or $50 a mile, if a dependable result was secured. It does not appear to be good taste either to criticize costs of work in

other States, or compare the costs in Wisconsin and Michigan with the costs in Washington.

2.—A number of criticisms, amounting almost to reflections, are made on the methods elsewhere. The appraiser says:

"Speaking for myself, I found the precedents established by Texas, Michigan, and Wisconsin of little value either in deciding the methods to be pursued in making the appraisals or in estimating the probable cost of appraisal....

"In estimating present or depreciated values of structures, rolling stock, etc., both Michigan and Wisconsin had sent experts into the field to estimate the percentage of present value to each unit. In this manner 40,000 freight cars were inspected in Michigan and their 'present value' estimated. To me this seemed to be not only a useless procedure but very erroneous....

"The appraisals heretofore made in other states have been based almost entirely upon field surveys and inspection, no attempt having been made to secure the necessary data from the engineering and accounting records of the railways. Why? The answer is found in the purpose of the appraisal."

Such sentences, and others which, by inference if not by name, reflect on work executed by men of high professional standing, are hardly in good taste, even if true, in a report to a railroad commission of another State. Whether or not he found little of value, the appraiser's general line of procedure was not radically different from that followed in Michigan and Wisconsin in getting all available data first from the companies, then in making a field inspection before fixing values. If misled by erroneous profiles, he went into an error needlessly, as it was fully known in Michigan that records were in the condition described before any field work was begun.

The inspection of freight cars in Michigan was not to "estimate present value" but to determine at first hand whether the Master Car Builders rules for valuation were safe to use, and to back up their use in Court.

The third paragraph quoted is a misstatement, due clearly to a misapprehension of what really was done.

3.—The spirit of suspicion of railroad men's motives is an unfortunate one to carry into a railroad appraisal, much less into a report.

4.—The writer fully realizes the magnitude of the task before the appraiser who is asked to determine first cost plus improvements or betterments.

Hardly a trunk line road exists to-day that has not grown up from a small beginning, changed its line, reduced its grades, added safety devices, changed the type of its bridges and buildings, increased the weight of its rails, put in service much heavier equipment, in fact, completely changed everything, except, perhaps, the original right of way.

The task of securing from old accounting department records an accurate statement of cost is—and the writer says it with the confidence born of experience—an impossibility. It is a job of such magnitude as to be practically prohibitive. The different systems of accounting, the different policies of the management, as to charging betterments to capital or operating expense, to say nothing of the countless errors that creep into the distribution of accounts, place such an undertaking among the labors of a modern Hercules, and, to one who has been engaged even in the task of trying to ascertain what one year's accounting on a large road may do in concealing betterments under the guise of operating expense, it would appear that a result that could be sworn to as correct was impossible of attainment along the lines suggested in this report.

The general question of the propriety of the use of mortality tables is discussed elsewhere in this paper.

This document, as an addition to the literature of the subject of valuation of properties, is disappointing, for if there were original and valuable methods they are not explicitly described.

The cost of making the appraisal was about $13 per mile of line.

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11. *Engineering-Contracting.*

During 1906 a complete valuation of the property and franchises of the surface roads of Chicago was made under the direction of a Commission consisting of Bion J. Arnold, M. Am. Soc. C. E., and Messrs. Mortimer E. Cooley, and A. B. du Pont. The report of this valuation was published in the form of a pamphlet which is now practically out of print, as all extra copies were long ago exhausted.

The instructions of this Commission from the Chicago City Council were:

"To consider the detailed inventories and estimates of value to be submitted by the Street Railway Companies, to investigate the same and to ascertain whether the values thus listed were reasonable, fair and just."

Detailed inventories and estimates of value were submitted by the roads, and, from time to time during the progress of the work, additions or corrections to these schedules were made.

Reports showing income, operating expense, and traffic statistics were made, and such detailed statements as were called for from time to time were furnished.

The Commission organized its force for valuation work by using the office and field organization of the Arnold Company under the direct charge of George Weston, M. Am. Soc. C. E., for the major part of the work, and retained Messrs. Theodore H. Hinchman, Jr., C. V. Conover, and the writer to give special study to certain features of the appraisal. In the determination of franchise values, Professor Henry C. Adams was retained in consultation by the Commission. 95

In arriving at the value of the physical properties, a complete field examination was made, depreciation determined, cost of reproduction estimated, and in general, the work was carried on along lines quite similar to those of the railway appraisals heretofore described in detail.

Several very interesting and unique problems were presented, some of which were as follows:

"Upon what basis shall the cable properties of the companies be estimated—(*a*) as operating cable systems, or (*b*) as obsolete systems having no value except so far as the physical property can be utilized in the conversion of the cable lines into electric?"

In the final conclusions of the Commission, part of the cable lines were treated in one way, and part in the other.

"What allowance, if any, shall be made for the pavements laid by the companies on their right of way?"

The discussion of this topic, together with the opinions of counsel as to the legal status, is of interest. The Commission did not consider the value of paving as constituting any part of the physical property, the value of which must be supported out of earnings. The present value of the pavement was estimated and reported without specific recommendation as to whether an allowance should be made.

The valuation of real estate was left in the hands of real estate experts familiar with values in Chicago, each piece of property being personally examined and valued, and the representatives of the roads given such hearings as they desired.

In computing the value of physical properties, an allowance of 10% was made to cover the following items:

"*1.—Legal Expenses*—including those incurred in securing right of way and frontage consents.

"*2.—Interest or carrying charge* for the money expended during the construction period and up to the time the property goes into operation.

"*3.—Brokerage*—or the expense of securing the necessary moneys.

"*4.—Contingencies*—to cover incomplete inventories, unforeseen difficulties of construction, and any and all other items of expense which cannot be foreseen."

The only novel feature in this list is Item 3, which was not included specifically in any of the railroad valuations made by States and heretofore described. 96

The franchise and intangible property valuation, amounting to some $9,000,000, or about one-fifth of the total, was a very important phase of the work, and the Commission gave up a large part of the report to its discussion.

The difficulties in this part of the work are described as threefold:

"*First.*—The difficulty of determining what are the exact legal rights of the companies in any given street or part of street, in absence of a direct and final judicial decision as to these rights;

"*Second.*—The difficulty in estimating the value of a line of street railways, consisting of several parts, where each of these parts is operated under a different tenure due to the character of the ordinances or franchises, respectively; and

"*Third.*—The difficulties arising from the absence of exact information as to the receipts and expenditures on the several parts of a single line covered by franchises of different length and character."

The Commission, having arrived at such an adjustment of the difficulties as appeared just, determined the value of franchises in the following manner:

It was assumed that the gross earnings on the different parts or routes of each system were in proportion to the car-mileage.

The system was divided into routes, and the car-mileage was determined for each route; then this information was compiled so as to show the car-mileage, and consequently the gross earnings, apportionable to each franchise.

The next step was to determine, in the same manner, the proportion of operating expenses assignable to each franchise, the operating expense being assumed to be uniform with gross earnings. A study of the conditions in Chicago resulted in a determination upon 70% as a fair proportion for operating expenses, taxes, and maintenance.

Next, the amount of capital investment to be supported out of earnings was computed by estimating the cost of reproduction of track and overhead lines under each franchise and apportioning the cost of land, power-houses, barns, cars, tools, and stores in proportion to car-mileage.

In determining earnings for the unexpired years of franchise life, it was assumed that the earnings would increase in accordance with the law laid down by Mr. Arnold in 1902.

The last step was to find the value of the net earnings of future years, after deducting the sum required to support the invested capital. The rate chosen was 5% compound interest. The sum of the different present values thus found was the value of the franchise sought. 97

Two other points arising in connection with franchise values were:

"Where, on a street, franchises covering part of the street have expired, and others remain in force, the contention of the city is that the expired franchise is valueless because traffic under it can be stopped; that of the company is that it still has value, as traffic can be routed over other streets where franchises have not expired."

This was set aside on the ground that the value of any particular portion of a street, or of a franchise, remains the same as long as the system is considered as an entirety.

The second point was as to the value of traffic agreements; but this complicated problem was also dismissed on the theory that when two systems are considered as co-operating, the value of individual parts of either system remains the same regardless of their ownership.

The values of their properties, fixed by the companies, included paving. The total figures reached in this valuation were:

Companies' valuation,	including paving,	$73,555,675
Commission's "	" "	50,994,782
Commission's "	excluding "	46,652,747

This work affords many interesting problems, and is perhaps the largest valuation for determining a price for the purchase of property that had been made to date.

The Commercial Valuation of Railway Operating Property of the Department of Commerce and Labor.

In 1902 the permanent Census Office was established, and the Director was authorized to collect statistics relative to public indebtedness, valuation, taxation, and expenditures. The Bureau of the Census co-operated with the Department of Commerce and Labor in the preparation of the appraisal of the commercial valuation of railway properties of the country.

The report of this work, issued as Bulletin 21 of the Bureau of the Census, is the most interesting and valuable exposition of the subject of railway valuations yet published, as it includes not only the report of this particular work, together with the results, tabulated by States, but appendices describing and discussing the work in States and foreign countries, and the work of valuation by railway men. 98

The results are of prime interest, as they show the valuation of all railway property in all the States, based on uniform methods of appraisal and distribution, which enables a comparison to be made with work done by the States.

The method adopted in this work was so radically different from that of the various State appraisals as to make a detailed description a matter of interest, and it is to be regretted that it cannot be included. The method is really a capitalization of net earnings.

Owing to the nature of the inquiry, namely, to determine what part of the wealth of the nation is devoted to railway transportation, it was obligatory on the appraisers to adopt a method which would disclose as nearly as possible the true market value.

Certain restrictions and limitations on the term, "value," and on the use of the resultant figures of the appraisal, are suggested by Professor Adams, as follows:

"The valuation submitted in this report may be properly defined as the commercial value of property used by railways in connection with the business of transportation. By 'commercial value' is meant the estimate placed upon the worth of property regarded as a business proposition. This must, of course, be the market estimate and not the arbitrary estimate of a public official. The two fundamental considerations by which the market is influenced in placing a value upon property when bought or sold, are the expectation of income arising from the use of the property, and the strategic significance of the property. These two considerations are made the basis of the valuation of railway property submitted in this report. The material made use of in this valuation is, first, the operating and financial accounts of the railways; second, inter-railway contracts and agreements; and, third, the published records of the stock market.

"This is no place to enter upon a discussion of the nature and classification of different kinds of value, but a word of caution may be allowed in order to guard against an unwarranted use of the figures here submitted. The commercial valuation of railway property, in so far as it depends on income arising from the sale of transportation, is the result, among other things, of an established schedule of freight and passenger rates, from which it follows that such a valuation cannot be used for determining the reasonableness or unreasonableness of the rates in question. The solution of the rate problem demands a separate valuation of the physical property.

"Again, in so far as the Government is precluded by its political character from following commercial rules in the sale of any service which it renders, a commercial valuation which assumes that property is administered under the rules of private rather than public financiering, might differ from the valuation of the same property regarded as a public property. The purpose of this remark is to preclude a discussion of the problem of the Government purchase of railways on the basis of the values submitted in this report. It would of course be necessary to modify these values by considerations of public utility, in order to determine a public purchase price. 99

"Whether or not the commercial valuation here submitted can be used as the basis of assessing railway properties for the purpose of taxation depends entirely upon the taxing laws of the state for which the question is asked. If these laws confine the appraisal of railway property to its physical elements, the values here submitted would, in the case of prosperous roads, exceed an appraisal for the purpose of taxation. If, on the other hand, it is the purpose of the taxing law to appraise railway property at its true cash value, unusual or abnormal conditions being excluded, it may be that the commercial valuation of operating property submitted in this report fairly measures its appraisal for the purpose of taxation."

The methods are explained in the most minute detail by a series of papers in the Bulletin.

The work of Professor Adams and his associates is of great practical value in that it shows the discrepancy in the taxation laws of the different States as relating to railroad properties, and in that it gives a set of values determined by a uniform method, which, within reasonable limits, furnishes a check on the work of the State appraisals.

This method, of course, cannot be used for purposes of rate-making, or of bond or stock restrictive legislation, but the general uniformity of its results with those of State appraisals, and the radical differences noted in the case of values for taxation in other States, lead very properly to the inference that a value determined by this method is very close to the truth.

There have been many appraisals of property besides those reviewed in the foregoing pages. Several excellent contributions to valuation literature, as a result of the numerous water-works appraisals, are mentioned in the Appendix.

New Jersey and Nebraska have had railway appraisals in progress during 1909-10. At the time of writing, neither appraisal has gone far enough to add any points of interest to the subject, except as the appraisers in these two States discuss the subject and bring out new points. 100

Valuations of street railway property have been made in several cities, Cleveland, Ohio, Detroit, and Milwaukee being the most recent.

The Cleveland and Milwaukee hearings have produced large records, and have tended to determine finally certain principles of valuation. Several valuations have also been made for corporations, among which may be mentioned that of The Toledo Railways and Light Company, by Messrs. Ford, Bacon, and Davis, and that for the New York, New Haven, and Hartford Railway, under the direction of John F. Stevens, M. Am. Soc. C. E.

This latter valuation offers some very interesting points, and, in view of Mr. Stevens' standing as a railroad engineer, the adoption by him of methods of inventory and field inspection would go far toward fixing a precedent which would be acceptable to the railroads. It is to be regretted that the interests of the road are such that it is not deemed wise by its President to discuss even the principles of this work at present.

In connection with the recent appraisal made by the City of Detroit, The Detroit United Railway made an independent examination and appraisal of its own property, with the double purpose of furnishing an inventory to the city and of checking the work of the staff employed by the city. This work for the railroad was done by officials and employees of the company, under the personal direction of Mr. R. B. Rifenberick. It is noteworthy for the completeness of its inventory, which goes into the most minute detail, and for the excellence of the maps and drawings which accompany it and show, not only every standard type of track, rail, and all buildings and machinery, but every piece of track and overhead special work on the entire system. This appraisal includes a most complete and exhaustive study of average unit costs. Inasmuch as this work is likely to be fully reviewed in the Courts in the near future, any further description would hardly be proper. It is not too much to say, however, that it probably stands as the most complete in every detail, as to inventory and records, of all American appraisals up to this date.

During the summer of 1910 the Railway Commission of Michigan ordered an appraisal of certain large electric-power properties of the State. This work was done by Professor Mortimer E. Cooley, assisted by Mr. Henry C. Anderson and the writer. This appraisal, involving certain comparatively new corporations, made it possible to obtain a fairly definite solution of some of the problems relative to overhead charges. 101

It is evident that the demand for valuation work of a high character will increase, and that it will come, not only from States and cities, but from corporations. Much of the work done in the past has not been described in the publications of scientific societies; much very valuable work has secured only partial notice through reports of litigation; and it is undoubtedly true that the most complete and full discussions of the principles of valuation have been in the form of expert evidence before the Courts, and are buried in the mass of unprinted records of testimony.

Much of the available literature on the subject of valuations is in the form of papers descriptive of water-works appraisals and arbitrations, many of which have been made, and a few of which have been the subject of valuable papers and discussions before learned societies.

Before the American Water-Works Association, D. W. Mead and J. W. Alvord, Members, Am. Soc. C. E., have presented papers[12] which have been quite fully discussed. The chief point of interest in these papers is the treatment of the intangible element termed "going value." Mr. Alvord advances the argument that, after the determination of physical present value, there should be added, to determine the fair value, two non-physical elements: the "going" or "business" value, and the franchise value. The first element is defined as that special value which is:

"Built up ... by the energy, perseverance and solicitation of the officers in charge, as distinct from the inert plant itself, ...

"The element of 'going value' has been before described as the element of growth in the plant irrespective of its physical condition. It is comparable somewhat to that indefinable quality known in other lines of business as 'Good Will'. Nevertheless it is something more than good will in water works business, as it represents what might be more aptly described as 'connected good will', that is to say, the acquisition of customers who have invested considerable sums in actually connecting their premises with the plant of the company, and provided appliances for the use of the water which it can deliver." 102

The method advocated by Mr. Alvord as the most rational one for computing this value is described as follows:

"It is assumed that a new plant will be constructed, the inception of which is coincident with the data of arbitration. Such new plant is to be of an equal capacity with the older plant under consideration, and a due allowance of time in which to construct this new plant, and the necessary capital to be invested in it from time to time is estimated. At the completion of this new imaginary plant, it is assumed that it commences to obtain business in that community from those who are not previously accustomed to the free use of public water, except in a general way; that it is to require the business ability and consequent increase in number of customers which the earlier and older plant went through within the early years of its existence. An assumption of the amount of business thus created for each year for a period of years in advance is carefully computed and estimated by the board of arbitration. The losses of interest upon capital invested are duly fixed, as well as the first absence and later addition of revenue from hydrant rentals, and a table is prepared showing each year, the total business developed and the total losses, if any. After this is completed a forecast is made of the business of the older works for the same period of time in the future that it takes the business of the new works to equal the business of the old works. If the business of the old works is found to be a growing one it will be a longer period that the new works will require to overtake it than will be the case if the business of the older works is stationary or decreasing. In general, the differences which might be called the debits and credits of this new imaginary plant and the debits and credits of the older working plant are reduced to their present worth at the time of appraisement, and an estimate is made up which will adequately represent the financial advantage which the old works (already fully equipped and in running order and having a large number of profitable customers) will have over the new works, where everything must be built and customers secured.

"It is necessary in making this supposititious estimate of the new plant to consider it in no way a competitor of the older works; there is not supposed to be competition between the new and the old, but it is left to the experience of the board of arbitration to consider how long it would take the new company to build new works, and build up business for the new works, until they have overtaken the business of the old company should it continue to occupy the same territory."

Mr. Alvord's description of his method has been quoted fully, as it is an interesting one and has been often used. It is open to the very decided objection that it is purely theoretical, a rational method of computation, perhaps, but based on assumption throughout. It may be said to be a method which is within the field of pure speculation. Mr. Alvord, himself, says that where experience in financial matters and the financial management of water-works is not brought into the valuation, there is usually to be found guesses of the wildest character. Professor Mead, in discussing Mr. Alvord's method and agreeing that it is consistent and logical, says: 103

"The method is by no means an exact one, and must necessarily lead to a very great divergence in opinions as to the 'going value,' in accordance with the assumptions on which it is based.... Its very logic is an element of danger, for if clearly presented from a biased standpoint to one previously unacquainted with its application, and if accepted without careful analyses it may lead to very unjust conclusions. If used, however, carefully and conscientiously with the desire to do justice to all concerned, it is a valuable method of estimating going value, and the only logical one with which the speaker is familiar."

In addition to the element of going or business value, Mr. Alvord considers the franchise value, and presents two methods for its determination:

First.—The physical value, depreciation, and going value are entirely neglected, and the entire valuation is fixed on the basis of its earning power throughout the remaining life of the franchise and its probable sale value.

The probable net revenue for each year of franchise life must be estimated and capitalized at a sum, which, if put at interest, would pay such yearly revenue and extinguish itself at the end of the franchise period. To this must be added the physical value of the plant at the end of the franchise period.

Second.—The cost of reproduction, depreciation, and present physical value are ascertained, and the going value computed. Then it is determined whether or not the net revenue is paying interest on a capitalized value greater than that indicated by the sum of the physical and business values. If such capitalized figure is less than this combined value, there is, of course, no franchise value; if it is more, there is a franchise value which should be determined by estimating, for the remaining years of the franchise, the excess income over and above that necessary to cancel all obligations (including interest on the physical and business values), and the reduction of these several sums to a basis of present worth. 104

A number of other articles and papers are listed in the Appendix. Many of these are of great value and are well worth careful perusal, but they offer no definite plan of valuation. Inasmuch as the general principles involved in the valuation of a water-works plant and a railroad plant are similar, it is advisable, in any exhaustive study of the subject, to review the articles descriptive of water-works valuation, and it is a matter of regret that greater consideration cannot be here given to some of the points raised by such engineers as George H. Benzenberg, Past-President, Am. Soc. C. E., Kenneth Allen, Arthur L. Adams, Emil Kuichling, Members, Am. Soc. C. E., and others in their various papers and discussions of this subject.

The *Railway Age*, the *Railroad Gazette*, the *Railroad Age Gazette*, and the *Railway Age Gazette* contain many editorials and articles on the valuation of railroad properties. These are written mainly from the standpoint of the railway official, and present many matters of interest which are worthy of study prior to undertaking a large appraisal. One series of articles in the *Railway Age Gazette*[13] is a most masterly argument, and it is to be regretted that the author has not disclosed his identity.

The Michigan valuation has been discussed in two papers by Mr. Charles Hansel, whose connection with the work, as a member of the Board of Review, gave him probably a more intimate knowledge of it than any one else, not connected with the actual working organization, who has undertaken to review the work. His first paper, published in 1901,[14] entitled, "What is the Value of a Railroad for Purposes of Taxation?" is a discussion of the work of Professors Cooley and Adams, written while the subject was fresh in his mind. His second paper, an able argument for a Government valuation, appeared in the *North American Review* in 1907. The one point to which special attention is drawn is Mr. Hansel's astonishing misconception of Professor Adams' plan of work. This misleading statement appears in the first paper and is reiterated in the second. It is of such a character that to pass it unchallenged would be doing great injustice to Professor Adams. He states Professor Adams' plan as follows: Capitalize net earnings and add to the present value of the physical appraisal as found by Professor Cooley. 105

"The result would be that in case the present value per mile as determined by Professor Cooley is found to be $15,000, and the net earnings by Professor Adams are found to be $1,000, this capitalized at 5 per cent. would equal $20,000, and added to the present value would make $35,000, which would be the sum upon which taxes were to be levied. In other words, if the company actually earns $1,000 it increases its value for purposes of taxation 20 times that amount. If, however, instead of having a net earning of $1,000 it spends that sum in improving the property, it has only increased its taxable property by $1,000."

This statement is not only inaccurate, but involves the other error of assuming that the appraisal figure was to be used for taxation. It was not. It was merely information to aid the legislature in framing new taxation laws. The chief error, however, is in assuming that Professor Adams added the value of the property, as determined by a capitalization of net earnings (which *per se* is a well-recognized method of valuation), to the value of the physical property. This error probably is due to the flood of criticism which at the time was aimed at any form of non-physical valuation.

Professor Adams finds the net earning in Mr. Hansel's example to be $1,000 per mile. From this, in the method actually used, he deducts an annuity for the support of invested capital, which he assumes to be the present value found by Professor Cooley. In the example given by Mr. Hansel he would deduct 4% on $15,000, or $600 per mile, leaving $400 per mile as surplus, or the earnings due to non-physical

elements of value. This, capitalized at 5%, would give $8,000 per mile, which, added to Professor Cooley's figure of Present Value, would make $23,000 per mile, instead of $35,000, as stated by Mr. Hansel.

The most recent criticism of the Michigan valuation work was in an address[15] before the New York Traffic Club in January, 1909, by Mr. W. H. Williams, Third Vice-President of the Delaware and Hudson Company. This address is devoted to an attack, not only on the work of the Michigan appraisal, but on Professor Adams' work and on the propriety of valuation work being undertaken for any reason. The 106
arguments advanced in this address are such that a discussion of them becomes almost necessary in any complete review of the Michigan work, and it contains so many statements which are erroneous that it would hardly be permissible to pass them without comment. The manifest impatience with all forms of governmental interference with corporations, which so often characterizes the utterances of prominent railway officials, appears in this paper to a marked degree. After stating that the present agitation for a physical valuation appears to be the result of a misconception, on the part of the Interstate Commerce Commission, of Section 20 of the Act to Regulate Commerce, and quoting Professor Adams' suggestion of an inquiry, he says:

"Subsequently, the desire of Governor Pingree to find a means of increasing railway taxation in Michigan gave Professor Adams an opportunity to experiment with his project within the limits of that State."

This is a direct imputation of an improper motive, not only to Governor Pingree, but to Professor Adams. As stated elsewhere, the investigation was to determine whether the railroads were paying taxes on the same basis of valuation as other property in the State—an absolutely proper proceeding. Professor Adams was associated with the Michigan appraisal, but had no connection whatever with the "physical valuation," to which such objection is taken, and his appointment was made after the work of physical valuation had been fully outlined and was well under way.

The opening statement is followed by a brief *résumé* of the recommendations of the Interstate Commerce Commission and President Roosevelt, and of bills introduced in Congress, also by quotations from Bulletin 21, describing the methods of valuation used in Michigan and a showing that practically a similar basis was used in other States. Mr. Williams then summarizes his objections to the Michigan work:

"(1) No allowance is made for discount on securities sold.

"Discount is a partial capitalization of the commercial risk had in making the investment, and it increases or decreases in proportion to the probability of the earning power of money under existing conditions. Not only is this practice justified by long-established commercial usage, but also by judicial determination."

The correctness of this position cannot be conceded on any grounds of economics or accountancy. It is answered conclusively in an 107
article,[16] elsewhere referred to, as follows:

"There is considerable diversity of opinion as regards the proper treatment of discount on securities sold. There is a distinction between bonds, representing corporate indebtedness and having a definite limitation as to the time of their redemption, and share capital, representing ownership and which as a rule is irredeemable. In relation to the former there can be but one tenable view. If a company can market its 50-year 4 per cent. bonds at 90 per cent. of par, it means that the company's credit is on a 4½ per cent. basis; that it could market a like security paying 4½ per cent. at par. If it elects to issue at the lower rate it is merely sacrificing principal for the sake of a reduction in the annual interest charge; in other words, it is pre-paying interest which would accrue during the life of the issue. If $10,000,000 par value were issued at 90 per cent., the discount would amount to $1,000,000, and the saving in interest to $50,000 per year, or $2,500,000 in 50 years. Obviously the company cannot claim the privilege of capitalizing the discount, while thereby availing itself of the reduction in interest. If such a course were legitimate in the case of a 5 or 10 per cent. discount, it would be equally so if the discount were 50 or 75 per cent., when the absurdity of the proposition would be perfectly apparent. The somewhat general practice of prorating the discount, as a charge against revenues, over the term of the obligation's existence is sound; but this should be done, not in equal installments, but on the basis of the appreciated value of the bond as it approaches par at maturity. There is no apparent objection to charging discount of this nature in a lump sum against an accumulated surplus. The capitalization of discount on stocks, involving as it does the introduction of fictitious values in capital assets, is wholly indefensible."

The writer has failed to note any particular "judicial determination" which approves of the charge of any such item to capital account.

"(2) The interest during construction (3 per cent.) is less than a fair and reasonable return on the investment."

The amount actually paid out for interest on money used during the period of construction will vary, of course, depending on the time of construction and the way in which payments on construction materials are made. On the basis of a rate of 6% per annum and construction lasting one year, only a very small portion of the construction cost will pay 6%, while the great items of rails, buildings, motive power, and equipment will be put into the work from 90 days to 10 months after the commencement of work, and will actually 108
bear but little interest. In the Michigan appraisal the assumption was made that all work must be replaced in one year, and that on long roads partial operation would commence as various sections of the line were completed; and 3% was agreed on as a fair average, perhaps having in mind Governor Pingree's "desire to increase railway taxation." Some assumption must be made. This one, that long roads, covering several years of construction work, are in Michigan put in partial operation as soon as built, is not unreasonable. Such an assumption clearly would not be proper in the case of long lines crossing mountains, or involving such a class of construction as to make it impossible to complete the property short of two or three years; and, in any such cases, the interest charge should be made sufficient to cover.

"(3) No allowance is made for working capital with which to carry on the business."

All the appraisals of physical property have been made on the basis of securing a figure representing the cost of reconstructing the property in the condition in which it existed on the date of the appraisal, including only items properly chargeable to capital, cost of road, and equipment. This is not such an item. The writer is of the opinion, however, that it is a proper one to determine and include in any report.

"(4) No allowance is made for wear and tear of material during the period of construction. Assuming eight years to be the life of a tie, and three years the period of construction, a substantial percentage of the period of usefulness is over before the road is in operation. The use of the rails before the track is put in proper line and surface hastens the time when they must be removed."

This deterioration is a necessary incident to any construction work. It has not been customary or usual to take account of it. To add to the amount capitalized on account of this item would be manifestly improper. The only way in which this could be cared for would be in an adjustment of the depreciation reserve when raised to cover that which takes place during the construction period. This reserve, later in the address, is objected to by Mr. Williams as improper accounting:

"(5) No allowance has been made for impact and adaptation. After the line is placed in operation, each fill will sink 1 ft. for every 10 ft. of 109
height. The slope of cuts must be increased to prevent landslides and washouts. The ballast will pound into the roadbed, necessitating additional ballast to secure a standard cross-section."

Part of this objection is covered by the item, "Appreciation of Roadbed," discussed elsewhere. This, perhaps, is a proper item, but a comparatively small one. One of the examples cited is clearly maintenance. This objection is largely covered in the Michigan work by the contingency item.

"(6) A uniform price for earthwork was used, thus ignoring the varying character of soil and length of haul."

This is erroneous. On the Michigan appraisal prices were used for earth, loose rock, and solid rock. There is practically no classification in the Southern Peninsula of Michigan, or, in fact, on 90% of the mileage of the State. The price used was not much out of the way when considered as a fair average for the territory. The same was apparently true of other appraisals. It would not be a proper figure to use in an estimate based on 1909 prices, which are materially greater than those obtaining in 1890-1900.

"(7) A uniform price list for all materials was used, thus ignoring the source of supply and cost of delivery to point of use."

This, again, is not true. Differences were made between the Upper and Lower Peninsulas; and an exhaustive study was made of rates to different sections. It is believed that the prices adopted took all these points fully into consideration. It is true that no effort was made to use different unit prices as between counties, but, in a number of cases, differences in prices were made for different sections of the State, where either local conditions as to production of materials, or traffic rates, seemed to warrant.

"(8) No allowance was made for interference with work on account of labor troubles, condition of the weather, etc., which would vary materially in the different counties of the same state."

True. Nor is such allowance ever made in actual construction, beyond the contingency item. Such items are a frequent source of annoyance, delay, and sometimes of expense, but an expense difficult to separate and set up, and clearly belonging to contingencies.

"(9) No allowance is made for carrying charges until such time as the road was placed on a revenue basis."

True; and such item is not a part of a physical appraisal.

The foregoing nine points are classed as "among other things" open to criticism. The next two quoted paragraphs are introduced to 110
indicate the "other things" as they appear. These are mainly non-physical or intangible elements of value, which, under the method of Professor Adams, are treated *en bloc*, and which, from their nature, it would be impossible to set out and value separately; therefore, no

effort is made to answer them point by point, further than to say in general that, if there is any value attaching to these items, it was presumed to have been disclosed by the method of Professor Adams, and to suggest further that had Professors Cooley and Adams had such an advocate of intangible values ten years ago, their labors would have been lightened, as all arguments by railway officials at that time were against the use of any such elements of value in an appraisal.

"No consideration has been given to the leasehold interests.... Therefore it will be seen there remains to be determined many questions vitally affecting the value of the property without regard to its value as a 'going concern.'

"There should be no difference in the basis of arriving at the value, as a 'going concern,' of the property of a railway and any industrial establishment, nor should there be any difference in the basis of valuation for taxation [exactly what Governor Pingree maintained] or other purposes. There is common to both the value due to location, good will, etc."

While the remainder of the address in question contains no specific criticisms of methods of valuation, it does go into a discussion of sundry legal decisions; and conclusions are drawn quite at variance with those set forth elsewhere in this paper. The thing most noticeable in the entire address is the lack of a proper spirit of fairness, an apparent inability to state fully and fairly the position of the men whose views are being opposed, and an undue emphasis in quoting some public official whose views coincide for the time being with the theories which are being advocated. The fact that Mr. Williams quotes from an address of Hon. Robert H. Shields, President of the Michigan Tax Commission, a statement criticising the work of Professors Cooley and Adams, illustrates the latter point.

The statement is made again and again that the Michigan work was a physical valuation; that no attempt was made to secure a "fair value" (the language of the Courts), and that the value as a going concern was not attempted to be given. In no case is the statement made that Professor Cooley had charge of the physical valuation in Michigan, and that Professor Adams took this physical valuation, and, under his method, treated it as one element, and with it and other data derived from a study of the reports and earnings of the company, undertook to determine a "non-physical," "intangible," "franchise," or "going concern" value, which included all tangible elements, and which, added to the physical value, was assumed by Professor Adams to give the true value. Had such a statement been fairly made, no possible objection could be raised to the making of any number of points against the correctness of the methods used by Professor Adams. 111

"Certainly it cannot be denied that a road between New York and Chicago, 950 miles in length, passing through a manufacturing district, is of greater value than a road 1,200 miles in length, between the same cities, but passing through a hilly and undeveloped territory a portion of the distance, and through a farming section for a greater portion of the remaining distance; yet the advocates of a physical valuation would have us believe that there is no difference in the value of the two if they can be reproduced to-day at the same cost."

This statement is entirely unfair to every man who has been in responsible charge of valuation work in recent years in the United States. No theory has ever been favored by any honest-thinking advocate of a valuation. In the first place, no interstate valuations have ever been made, and no parallel case to the one assumed is to be found, except for very short sections of roads, a very marked instance having been referred to elsewhere in this paper. Such a condition as assumed would be reflected in the earnings of the companies to such an extent as to cause the non-physical element of Professor Adams as used in Michigan to correct largely or wholly the inequality and inaccuracy of the physical valuation; such at least was the theory, and, if carried to its logical end by the use of negative non-physical values, such would be the result.

The final arguments of Mr. Williams' address are devoted to an attack on the plan outlined by the Interstate Commerce Commission for valuation, and on some of the accounting methods of the Commission—points not proper to be discussed in this paper—but it is difficult indeed to read them without noting the apparently studied misrepresentation of the real attitude of Professor Adams and the Commission, and the evident object of the entire address to create a wrong impression regarding what has been done, and a prejudice against the men who have been engaged on State appraisal work and those who advocate the appraisal of properties as a proper step in the way of securing such information as will enable an intelligent consideration of the great corporation problems that must be solved. 112

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12. *Proceedings*, Am. Water-Works Assoc., 1902.

13. Commencing with the issue of January 22d, 1909.

14. The *Railroad Gazette*, April 19th, 1901, Vol. XXXIII. No. 16. p. 271.

15. *Railroad Age Gazette*, April 2d, 1909, p. 761.

16. *Railroad Age Gazette*, January 29th, 1909, p. 219.

The preceding narrative of methods of appraisal work logically leads up to the question: Will these methods that have been adopted in various appraisal undertakings stand the test of the Courts? After all, the final seal of approval must be stamped on a method by the highest Courts before it can be said to be a definitely fixed and determined principle for general use in valuation.

In a careful perusal of many papers on this subject, quotations from judicial decisions will be noted which are literally correct as far as they go, but which are incomplete and often very misleading; and often such incomplete quotations are presented as to convey an entirely wrong impression of the full decision. In order that no such charge may lie against this paper, the quotations given are full enough to indicate clearly the intent of the Court, even at the expense of undue length.

An examination of all Federal and Supreme Court cases which bear on the subject of property valuation has been made, and quotations at length from some of the older cases, establishing precedent, together with citations to more recent decisions, are submitted. It is believed that the points of principle and method, in so far as they have been determined by the highest Courts, are quite fully set forth.

A study of the complete methods of the railroad valuation in Michigan, in connection with these decisions, discloses the fact that they comply with the requirements of the earlier cases, that all matters affecting value be taken into consideration, and that in the more recent decisions the detailed methods adopted in the Cooley physical appraisal have been sustained as to very many points. In no case have any of such methods been unfavorably criticized, and, while at this date the Supreme Court has not squarely passed on the propriety of any method for securing non-physical or intangible values, it has fully sustained the general position of Professor Adams in several important points. In addition to the complete examination of Federal cases, certain very interesting and valuable State cases have been examined, and some of them are quoted. 113

These cases involve both matters of taxation and rate-making. They cover railroads, water-works, gas-works, and other classes of public service corporations, and clearly demonstrate the fact that any analysis of the subject of property valuations must include all classes of corporations. Rate-making and taxation in themselves are entirely separate and distinct from valuation, which is a necessary preliminary step in either undertaking. For this reason all references which are not of special interest in the valuation part of the problem are omitted.

The case of Smyth *vs.* Ames (169 U. S., 466) was an action to question the constitutionality of a statute of Nebraska establishing rates. It is of great interest, and, based on the ruling of the Court in this case, the appraiser in Washington and the appraisers in Nebraska have undertaken to secure first cost as an element of value. The decision holds that:

(1) A railroad corporation is a person within the meaning of the fourteenth amendment.

(2) A State enactment establishing rates that will not admit the carrier to earn such compensation as would be just to it and to the public, would deprive such carrier of its property and would be repugnant to the fourteenth amendment.

(3) Rates established by a State cannot be so conclusively determined by the legislature that they cannot become the subject of judicial inquiry.

The reasonableness of rates prescribed by a State for intra-state business must be determined without reference to the interstate business done by the carrier or the profits derived from that business.

This paper is not concerned with the question of rates, which is discussed at length in this decision. It is, however, of special interest to note what the Court says in regard to the relation of the corporations to the people, and to elements of value.

> "A railroad is a public highway, and none the less so because constructed and maintained through the agency of a corporation deriving its existence and powers from the State. Such a corporation was created for public purposes. It performs a function of the State. Its authority to exercise the right of eminent domain and to charge tolls was given primarily for the benefit of the public. It is under governmental control, though such control must be exercised with due regard to the constitutional guaranties for the protection of its property.... It cannot therefore be admitted that a railroad corporation maintaining a highway under the authority of the State may fix its rates with a view solely to its own interests and ignore the rights of the public. But the rights of the public would be ignored if rates for the transportation of persons or property on a railroad are exacted without reference to the fair value of the property used for the public, or the fair value of the services rendered, but in order simply that the corporation may meet operating expenses, pay the interest on its obligations, and declare a dividend to stockholders. 114
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> "If a railroad corporation has bonded its property for an amount that exceeds its fair value, or if its capitalization is largely fictitious, it may not impose upon the public the burden of such increased rates as may be required for the purpose of realizing profits upon such excessive valuation or fictitious capitalization, and the apparent value of the property and franchises used by a corporation, as represented by its stocks, bonds, and obligations, is not alone to be considered when determining the rates that may reasonably be charged."

(The Court here quotes 164 U. S., 578, Covington and Lexington Turnpike *vs.* Sanford.)

> "A corporation maintaining a public highway, although it owns the property it employs for accomplishing public objects, must be held to have accepted its rights, privileges, and franchises subject to the condition that the government creating it, or the government within whose limits it conducts its business, may by legislation protect the people against unreasonable charges for the services rendered by it. It cannot be assumed that any railroad corporation, accepting franchises, rights, and privileges at the hands of the public, ever supposed that it acquired, or that it was intended to grant to it, the power to construct and maintain a public highway simply for its benefit, without regard to the rights of the public. But it is equally true that the corporation performing such public services, and the people interested in its financial affairs have rights that may not be invaded by legislative enactment in disregard of the fundamental guaranty for the protection of property. The corporation may not be required to use its property for the benefit of the public without receiving just compensation for the services rendered by it. How such compensation may be ascertained, and what are the necessary elements in such inquiry, will always be an embarrassing question.
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> "We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public. And in order to ascertain that value the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stocks, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates established by the statute, the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth." 115

The body of this decision is quoted at length to show:

First. That the Court reiterates the relation of the people to the corporation, as defined by Covington and Lexington Turnpike Road *vs.* Sanford (164 U. S., 578) and by Stone *vs.* Farmers' Loan and Trust Company (116 U. S., 307).

Second. That the basis for computing a fair rate is the fair value of the property, which must be arrived at by a computation or series of computations taking into account many different factors.

Third. That while the Court mentions certain things that may serve as indices of value, which are to be taken into account and given due weight, the Court does not outline or define any method of arriving at a value, but does recognize it as an embarrassing question.

Fourth. That no such stress has been laid by the Court on original cost as has been construed by some appraisers.

The principles enunciated in Smyth *vs.* Ames are reiterated by the Court in San Diego Land Company *vs.* National City (174 U. S., 739), with the further ruling:

> "The contention of the appellant in the present case is that, in ascertaining what are just rates, the Court should take into consideration the cost of its plant; the cost per annum of operating the plant, including interest paid on money borrowed and reasonably necessary to be used in constructing the same; the annual depreciation of the plant from natural causes resulting from its use; and a fair profit to the Company over and above such charges for its services in supplying the water to consumers, either by way of interest on the money it has expended for the public use, or upon some other fair and equitable basis. Undoubtedly, all these matters ought to be taken into consideration and such weight given them, when rates are being fixed, as under all the circumstances will be just to the company and to the public. The basis of calculation suggested by the appellant is, however, defective in not requiring the real value of the property and the fair value in themselves of the services rendered to be 116

taken into consideration. What the company is entitled to demand, in order that it may have just compensation, is a fair return upon the reasonable value of the property at the time it is being used for the public. The property may have cost more than it ought to have cost, and its outstanding bonds for money borrowed, and which went into the plant, may be in excess of the real value of the property. So that it cannot be said that the amount of such bonds should in every case control the question of rates, although it may be an element in the inquiry as to what is, all the circumstances considered, just to both the company and the public."

In the case of Columbus Southern Railway *vs.* Wright (151 U. S., 479), the Court quotes approvingly from Franklin Company *vs.* Railroad (12 Lea (Tenn.), 521-537-538-539), and shows that the doctrine quoted had already been enunciated by the Supreme Court in the State Railroad Tax Cases (92 U. S., 575-607). The Court quotes as follows:

"The property of a railroad company for purposes of taxation consists of its realty, its local personalty, its rolling stock, its choses in action, and its franchises. The franchise is a privilege conferred by the charter of incorporation, namely the right to exercise all the powers granted in the mode prescribed for the purpose of profit. It is a unit not confined to any one county in which it may be exercised.

"Obviously, after ascertaining the value of the entire franchise in the State as a unit, no more approximate or just division of this value can be made for purposes of taxation than to allot it among the counties through which the track runs in proportion of the entire length of track in the county to the entire length of track in the State....

"The roadway itself of a railroad depends for its value upon the traffic of the company and not merely upon the narrow strip of land appropriated for the use of the road, and the bars and cross-ties thereon. The value of a roadway at any given time is not the original cost, nor, *a fortiori*, its ultimate cost after years of expenditure in repairs and improvements. On the other hand, its value cannot be determined by ascertaining the value of the land included in the roadway assessed at the market price of adjacent lands, and adding the value of the cross-ties, rails, and spikes. The value of land depends largely upon the use to which it is put and the character of the improvements upon it." 117

The mileage basis of apportionment is sustained in the following and other cases:

State Railroad Tax Cases	92 U. S., 608
Delaware Railroad Tax Case	18 Wall., 206
Erie Railway *vs.* Pennsylvania	21 Wall., 492
Western Union Telegraph Company *vs.* Mass	125 U. S., 530
Pullman Palace Car Company *vs.* Pennsylvania	141 U. S., 18
Maine *vs.* Grand Trunk Railway	142 U. S., 217
Pittsburg, Cincinnati, Chicago, and St. Louis Railway *vs.* Backus	154 U. S., 430

Therefore this basis of division of values between territorial units appears to be well established by precedent. This is in a measure unfortunate, as certain classes of property cannot be apportioned equitably in this way, unless the value of a railroad be determined, and then that value allocated between different territorial units in proportion to mileage, without any regard to the location of any structure or series of structures in any State or county, the track-mileage basis must be looked upon as a method of apportionment which is subject to modification or which will lead to error.

In an Indiana tax case, Cleveland, Cincinnati, Chicago, and St. Louis Railway *vs.* Backus (154 U. S., 444), the late Justice Brewer, of the Supreme Court, in handing down the judgment, said:

"The true value of a line of railroad is something more than an aggregation of the values of the separate parts of it, operated separately. It is the aggregate of those values plus that arising from a connected operation of the whole, and each part of the road contributes not merely the value arising from its independent operation, but its mileage proportion of that flowing from a continuous and connected operation of the whole.... The value of property results from the use to which it is put, and varies with the profitableness of that use, past, present and prospective, actual and anticipated. There is no pecuniary value outside that which results from such use....

"In the nature of things it is practically impossible, at least in respect to railroad property, to divide its value and determine how much is caused by one use to which it is put and how much by another. Take the case before us, it is impossible to disintegrate the value of that portion of the road within the State of Indiana and determine how much of that value springs from its use in doing interstate business and how much from its use in doing business wholly within the State. An attempt to do so would be entering upon a mere field of uncertainty and speculation." 118

In the Michigan cases, the principal one being Michigan Central Railroad *vs.* Powers (201 U. S., 245), the question of method of valuation was not passed on by the Courts for the reason that, after the evidence was in, and during the argument, counsel for the railroad admitted that the Cooley valuation was as correct a figure as it was possible to secure under then existing conditions, methods and rates of taxation being the issue.

It is thus seen that the Supreme Court of the United States was not, in any of the earlier cases, required to pass squarely on the propriety of any method of arriving at a "fair value," and consequently had not, prior to 1909, defined any hard-and-fast rules of procedure in determining such value. The Circuit Courts have passed on kindred questions in a few cases, among which San Diego Land and Town Company *vs.* National City (74 Fed., 83), and San Diego Land and Town Company *vs.* Jasper (110 Fed., 714) hold as above, and cite most of the cases referred to. In the latter case the Court says:

"The actual value of such property obviously depends upon a variety of considerations—among them the actual and prospective number of consumers—and is no more unchangeable than the value of any other kind of property."

As an illustration, there is cited the effect of a year's drouth on an irrigation plant as temporarily affecting the value of property.

In the case of Cotting *vs.* Kansas City Stock Yards (82 Fed., 839) the Circuit Court touches on one very interesting argument, in the light of some of the methods of valuation advocated by railway managers and some of the criticisms of recent valuation work.

"Different methods of estimating the value of property may properly be employed when it is valued for different purposes. When a valuation is placed on property which has become affected by a public use, for the purpose of ascertaining whether the maximum rate of compensation fixed by law for its use is reasonable or otherwise, it is obvious that the income derived therefrom by the owner before it was subjected to legislative control cannot always be accepted as a proper test of value because the compensation which the owner charged for its use may have been excessive and unreasonable. Again, when property has been capitalized by issuing stock, neither the market value nor the par value of the stock can be accepted in all cases as a proper criterion of value, because the stock may not represent the money actually invested, and furthermore because the property may have been capitalized mainly with reference to its income producing capacity, on the assumption that it is ordinary private property which the owner may use as he thinks proper without being subject to legislative control. On the other hand, however, when property is valued for the purpose last stated, it is clear that the owner thereof is entitled to the benefit of any appreciation in value above the original cost and the cost of improvements, which is due to what may be termed natural causes. If improvements made in the vicinity of the property, the growth of city or town where it is located, the building of railroads, the development of the surrounding country and other like causes, give property an increased value, the owner cannot be deprived of such income by legislative action which prevents him from realizing an income commensurate with the enhanced value of his property." 119

The language of the late Judge Brewer, sitting as one of the circuit judges in the case of National Water-Works Company *vs.* Kansas City (62 Fed., 853), is definite as to the necessity of taking into account some elements of intangible value, and is here quoted as giving the views of this eminent jurist:

"The difficult question, however, still remains; and that is, what is the 'fair and equitable value,' which by the statute and ordinance the city is to pay for the water-works? * * * We are not satisfied that either method, by itself, will show that which under all the circumstances can be adjudged the 'fair and equitable value.'

"Capitalization of earnings will not, because that implies continuance of earnings, and a continuance of earnings rests upon a franchise to operate the water-works. The original cost of construction cannot control, for original cost and present value are not equivalent terms. Nor would the mere cost of reproducing the water-works plant be a fair test, because that does not take into account the value which flows from the established connections between the pipes and buildings of the city. * * * A complete system of water-works, such as the company has, without a single connection between the pipes in the streets and the buildings of the city would be a property of much less value than the system connected as it is with so many buildings and earning, in consequence thereof, the money which it does earn. The fact that it is a system in operation, not only with a capacity to supply the city but actually supplying many buildings, in the city—not only with a capacity to earn but actually earning—make it true that the 'fair and equitable value' is something in excess of the cost of reproduction." 120

The foregoing authorities cover practically all the older cases in the Federal Courts. These cases have been examined, and such of the subject matter has been quoted as would show the conclusions of the Courts as to what constitute the various elements of true value. The latest Federal decision bearing on the subject, and in many ways the most replete with argument, is the case of Consolidated Gas Company *vs.* City of New York (157 Fed., p. 849), which was decided in December, 1907.

In this case the valuation was determined by the master:

1.—A valuation of tangible assets, consisting of real estate, plant, mains, services, meters and miscellaneous equipment, and the property of subsidiary companies, the whole aggregating $63,357,000. Of this an allowance of $3,616,000 was made by the master for working capital, and this entire amount was treated as tangible property.

2.—Finally, an intangible value of 0,000,000 was assigned by him to the franchise and good will.

Objections were raised, as follows:

(*A*) Land values represent no original investment by the Company, do not indicate land especially appropriate for the manufacture of gas, and increase the apparent assets without increasing the earning power.

(*B*) The values of physical property are not original cost, but are cost of reproduction less depreciation.

(*C*) Some of the property cost more than new articles of the same kind at the time of inquiry. Some are of designs not now favored by the scientific and manufacturing world.

The disputed questions involved, as far as tangible property is concerned, were:

1.—Whether the values ascribed to the several enumerated items are based on competent and persuasive evidence.

2.—Whether the method of valuation pursued by the master is in accordance with law.

3.—Whether the items of property are "employed" (in the legal signification of the word) in the production of gas.

The first, a question of fact, is found affirmatively, and the evidence was found to be competent. 121

The second question is one of law, and, quoting from the cases cited in this paper, the Court holds as follows:

"This method of valuation correct * * * upon reason it seems clear that in solving this equation the plus and minus quantities should be equally considered and appreciation and depreciation treated alike.... The value of the investment of any manufacturer, in plant, factory, or goods, or all three, is what his possessions would sell for upon a fair transfer from a willing vendor to a willing buyer, and it can make no difference that such a value is affected by the efforts of himself or others, by whim or fashion, or (what is really the same thing) by the advance of land values in the opinion of the buying public. It is equally immaterial that such value is affected by difficulties of reproduction. If it be true that a pipe line under the New York of 1907 is worth more than was a pipe line under the city of 1827, then the owner thereof owns that value, and that such advance arose wholly or partly from difficulties of duplication created by the city itself is a matter of no moment. Indeed, the causes of either appreciation or depreciation are alike unimportant if the fact of value be conceded or proved; but that ultimate inquiry is oftentimes so difficult that original cost, and reasons for changes in value, become legitimate subjects of investigation as checks upon expert estimates, or bookkeeping, inaccurate and perhaps intentionally misleading. * * *

"The so-called money value of real or personal property is but a conveniently short method of expressing present potential usefulness, and 'investment' becomes meaningless if construed to mean what the thing invested in cost generations ago. Property, whether real or personal, is only valuable when useful. Its usefulness commonly depends on the business purposes to which it is or may be applied. Such business is a living thing, and may flourish or wither, appreciate or depreciate; but, whatever happens, its present usefulness, expressed in financial terms, must be its value. * * * It is not to be inferred that any American government intended when granting a franchise, not only to regulate the business transacted thereunder, and reasonably to limit the profits thereof, but to prevent the valuation of purely private property in the ordinary economic manner, and the property now under consideration is as much private property as are the belongings of any private citizen. Nor can it be inferred that such government intended to deny the application of economic laws to valuation of increments earned or unearned, while insisting on the usual results thereof in the case of equally unearned and possibly unmerited depreciation.

"I think the method of valuation applied by the report to land, plant, mains, services, and meters lawful. To 'working capital, Coke and Coal Company, and Astoria' the above considerations are not applicable, and these items will be treated separately." 122

The Court's review of the third question raises no points of special interest as to valuation.

The question as to amount of "working capital" is taken up, and that term is defined as:

"The amount of cash necessary for the safe and convenient transaction of a business, having regard to the owner's ordinary outstandings both payable and receivable, the ordinary condition of his stock, or supplies in hand, the natural risk of his business, and the condition of his credit; and unless these matters, and perhaps others, be looked into, no comparison can be drawn between one business and another, or even between those of the same general nature."

In this instance it is of interest to note that the Court reduced the "working capital" from $3,616,000 to $1,616,000.

Perhaps the most novel and interesting part of this decision is that dealing with the intangible elements of value. The master was unable to separate the two elements, good will and franchise value, but gave their combined value.

"From the testimony I think it apparent that what is here meant by good will is the organization of complainant, long established, and doubtless well manned and equipped. Such organization is clearly of value, because without it neither tangible nor intangible property can be profitably managed. Yet the organization itself is but a method of utilizing that which is invested, it is really dependent for its existence and continuance upon the franchise, without which there can be no useful organization. Tangible property has a certain value entirely apart from franchise or right to continue business, but good will in the sense of the organization for the business of furnishing gas, can have no existence whatever apart or detached from the franchise conferring the necessary privilege. Would any one think of capitalizing good will of this kind and distributing its assumed value in the shape of new shares among stockholders new or old? I think the most ingenious financier could not imagine such a proceeding, and, if this good will be not property capable of such capitalization and distribution, I do not think it property capable of capitalization as against the State.

"Finally, this claim of good will seems to forget that for many years the price and distribution of complainant's gas has been regulated by law. A citizen is entitled to have a clean street before his house because he pays taxes, *inter alia*, for that purpose. He is much more plainly entitled to have complainant's gas in his house because the company must give it to him if he pays for it. 123 I think it apparent that the conceivable good will of a gas company in this city is about equal to that of the street-cleaning department of the municipal government."

Is a public service corporation entitled to add the value of its franchise to the assets from which a fair return may lawfully be demanded? This question is taken up and discussed exhaustively by the Court (157 Fed., 872 to 879), and while it is clear in reading his judgment that he does not believe it sound doctrine to invest a franchise with value, yet, after citing a large number of cases, he reaches the conclusion that he is "compelled" to consider franchises, not only as property, but as productive and inherently valuable property, and to add their value, if ascertainable, to complainant's capital account before declaring the rate of return.

This case went to the Supreme Court of the United States, where, under the title Willcox *vs.* Consolidated Gas Company (212 U. S., 19), citation is made to many cases in connection with the matter of franchise value. The decision of the Court is:

"The value of real estate and plant is to a considerable extent a matter of opinion, and the same may be said of personal estate when not based upon the actual cost of material and construction. Deterioration of the value of the plant, mains, and pipes is also to some extent based upon opinion. All these matters make questions of value somewhat uncertain."

The Supreme Court permitted the tangible values found by the lower Court to stand. It concurred with the lower Court in that it was not a case for a valuation of good will. It concurred with the lower Court in holding that the company was entitled to the benefit of any increase in tangible values, and that such increases should appear in the appraisal. It did not agree with the Court in the increase of franchise value above that which was capitalized in 1884, with the consent of the State of New York, and reduced the franchise value figure to $7,781,000. On this basis, the estimated return, under the new rate on the valuation of $55,612,435, was 5½%, which rate, in view of all the circumstances, is held to be not confiscatory and to be a not unreasonable return on the investment. The franchise value, as commented on in these cases, is referred to at considerable length in the following pages.

On January 4th, 1909, the case of Knoxville *vs.* Water Company (212 U. S., 1) was decided. This, in some respects, is of greater value to 124 the engineer than any others cited, in its determination of methods. In this the appraisement of the tangible property was made in minute detail, the sum of $10,000 was added for "organization, promotion, etc.," and $60,000 for "going concern."

"The latter sum we understand to be an expression of the added value of the plant as a whole over the sum of the values of its component parts, which is attached to it because it is in active and successful operation and earning a return. We express no

opinion as to the propriety of these two items in the valuation of the plant for the purpose for which it was valued in this case, but leave that question to be considered when it necessarily arises. We assume without deciding, that these items were properly added in this case. This valuation was determined by the master by ascertaining what it would cost to reproduce the existing plant as a new plant. The cost of reproduction is one way of ascertaining the present value of a plant like that of a water company, but that test would lead to obviously incorrect results if the cost of reproduction is not diminished by the depreciation which has come from age and use.... The cost of reproduction is not always a fair measure of the present value of a plant which has been in use for many years. The items composing the plant depreciate in value from year to year in a varying degree. Some pieces of property, like real estate for instance, depreciate not at all, and sometimes, on the other hand, appreciate. But the reservoirs, the mains, the service pipes, structures upon real estate, stand-pipes, pumps, boilers, meters, tools, and appliances of every kind begin to depreciate with more or less rapidity from the moment of their first use. It is not easy to fix at any given time the amount of depreciation of a plant whose component parts are of different ages with different expectations of life. But it is clear that some substantial allowance for depreciation ought to have been made in this case.

"The company's original case was based upon an elaborate analysis of the cost of construction. To arrive at the present value of the plant large deductions were made on account of the depreciation. This depreciation was divided into complete depreciation and incomplete depreciation. The complete depreciation represented that part of the original plant which through destruction or obsolescence had actually perished as useful property. The incomplete depreciation represented the impairment in value of the parts of the plant which remained in existence and were continued in use. It was urgently contended that in fixing upon the value of the plant upon which the company was entitled to earn a reasonable return, the amounts of complete and incomplete depreciation should be added to the present value of the surviving parts. The Court refused to approve this method, and we think 125
properly refused. A water plant with all its additions begins to depreciate in value from the moment of its use. Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs but for making good the depreciation and replacing the parts of the property when they come to the end of their life. The company is not bound to see its property gradually waste, without making provision out of earnings for its replacement. It is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision but it is its duty to its bond and stockholders, and, in the case of a public service corporation at least, its plain duty to the public. If a different course were pursued the only method of providing for replacement of property which has ceased to be useful would be the investment of new capital and the issue of new bonds or stock.... If, however, a company fails to perform this plain duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over issues of securities, or of omission to exact proper prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question, the true value of the property then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors of the management which have been committed in the past."

The Court holds that there was error in only considering the operations of the company for a period of one year, and that this should have extended to enough time to remove danger of abnormal business conditions and observe the effects of certain ordinances.

The decision of the Supreme Court, in the Omaha Water-Works case, decided on May 31st, 1910 (*Supreme Court Reporter*, July 1st, 1910), is of general interest in its discussion of the procedure of appraisers in making a water-works appraisal, and in the distinction drawn between appraisals and arbitrations; but it does not touch on appraisal methods or elements of value, except to discuss "going values." The language of Judge Lurton on this point is as follows:

"The option to purchase excluded any value on account of unexpired franchise, but it did not limit the value to the bare bones of the plant, its physical properties, such as its lands, its machinery, its water-pipes or settling reservoirs, nor to what it would take to reproduce each of its physical features. The value, in equity and justice, must include whatever is contributed by the fact of the 126
connection of the items making a complete and operating plant.

"The difference between a dead plant and a live one is a real value, and is independent of any franchise to go on, or any mere good will as between such a plant and its customers. That kind of good will, as suggested in Willcox *vs.* Consolidated Gas Company (212 U. S., 19), is of little or no commercial value when the business is, as here, a natural monopoly, with which the customer must deal, whether he will or not. That there is a difference between even the cost of duplication, less depreciation, of the elements making up the water company plant and the commercial value of the business as a going concern is evident. Such an allowance was upheld in National Water Works Company *vs.* Kansas City (62 Fed., 853), where the opinion was by Mr. Justice Brewer. [This decision is quoted in the foregoing pages.] We can add nothing to the reasoning of the learned Justice, and shall not try to. That case has been approved and followed in Gloucester Water Supply Company *vs.* Gloucester (179 Mass., 365, and 60 N. E., 977), and Norwich Gas and Electric Company *vs.* Norwich (76 Conn., 565). No such question was considered in Knoxville Water Company (212 U. S., 1) or in Willcox *vs.* Consolidated Gas Company (212 U. S., 19). Both cases were rate cases and did not concern the ascertainment of value under contracts of sale."

The writer does not read into the language of this decision an approval of a separate element of value to be called "going concern value" or "going value" in addition to other non-physical values, but rather a recognition of the fact that certain non-physical elements of value, by whatever name they may be called, must be taken into account in arriving at the fair and equitable final figure of value of a live and operating concern for the purpose of carrying out a contract of sale.

It appears to be doubtful whether the Court can be construed as approving such an element of value in rate cases.

It thus appears that the United States Courts have laid down a few rules, which may be regarded as fixed and definite and must be followed, but that many important questions have not yet been decided. The value to be determined must be a "fair value" of the property being used for the convenience of the public. The par value of stocks and bonds may not alone be considered (although it may be considered), the market value of stocks and bonds, original cost plus cost of additions, the probable earning capacity, the cost of reproduction, depreciation, appreciation, all these, and any others that will throw light on the "fair value" must be taken into account and 127
given the weight to which they are entitled. Any fictitious book values due to over-issues of stock and bonds are to be given no weight, but the appraisal must give the fair value, in the light of all the facts, of the property in actual use at the time of the appraisal.

There are several decisions of the State Supreme Courts which discuss these subjects, but an examination of a number of these gives practically nothing more, in the way of definite conclusions as to method, than has been cited. Perhaps the most complete and painstaking consideration of appraisal problems by any Court was that given by Judge Savage of the Supreme Court of Maine (97 Maine, 185, and 99 Maine, 371). These were neither rate cases nor taxation cases, but proceedings under statute to require from the Court instructions to a board of appraisers appointed to value the plants. In the later or Brunswick case, Judge Savage elucidates a number of points left not altogether clear in the Waterville case. The Brunswick decision contains some interesting views on "going value," and the Court's remarks on the general difficulties in making rules for an appraisement are exactly to the point:

"There are many difficulties, if not dangers, in attempting to formulate rules which are to be applied to facts not yet ascertained. While it may be easy enough to state rules in the abstract, it is much more satisfactory in an opinion of the court, to express them in terms which are applicable to the facts in the precise case in hand.... It must be always understood that our answers to these questions are intended to be given only in the most general and comprehensive terms, which may, or may not, be found to be fitted to the facts which may subsequently be developed. No other course would be wise or safe.... A public service property may or may not have a value independent of the amount of rates, which for the time being may be changed. A public service company may, under some circumstances, be required to perform its services at rates prohibitive of a fair return to its stockholders, considering their property as an investment merely....

"Now, what is the property which the district has taken by power of eminent domain? In the first place it is a structure, pure and simple, consisting of pipes, pumps, engines, land rights, and water rights. As a structure, it has value independent of any use, or right to use, where it is, a value probably much less than it cost, unless it can be used where it is, that is, unless there is a right to use it. Nevertheless, it has value as a structure. But, more than this, it is a structure in actual use, a use remunerative to some 128
extent. It has customers, it is actually engaged in business, it is a going concern. The value of the structure is enhanced by the fact that it is used in, and in fact is essential to, a going concern business. We speak sometimes of a going concern value as if it is, or could be, separate and distinct from structure value—so much for structure and so much for going concern. But this is not an accurate statement. The going concern part of it has no existence except as a characteristic of the structure. If no structure, no going concern. If a structure in use, it is a structure whose value is affected by the fact that it is in use. There is only one value. It is the value of the structure as being used. That is all there is of it."

The Court then argues that, as the structure is being used under authority and by virtue of franchises, it is more valuable. The franchise, however, is limited; other and competing franchises may be granted; a franchise may exist entirely independent of a structure. He holds that the structure is more valuable with the franchise.

"It is a structure in actual use, and with a right on the part of the owner to use it and to charge reasonable rates to customers for services rendered. It is threefold in discussion but it is single in substance."

This case is largely taken up with a discussion of the reasonableness of rates which furnish a basis for the estimate of value. There is no specific attempt to describe methods of procedure. That is left to the appraisers. These two Maine Cases, together with a valuable

paper[17] thereon by Leonard Metcalf, M. Am. Soc. C. E., constitute an extremely valuable addition to the literature of appraisements.

It is clear, from a study of all the cases referred to in this paper, that the Courts have laid down a line of precedent which is equitable and just, that the interests of both public and corporations will be safeguarded, and that the likelihood of any unfair or improper valuations passing the scrutiny of the Supreme Court is but remote.

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17. *Transactions*, Am. Soc. C. E., Vol. LXIV, p. 1.

All the foregoing narrative of methods adopted in recent valuations, review of judicial opinions, and comment on the expressed opinions of various engineers and railway officials, is presented as being proper and necessary to support the contention that the Michigan valuation, while not the first appraisal work, was the first valuation work of large magnitude undertaken by any State; that it was a work 129
which established many precedents; and that the complete discussion of methods and principles in connection with and following this appraisal has given it probably a greater general value than any similar undertaking. The Wisconsin work, which immediately followed that of Michigan, was along lines similar to those of the Michigan physical valuation, and carried the work forward, adding to and strengthening certain of its features. Without any impropriety, it may be claimed that these two appraisals have laid down the general lines on which this class of engineering effort will be largely directed in the future.

It is desirable, in closing this paper, to indicate such general methods of procedure in valuation practice as may be said to have been thoroughly established by precedent, and to present such argument as will support the contention that such methods are proper.

The fact has been emphasized, again and again, by every writer on the subject, that problems of this class are not capable of exact mathematical solution; that, no matter how much care may be exercised in the execution of the work, the result is tempered by the personal judgment of the men engaged on it, and that only when it is executed by men of experience, sound judgment, and high moral worth can it have a definite, final, and just result.

This feature of appraisal work cannot be too strongly emphasized. The value of the work depends on the character of the men doing it, their experience in design, construction, and operation of properties, and their absolute fairness and freedom from prejudice.

That there will be many large valuations undertaken in the near future, there appears to be no doubt. These valuations will be made as a necessary preliminary to three classes of corporate control: rate-making, taxation, and the regulation of capitalization.

The Courts hold that the value must be "the fair value of the property used for the public," and that the corporation:

> "may not impose upon the public the burden of such increased rates as may be required for the purpose of realizing profits upon [such] excessive valuation or fictitious capitalization." (Smyth *vs.* Ames.)

This language is repeated, again and again, so that it is clear that any valuation, to be sustained by the Courts, should: 130

1.—Be based on a careful study and analysis of all the information applicable to the case in hand; and

2.—That it must separate the various elements so that every step of the work may be reviewed and supported.

Public interest demands that, in any valuation, certain figures shall appear which shall show the amount of *bona fide* capital actually existing in the property at the date of appraisal.

The fact that a given amount of money was invested in building a railroad in 1880, and that certain other sums were spent for additions in subsequent years, does not necessarily indicate that these amounts of capital will still be found in the property in 1910.

The removal of timber from surrounding lands, the destruction of industries and the removal of tracks leading thereto, the destruction of equipment and facilities, the depreciation in value of adjacent property, along with wear and tear, and obsolescence, have gone to effect the destruction or loss of capital on many Michigan railroads. The case in 212 U. S., 1, clearly directs that the valuation must not take into account this destroyed capital, but must return a "fair value of the property as it is."

On the other hand, the amount of money actually spent in producing a given property in the past may be far below the present value. The appreciation of value of lands by reason of development of cities and growth of industries, the increase in cost of the materials entering its construction, and many other causes, may lead to an appreciation of the value of the property, and this appreciation should appear in the valuation and the company be entitled to the benefit of it. It is in the nature of an increase of the investment, and should appear as capital.

It is clear that there are two classes of elements of value in the final value of a public service property: those which are physical, and those which are intangible. There are various of the physical elements of value which are not material or susceptible of inventory, but which, nevertheless, attach themselves to the physical property, are capable of determination, within reasonable limits of certainty, and should be taken into account and computed as physical property.

In the subsequent discussion of physical and intangible values, it is attempted to differentiate between such elements as should attach to 131
the physical value, or capital remaining in the plant, and the purely intangible or franchise values.

It is contended by the writer:

That the Physical Value, or present value of the physical property, should fairly represent the actual capital invested in the property at the date of appraisal; that it should be made up of the sum of the various elements which constitute the cost of reproducing the property together with any appreciation which may have been added to any of them, less all depreciation.

That the Non-Physical Value is the difference between the "fair value" as defined by the Courts, or the reasonable value of the property as a business or producing property, and the physical value, or actual present worth; and that the only proper method for determining such values involves a study of income accounts.

This Non-Physical Value may be: positive, or a value in excess of the physical property, or negative, or less than the physical value. In the case of a property having a negative intangible value, a deduction should be made from the physical value.

It is further contended that, in making the physical appraisal, the purpose of the appraisal should not be permitted to modify the figures. The resultant figure should be the same, whether it is to be used as a basis for assessment, rate-making, or limitation of capitalization. It should be an engineering estimate of the amount of *bona fide* capital still remaining in the property, or of the complete cost of reproduction under existing conditions, less depreciation. This figure is definite, within reasonable limits, and it cannot be conceded that it is permissible to vary it, submitting one result as a physical value for taxation, and another and different result as a present physical valuation for rate-making.

There may be some question as to the propriety of using non-physical values for certain ultimate ends; in fact, the Supreme Court, in the Omaha and Knoxville water cases, clearly indicates that they must not be used for certain purposes; but, in any case, to furnish information, this element of value should be determined, and, as in the case of physical values, it should be an unchangeable figure[18] and should represent the difference between the worth of the actual physical property and the final business value of the property considered as an earning proposition.

It is not necessary to go minutely into detail as to the various steps to be taken in making the appraisal of physical property. Each 132
appraisal will offer some problems peculiar to itself, and no general set of rules can be laid down which will be applicable to all cases. It is deemed sufficient to call attention to general matters of major importance and to refer to some points which have not been mentioned in the preceding narrative, omitting argument in the case of such as have there been fully discussed.

The distinction should be kept in mind that any element of value which belongs to the property by reason of its physical existence is classed as an element of physical value. The property is considered as an operating property in the sense that it is reproduced complete, ready to operate; and any expense, or any element of value needed to complete it, is an element of the physical value, but any value arising as a result of surplus earning power, any good-will value, going-concern value, or value due to established business, strategic location, favorable traffic arrangements, etc., should be considered as intangible values.

The valuation of physical property is naturally divided into four parts:

I. —The preliminary study,

II. —The field inspection,

III. —The computation,

IV. —The preparation of the final figure.

I.—The Preliminary Study.

The preliminary steps should include a general examination of the property, a study of its corporate history, an examination of its records, maps and profiles, and the preparation of an inventory of its property.

The work in Wisconsin and Minnesota was done in co-operation with the railroad companies, who prepared (generally, but not in every case) their own inventories on forms adopted by the appraiser. In Michigan, all this information was secured by the appraiser. There can certainly be no valid objection to the use of information compiled by the companies, whose familiarity with their own records and property would enable them to supply lists which under all ordinary conditions would be more complete and up-to-date than if made up by men having no special knowledge of the property. 133

The chief difficulty encountered in making an inventory from recorded data lies in the fact that very few sets of records are corrected to date, and many additions and erasures will of necessity have to be made in the field.

In making a field inspection, it is of great assistance to be able to refer to maps of large yards, to profiles, to standard plans, and to drawings of the principal structures, so that the investigation of office records should include a careful examination of the maps of principal terminals, with a view to securing such as will simplify the field inspection. The investigation should be extended to cover a study, not only of the engineering office data, but also statistical data to be derived from the records of the auditor, superintendent, and superintendent of motive power, and should cover earnings, operating expenses, car and locomotive mileage, and such other data as will facilitate the distribution of such elements of value as are not localized, together with such other statistics as will furnish a thorough knowledge of the property and its operations.

It has been claimed by the appraiser in Washington—and the view is also held by the Commissioner of Railroads in Nebraska—that original cost is essential, in view of the Supreme Court's decision, particularly in Smyth *vs.* Ames. The writer cannot accept the correctness of this position. It would appear that the language of the Court should be construed to mean that original cost, where ascertainable, is a proper matter to take into account, along with many other things; but it can hardly be considered mandatory.

In the case of a property only recently built, in which the records are complete and the engineering and construction files are available, it may not be specially difficult to determine cost, but in the case of any of the large railway systems of the United States, which are made up of the consolidation of many different roads, some of them built many years ago, some of them having gone through many changes of management, reorganization, and earlier consolidation, it is practically impossible to secure either the old financial books or the old construction records, and without these complete records it would appear to be an utter impossibility to secure the primary cost. Primary cost is but the first step. The work of building up, by securing the amount of additions and betterments that have been made from year to year, is one of appalling magnitude and of utter uncertainty and conjecture. Keeping in mind that, prior to July 1st, 1907, the railroad companies of the country did not have a system of uniform accounting, and that additions to property were charged to operating expenses to the extent of hundreds of millions of dollars; that policies were different on different roads, and under different managements of the same road, and that the accounting methods were determined by the policy of the road or management; and the further fact that the distribution of ordinary railroad accounts may be extremely reliable on one road and abounding with errors on another; it will be seen that any attempt to depend on the auditor's office for anything approximating a complete statement of cost would lead into a maze of figures which would be confusing, unreliable, and incapable of proof. 134

Therefore, it is the writer's conclusion that, beyond such figures on recent construction, or records of cost of such special structures as are matters of particular record, it is not advisable to attempt to secure complete data as to the cost to date of a railroad. In the Michigan appraisal, original cost was secured in the case of many structures, notably the Port Huron Tunnel, and it is by no means argued that original cost should not be considered, or investigated, but it is held that such an undertaking as to secure, from the financial books of the company, an accurate or reliable statement of construction cost, plus additions and betterments, less property destroyed, of the Michigan Central Railroad, for example, would be absolutely an impossibility, particularly if the work was to be undertaken, as in the Washington appraisal, by men who were utter strangers to the property. The admission of the appraiser of Washington, that, except for a few gaps, the information was complete, is fatal, as the gaps must needs be filled by estimates, and it would appear to be better to depend on estimated figures throughout than to use what purported to be actual costs on part and estimates on the remainder.

If original cost is essential, it is hard to get away from accepting the book values of the companies, as these, objectionable as they may be, from the viewpoint of the public, are just as apt to be as near the actual truth as any statement made up by strangers from an examination of old records covering many years of operation.

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II.—The Field Inspection.

The field inspection, to be of the greatest value, should be made by civil or mechanical engineers of long experience, preferably by men who have had charge of their respective departments on railroads of considerable extent, or of properties similar to that under investigation. The writer is of the opinion that in this particular phase of the work, the practice adopted in the Michigan appraisal was considerably in advance of more recent valuations. Each particular structure or piece of equipment should be examined and its condition noted; special features should be fully described and careful record made of everything that would tend to affect the value. The argument has been often made that the fixing of a percentage of depreciation by a man in the field is purely arbitrary and amounts to nothing but a guess. In the computing office it is often necessary to check the field figure of depreciation by the use of tables of fixed annual depreciation, but it must be borne in mind that mortality tables of any form are based on a system of averages. The actual depreciation on rail, for instance, varies greatly; the conditions of traffic, curvature, gradient, rolling stock, and various local conditions tend to shorten or lengthen the life, so that the personal opinion of an experienced man on the ground is likely to be much more nearly correct than the arbitrary application of a rule of averages.

The writer has inspected station buildings more than 50 years old, and their condition and adaptability for the service required of them would give them a very high percentage; he is also familiar with buildings less than 10 years old, which, by reason of changed traffic conditions and consequent shifting of business, have become obsolete and have been permitted to depreciate so rapidly that any table average would give too high a result.

In the case of a water-works inspection, so much of the value is included in the system of distribution mains, a form of property which is inaccessible, that much more dependence must be placed on a figure based on age; but there, also, as full investigation as possible should be made, in order to determine to what extent tuberculation or electrolysis has affected the pipes.

A general inspection (made in Minnesota by the appraiser with two assistants) would appear to be an excellent thing as a review of the whole work, but whether such an inspection would be sufficiently thorough to base thereon a set of final values, would appear to be doubtful. 136

The inspection in the field, in addition to the placing of a percentage for depreciation, should involve a complete check of the inventory, a correction of all errors, due to the construction of new property or the destruction or removal of old, and a compilation of all information required for a complete, correct, and intelligent appraisal of the physical property by the computing office. Every appraisal is different, and every property offers new problems and diverse conditions. These must be met, and therefore the field inspector must call particular attention to all matters specially affecting the values of the property he is inspecting.

It is impossible to anticipate all these conditions in advance, although the use of carefully prepared blanks and the standardizing of the form in which the data are gathered greatly simplify the work, not only in the office, but in the field.

III. The Computation.

On the completion of the field work, with all the preliminary data in the office, the computation must proceed, and with this part of the work there are many questions which must be taken up, considered, and definitely answered.

The classification and arrangement of the information as to the property to be valued, the costs and prices of the various materials entering into construction, the making and checking of such tables as may be required for estimating, the computing, checking, filing, indexing, and the various other routine details of work need not be referred to specially, as they must be worked out for each appraisal. The matters of principle that will be met are more important, and, while it would be impossible to mention all that may come up, it may not be amiss to refer to a few.

(*a*) In making an appraisal of several properties, to what extent shall these properties be grouped or classified?

(*b*) What unit prices shall be assigned in the estimates of cost of reproduction, and how shall they be determined?

(*c*) How shall right-of-way and real estate values be ascertained? Shall such elements as appreciation, or any increments due to the purpose for which the land is used, be treated as physical or non-physical values?

(*d*) What method shall be finally adopted in determining depreciation? What elements shall depreciation be made to cover? 137

(*e*) What elements of cost or appreciation shall be treated as parts of the physical property although not capable of inventory, and what shall be treated as non-physical?

(*f*) Is an allowance for contingencies a proper item to include in an appraisal?

(*g*) What weight shall be given the matters of adaptability, proper or improper design, and the economics of location?

(*h*) How shall the values of such property as locomotives, cars, etc., be geographically assigned?

(*i*) What is the effect upon values of large terminals?

(*j*) Should an allowance be made by reason of rapid development of the art?

These are not by any means all the perplexing questions that arise; each valuation offers some that are special, but these cover the more important points.

(*a*) *Classification of Properties.*—In making an appraisal involving the properties of a large number of companies, such for instance as any of the State railroad appraisals, it becomes evident that there are certain properties which are small, badly run down, and either built to serve a very limited trade or located in a territory which has not developed, and that such properties cannot be compared equitably with the large trunk-line roads, or even with smaller roads in a good territory and doing a good business. Several such properties exist in Michigan in a district which was originally a lumber-producing country, and at the time they were built local conditions were such that prices of timber and labor were far below any cost that it would be reasonable to assume to-day. Whether taxation or rate-making be the ultimate end of the work, it is certain that these carriers are entitled to some classification which will separate them from the more prosperous roads. Many of these roads would not be built to-day under any circumstances, yet their maintenance and continued operation is absolutely essential to the people of the district served by them.

Whether this classification should be undertaken at the time of making the appraisal of physical property, and an attempt be made to classify unit prices, or whether this should be taken up in connection with the intangible values, and solved, as far as the valuation is concerned, by the adoption of such a method as will affect these physical values by a subtractive or negative non-physical value, or 138 whether the entire matter should be left for the subsequent work of rate-making or assessment, is one which must be determined at the outset of the physical valuation. It may not be left without determination, as the question will be raised in all probability in the form of an attack on the valuation, if it is not considered and a conclusion reached.

It is the writer's opinion that the application of an intangible subtractive value is the proper solution, except in the case of roads which would not to-day be rebuilt. In fixing a uniform price for identically the same labor or material, whether on a small poverty-stricken road or a main trunk line, no serious injustice is done, provided the price fixed is one which, from a strictly engineering standpoint, is a reasonable figure for cost of reproduction. The differences in class are due, not to special differences in cost of physical property, but rather to differences in earning ability on account of good or poor territory served, efficient or inefficient management, or other reasons not connected with the physical structure; hence such differences are reflected in the earnings, and are clearly elements to be adjusted in the non-physical valuation.

(*b*) *Unit Values.*—The general reliability of the appraisal rests very largely on the reasonableness and fairness of the various prices which are applied to the different parts of the property in making the estimate of cost of reproduction. These unit prices should be determined before any actual figures are made. They should be made up from the most complete data available, and, before being tabulated, should be carefully reviewed by all the experienced men engaged on the appraisal, in order that no figure which is either too high or too low may be used.

As a basis, the average of either 5 or 10 years should be used in preference to current prices on all such material and equipment as is fairly stable. Rail, and all forms of rail structures, machinery, locomotives, cars, etc., can be reduced to such a unit that averages can be secured which will eliminate the error due to a period of extreme high or low prices.

In the case of such materials as lumber and ties, the price of which has been steadily rising, due to the growing scarcity of the material, a price based upon a long average is unfair to the corporation, and it would appear to be proper to use current prices. There can be no 139 hard-and-fast rule which will be applicable to all appraisals. The unit prices must be such reasonable figures as can be sustained in Court. Their adoption should not be final until every possible test of their accuracy and reasonableness has been made. When they have been adopted, and such modification made as may be fair for certain territory, on account of local conditions, transportation facilities, or other consideration which may affect them, the adopted figures should be applied to all property alike. The use of different unit figures for different roads in the same territory is highly undesirable, and should be avoided.

(*c*) *Right of Way and Real Estate.*—The valuation work which has been accomplished during the past decade, and the study of values for taxation and rate-making, have brought into prominence the perplexing features of land values as applied to corporation property. It is comparatively simple to fix within very close limits the reproduction cost of tracks, bridges, locomotives, or any of the other elements of physical structure. Not so with the land. A few years' development may change farm land right of way into city right of way, surrounded by factories, or it may change desirable residential property adjacent to a road into slums.

In view of the clear language of the Court in 82 Fed., 839, and 157 Fed., 849, it is evident that any valuation which does not take into account the appreciation or depreciation of land values cannot be sustained. There can be no serious objection to the doctrine that the property of a corporation generally increases or decreases in value in the same proportion as adjacent property, and it must therefore be admitted that a value based on the sale value of adjacent lands is a reasonable one and must stand. This reasoning, of course, will be subject to exceptions, in the case of terminal properties, docks and water-front properties, and right of way in large cities, but it is believed to be sound when applied to right of way in the country and in small towns and cities.

The next question to be determined is whether the increment of value due to the use of the land is a proper one. It would appear that in the use of land for water-works, gas-works, street-car barns, or other isolated tracts of land used for corporation purposes, this increment would be much less than in the case of a steam or interurban railroad, the holdings of which form a continuous and unbroken 140 strip; and, in the case of street railroads, water-works, and like properties, it would be indeed difficult to compute and afterward sustain any considerable increment.

In the case of railway properties, however, it is quite evident that the following facts can be sustained: The actual cost of property purchased for railway purposes will range from two and one-half to five times the selling price of similar and adjacent property used for other purposes. While the actual percentage will vary somewhat, as between land in cities and in the country, and as between fully settled districts well served by roads and sparsely populated regions, yet the difference is very marked, and is capable of determination by an examination of the public records.

This difference can be determined either by a comparison of railway purchases and other transfers, as was done in the later studies in Michigan and in Wisconsin, or by extending the investigation to include assessed valuations, and using the averages, as was done in the work of Mr. Morgan in Minnesota.

In establishing figures for use in a valuation, it would appear to be better to base them on an analysis of actual transfers than to undertake to fix values by any methods of examination and personal appraisal. Enough instances of the wide divergence of expert opinion have been cited to show conclusively that such a method, applied to the thousands of acres of a large corporation, may lead to serious error.

A single attorney or real estate man who has had experience in abstracting and conveyancing, and who has bought some right of way, can examine the records of an average county the largest city in which has a population of 20,000 or less, abstract all railway transfers for 5 years, locate them on the maps, secure data as to actual selling prices of near-by lands, and, in a comparatively short time, be in position to furnish figures which will establish the relation between sales for railway and other purposes in that county. The work that

half a dozen such men could do in 90 days would go very far toward establishing with a fair degree of definiteness the value of the railway purpose increment for the majority of counties in any average State. Of course, such an investigation in the large cities is a matter of much greater labor, and would require sufficient time to make complete examinations, probably necessitating a special force for such city work. 141

On every appraisal, the question has been asked, should this railway purpose increment be added to the value of the property? Clearly, yes.

The Supreme Court quotes approvingly from the Tennessee Court, as follows (151 U. S., 479):

"The value of the land depends largely upon the use to which it is put and the character of the improvements upon it."

This is stated again and again. It must be remembered that, for railroad uses, the strip must be continuous; that it must be located so as to permit curves and grades which conform to the requirements of the road; that, no matter what damages may accrue to adjacent property, the road must take its strip; that its use is entirely changed and is a structure placed on it which is capable of vastly greater earnings than the property produced before—all these elements add to the cost of the property when it is acquired for railway purposes, and in the same measure to its value under its new use.

In a new country, where transportation facilities are limited and land cheap, this added increment may be little or nothing, but in a thickly settled State, with many railroads, this element will increase with a good degree of uniformity; while, in terminals, the price rises to almost inconceivable figures. It is capable of being determined, and is clearly an element in the cost of reproduction. The writer holds to the view that it is properly to be placed with the physical values, and that it should not be considered as an intangible element of value.

(*d*) *Depreciation.*—Thus far, this discussion has not dealt at length with the subject of depreciation, and it is not considered essential to the purposes of this paper that it be done. The State appraisals have raised a question as to the propriety of using mortality or life tables as compared with personal inspection and the placing of a percentage based on individual judgment. Either method is subject to error. It is certainly desirable to secure the opinion of the man who inspects a bridge, or building, or locomotive, as to its physical condition. It may be desirable to use the check secured by the fact that the age of the building is known and also the average life of structures of its class.

The result of the Michigan inspection of rolling stock was to sustain fully the rules for valuation issued by the Master Car Builders Association; and clearly, it is not only proper, but extremely desirable, to apply tables to such equipment as freight cars, which are scattered all over the United States, for it would be absolutely impossible to inspect completely those of any road or system. On the other hand, the life of steel rails cannot be determined by any simple table, because the number of car movements, the weight of motive power, the speed of trains, the location (on curves or on heavy grades), and many other conditions affect their life. This also pertains to buildings, locomotives, and other equipment. The character of service rendered, the nature and extent of repairs, and the way in which they have been maintained, add to or take away from any life assigned by tables, so as to render them valueless in many individual instances. 142

In placing depreciation, allowance should be made, not only for wear and tear due to use, and decay due to the elements, but also to cover that which is due to obsolescence, or the fact that the facility is of an antiquated or inefficient type, and has been superseded in general use by more efficient and economical devices; this may be called commercial depreciation, as distinguished from physical depreciation. The method to be used in placing depreciation is clearly one of the important things that must be determined by each set of appraisers, and, while the writer believes that the use of expectancy tables would greatly facilitate the work in many cases, the data on which to found a complete set of tables and to support them and justify their use are often lacking; therefore, any use of tables should be safeguarded in every possible manner, and personal inspection of fixed property should always be made.

(*e*) *Immaterial Elements of Physical Property.*—There are certain expenses, inseparable from the construction of any public works, which are a necessary and proper part of the cost, and are arranged for in the original financing, but are not capable of identification after the completion of construction work. These expenses are:

(1) Organization,

(2) Legal expenses,

(3) Engineering,

(4) Administration,

(5) General expense.

(1) Organization.—This includes the cost of the original organization of the company, the cost of securing the charter and franchises, arranging the financial plan, and securing the funds for construction. 143

The latter item is intended to include all salaries and expenses of officials in soliciting and negotiating for funds, the services of trustees, and all other proper expenses which are usual and unavoidable in the process of exploiting a projected enterprise and interesting capital therein. Discount on bonds is not included, and any allowances for "premium," or "bonus," or other cash payment to any party for services in securing funds, which are in excess of legitimate expenses, should receive scant consideration at the hands of appraisers.

(2) Legal Expense.—This is for attorneys and all legal expenses, costs, and fees in the organization and during the construction of the property.

(3) Engineering.—This includes reconnaissance, preliminary and location surveys, supervision of construction, and design and superintendence of special structures. The cost of engineering on some of the more difficult properties becomes a very large sum; on certain small lines it may be comparatively small; and in some cases no engineers have been employed at all; but the items of cost covered by this charge have in every case been expended, even if done under the direction of some superintendent.

(4) Administration.—This comprises the cost of the management during construction—the direction of the enterprise.

(5) General Expense.—This is the cost of the general office organization during the construction period, also numerous minor expenses, not distributable.

It is not possible to build any public service plant without incurring all these expenses to a greater or less degree. They are essential elements of cost, and must go into the value of the plant when completed. It can hardly be argued that cost, which in a large property runs into thousands or hundreds of thousands of dollars, has no value at the commencement of operation, nor does it appear that the value is subject to depreciation as long as the property is an operating plant. The writer holds the view that the line between physical and non-physical elements of value should be drawn as follows:

Any value which attaches to the property by reason of any money expended during the construction is part of the physical property values; while any value due to the operation of the property which is in excess of the physical value is a non-physical or intangible element. If the correctness of this position be conceded, then all the foregoing items are charges against the physical property, and, as long as it is an operating property, these items of value remain part of the physical property, and the writer contends that they should not be considered as affected by depreciation, as long as the property is a going concern. 144

Different engineers have included in the appraisal other items which are of a somewhat different nature, and some of which are open to argument; among these are "interest during construction." This item is clearly an allowable one, but serious differences of opinion develop as to a proper amount to allow in making an appraisal.

The corporate history of the Ann Arbor Railroad, in Michigan, shows that it was built in sections of from 25 to 30 miles, and that each section was put into operation as soon as built, so that, while the actual period of construction of the complete property extended over 15 years, no section was under construction much more than one year. This is typical of much of the railroad building of the past, and on such a property the interest charge would be comparatively small.

A proper charge in such a case would clearly not be sufficient in the case of a road several hundred miles in length, through mountains, with tunnels, heavy bridges, and other structures which would extend the actual construction over periods of from 3 to 5 or 6 years, and this is particularly true where the road is a main line or artery, and where local traffic is of minor importance.

The computation of the interest charge is complicated by the fact that interest begins to run as the bonds are taken up, and but a small part of the construction money draws interest during the whole period.

The practice in the State appraisals has been to fix a uniform percentage for all properties. This has had in its favor the argument that it was conservative valuation where taxation is the ultimate end, as the amount was less than one year's interest in every case. It would appear to be more correct to use the corporate history of each company, determine the actual construction periods, and use a rate based on the actual time in each case. This can be fixed with a fair degree of accuracy, and a reasonable percentage determined, to equalize the varying periods of time on which the interest runs on different parts of construction. 145

Discount.—Discount on bonds is claimed by certain railroad men as a proper item for consideration. As has been argued elsewhere, this

is not a proper charge against capital. It is an adjustment of the interest rate to the market, or an advance payment of interest; and, in the writer's opinion, should under no consideration be allowed.

Working Capital.—Working capital is another item claimed and conceded in some valuations. It is not a part of the "cost of construction." The money provided for working capital at the outset is not a permanent investment, but is rather a temporary loan paid back out of earnings. The writer fails to perceive any possible argument in favor of adding such an item to the permanent value of the property. In making an appraisal, after the physical value is determined, it is usual to set up a statement of stores, supplies, fuel, and cash on hand, and working capital is certainly shown by the current balance sheet, in the form of cash or accounts receivable. It would appear to have no place in a physical appraisal. Although the items of cash, stores, and supplies were shown in the Michigan appraisal, they did not appear as part of the physical value, nor were they taken into account in computing intangible value, but, being taxable property, they were reported separately.

(*f*) *Contingencies.*—The use of a percentage for contingencies in the appraisal in Michigan was bitterly contested by the railroads as improper and excessive. In Michigan 10% was used, in Wisconsin 5½%, and in Minnesota 5 per cent.

Subsequent work in Michigan has demonstrated that the use of as high a figure as 10% was fully justified; and the probability is that the latest Michigan appraisal did not eliminate omissions, inaccuracies of description, and excess cost of construction due to difficulties, to such an extent as to justify much reduction in the percentage.

In making an appraisal, the percentage to be applied to cover contingencies is a proper matter for consideration, and in some cases conditions might well be such that even a smaller allowance than that fixed in Minnesota would be proper, but such cases would doubtless be the exception. The writer believes it to be proper practice to add liberally for the contingency item. The strongest argument against it is that it is incapable of being described and located definitely, and is difficult of exact proof. Therefore it has been claimed that 146
it partakes of the nature of a non-physical element, and that if there be any value over and above the physical property value, it will appear with other non-physical elements reflected in the earnings, and may be properly included in the intangible value if such exists. This argument does not appeal to the writer as being final, and he would advocate the use of such a percentage of physical values as appears proper in each appraisal to cover the error due to the extreme difficulty of securing an exact inventory and construction history of the properties.

(*g*) *Design.*—Among the matters which were considered in the Michigan work was that of adaptability, or the economical questions of location, design, and construction. It is possible that in some properties, such as water, gas or electric companies, the efficiency of the plant may be very greatly affected by faulty design, uneconomical arrangement, improper construction, and to such an extent that any cost of reproduction, less any ordinary depreciation, would be greatly in error without further allowance. This may also be true of railroads. Excessive curvature and gradients greatly decrease the tonnage hauled by a given power, without decreasing the cost per train-mile.

It is extremely difficult to treat this as a physical element. It is impossible to reduce it to terms of dollars and cents by any usual or customary methods. It is impossible to separate it from any one of half a dozen other items that may be brought up. It opens the door to endless speculation as to what might or might not take place under somewhat different conditions. For these reasons, it was treated in the Michigan appraisal as a non-physical element of value and dismissed from all consideration in the physical appraisal. This was clearly proper, and the subject is only referred to here for the purpose of making clear that it was fully studied and a definite conclusion reached.

Adaptation.—In the sense that this term is used by Mr. Williams and Mr. Morgan, the appreciation or solidification of roadbed was considered in the Michigan work, but given no place in the appraisal. This is a very proper item to consider, but it would appear to be better to include it directly with the roadbed item in the physical appraisal as appreciation or solidification. There can be no reasonable 147
objection to adding to the contract prices for grading, ballasting, etc., a reasonable amount to cover, not so much the seasoning and settling of the new roadbed, as the actual money disbursed in work on this new roadbed during the first 3 or 4 years of operation in order to bring it up to the proper operating condition. A very considerable part of the money spent on "maintenance of track" for the first few years after a new line is built is in reality deferred construction cost.

(*h*) *Apportionment of Values.*—The apportionment of values of locomotives, cars, miscellaneous equipment, shops, and those other parts of the cost which are not susceptible of separation from the operation of the property as a whole, is an interesting and at times a perplexing problem. While the Courts have viewed as equitable the distribution of values between territorial units when made on a track-mileage basis, it is hardly likely that a Court would look with favor on an appraiser appointed by Michigan giving any consideration to values of bridges, track, or buildings in Ohio. Thus far, every State appraiser has concerned himself only with the fixed physical property in his own State, together with his proportionate share of the floating property. The methods that may be considered are track-mileage, car-mileage, locomotive-mileage, and train-mileage.

The method finally used must be such as will give the fairest result for the property under consideration. In some cases one or more of these methods will give a fair value, while in other cases the same system would be most unjust.

(*i*) *Terminals.*—There is no one feature of the entire problem so big with possibilities, and so far from solution, as that of terminal property values and their proper assignment. The property must be considered as an operating unit. Its value must be made up of the values of the parts or elements plus an added value that comes from the operation of the whole. The problem would be simplified if what were sought were the value of a certain railroad, but, as it has been presented up to this time, the problem is: what is the value of that part of this railroad in Michigan? or Wisconsin? or Minnesota? A fairly satisfactory solution of many of the value questions has been obtained, but nothing in the way of a solution of the terminal question. A road owns 300 miles of line in Michigan and 7 miles in Ohio. That 7 miles includes its largest terminal; its principal connections are there; it has a fine property, and is in the capacity of landlord to 148
several other roads. What part of that terminal value, if any, is assignable to the State of Michigan? Decidedly, it would not be proper to appraise the entire property as a unit and assign to Ohio only the proportion that 7 miles bears to the whole length; it is equally unfair to appraise it as a Michigan property down to the State line, and add nothing to the value by reason of the terminal.

The influence on the value of the property, of the ownership of terminals in such cities as Chicago, New York, Jersey City, Hoboken, Pittsburg, Detroit, St. Louis, Kansas City, and other large centers of population is tremendous, yet a very large part of the railroad mileage entering those cities belongs to roads which have their largest mileage outside the State in which the terminal is located.

There can be no doubt that the influence of a large terminal affects in a measure the value of every mile of line owned by the company; that this influence is greatest on the principal and direct lines, and less as more remote parts of the system are reached. As yet, no plan has been suggested for determining what this value is or for apportioning it.

The final solution in Michigan was to treat terminal properties within the State exactly as other property was treated, and to assume that, if there was any value assignable to Michigan by reason of outside terminals, it would appear as a non-physical value through the earnings.

When all the phases of this question are considered—the enormous land values, the value due to possession of deep-water terminals, the effect on the business of the entire property by reason of the ownership of such properties as those, for instance, in New York City, Jersey City, and Hoboken—it is evident that no appraisal which has yet been made has established any rule of valuation which may be considered proper for terminals.

It is to be hoped that the work now in progress in New Jersey may be so well supported by the State that it will be possible for the appraisal board to make an exhaustive study of this subject and reach definite conclusions as to the real extent, manner of computation, and proper method of distribution of these values.

(*j*) *Development of the Art.*—Is any value assignable to property on account of expenditures by reason of the rapid development of the art? This question seems not to have been squarely asked or answered in connection with any of the past appraisals. 149

Every piece of material and every facility purchased by a company is bought with a definite expectation that it will have a certain life, that during that term of life it will add sufficiently to the earnings to provide a fund for its replacement and earn a profit. No matter whether or not such a reserve is created on the books, this is the theory, and, under it, accident may wipe out certain new property, other property will outlive its expectation and maintain the average life of the entire group of facilities.

There are countless cases where this will not hold. The rapid development of large cities has compelled electric lines to extend largely. The demands of the people for more frequent and more rapid service, and more modern and larger equipment, have greatly shortened the term of life of power-plant equipment and cars. The rapid development in the art of electricity, the congestion of traffic in streets of cities, the enormous increase of train movements, and the use elsewhere of newer types of cars, have compelled the abandonment of millions of dollars' worth of property and the investment of other millions in new and improved facilities to provide for the increased movements of traffic and increased safety to the public. These changes are not due to the fact that the original installation was defective, but to the demands of the public for frequent, safe, and speedy service, demands which are perfectly reasonable. The query is: should a corporation which complies with public demands be compelled to lose capital invested in facilities which have not yet paid for themselves; and which, under a continuance of conditions which existed when they were installed, or any that might then have been anticipated, would normally have a useful life of several more years, and which were abandoned, not by reason of being worn out or unfit for service, but purely because facilities of a more modern type were called for?

To answer this affirmatively increases the hazard of investment greatly in the large centers of population. To answer it affirmatively in some cases might amount to confiscation of property. The writer inclines to the view that, as far as appraisal is concerned, the value due to the remaining life of the abandoned facility, where such abandonment was in response to legal requirement, and where no element of corporate necessity due to increased efficiency or economy of the new facility enters into the computation, should be added to the value of the facility replacing it. Any consideration that is given such claims by an appraiser must be most careful, as the inference to be drawn from the decision of the Court in the Knoxville Water Case (212 U. S., 1) is that such elements of value will receive scant consideration unless most fully supported.

If the policy of the management of any public service company is to keep up with the demands of modern civilization, it would appear that such policy should not be discouraged, and, in computing the value of the property, some provision ought to be devised for covering such values as remain in serviceable property at the time of its abandonment in response to public demand; or else the rates for service should be increased sufficiently to compensate the corporation for losses of this nature on the ground that it constitutes an element of extra hazard.

These and like subjects in connection with the appraisal must be taken up during the period of computation and settled. The computing office organization and methods call for no special comment, except to emphasize the need of experienced men, the use of every possible check on the accuracy of the work, and the prime necessity of keeping all notes in such manner that they can be identified and used to re-establish every step taken in the course of the appraisal.

IV.—The Preparation of the Final Figure.

The final form of the work is, of course, so much a matter of personal judgment that even a suggestion may appear to be useless. The use of such a classification as will conform approximately, if not exactly, with that adopted by the Interstate Commerce Commission is more desirable now than it was 10 years ago, as all the roads in the country are using this classification in their accounts, and the more nearly uniform the work of various State appraisals, the better the results will be.

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18. Unchangeable only for the period under consideration and as regards the purpose of the appraisal. This value varies from year to year, depending on business conditions and on earnings of the company.

In the published articles treating on the subject of valuation, much stress is laid on the intangible or non-physical elements of value. They have been termed "going concern values," "business values," "good will values," "franchise values," as well as "non-physical" and "intangible" values.

So much of the argument of many writers has been taken up with this phase of the question that it is impracticable to recapitulate the various arguments in support of giving these elements a place in the appraisal. 151

The writer cannot agree with those who would place any of these elements of value in the physical appraisal.

Value is given to a property, either by reason of the fact that it is an instrument for earning profit, or that it does earn profit or gives promise of profit. The actual investment of capital in a new plant is made with the expectation of earnings. It is not reasonable to attach as physical value, to such a plant, any value in excess of the actual investment. Nor does it appear to be any more reasonable, in the case of an old plant, to assign arbitrary and fictitious values over and above the actual investment remaining in the plant, unless such values are justified and supported by actual earnings in excess of such a rate of interest on the money invested, as it would earn if invested in some non-hazardous security, and—carrying out the clearly-expressed idea of the Courts—such intangible value can only accrue when the rates charged for the service are fair and proper.

The capitalist seeking investment bases his ideas of value on:

(*a*) The market price of stocks and bonds, an estimate of worth based primarily on actual earnings of the property, but affected to some extent by outside conditions; or

(*b*) On the capitalized net income, or actual earnings, of the property; or,

(*c*) In the case of a new property, on an estimate of what the probable earning capacity of the property will be, where the business is more fully developed.

Methods (*a*) and (*b*) ignore cost of construction, or present investment in physical property, and base a value on past performances. Method (*c*) is based purely on hypothetical earnings, but the only real measure of value in this instance is the actual amount of capital that has been invested.

No appraiser would be justified in placing a "going concern" value, in excess of original cost, on a new property, nor would he be justified in placing such a value on a property 3 years old, or 10 years old, unless the net earnings were such as to indicate that the property had a business or commercial value in excess of the physical property value.

It would seem reasonable to say that this difference between the physical value and the value based on earnings represents the "good will," "established business," or "going value," and all the other non-physical elements of value. 152

To take a specific example: it would be impossible to separate the different elements of intangible value of the Michigan Central Railroad, and say that a certain sum of money represented "good will," another sum "established business," still another sum the "franchise value," and still another sum the "going concern."

The "going concern value" of the Michigan Central Railroad is exactly analogous to the going concern value of the hypothetical water-works cited by Mr. Alvord. Instead of having water pipes connected with buildings along the mains, and considerable sums invested in appliances for using the water, there are manufacturing plants located along the railroad, connected with it by side-tracks built by the industry, and depending on the transportation facilities of the road for their connections with their customers, the very life of the manufacturing plant dependent on its connection with the road. This is "connected good will" of the same kind as described by Mr. Alvord. Yet, to fix a value on it by the method described by him involves going into the realm of conjecture and speculation to a degree that could never be sustained.

Difficulties as great would be encountered in an effort to separate and set up any other elements which go to make up the intangible value, and any figure thus determined would be absolutely incapable of proof.

The Courts say that the value must be the "fair value of the property being used," all the conditions being taken into account (169 U. S., 466).

It can be readily seen that the physical present value is not always—indeed, is not often—the "fair value." The "fair value" may be more, or less, than the present value of the physical property. It would seem to be reasonable to interpret the Court's meaning of the term "fair value" to be the value as a business or commercial property, taking into account the actual investment existing in the property, together with any favorable conditions which would enable it to earn, on rates which were fair and reasonable to the consumer, an income in excess of a usual rate of interest on the actual investment, or any unfavorable ones which under the same rates would reduce its earnings to less than usual interest. If such an interpretation be allowable, it would appear to be correct practice to use a "fair value" made up of two elements: a physical value, representing the investment, and a non-physical value, representing all the elements which affect that investment to give it favorable or unfavorable financial returns. Is it not, then, proper to conclude that the non-physical or intangible value, composed of all these various elements of value, can only be determined absolutely by a study of the earnings and operating expenses? Is not this clearly what the Court had in mind in the Nebraska Rate Case? 153

Much of the argument on the subject of "going" values and other kindred elements of value consists of statements of theory and generalities, and may be said to be merely argument to support the theory that there is an intangible element of value. If work of valuation is to be of any real benefit, must it not give a definite result? Must not this result be based on absolute facts?

In securing the present value of any physical property the fixed and certain facts are:

The inventory of property owned.—This is absolute.

The cost of reproduction of the different elements.—This is capable of determination within very close limits.

The depreciation.—This is in a measure a matter of judgment, based on the experience, not only of the engineers making the appraisal, but of the entire scientific world; and, if properly made and properly checked, there should be no very wide divergencies in results.

The items of general expense.—These, based on available statistics, must be estimated. The exact determination of these items will be made comparatively easy as statistics based on the uniform classification of accounts become available.

It is believed that the physical values, when secured along the lines suggested, are definite enough to be accepted as a fair estimate of the amount of capital actually invested in the property, and that, if a sufficiently large force of men experienced in the construction, operation, and financial management of the kind of property under investigation is engaged on the work, the element of uncertainty due to errors of personal judgment can be largely eliminated.

The next question to be determined is whether there is, at the time of the appraisal, any non-physical value, and, if so, to select a method for computing it that will give a result that can be definitely supported as to the particular property under investigation. A study of the income accounts of the property being valued should be made. If the property is not earning a sufficient sum to pay its operating expenses, and taxes, and to set aside a fund to cover depreciation and obsolescence, there is clearly no intangible value of any sort to be added to the physical value. If, however, after all these charges are taken care of, there is a net earning which is large enough to pay 4 or 5% on the physical property and still leave a surplus, is it not perfectly reasonable and proper to hold that this surplus represents earnings on all intangible elements of value? 154

The contention that all the different elements of non-physical value merge into one intangible value, not capable of separation, will doubtless be objected to by many engineers and corporation managers.

Among the elements adding value to property have been described:

1.—"Going Concern" Value.—Professor Mead defines this as the value due to the fact that a plant has consumers actually utilizing its product, and that it is in actual and successful operation and has its business developed. This value is the worth of the plant in excess of a similar plant without connections, and constitutes an asset in the consideration of its physical value. Mr. Alvord has used the term "connected good will" as applicable to this element of value.

The writer does not concede that "going concern" is a proper element to consider in the physical value, as it does not represent any part of the cost chargeable to capital, and the physical valuation should be confined to the determination of capital invested.

It has already been argued that to the physical property as inventoried should be added proper figures to cover organization, legal expense, administration, engineering, and contingencies. All these items are in the nature of additions on account of the fact that the property is a "going concern." It is maintained that these costs should carry to the present value column as values, for the reason that all these services rendered in connection with the creation of the property remain, unimpaired in value, as long as the property is operated. When, however, a property ceases to be operated, and is abandoned and dismantled, not only do all these elements absolutely disappear,

but also all increments of value by reason of the special use of the property are wiped out, and there exist only a lot of partly worn out and partly obsolete machinery and equipment, salable at scrap values, buildings constructed for a purpose which renders them unfit for other use, and land partly salable at going prices and much that will not sell at all. 155

As long as a gas-works, a water-works, or a railroad is in operation and earning, it is a "going concern," and all increments which attach to its physical property as a whole continue to exist, even if the physical value of the property is greater than a fair value. That fair value can be determined and reached by means of a negative non-physical value.

In view of these things, it would seem to be highly improper to add to physical value anything more for "going concern." In the final report of U. S. Judge R. W. Tayler, Arbitrator in the Cleveland Street Railway matter, in December, 1909, the following language supports the above contention:

> "I allow nothing for going value, except in so far as that is the result of the necessary expenditure of money in building the road, acquiring its land, power-houses, and equipment, and putting them into successful operation. The expenditures for these purposes are, and necessarily must be, included in the valuation of the physical property."

2.—Developed Business.—It is perfectly clear that the "fair value" of a property must take into account the established business of the concern. This really is covered by the "going concern values," as defined by Messrs. Mead and Alvord. The only manner in which this can be determined intelligently is by an analysis of income accounts.

3.—Cost of Handling Business.—A railroad with heavy grades, bad curves, poor equipment, or unskilful management is not nearly as valuable a property as one having good line and grades, and far-sighted, economical, and skilful management, and which handles its business at a lower cost per unit.

In such cases the differences in location and management are bound to show in the earnings, adding to the physical value of one property and possibly taking from the value as shown by the physical appraisal in the case of another.

4.—Good Will and Established Organization.—These are valuable assets. It is difficult, indeed, to attach exact weight to these elements of value, except as they are shown in the intangible value indicated by the earnings. In most cases of public service companies, as is argued elsewhere, it is doubtful if such elements are entitled to any place in a public valuation. 156

5.—Franchise Values.—These cover various specific items arising out of the ownership of special franchises, or, out of the general rights granted by law to corporations.

All these elements of value have been presented, and have been supported by able arguments. No one has offered a method of separating them. While there is universal recognition of their existence, in the case of many properties, they are supported by nothing visible or tangible. They are practically inseparable, one from another. They are not always present, and the application of any such arbitrary rule as that suggested by Mr. Alvord would make it possible to place values which were purely fictitious. Therefore, it follows that, if they are to be considered at all, they must be treated as parts of one intangible value, and that value must be derived from a study of the income account of the property.

There are other points to be noted as reasons why no such elements of value may attach to the physical property.

Any value of an old and well-established property in excess of a fair return on its physical property (in other words, any intangible value) must be limited and restricted, when used for rate-making purposes, by the value to the consumer of the services rendered. The Courts hold so squarely that the rates charged for services must not be more than the particular service is worth, and that the Company may exact a fair return on property actually being used, that it is not conceivable that any valuation which attempts to attach fictitious elements of value to physical property can be sustained.

This argument is not intended as an attempt to show that intangible values are improper and that where they exist rates should be lowered. It is contended that the determination of rates that will be just and fair to all competing companies involves other consideration than the valuation of either physical or intangible properties, and that when all these rate-making problems are properly solved, there will remain large intangible values on the well-designed plants. It is further contended that the work of valuation should separate the tangible and intangible elements, so that the further work of rate-making or assessment may not be complicated by improper elements which are included among the items of the physical properties. 157

In consideration of franchise value, the history of the corporation should be investigated with a view to determine what part the public played in the creation of the property.

The granting of aid bonds, of public lands, and of aid money to railroads, the giving of encouragement to water-works companies by the payment of excessive hydrant rentals, are illustrations of the fostering and development of public service utilities by the public to such an extent as to justify in a large measure the claim that in many cases the allowance of an intangible value is improper as against the public.

A further consideration in the matter of intangible values is the fact that they all partake more or less of the nature of "good will," and the question very properly arises, in the case of a purchase by the public, or of a rate-making valuation: "Should the public be compelled to pay for its own good will?" In the case of such a corporation as a street-railway company in a large city, any value arising from a surplus of earnings is due to the franchise, established business, or going value, or good will of the citizens of that city. This element of value frequently sustains an excessive bond indebtedness. At the expiration of the franchise period the citizens of that city consider a purchase, and are asked to pay, among other things, for their own good will. In view of the attitude of the Federal Courts in the Consolidated Gas Case, and the language of the lower Court in disallowing the item of "good will," which judgment was sustained by the Supreme Court, it is very evident that any attempt to fix arbitrarily a value on such an item in an appraisal is not likely to be supported successfully. The grounds named by the Court are:

> Tangible property has a value apart from any franchise or good will value.
>
> The franchise, conferring the privilege to be a corporation, to use public property, to be free from competition, and to enjoy many other privileges, has some value apart from tangible property.
>
> Good will can have no existence as apart from or detached from the franchise conferring the necessary privilege. Such good will (by itself) is not capable of being capitalized and distributed among stockholders.
>
> Citizens are entitled to have gas (or water) because they pay for it, exactly as they are entitled to have clean streets (and, in the same way, police protection or fire protection), because they pay taxes among other things for that. 158

The Court, therefore, finds that there is no good will value in connection with the gas business in the City of New York, although it is said, elsewhere in the finding, that it is the best, most favorably located, and most prosperous business of its kind in the country.

Judge Tayler, in the Cleveland Railway arbitration, says:

> "I allow nothing for good will. A street railway company which has a monopoly, and especially if it has a franchise value remaining, can have no good will value."

Judge Lurton, in the Omaha Water-Works Case, says:

> "That kind of good will, as suggested in Willcox *vs.* Consolidated Gas Co., is of little or no commercial value when the business is, as here, a natural monopoly with which he must deal, whether he will or no."

In connection with a consideration of franchise values, the following points are raised by the Federal Court in the Consolidated Gas Cases (157 Fed., 872-879):

> "Should a corporation have a right to demand an income return, separable from any return upon its tangible property, from its right to place gas mains in the public streets and maintain them for its private profit, a right which it did not buy from city or state or pay therefor any legal valuable consideration? The Court thinks not, because 'Return can be expected only from investment, and he that invests must part with something in the act of investing.' Does any company invest its franchise in its business? It does not part with its franchise in the same way it parted with money or money's worth in acquiring or creating mains or plants. The investment of property was made, not in the franchise, but under the franchise, and on the faith thereof. The franchise is but a part of the power or sovereignty, allotted to a private person for the benefit of all, and only incidentally given for private emoluments.
>
> "What is the value of a franchise to perform a certain service, under which no money is invested and no service yet performed? What is it worth apart from performance under it?
>
> "Unless it can be seen to possess inherent value entirely apart from the earning capacity of the subsequent investment or from the actual earnings resulting from such investment, the value asserted or claimed is but a duplication of that derived from the use of the tangible property when so invested.
>
> "The concepts of the nature and value of franchises are seen dimly and confusedly because of the failure to distinguish between productive and non-productive property. Land, money, chattels may by industry and intelligence be made productive without a franchise; but no excellence in these desirable qualities can ultimately render a franchise productive without the use of money, 159

chattels, and land in connection therewith, and when the juncture is made the earning capacity of the real and personal property, plus the franchise and plus intelligence and industry, is really no greater than it would be without the franchise, for the franchise has added no producing power to the realty or personalty; it has but authorized their employment in a particular way and protected the owners while so employing them."

The Court emphasized the fact that the particular way in which they are used is in performing a function of the State—in doing a service for the public which the public might do equally well for itself, in the following language:

"I can imagine no more than three ways in which the value of a franchise can be stated. It is valuable: (1) because it authorizes the gainful use of private property in a particular manner; (2) because once obtained it is often difficult or impossible to get another like it; (3) because it may be used to injure or hinder another enterprise, although itself conferring or securing nothing of value.

"The third method of statement has been accurately, though colloquially, described as a 'nuisance value,' and is so obviously illegitimate as to require no discussion. The second method of statement, when carefully considered, asserts that because the sovereign has deemed it advisable to entrust a public work to one citizen or a body of citizens such quasi monopolistic grant confers the right to charge for the service more than would be just or lawful were the occupation open to all. Nor does it change the truth of the last statement that the difficulty of procuring franchises produces, and long has produced, a traffic in them. On every private sale of franchise property, the price paid is so much money lost to the public by official incompetence or worse, and such sale can confer on the vendee no right to compel the consumer to repay him a price that should have been paid to the State. For these reasons, I believe that on principle a franchise should be held to have no value except that arising from its use as a shield to protect those investing their property on the faith thereof, and that, it renders fruitful, it possesses no more economic value for the investor than does an actual shield possess fighting value, apart from the soldier who bears it."

It will not do to leave this decision without calling attention to the fact that the foregoing quotations are but argument advanced by the Court, and that he found a franchise value, following the reasoning of the Supreme Court in cases cited heretofore, and other cases, and upon the doctrine that: 160

"Private citizens may acquire vested property rights through a series of even erroneous decisions; rights so firmly vested that it becomes unconstitutional for the court which persisted in error suddenly to rectify its mistakes to the detriment of those who had securely rested upon the decisions sought to be invalidated."

After citing numerous cases, and considering methods of valuing franchises, the Court says:

"I think it obvious, as I have endeavored heretofore to point out, that either for the purpose of condemnation or regulation the value of a franchise depends wholly upon what is earned under it and I believe the best way of finding out how much a franchise, separately considered, is worth, is to ascertain what those persons desirous of continuing operation under it consider it to be worth. In a corporation whose stock is freely bought and sold, such value is measured by the success attending the sale of stock based entirely upon capitalization of the franchise; yet the value of stock issued only in consideration of the franchise is obviously dependent on earnings after the stock based on tangible property has received a satisfactory dividend * * * yet it will always be true that, unless the whole net return, compared with the value of tangibles, is above a satisfactory return on tangible investment alone, the addition of stock issued for franchise will be regarded as 'water,' and detract from the value of the entire issue, and I think this conclusive proof that value on a franchise depends wholly on what actual investment can earn."

In this particular instance stock to the amount of $7,781,000 had been issued in 1884 and divided among stockholders without any consideration, which stock represented the company's own valuation of its franchise at that date. The Court, in fixing a value, held that it would be proper to increase it proportionately to the increase in tangible property; this he did, fixing the franchise value at more than $12,000,000. The Supreme Court of the United States, in disposing of this, says (212 U. S., 47):

"But although the state ought for these reasons [applicable to this case—not general], to be bound to recognize the value agreed upon in 1884 as part of the property upon which a reasonable return can be demanded, we do not think an increase in that valuation ought to be allowed upon the theory suggested by the Court below. Because the amount of gas supplied has increased to the extent stated, and the other and tangible property of the corporations has increased so largely in value, is not, as it seems to us, any reason for attributing a like proportional increase in the value of the franchises. Real estate may have increased in 161
value very largely, as also the personal property, without any necessary increase in the value of the franchises. Its past value was founded upon the opportunity of obtaining these enormous and excessive returns upon the property of the company, without legislative interference with the price for the supply of gas, but that immunity for the future was, of course, uncertain, and the moment it ceased and the legislature reduced the earnings to a reasonable sum, the great value of the franchises would be at once and unfavorably affected, but how much so it is not possible for us to see. The value would most certainly not increase."

The Court did not concur in the increase of the franchise value, and, in dismissing this subject, says:

"What has been said herein regarding the value of the franchises in this case has been necessarily founded upon its own peculiar facts, and the decision can form no precedent in regard to the valuation of franchises generally where the facts are not similar to those in the case before us."

It appears, then, from this, the latest case, that:

1.—The view of the lower Court that a franchise or intangible value is not separable, and that if there be a value it must be determined from the earnings, is concurred in by the Supreme Court.

2.—That the arbitrary increase of franchise value, by the lower Court, proportional to the normal increase of the physical property, is not concurred in.

3.—Inferentially, it appears that the acquiescence of the State in the franchise value of 1884 is the main reason for permitting that value to stand, and it would seem to follow, from the reasoning of the Court, that it is very questionable whether any franchise or intangible value based on excessive rates should be allowed to stand.

Another view of franchise values, as stated by George H. Benzenberg, Past-President, Am. Soc. C. E., in discussing water-works franchises, is as follows:

"Some contend that a franchise is simply and purely a privilege given by the municipality to a water company to utilize the streets for the purpose of laying a system of pipes through which it may distribute and deliver water. It is not a license to do business, but a privilege to use public streets, alleys, and grounds. * * * If that interpretation is the proper one, the value of the franchise, if the property is to be purchased by a municipality, is comparatively nothing. If the property is to be purchased by another company, it represents all of the great value that such franchise possesses to the original holder, together with all the privilege it 162
confers; but in the event it is purchased by the city, it is dispossessed of that certain element of value, and I think for that reason it is stipulated in many of the ordinances that no value shall be placed on the franchise by appraisers."

In the paragraph just quoted, it is evident that the term "franchise" is used in a restricted sense, and refers to the ordinance or contract from a municipal corporation granting the right to operate on specific terms, rather than the broad use of the word as indicating all rights derived from general laws or special contracts or grants. The point, however, is applicable to the case of any corporation occupying public ground.

It is believed that enough argument has been adduced to show that any attempt to give separate value to the different elements that enter into the intangible value of a property is a very risky proceeding on the part of appraisers, and to support further the contention that, as a business proposition, the value of any property depends on its earnings; that the franchise simply protects the owners of the property in their enjoyment of those earnings; that the value of the franchise merges in the "fair value" of the property, and that the franchise can have no special value of itself unless the earnings of the property are in excess of a usual and fair rate on the actual investment. In case there are surplus earnings, they measure and determine not only the value of the franchise, but also the value of all other non-physical elements. If this be true, any readjustment of rates, any restriction of operations, or other form of legislative control which would unfavorably and violently affect earnings, is bound to hold down franchise or non-physical values; as it would not seem possible to read into the various decisions any intention on the part of the Court to base the right to demand fair return on anything but the "fair value of the property being used."

The writer, therefore, reaches the following conclusions regarding non-physical values:

1.—That all the different non-physical elements of value are inseparable.

2.—That in the case of very many properties, no non-physical value can attach, and in many cases this value will be a negative or subtractive quantity.

3.—That in the case of properties located so as to secure either a monopoly of business in a congested territory, or in which the construction, location, strategic position, or economic excellence of design, is such that, on a schedule of rates which is fair and 163
reasonable for competitors less advantageously situated, an earning is secured which is in excess of usual returns, a non-physical value of considerable magnitude may very properly be assigned.

4.—That, for the computation of non-physical values, the income account of the property under consideration affords the only legitimate basis, but even then consideration must be given to duration of franchise, reasonableness of rates, and other modifying conditions, and also, possibly, the purpose for which the appraisal is made may determine whether or not a non-physical value may be used. The language of the Court in the Knoxville and Omaha cases apparently leaves this a very open question.

This brings us substantially to the conclusion reached by Professor Adams in 1900, and a careful study of the method laid down by him shows nothing that cannot be accepted as fair and reasonable. His plan should be extended so as to cover subtractive values or the case of properties showing a deficit.

This method has the merit of being based on the actual earnings and expenses of the company under investigation and on the value of the physical property as already computed. It does not introduce a mass of purely supposititious figures, nor depend on hypothesis. The proposition is simply this: If a property earns only its operating expenses, including therein proper depreciation reserves, taxes, and such a percentage on its actual invested capital as could be earned by that capital if invested in good non-taxable bonds or other like security, it is worth no more than its physical property is worth. If it earns more than that, it is due to the franchise, going concern, or other intangible elements of value, and, to determine that value, capitalize the surplus.

It takes several years for a property to reach its normal earning capacity after construction is completed, and, in the investigation of a property of comparatively recent construction, where the gross and net earnings show a steady annual increase, the application of a negative or subtractive value should be made with great caution; but where the earnings have been fairly uniform and stationary for a period of years, and the property does not earn a sufficient sum to care for depreciation and annuity, it is clear that the value as an earning investment is less than the determined physical value, and that the physical valuation should be reduced by some amount to arrive at the "fair value." 164

The Courts hold that public service corporations are entitled to earn:

(*a*) Operating expenses,

(*b*) Expenses of maintenance and running repair,

(*c*) Taxes,

(*d*) A sinking fund from earnings to cover depreciation and obsolescence, and

(*e*) A reasonable profit on the fair value of the property.

An investigation of non-physical values should then include an analysis of operating expenses, to determine that additions and betterments to property are not included therein.

The general practice of corporations in the past has been to ignore any reserve to cover depreciation and obsolescence. If, at the beginning of operations of any property, such a sum should be annually set aside out of earnings as should, when invested as a sinking fund, maintain the integrity of the investment, then this amortization fund at any period, plus the depreciated value of the physical property, should equal the amount of the total capital actually invested in the property. In most cases this has not been done, and the Supreme Court in the Knoxville Water Case holds that, by reason of the failure to create such a fund, whether due to carelessness, excessive dividends, or other cause, the company must lose the amount of capital represented by the depreciation that has taken place. In making a computation of intangible values, it is certainly proper to consider the income account as averaged over a period of years, to avoid violent fluctuations of gross or net earnings, and a depreciation reserve should be determined for such years, as it cannot be claimed that, unless such an amortization fund is earned, in addition to other operating expenses and taxes, there is any non-physical value.

Professor Adams covered the depreciation in the Michigan work in the 4% annuity which was deducted before non-physical values were computed. The writer is inclined to go a step farther than Professor Adams, and hold that, before any intangible values can be attached to the property, it should earn not only all operating expenses, taxes, and reserve for depreciation, but also interest on the actual investment equivalent to the return that would be had were the money invested in a non-taxable bond, say 4%, and that any earnings in excess of such a sum might be termed properly "earnings on franchise," or intangible values. 165

On this basis, then, a rule would be formulated, being that of Professor Adams, with some modifications:

1.—Deduct from gross earnings from operation the aggregate of operating expenses, including in operating expenses an annual sinking fund to amortize the depreciation and obsolescence, and the remainder may be termed "income from operation."

2.—To this income from operation add income from investment, giving "total income," which represents the amount at the disposal of the corporation for the support of its capital and for the determination of its annual surplus.

3.—From "total income," deduct taxes, rents paid for lease of operated property (provided such property is not included in the appraisal), and improvements chargeable to income. The remainder represents the income after all charges against operation of property, and maintenance of the integrity of the capital investment have been cared for.

4.—From this remainder (*3*) deduct such a percentage of the value of the physical property (representing invested capital) as would equal the income of that capital if invested in government or other non-taxable bonds. The remainder would represent surplus, which, capitalized at a proper rate, would equal the value of intangible or non-physical properties, which is to be added to the appraised value of the "physical property."

5.—If, instead of a surplus, a deficit occurs, a careful study of all the conditions surrounding the operations of the property should be made, and, if there be no reasonable expectation of increase of earnings, or other modifying conditions, a proper figure, based on the average deficit, should be determined, and, as a negative intangible value, deducted from the value of the physical property.

6.—In the determination of rates, to be used in computing income and for capitalizing surplus or deficit, the greatest of care must be exercised to adopt such figures as will be proper and absolutely just.

Conclusion.

The subject of valuation is so appallingly great that, notwithstanding the length this paper has reached, many points have not been covered.

No discussion of the method of valuation by capitalization of net earnings, which is practically that adopted by Professor Adams in his commercial valuation, has been attempted; nor has any attempt been made to describe the stock and bond method. Neither method is adaptable to the requirements of any public appraisal. 166

The so-called cash investment in property, or the actual cost of construction through the entire history of the property, cannot be sustained by any process of argument as a proper method of valuation, nor can the method of computing the cost of construction of an adequate modern property assumed to replace the existing property. The scope of a valuation must be limited to the property as it exists on the date of the appraisal, and it would be equally fallacious to include non-existent and long-perished facilities, or to assume a hypothetical and never-existing property.

There are many intricate problems in connection with a valuation for rate-making or taxation which really belong to these undertakings, not to valuation. They are usually brought into the discussion of valuation, but have been here excluded. Among these are the separation of interstate from intra-state business, and others, of great interest, it is true, but foreign to the subject of valuation.

The question of the fair return on money invested is not referred to, for the reason that it has no direct bearing on valuation, and for the further reason that it has been quite exhaustively discussed in the papers listed in the Appendix. The writer desires to make clear the fact that he is not advocating low rates *per se*. The rate must be determined to meet the special requirements of each investigation. The Supreme Court of Maine says (97 Maine):

> "The reasonableness of the rate may for a time be affected by the degree of hazard to which the original enterprise was naturally subjected. That is such hazard only as may have been justly contemplated by those who made the original investment, and not unforeseen and emergent risks, and such allowances may be made as is demanded by ample and fair public policy."

While the Supreme Court of the United States, in Willcox *vs.* Consolidated Gas (212 U. S., 12), fixed a rate of 5½% as reasonable in that instance, they said:

> "No particular rate of compensation must in all cases be regarded as sufficient for capital invested in business enterprises. Such compensation must depend greatly on circumstances and locality. Among other things the amount of risk in the business is an important factor, as well as the locality where the business is conducted and the rate expected and usually realized there upon investments of a somewhat similar nature with regard to the risk attending them. There may be other matters which in some cases might also be properly taken into account in determining the rate which an investor might properly expect or hope to receive and which he would be entitled to without legislative interference. The less risk, the less right to any unusual return upon the investments." 167

In view of these dicta, it is needless to argue whether a rate of 6% or 10%, or 15%, or more, be reasonable.

The writer has herein endeavored to narrate the story of the Michigan appraisal in some detail, to review briefly subsequent similar work, to present the main points in the legal decisions bearing on appraisal practice, and to present his own views as to proper and legitimate methods of valuation in the light of judicial opinions. He has attempted to do this in the spirit of absolute fairness, without permitting either early years of training in corporation service, or more recent investigations for State and city, to bias the presentation of truths.

The subject is one which has not attracted the average citizen sufficiently to compel him to give it deep study. Those who are familiar with it all too frequently have views biased by interest, and it is hardly conceivable that any final conclusion will be reached until each and all of the main issues are determined by the Courts. When thus determined, it will be done with wisdom and with justice. It is impossible to study the cases referred to without being impressed with the absolute fairness of this great tribunal. Quotations from decisions have been included at considerable length in order to obviate the criticism that the references do not convey the exact meaning of the Courts.

The writer acknowledges the valuable suggestions, criticisms, and information furnished him by Professors Henry C. Adams, Mortimer E. Cooley and W. D. Pence; Mr. Henry L. Gray, Engineer of the Railroad Commission, Washington; Mr. D. F. Jurgensen, Engineer, Railroad and Warehouse Commission, Minnesota; Mr. Bion J. Arnold, and others who have made possible the presentation of data regarding State and other appraisals.

Bibliography.—Accompanying this paper will be found a bibliography of the principal articles on the subject of property valuation. 168

APPENDIX

Railroad Valuation.—

"The Appraisal of Plants for Public Services." Nicholas S. Hill, Jr. *The Engineering Record*, June 8th, 1901. A review of the principles on which a property is valued when purchased by private parties or by municipalities.

"The Value of Railways and Their Capitalization." H. T. Newcomb. *Railroad Gazette*, August 29th, 1902. Abstract from *Yale Review*, August, 1902.

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"Railroad Taxes and Plans for Ascertaining the Fair Valuation of Railroad Property." *The Railway Age*, September 8th, 1905. Report presented at the meeting of the National Association of Railroad Commissioners, at Deadwood, S. Dak.

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"Railroad Franchise Values in Texas." W. H. Coverdale, Assoc. M. Am. Soc. C. E. *Railroad Gazette*, February 12th, 1904. Discussion of methods used in Texas. 170

"Methods Used by the Railroad Commission of Texas Under the Stock and Bond Law, in Valuing Railroad Properties." R. A. Thompson, Assoc. M. Am. Soc. C. E., with discussion by Messrs. E. L. Corthell, F. Lavis, W. H. Coverdale, and W. D. Taylor. *Transactions*, Am. Soc. C. E., Vol. LII, p. 328, *et seq.*

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Water-Works Valuation.—

"Water-Works Valuation and Fair Rates, in the Light of the Maine Supreme Court Decisions, in the Waterville and Brunswick Cases." Leonard Metcalf, M. Am. Soc. C. E. *Transactions*, Am. Soc. C. E., Vol. LXIV, p. 1. (A

complete bibliography of the subject of water-works valuation may be found on p. 69 of Mr. Metcalf's paper.)

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FRED LAVIS, M. AM. SOC. C. E.—The author states that his paper is confined to "a discussion of the methods which should be used in arriving at a correct figure of cost of reproduction and depreciation," and that "it does not take up questions involving the propriety of those figures when reached." In so far as this is concerned, it is probably the most complete compilation of the available information on this phase of the subject which has yet appeared in print. The author refuses to recognize that the consideration of the so-called intangible values has any place in a physical valuation. As, however, there exists such a widespread feeling, especially among those interested in railroads, that physical valuations, for any purpose whatever, are absolutely useless, because these intangible values are not or cannot be included, it does not seem out of place to refer to this phase of the subject at this time, and more especially in view of the fact that many persons, the prominence of whose position entitles them to consideration, have taken this point of view very recently, and their remarks have received considerable publicity. Not more than two weeks ago, Judge Lovett, the head of the Harriman System, expressed the opinion that the theory of valuing railroad property by trying to determine the cost of reproduction was utterly impractical. It seems important, therefore, that we, as engineers, interested in having the question properly understood, should be careful, in referring to valuation, to make it plain that other features besides the value of the physical property are to receive due consideration. The speaker, therefore, proposes to examine some of the arguments advanced by the opponents of valuation to see if the objections most generally brought forward are insuperable.

Some critics of valuation go so far as to say that engineers cannot make a close valuation of even the purely physical property. For instance, Mr. W. H. Williams, Vice-President of the Delaware and Hudson Company, in a paper on this subject,[19] states that:

> "No engineer in estimating on the several important items of construction work for the year will come within 10 per cent. of the total aggregate cost. Many of the more important items are frequently underestimated 25 to 50 per cent."

He cites, as an especially good illustration, the Panama Canal, the original estimate of the cost of which was $140,000,000, though the present estimate is $300,000,000. Almost every one who has kept in touch with that subject knows why the Panama Canal has cost more than the original estimates, and that the greater cost is no reflection on the judgment of the engineers who made such estimates. One cannot always foresee what changes in plans may be made before construction is completed, and would hardly expect the estimates of the cost of a railroad to be adequate if they were made for a single-track road and a double-track was built. In any event, there is a vast difference in estimating the cost of an engineering work already completed and one which has yet to be started, the difference being largely in favor of a closer estimate of the completed work.

Limitations are often placed on engineers, in connection with work they do, which are afterward forgotten. The speaker was asked not long ago to prepare a report in connection with the valuation of a large railroad property. The time within which the results were required was very limited, and the methods used in the valuation necessarily had to be a combination of the inventory method and reliance, in a great many matters, on the judgment of those making the appraisal. Undoubtedly the result obtained was entirely adequate for the purpose for which it was required, but would hardly stand if an attempt were made to use it as a basis for an argument before a Court of law or a public service commission, though it would not be beyond the range of the experience of many engineers to have a matter of this kind brought forward some time in the future as an absolute statement of fact, with no reference to the way in which the work was done.

It is inevitable, of course, that engineers will differ in their opinions as to some details of methods of making an inventory of the property of a railroad or other public service corporation, and also as to exactly what unit prices should be applied, but in general it is safe to say that any engineer of proper experience and training can make a satisfactory appraisal of the value of the physical property of a railroad, and that if two or more such competent fair-minded engineers, unhampered by any consideration of the purpose for which it is to be made, should make such an appraisal, the variation in the result would be so small as to be negligible. The speaker, however, does not entirely agree with the author, that the purpose for which the appraisal is to be used should be entirely ignored by those who are making it. There can be little doubt as to the propriety of using a properly made physical valuation as a basis for taxation, or as information for the owners, although there may be some as to the methods whereby the so-called intangible values are to be determined in these cases, or even whether they should be considered at all. The greatest difference of opinion arises when an attempt is made to regulate the issue of stocks and bonds, or to fix the rates which should be charged for transportation, on the basis of a physical valuation.

Arguments for and against rate regulation revolve in a circle, and, apparently, there is no starting point which will satisfy every one. The Courts have ruled that the railroads are entitled to such rates as will enable them to earn a fair return on the value of their property; the railroads claim that the only way to determine this value is on the basis of the earning capacity; that is, one side claims that the rates must be based on the value and the other that the value should be based on the rates. It is evident, however, by this time, that the railroads must submit to regulation, therefore a way must be found to break into the circle, and it would seem to be incumbent on them to direct their energies along lines which will tend to make such regulation fair and just rather than to oppose it entirely. There is little claim that unduly large dividends are paid, but there is a feeling in the mind of the public that the railroads are over-capitalized. Is it not possible, therefore, to break into the circle at this point, and decide, by means of a proper valuation, as to the fairness or otherwise of the capitalization? The objection to this, on the part of the railroads, is that the value of the purely physical elements is by no means the whole value of their property, but that something should be added for the so-called intangible values.

To emphasize the difficulties of appraising the intangible values in any way which will permit the application of such value to the determination of rates for transportation, the opponents of physical valuation cite what is now the familiar instance of two mythical roads between the same termini, the first with good alignment and easy grades following a valley, and the second forced into the mountains, having not only heavier grades and more curvature, with consequently a higher cost of operation, but also more expensive construction. The value of the purely physical features of the former, of course, would be much less than those of the latter, but its actual value as a property would be greater. How then should the rates on the two roads be fixed? The fallacy of using this example as an argument against physical valuation as a basis for rate-making is in assuming that there would be two railroads built under such circumstances, with no other features than the two termini and the line between.

One has only to call to mind such examples of competing lines as those of the Denver and Rio Grande between Denver and Salt Lake, the Union Pacific between Cheyenne and Ogden, the Lackawanna and New York Central between New York and Buffalo, or many others, to realize that there are, on all roads of this nature, many other factors than the actual cost of operating through trains between the termini, which determine the through rates.

One would hardly suppose that at this late date any one believes that it is proposed to use only the value of the purely physical property of railroads as a basis for rate regulation, yet the *New York Sun*, a paper of national prominence and usually most ably edited, devoted a column of its editorial page[20] to a discussion intended to show that rate regulation, based on physical valuation alone, was an impossibility.

In addition to citing the example given above, the following is put forward as the *reductio ad absurdum* of the argument for rate regulation based on physical valuation. It is said:

> "Suppose there are two bridges over the Ohio, the *cost of the construction of each being the same*, one between Cincinnati and Newport and the other twenty miles below where there is nothing but a village on either shore.... On what basis would the proponents of physical valuation, as the determining value in rate making, adjust a toll charge on these respective bridges?"

The example is far-fetched, and in no way applicable to the question of the adjustment of rates on railroads, but inasmuch as it is seriously put forward from a responsible source, it seems worth while to consider it.

Assuming, as apparently the propounder does, that the proposition is uncomplicated by any questions of franchises, public rights in the land on which the bridge and its approaches are built, etc., then there is no question but that the owners of either bridge have a perfect right to charge what toll they please. On the other hand, suppose the permission of the War Department, or some other governing body, had to be obtained in order to build piers in the river, or even to build the bridge at all; the argument used in asking for this permission is that the bridge is needed as a public convenience; or it is desired to occupy certain streets for the approaches, again is used the argument of public convenience, and so on. These privileges are granted on the tacit understanding, at least, that the public convenience is to be served, and the Courts rule that, in such cases, in consideration of the equity which the public has in the property by reason of the rights granted, a fair return on the value of the property, but no more, should be the basis for establishing the rates of toll. Would the *Sun* claim that the value of the rights and franchises given by the public in such a case, be included in the value of these bridges, and that a higher total income should be derived from one bridge than the other because the value of the streets on which the approaches had been built is greater in one case than the other; or that a greater income should be derived in one case than another because the cities furnish more people than the villages? Is there any particular reason, except for the slightly larger depreciation and cost of maintenance, and, bearing in mind the fact that both bridges cost the same, why, if there is ten times as much traffic on one bridge as on the other, the toll should not be proportioned accordingly, to provide the same income on each?

If the *Sun* had imagined a bridge built by private individuals, with their own money, between two villages, the inhabitants of which, at the time the bridge was built, having been willing to grant almost any franchises or privileges in order to get the bridge, the villages in course of time growing to large cities, and the old bridge having been replaced by a heavier modern structure, the example might have been more nearly comparable to the railroad situation. In this case, the original toll, of say 10 cents a head, may have, in the early days,

only barely returned a meager rate of interest on the investment, or even for some years resulted in a deficit. Would the *Sun* uphold the owners of the bridge if, since the villages have grown to cities, they still insisted on collecting the original toll, if it could be shown that a new bridge could be built and would be a paying investment with a toll of, say, 2 cents, except for the fact that the original bridge was built in the only location where it was practical to build a bridge at all? Or is it reasonable to say that the foresight and energy of the owners of the bridge, even though it may have been one of the principal factors in enabling the villages to grow into cities, entitle them to capitalize their enterprise on the basis of a 10-cent toll? It cannot be denied that the energy and foresight of the original builders should be recognized in fixing the rate of toll, but there is a limit to the value of this, and it is because of the feeling on the part of the general public that the capitalization of similar intangible values on the part of the railroads and other public service corporations is too large, which, whether true or not, has caused the present agitation against them. If the capitalization is reasonable, there must be some way to demonstrate the fact, and it seems as if a properly made physical valuation, with due allowance for the intangible values, is at least a step in the right direction.

The *Sun* states in its editorial that:

> "The scheme of physical valuation, as a basis for rate making, is flatly rejected as unworkable by practically all the ablest railway authorities of the country, and that the only true measure of value is the earning capacity."

To quote only one, namely: Dr. Emory R. Johnson, who is generally regarded as an authority and not by any means predisposed in favor of the public as against the railroads, it is found that he states in his "American Railway Transportation" that:

> "The earning capacity of the railroad cannot be equitably or logically made the sole criterion of value, because the rates, and hence the earnings, should depend to some extent, at least, upon the amount of capital justly entitled to profit."

It would seem to be self-evident that the earnings alone, either gross or net, are not necessarily an indication of the value of the road. Gross earnings are not, because, if a minimum proportion of them is used for maintenance and betterment, the value of the property will steadily decrease; whereas, if the opposite policy be followed, it will increase. On the same principle, the net earnings offer no criterion as to the manner in which the property has been kept up, and alone are, therefore, no measure of its true value.

As an example of the arguments used by some of the opponents of physical valuation, the following quotations are made from an article 179
by Mr. Henry Fink, Chairman of the Board of the Norfolk and Western Railway.[21] Referring to the fluctuation in the costs of construction, he says:

> "As the cost of materials and labor fluctuates ... it follows that what may be a fair valuation of a railroad one year may not be so one or two years later. Hence, it would be necessary to make new valuations from time to time."

Further, in the same article, referring to a valuation based on the market value of bonds and stocks, he says:

> "Unlike the physical valuation, this method has a rational basis.... It is true that prices of stock fluctuate—at times violently—but this difficulty can be overcome in a measure by using the average prices for long periods."

It is strange that it did not occur to so able a man as Mr. Fink that the value of the physical property might also be based on average prices for long periods; the cost of railroad construction and equipment as a whole does not fluctuate nearly so violently as the stock market.

The report on "The Basis of Unit Prices,"[22] by W. D. Pence, M. Am. Soc. C. E., the Engineer of the Wisconsin Railroad Commission, in connection with the Appleton Water-works case, is an excellent example of a fair and impartial study of this phase of the subject, and the conclusion of the Commission in this matter can only be regarded as reasonable by any one who is disposed to be at all fair-minded. It says:

> "If the standard by which the reasonableness of charges is to be determined should fluctuate with the market prices of material, labor and land, no schedule of rates could be established for any length of time, for, under the circumstances, a rate that would be reasonable to-day might be very unreasonable to-morrow. The principles of the law applicable to the subject certainly involve no such absurd consequences."

Another instance of an argument based on technicalities is found in the *Railway Age Gazette*.[23] In an editorial on Valuation and Rate Regulation, it is said:

> "It has been supposed in the past that rate-making is an exercise of judgment. It seems to be assumed by many that after a valuation has been made it will be merely an exercise in mathematics. Suppose the value of a railway for state purposes is $50,000,000. Then, on this theory, all that will have to be done will be to multiply this amount by 6 per cent.—or whatever may be regarded as a fair return—and so adjust the rates as to enable the road to earn, say, $3,000,000 a year," but, the writer goes on 180
> to ask, "how are the specific rates to be fixed? A great majority of those who advocate valuation say that they should be based on the cost of the service. The proper method, then, would be to ascertain the exact cost of hauling each commodity and then base rates on these ascertained costs, making them just high enough to allow the road a fair return."

Then the article goes on to point out the difficulties of doing this, which of course we all know, and finally concludes that: "The theory of basing rates absolutely on the cost of service is unjust and impracticable." In the present state of the art this is probably true, but why is it necessary to change the present theory of rate-making because the rates are to be lowered or raised? If, for instance, it is shown that it is necessary to reduce the rates sufficiently so that the net earnings will be reduced, say, approximately 10%, is it beyond the capacity of the traffic officials of a railroad to adjust their rates accordingly?

In an editorial in another part of this same issue the *Gazette* advocates the raising of rates to meet higher prices of supplies and higher wages; it is surely as feasible to lower rates as it is to raise them, and, even though it were necessary to base rates on the cost of service, it does not seem as if that would be entirely impractical, inasmuch as it is the whole argument advanced for raising the commutation rates on the railroads entering New York City. Will the *Gazette* say that the arguments put forward by these railroads are all wrong? Mr. Fink, in the article[24] already referred to, states:

> "It cannot be said that ... railroads make tariffs; they can only adjust them to varying conditions."

> "Adjusting freight rates is practical work of men who have special training for it and large experience. They may not all be able to explain underlying principles, such as the value of service, but they have used this principle for years, and apply it, intuitively in every case which comes before them."

Surely this body of men is equal to whatever adjustment may be necessary. Rates will probably never be arranged to suit every individual shipper; but if the people, as a whole, believe that the railroads are fairly capitalized on a reasonable basis of value, and the rates, in the aggregate, are adjusted so that unduly high profits are not made, individual complaints of injustice may easily be taken care of.

The most important considerations affecting the regulation of railroad rates arise in attempting to fix the amount which shall be considered a fair return on the investment. If a certain rate of interest is fixed as the maximum which may be earned, all incentive toward improvement or progress is removed. The effect of this would be, of course, to retard all development. Once a railroad was earning its legal rate of interest, there would be no necessity of cutting down grades, building larger locomotives to handle larger trains, 181
investigating the economics of operation and location, in order to introduce the thousand and one economies which are being developed day by day, or for our railroad presidents to lie awake nights thinking how they are to save that million dollars a day for the benefit of the always ungrateful shipper. This objection against rate regulation, and incidentally against physical valuation, can undoubtedly be overcome. One proposal which has been made is somewhat along the lines on which it is proposed to finance the New York Subways, the profits to be divided between the railroads and the State, after a certain rate of interest had been earned. There is nothing novel about this, as several railroad charters have been granted with a provision that all earnings, over an amount necessary to provide a certain rate of interest, should be paid to the State. Another suggestion[25] is that the reasonable rate of return be fixed as a percentage of the gross income, irrespective of the amount of capital required to produce it. There are probably other ways in which this might be worked out and adjusted, and this phase of the subject surely does not present any insuperable objections.

That the railroads have little to fear, in regard to capitalization, from a properly made valuation, is shown by the results in the State of Washington, where the valuation was undertaken solely for the purpose of fixing rates, the result being a determination of the market value of the three principal railroads of the State—the Northern Pacific, Great Northern, and Oregon Railroad and Navigation Company —at an amount considerably in excess of their capitalization.[26] It is true that rates were lowered in this case on some commodities, but it does not necessarily follow that every change of rates on the basis of valuation must be toward a lower scale. Railroad rates are low and have stayed low while the cost of everything else has been raised, and yet, while this fact is well known to the general public, they still believe that, in some way or another, the railroads are getting or have been getting more than their proper share of profits. Evidently there is something wrong somewhere, and it is not going to be set right by calling the public fools and ridiculing their presumption for meddling in any way with railroad affairs. Mr. F. W. Whitridge, the Receiver of the Third Avenue Railroad, of New York, while stating[27] that he had only just discovered that there was such a thing as valuation, at the same time held up the whole scheme to ridicule, though he admitted that:

> "The people of this country have, I think wisely, made up their minds, in consequence of great corporate abuses, that public

service corporations should be subject to regulation, etc."

He nevertheless ridicules the efforts of the authorities, particularly their endeavors in the matter of valuation, with its "irreverence for facts." They seem, he says, "to be singing the song of the Banderlog who dreamed of

"'Something noble, grand, and good
Won by simply wishing we could.'"

Valuation, however, has gone far beyond the point where it can be considered a visionary scheme, or can be held up to ridicule; and it has been worked out far enough to show, at least, that there is a rational basis, on which a determination of values can be made, which will do justice to both sides; furthermore, the Supreme Court of the United States has not only ruled that valuation must necessarily be precedent to rate regulation, but has gone so far as to specify at least some of the elements which must be taken into account, and it may be worth while noting that, in spite of the author's criticisms of the Washington State Valuation, it is the only one, thus far, in which an attempt has been made to comply with the rules laid down by this Court. The results in Washington, however, indicate clearly the need of regulation of the railroads, as a whole, and not varied regulation by individual States of the parts of systems within the borders of each.

Arguments on either side can be prolonged indefinitely, and many good reasons for and against physical valuation are advanced from time to time, just as they may be on any proposition. Some of the principal objections have been referred to here in an endeavor to show that they are not insuperable; the point which concerns us now is that to-day we are confronted with a fact and not a theory, and that fact is that the railroads are going to be regulated, and that their proper development is held back and general business is hampered by the feeling of uncertainty as to the outcome. Physical valuation is not a panacea for all evils, but a properly made valuation of the physical elements, with a due allowance for the intangible values, based possibly on some such method as that developed by the Washington State Commission or by Professor Adams in Michigan, is surely as good a way of breaking into the circle of argument as any that has been proposed thus far.

The equipment of freight trains with air brakes and safety couplers was practically forced on the railroads by the pressure of public opinion led by laymen, yet one will hardly find a railroad man now who will not admit that this is good practice, not only from the standpoint of safe operation, but from that of economy as well. The early attitude of the railroads in this matter is already being quoted by the advocates of valuation, and inasmuch as we have to admit, as we surely do, that a start is going to be made somewhere along the line of obtaining some more definite information in regard to the true relation of the value, capital, and profits, of railroad properties, than the mere statement by the railroads themselves that they are all that is good and fair, would it not be wise on their part to do all they can to have the start made properly rather than oppose it? Some of the most prominent and progressive railroad men of the country have already arrived at the point of believing and saying that regulation properly carried out may not be an unmixed evil, in fact, would probably be beneficial, but they still balk at valuation, without, however, suggesting any other means whereby the general public is to obtain the information on which to base an intelligent opinion as to how such regulation is to be carried out.

The speaker does not for a moment underestimate the difficulties incident to the determination of the intangible values, or forget the difference between the problem presented by the comparatively new lines in the State of Washington and a valuation of, say, the Pennsylvania Railroad or the New York Central. No one who gives any real thought to the problem pretends that the value of a railroad is the value of its purely physical property; but, because the matter of determining the intangible values is difficult and complicated, is it necessary that we should sit back and fold our hands and say "it can't be done"; that in the whole country there is no man or body of men, or engineers, if you please, with brains and ability enough to solve the problem? As for cost, is it not worth $10,000,000, which is more than $40 per mile for all the railroads in the country, or about three times as much as the cost of the most careful appraisals yet made, to have the question put once and for all on a stable basis, satisfactory to all, if the problem be approached in a fair, broad-minded, common-sense way, by engineers big enough to command the respect of both sides? Aside from the question of rate regulation, is it not worth this much to the railroads of the country to be able actually to prove that the amounts at which they are capitalized are reasonable, as in the great majority of cases they probably are?

There are one or two points which, it seems to the speaker, cannot be too strongly emphasized:

First, that valuations properly made may be the means whereby confidence may be restored, not only in the mind of the general public, but in that of the investor; but, in order to obtain this result, the railroads should urge, with all the power they possess, the necessity of having such valuations made by a body of men, some of whom, at least, should be engineers, big enough to entitle their opinions to the respect of both sides, and thoroughly qualified by training and experience for the work.

Second, that, as far as possible, regulation should be general or national, so as to avoid the complication of dividing all roads at the State lines, and of having different regulations in different States.

Third, 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 adjustment of 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. The speaker believes that valuations made in this way and with these objects in view will do no harm to the railroads, and will do much to restore confidence and give us the much needed peace and quietness to carry out necessary development.

Charles H. Higgins, Assoc. M. Am. Soc. C. E.—Mr. Riggs' able and timely paper is of great interest and worth to all concerned with the matter of values, whether of public service corporation property, or other property; and what engineer is not concerned with values?

One cannot but wish that an index accompanied the paper, as its usefulness would be thereby greatly increased, particularly as, by its arrangement, such subjects as depreciation, non-physical values, etc., are treated of in many different portions of the paper.

The Wisdom of Having a Physical Valuation.—It is hard to understand how any thoughtful person can now doubt this, for we are in a period of regulation and taxation of public service corporations, and the only question is whether they shall be regulated and taxed with a full understanding of the investment involved, or by arbitrary methods, such as the 2 cents per mile passenger rate, which has been so popular in many States, under widely different conditions and irrespective of the cost of the service.

The time would seem to have arrived when the thoughtful public service corporation manager would welcome a fair valuation of the company's property, as protection against legislation conceived in ignorance of the capital invested.

Relation Between Railroads and Other Properties.—The relation between appraisals of railroad and of water, gas, and traction companies is very close, and the same general principles apply. In the former, however, it is complicated more often by the fact that the lines of a railroad extend through many States, with terminals in one or two, and, further, that the railroads have many subsidiary, controlled, or dependent companies, such as coal, lighterage, terminal, car, warehouse, contracting, elevator, stock yard, and supply companies, often owned, wholly or in part, by men in the railroad management. Agreements with these companies may greatly affect the non-physical values, as determined by the methods advocated in this paper, which may otherwise be sound.

Valuation of All Properties.—The author says that the valuation of all railroad properties in the country "would be of interest." It would be more; it would be of value infinitely greater than the cost. The mere presence of light prevents many vices, and this is as true in corporation practices as in the streets. It is in accord with Dr. Woodrow Wilson's "pitiless publicity"; and, which is, perhaps, more important, it is the basis, or should be, of all legislation concerning the regulation of these great highways.

One and Only One Fair Value.—Nothing in Mr. Riggs' paper is of more value than his insistence that there is one and only one fair value of the physical property of a railroad, no matter for what purpose it is to be used. How futile are the misdirected efforts of those who would have it otherwise, for, no matter what the purpose of the appraisal may be, who can foresee the use that may be made of it when it becomes public property?

Cost of Reproduction.—Cost of reproduction less depreciation seems to be the established method—that recognized by the Courts—for arriving at the value of the physical property. Cost, as the author contends, can only be an element in determining the present value, for the owner of a stone bridge has as much right to any appreciation in the value of masonry as the owner of land has in the increased value of his property; and, though the cost early in the life of the structure is usually near its value, it may lose that position. What relation exists between the value of the Pyramid of Cheops and its cost? Now, as then, our unit measure of value is changing. Cost is certainly of historic interest, but present value is the subject for present uses.

The points in favor of inspection to determine the physical condition of the object to be valued are convincing, where the structure may be readily inspected. Mortality tables mean little without a history of maintenance. With perfect maintenance there would be no physical depreciation.

Maintenance versus Depreciation.—Depreciation and maintenance are interdependent, so much so that some engineers have advocated dropping the term, "depreciation," and substituting "deferred maintenance." A little thought will make this clear. While this term would not apply in the case of a single rail or car, it is not illogical when applied to a system, built and renewed piecemeal and maintained at a certain standard of usefulness, that is, on all well-managed undertakings of magnitude, units are constantly being replaced, thus maintaining a standard of efficiency. This standard, on the entire system, is usually found to be between 70 and 90% of the cost of reproduction. Some items are even improved, and the cost is charged to the maintenance account, such as that referred to in the paper as "consolidation and adaptation" of roadbed; and only a few, such as steel rails, steadily and progressively become less useful, and even

these have a bottom value, that of scrap steel. Nor are examples numerous where all the rails are laid at one time, and they are extremely rare where all are replaced at approximately the same time. When the rails on a street or section are renewed, the cost cannot properly be charged to capital account, except in so far as the new rails are of a more valuable type than the old ones; for, if this were done, there would be no limit to the capitalization as time goes on. Furthermore, the moment it is admitted that, by reason of a change in the art, we may have depreciation through obsolescence, we admit that through a change in the art we may have appreciation through the opposite of obsolescence. This being the case, the use of "mortality tables" to determine present value is misleading, unless it is done with the full itemized accounts of maintenance, which are seldom, if ever, available. The author's position in regard to the need of inspection of each item is well taken. 186

Dead versus Live Properties.—These, perhaps, are not happy expressions, but they serve to emphasize a vital distinction which must be made in the valuation of properties. The difference may be as great as between a corpse and a man; here, also, the distinction is hard to define. We say the soul has departed, or the spark of life is extinguished, but these expressions do not contain a satisfactory scientific definition. So, as Mr. Riggs points out, the physical property of a going business may not be valued as so much junk, even if the non-physical values are to be determined separately.

The Franchise a Contract.—The Courts hold a franchise to be a contract, something often forgotten, both by the public and by corporations. The speaker, however, understands this only to mean, even where the franchise is in perpetuity, that the property of the corporation cannot be taken for public use without just compensation. In a sense, then, there can be no such thing as a perpetual franchise. Using the word franchise with its restricted meaning, the unreasonableness of the rates may be measured by the value of the franchise.

Physical versus Non-Physical Values.—The following division has been made by the author between physical and non-physical property, for the purpose of valuation:

> "That the Physical Value, or present value of the physical property, should fairly represent the actual capital invested in the property at the date of appraisal; that it should be made up of the sum of the various elements which constitute the cost of reproducing the property together with any appreciation which may have been added to any of them, less all depreciation.
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> "That the Non-Physical Value is the difference between the 'fair value' as defined by the Courts, or the reasonable value of the property as a business or producing property, and the physical value, or actual present worth; and that the only proper method for determining such values involves a study of income accounts.
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> "This Non-Physical Value may be: positive, or a value in excess of the physical property, or negative, or less than the physical value. In the case of a property having a negative intangible value, a deduction should be made from the physical value."

This division is convenient but arbitrary. It is the division of an engineer rather than of an economist; for these so-called non-physical values are like the breath of a man's life; without them, the physical value is like the discarded body. Again, the use of negative non-physical values, while convenient, may not be wholly logical. These remarks are not directed at Mr. Riggs, for he is careful to say that he is dealing only with active enterprises, and not with those which are inert, and the speaker realizes that he is not attempting primarily to build up a logical argument, but to formulate certain rules to overcome practical difficulties met by all who have attempted valuation work. As many who have not given this matter much thought are apt to be misled by the distinction made between physical and non-physical values, they should bear in mind that the line between them is like the equator, an imaginary one. 187

Water.—"The water is as much a part of the cost of putting that line there as the rails," remarked a corporation official, of admirable character and wide experience, pointing to a trolley line from the window of a Pullman car; and, bearing in mind what he meant by "water," this is undoubtedly so. The cost of promoting the enterprise, the discount on the hazard, the loss of interest during its infancy, the labor of building up the undertaking—these are all real elements of cost, and may remain in the property as value, but, like all other items of cost, they have their reasonable limits, which, in each individual case, can be determined within narrow bounds.

Purpose of a Valuation.—As Mr. Riggs points out, there are four reasons for a valuation: Taxation, rate-making, purchase, and control of the issue of securities, one of which is usually the primary cause for the valuation being made; and he argues that there can be but one "fair value" of the physical property, whichever of these reasons may prompt the appraisal. This is fundamental, for "fair value" is used in the sense of true value, which, to the writer, seems to be a more apt expression. It is rather surprising that it does not appear in the paper. Its use, of course, is old; in the Constitution of New Jersey, 1875, we find: "Property shall be assessed for taxes under general laws, and by uniform rules, according to the true value." Each of the three matters, taxes, rates, and authorized capitalization, are interdependent and, in the long run, cannot be considered separately. This can be emphasized by a *reductio ad absurdum*: Modern civilization is so dependent on transportation by rail that unquestionably all taxes could be raised by assessment on the railroads, if these roads were allowed to fix their rates and were protected in the collection of them; but how would this method differ from that of the Romans, of farming out the collection of taxes? Not materially, and no one advocates a return to that method. This is absurd, but it serves to emphasize the relation between taxes and rates. Taxes can only come from the rates.

Overhead Charges versus Unit Values.—There is much in various parts of this paper concerning overhead charges, but very little about the items considered in determining the unit values or unit prices used; and does not the latter greatly affect the former? For example, in discussing the Michigan appraisal, the author says: 188

> "For many items, such as clearing, grubbing, earthwork, masonry, etc., the price was fixed by agreement during the discussion at a figure which represented the fair average cost of this particular item during the 5-year period preceding the appraisal."

The "fair average cost" under what conditions? This word "cost" is understood by different men in as many different ways as the word value. Mr. Riggs very clearly gives the items included in "fair value" as finally arrived at by him, but it would seem to be as important to define "fair cost" as used in arriving at the unit prices, for otherwise the chain has a weak link.

What may be considered a fair cost per unit of measure for a particular item differs greatly: First, with the point of view and breadth of horizon of the man stating such cost; and second, with the methods of letting contracts and accounting with which he may be familiar, as applied to such items of work. Because of the first, a fair average unit cost may mean one thing to a contractor, another to a division engineer, still another to a chief engineer, and a fourth to a manager or consulting engineer; and because of the second, the understanding of the term may differ among men of the same class. All of this quite aside from what may be termed the personal equation of the individual. Thus the subject of overhead charges can only be discussed profitably in the light of knowledge concerning what has already been included in fixing the unit prices used. For example, the element of hazard common to all construction, but differing in degree on different classes of work, may be included in the unit cost used, or it may be added as a percentage to resulting sums, but it cannot rightly be included twice. This is equally true of other elements of cost of a similar character.

The foregoing is pertinent, for any valuation will probably be attacked in the Courts, and the unit values will be one of the most tempting points for assault, for the very reason that this wide difference of understanding in regard to cost, and particularly in regard to unit costs, exists. This same difference of understanding is usually the reason for the wide difference in unit costs testified to by able engineers and, consequently, for the distrust often felt for such testimony. The methods followed in taking expert testimony usually work to make "confusion worse confounded." The judge or layman, hearing two engineers testify to widely different unit prices as a fair average cost for certain work, forms a low opinion of their judgment, or worse, whereas the real difficulty may, and usually does, lie in a different understanding of the meaning of the term "cost," or "unit cost." To the speaker, this seems to be the weakest point in an admirable paper. 189

Paving.—Whether the value of the paving between and for a space outside of the tracks is an element of value in a street-car line, or whether the cost incidental to the construction and maintenance is in the nature of a tax, is a much disputed point in all valuations of street-railway properties, and an important one, for it may amount to $15,000, or more, per mile. It is interesting to remember that the custom of requiring street-railway companies to maintain the pavement between the rails and for a space of about 2 ft. outside of them, which has become almost universal, developed during the use of horses to draw the cars, the animals causing great wear on that portion of the street. This question of values is a difficult one. It would seem that the most tenable position is that: If the fee to the pavement is not in the company, and if the rule concerning cost of reproduction less depreciation is to be followed, the cost of taking up and relaying the pavement is an element of value in the physical worth of the track, for it would be impossible to reproduce the track without incurring the cost of such work.

S. D. Newton, Assoc. M. Am. Soc. C. E. (by letter).—The general scope of this paper is admirable. The author's views and definitions are unusually sound, clear, and forcibly expressed. To one minor detail, however, the writer is unable to subscribe. Referring to "the physical property element of value," he states that:

> "This consisted of those things which are visible and tangible, capable of being inventoried, their cost of reproduction determined, their depreciation measured, and without which the property would be unable to produce the commodity on the sale of which income depends."
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> Take the case of an industrial spur for some minor industry along a line of railroad. It is often a question in the minds of the management whether or not the car-load business done by such an enterprise is sufficient in quantity to warrant the expense of a spur track. There are probably other facilities in the neighborhood which could be used to take care of this business at the expense of some inconvenience; in a large proportion of cases, the railroad will handle the business anyway, and the spur can in

no sense be called a necessity. Still, it is visible, tangible, and capable of being inventoried, and should be included in an inventory of the property the same as any track or section of track belonging to the Company. This may also be said of an extra settling basin or filter bed in the case of a water-works plant. If such basin or bed were not in existence, and a leak should occur in the original plant, the business of supplying water to its customers could, in all probability, be carried along in some manner until the break could be repaired; nevertheless, such a tank or bed is desirable, and its value should most certainly be included in an inventory.

Take the extreme case of a piece of machinery which is utterly broken down or so far out of date as to be entirely worthless for the purposes for which it was designed. Yet such machinery has, at least, a scrap value, and as such it should be included in the inventory as part of the tangible assets of the concern at the date in question. 190

Of course, in many instances, certain interests endeavor to have inventoried items which should either be omitted altogether or included at a much reduced valuation from that sought to be placed on them, and, in such cases, the very best judgment of the appraising engineer must be called into play in order that injustice may not be done to either party; but to say, as Mr. Riggs' definition virtually does, that nothing should be inventoried which can, either with or without inconvenience, be dispensed with, is absurd, and the writer does not believe that such is the meaning the author intended to convey. Probably, if the word "economically" were inserted in the definition, it would more nearly represent the proper idea.

William V. Polleys, M. Am. Soc. C. E. (by letter),—In his very thorough and painstaking paper Mr. Riggs states that it is confined to a discussion of methods for arriving at a correct figure of cost, and disclaims any intention of considering the propriety of using said figure when reached.

Inasmuch, however, as he devotes the next eight or ten pages to a dissertation on law, political economy, rate-making, finance, and advice to railroad employees, with a word of encouragement to the good, and firm reproof to the bad ones, it is fair to assume that he intends this disclaimer in a Pickwickian sense, and that the real intent of the paper is to show that the physical valuation of property is, with certain determinative, corrective factors, a proper standard for gauging taxation, bond issues, and kindred evils.

Is it not a fact, however, that taxation is based on a much more intangible structure, and that the net earnings must necessarily have more to do with it than the physical valuation of the property—whether it be that of a wicked public service corporation, or that of an honest haymaker—rather on what their property can produce, than on what it would cost to produce the property? Is it not rather a battle of business acumen between the taxer and taxee, a battle which, among other things, is regulated more or less by the fact that an extreme in either direction will bring disaster to one or both, followed by the inevitable reaction and readjustment?

Take, for instance, an extreme case: A manufactory is erected on comparatively worthless ground. A million dollars or more is invested in a plant, with the result that surrounding real estate values go up with a bound. Supposing that the manufacturer has not made any previous arrangements for immunity, and the assessors are both acute and honest, the property will be taxed for a large figure, which tax, if the factory is making money, will be paid, with more or less grumbling, up to the economical breaking point. Suppose that, owing to a sudden permanent change in business conditions, it becomes impossible to operate this plant, and it is abandoned. A corps of experts may be thrown into the mill, before the last employee has left the building, and may carefully scrutinize and caliper the machinery, count the bricks in the wall, tap the stay-bolts in the boilers, and bore into the furniture to see whether it is solid or veneer, and when they are through and their figures are all in, they have not arrived at anything that is of the slightest use as a basis for a bond issue or taxation, and very little that would be of use for sale. In such an extreme (but by no means unheard-of) case physical value bears no relation to real value. 191

This is not to say that a physical valuation is without worth, and even great worth in some cases; it is merely offered as an opinion that the physical value is in many (and probably most) instances a very treacherous guide to the real value—a far poorer guide, as a general rule, than the accounting department; a minor quantity, in fact.

It seems doubtful whether there is a scientific way of arriving at the true value of a going property by the physical-valuation route. There is too large a percentage of values which, being intangible, are matters of judgment. At best, the determination of value must be that of opinion, and the worth of that opinion hinges principally on the practical qualifications and disinterestedness of the person who gives it.

Unfortunately, or fortunately, as the point of view may be, the disinterested person is not apt to be qualified, nor the qualified person to be disinterested, and it seems extremely probable to the writer that, while weapons may be changed and excuses vary, the tax war will be waged as of yore, and the fool and his money will continue along diverging paths until something more ingenious than physical valuation is invented, however well the valuation may be made.

C. P. Howard, M. Am. Soc. C. E. (by letter).—While there may be no material differences of opinion as to the principles on which a physical valuation should depend, such a detailed description of organization and methods as that presented by the author should be of great service to others undertaking similar investigations.

It may not be amiss, however, to mention certain features affecting the non-tangible values which should be more fully considered in any general discussion of the subject.

The author calls attention to one or more particulars in which the methods of the Michigan appraisal may "fail as a method of determining a value for use as a basis of rate-making." Later, after quoting various court decisions, he dismisses this phase of the subject with the words: "In view of these dicta, it is needless to argue whether a rate of 6% or 10%, or 15%, or more, be reasonable."

A value for purposes of rate-making might more properly be called a "permissible value." The writer holds no brief for the corporations, and would not like to fall under the imputation of being "apparently incited by, either the direct interest of corporations, * * * or an effort to confuse the subject of valuations," but will venture the following, which, while it does not exactly represent any particular case, it is hoped may be recognized as an illustration drawn from life. 192

A, B, C, and their associates, being familiar with a certain territory, its resources, transportation facilities, and growing development, believe that the time has come to build another railroad through their State or States. They have made careful estimates of the amount of tonnage that may be expected from the development of its mines, timber, farms, etc., and conclude as follows:

First.—The road, completed along the most approved lines, will cost, with equipment, $50,000,000.

Second.—It will take five years to construct and equip the road and put it in fair running order.

Third.—The traffic, when fully developed according to their hopes and expectations, will eventually afford at usual tariffs a handsome profit, say, from 8 to 12% per annum on the capital invested. This condition, they believe, in all human probability, will be attained in from 5 to 10 years after completion.

Fourth.—That half the traffic anticipated will pay 5% on the investment.

Fifth.—They are obliged to admit (though the chances of this are so remote as to be in their opinion negligible) that, due to unforeseen causes, obstruction, competition, etc., there is a possibility that, as has so often happened in the past, the enterprise may prove a financial failure, or that the period of prosperity may be postponed so far into the future as to amount to practically the same thing.

Here is a bold undertaking; but were it $5,000,000 instead of $50,000,000, the conditions would be essentially the same. Nevertheless, they have the courage of their convictions and go ahead.

Now, with all the risks and uncertainties attending an enterprise of this sort, if the ultimate profits were limited in advance to 5 or 6% on the capital invested, less depreciation, who but the Government itself could afford to build a railroad?

Evidently, when an existing railroad makes small additions from time to time to extend or take care of its business, the risk is not so great. Such extensions will continue more or less under any limitations.

For rate-making, it is evident that an appraisal based on earnings will utterly fail of its purpose if made during the lean years immediately following construction. If made some years later, when the property has begun to pay, the risk and necessary financial loss of the lean years should be remembered, as any one building a road in the future will necessarily have the same problems to meet, together with the expenses of interest, depreciation, loss from operation, etc., both during the construction and the lean years following, all of which must properly be considered a part of the real cost of constructing and developing a property. 193

J. E. Willoughby, M. Am. Soc. C. E. (by letter).—The determination of the cost of reproducing the property of any steam railway involves, together with other items, an estimate of the present cost of:

First.—The acquirement of the right of way, to the extent, in the form, and on the location of that held in connection with the railway to be reproduced;

Second.—The construction thereon of the roadway, to the form and dimensions, and of the materials which the roadway to be reproduced exhibits; and

Third.—The seasoning and adaptation of the roadway to the state of perfection which the roadway to be reproduced exhibits at the time the estimate of cost of reproduction is made.

The first conception, for fixing the cost of the several items, is to consider the railway to be reproduced as being non-existent at the time

the estimate is made, but having the environment which then exists along the operated railway, although that environment may be largely of the railway's own creating. The cost of the right of way is to be fixed as ungraded and unimproved property attached and forming a part of the adjoining improved property, which adjoining property will be entitled to receive, in addition to the market value of the land taken, all consequential damages due to the taking off of the right of way in the form and location that the land has actually been taken, and for the purpose of railway construction and operation. This adjoining property is to give credit on the consequential damages for the incidental benefits which it derives, if any, from the construction and operation of the railway.

In fixing these values, the drift of public sentiment—the bias of juries of view and of trial juries—at the time the estimate of cost of reproduction is made must be considered, since that sentiment may affect enormously the cost of the right of way. The amount to be paid for a right of way is in the end that which a condemnation court will award. The question as to whether or not the right of way was originally donated can no more enter into the determination of the cost of reproduction, for the purpose of lessening the estimate of cost of acquiring the right of way, than the fact that donations of lands or bonds (or of convict labor and slave labor, as in the South prior to 1860) made by governmental authority or private enterprise, at the time of the original construction, can be used to reduce the reproduction cost of the excavation made in the formation of the roadway.

No rule as to the sale of property for commercial purposes in the vicinity of an operated railway can be rightfully adapted as covering the 194
line as a whole. While the cost of right of way through farm or timber lands bears a general relation to the value of those for agricultural purposes, where improvements thereon bear but a small proportion to their total value, this relation is wholly wanting in the cost of a right of way through a village or city or at any point where the improvements on the property bear a large proportion to its total value. The relation is also wanting where a right of way is obtained through agricultural lands devoted to special purposes, like that of country homes for the rich. It is also wanting where the right of way is taken out of the narrow river lands in the Appalachian Mountains, where the total value of the whole farm is dependent on the small acreage of flat land along the river bank. The general rule of prefixing a constant to the current selling price of lands, in order to determine the estimated cost of right of way, should be limited to agricultural and timber lands, and to those which, owing to their extent, the carving out of the right of way does not wholly destroy for the continuation of agricultural and timber operations.

For villages and cities, and for lands devoted or adapted to special purposes, an accurate estimate of the cost of reproduction of the right of way can be determined only by a specific investigation of the conditions in each community. While it is difficult to conceive all the activities and sentiments which have growth in, from, and of railway operation, as being in existence without the railway, it is only through such an assumption that one can estimate correctly the make-up of the items of cost of reproducing a railway as such railway may now exist. To assume that the railway, not existent for the purpose of estimating the cost of reproduction, will now receive the donations of land and moneys that were made half a century ago, is merely going back to a determination of what the road has actually cost; and that is contrary to the intent of the theory of the cost of reproduction. The conception of a parallel line is not correct, for it imposes thereby a further burden on properties which have already contributed to the public good, probably to an extreme extent, and gives an abnormal cost for right of way, as shown when a railway seeks to enlarge its terminals in a crowded community, or to find a new entrance into a populous city.

So, too, in estimating on the formation of the roadway, one must consider the roadway to be reproduced as being obliterated—all cuts and borrow-pits refilled, and all embankments and spoil banks removed from the right of way—but all other lines of transportation, except the railway to be reproduced, must be considered as being in existence as they actually are at the date when the estimate of cost of reproduction is made, and that such other lines of transportation are available for bringing in machinery, tools, teams, materials, and 195
supplies for the construction of the railway to be reproduced. It is only by such an assumption that the benefit of the improved means and methods of construction now prevalent can be obtained; but it is not permissible to estimate for the construction of a railway with different grades, alignment, roadbed, widths, or with different materials than that of the railway to be reproduced merely because such construction at this day might be actually cheaper or better than to construct it in exact duplication. For example, if the rock cuts on the roadway to be reproduced be only 18 ft. wide, with ¼:1 slopes, one must not figure on the greater economy of steam-shovel excavation, because the steam shovel cannot be worked in cuts of that width; nor can the spoil from such cuts be carried long distances to eliminate a possible solid-rock borrow originally made elsewhere, because long hauls are practicable in steam-shovel work, but wanting in excavations where the mule is the transportation force. So, too, it is not permissible to estimate on reinforced concrete bridges to take the place of more costly cut-stone arches, if cut-stone arches are the structures that have been actually built. The idea of cost of reproduction is not synonymous with the idea of the cost of building a railway capable of serving the same transportation purpose. If all our railways were to be built anew, in the light of our present knowledge, and with our present traffic offerings and financial resources, vast changes would be made in the character of construction. The physical fact of existing construction prevents a theoretical substitution of what is the best construction for any community, together with its costs for the construction which was actually made years ago.

In the event that an estimate of reproduction costs be made for a State as a whole, or for a great railway system as a whole, the conception of reproduction is modified so that the construction may take the form of progressive construction, the principal lines being built first and the less important lines afterward. This method will require the estimate for interest during the construction period to be greater.

The money cost of the seasoning and the adaptation of the roadway to such a condition as will permit heavy trains to be run at high speeds, is great, but the amount is not readily ascertained. An estimate of cost of reproduction, to be true, must consider this item; and probably the more usual method of ascertaining it is to assume it to be an amount in some proportion to the cost of the excavation. This proportion will vary with the character of the material through which and of which the cuts and fills are made, and with the methods of construction necessarily adopted. There are many railways on which this cost will exceed 25% of the total cost of excavation.

After the estimate has been made, including the item for seasoning and adaptation, there should be added a contingent fund to cover the 196
omitted work, consisting of small borrow-pits and ditches, undetermined foundations, unexpected conditions encountered, unavoidable "force account" work, minor changes of streams and highways, damages to adjoining lands due to the methods of construction and to diversion of water, etc. This item will not exceed 5% of the cost of the roadway if the estimate be accurately made.

The more convenient form into which an estimate of cost of reproduction of a steam railway is to be put is to follow the sub-accounts, as prescribed by the Interstate Commerce Commission for Expenditure for Road. Each item given in that accounting has a place in the estimate. These comments are confined to the items covering the roadway, namely, Right of Way and Station Grounds, Grading, Tunneling, Bridges, Trestles, and Culverts.

Henry C. Adams, Esq.[28] (by letter).—To the writer this paper seems to be the most complete and comprehensive discussion of the general question of valuation of property invested in public service industries that has come under his notice. It is especially important in that it is a summary of the discussion on this most difficult subject during the past ten years, and the writer thoroughly agrees with the general conclusions reached by Mr. Riggs.

There is one point, however, which might possibly have been developed more completely, and that is the treatment of discounts, which presents itself from time to time in the general discussion. Mr. Riggs quotes with approval the following:

"If a company can market its 50-year, 4 per cent, bonds at 90 per cent. of par, it means that the company's credit is on a 4½ per cent. basis; that it could market a like security paying 4½ per cent. at par."

This is, of course, correct as far as the mathematics of the proposition is concerned, but it seems to overlook that peculiar psychology of the market which enables a corporation to secure a larger amount of actual cash for a given interest annuity when bonds are sold at a discount than when they are sold at par.

Aside, however, from the accuracy of the above quotation and of Mr. Riggs' apparent acceptance of it as the final word on discounts, one may ask if it recognizes all the elements necessarily involved in a discussion of the problems raised by discount financiering. From the literature of the subject one may read the following claims: Discount is a measure of the risk involved in a new enterprise; discount is a market adjustment that reflects the current value of money; discount is a sacrifice of principal for a slightly reduced interest annuity; discount is a dividend declared before the dividend is earned; and many cases are cited in which a discount is merely a promoter's fee for 197
services rendered.

The writer does not care to discuss at this time these various points of view from which discounts may be regarded. They are mentioned merely to suggest that the subject is not as simple as some writers seem to think. Any valuation of public service industries, from whatever point of view it may be regarded, must, from the nature of the case, touch the problem of fundamental equities; and one of the elements of this problem which has not as yet been fully analyzed is this element of discounts. From the point of view of taxation, such an analysis is not perhaps essential; but if the valuation is to be used as a basis of determining reasonable rates, or as a measure of reasonable capitalization, it seems to be essential.

The writer is sure this discussion will not be construed as in any sense a criticism on Mr. Riggs' paper; it is rather a suggestion of an unwritten chapter in the literature of valuation. The American Society of Civil Engineers is to be congratulated in securing from one of its members so complete and satisfactory a discussion of the principles and methods for the valuation of public service corporation property.

Carl C. Witt, M. Am. Soc. C. E. (by letter).—The appraisal of the railway property in Michigan was a wonderful performance in a great many ways, not the least of which was the thoroughness of the work, considering the short time available, and the writer desires to

express his appreciation of this paper, as it is a valuable addition to the meager literature on this subject.

More recent appraisals, made by States traversed by the same railway systems as those involved in the Michigan appraisal, have been made with a freedom from opposition by railway companies due to the educational effect of this pioneer work. Particularly is this true of the recently completed appraisal, by the Board of Railroad Commissioners of South Dakota, of the physical property of the railways in that State, of which work the writer was the Engineer in charge. No opposition was met; in fact, some of the railway companies had established regular departments for furnishing inventories and appraisals, had completed the necessary field work in South Dakota before the inventory had been requested by the State, and were able to furnish a very complete appraisal in a short time after the request for it was made.

This appraisal was made in compliance with an act of the Legislature of 1907, which required the Board of Railroad Commissioners to ascertain the true cash value of all the property of every railroad company in South Dakota used in the operation and maintenance of their respective roads. No attention was paid to the purpose of the appraisal, but one of the first uses made of the information thus secured was in the litigation following the passage of an act by the Legislature of 1909, prescribing a maximum passenger fare of 2 cents per mile on all railroads operating within the State. In connection with a rate case of this kind, some questions have been raised regarding proper bases for land values, the use of an item for adaptation and solidification as an element of physical value, the value of the intangible assets, etc.

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The lands of all railway companies were appraised at a cost to reproduce or re-purchase at the time of appraisal, regardless of the original cost of the property. The sales method was used for determining the market value of adjoining property. There has been a very large land movement in South Dakota in the last five years, and as most of the country is prairie, with similar soil over large areas, it was not difficult to determine the average market value of the land for farm purposes, at the date of the appraisal, and the gradual trend of values for five years previous to that date. An average multiple of 250% was used to arrive at the cost of reproducing or purchasing the right of way. This multiple was based on investigations made of recent right-of-way purchases, and inasmuch as there are no large terminals in South Dakota, the same average multiple was used throughout the State for both town and farm property, investigation showing that town property could be secured for slightly less and farm property for slightly more than the average multiple used.

In each supplemental appraisal the land values will be corrected to correspond to the changes in surrounding values, as the railway company is entitled to any increase, due to natural causes, based on the cost to reproduce at the time of appraisal. This is a well-established theory, as shown by Mr. Riggs.

No allowance was made for the item commonly known as "adaptation and solidification," except in the item of contingencies and in the consideration of the present value of the ballast. In some recent appraisals, large sums, based on a percentage of the cost of grading, have been allowed for this item. While there is no question that large sums of money are expended in maintaining a safe track on a new bank, and that this expense gradually diminishes as the roadbed becomes solid, due to the pounding of the trains and the action of the elements, this expense is, and properly so, charged to maintenance, and is paid for out of the operating revenues. Now, in the trial of a rate case, exhibits showing the operating expenses, including maintenance charges, are introduced, and to include this same item in the appraisal of the physical property leads to a duplication, for if the passenger or shipper pays for this maintenance charge, it should not be counted as an item of physical value as a basis for determining what is a reasonable rate.

The case is similar to that of a locomotive: When new, it is kept in the vicinity of the shops, because trouble from lack of proper adjustment and weak parts is likely to develop, and the maintenance charges may be much higher than a few months later when the machine has "found itself" and, as an operating machine, is more efficient than when new. However, no one will insist that it has an added physical value in dollars and cents, or that the excess cost of repairs and maintenance during its early life should be added to its cost of reproduction now; in fact, it is a second-hand machine, and the maintenance charges must be paid for out of its use.

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Generally, when a roadbed is turned over to the operating department by the construction department, it is in good line and surface, and if an appraisal were made at that time its condition would be 100%; but as soon as it is placed under traffic, it begins to depreciate, as shown by the fact that it requires constant attention to keep it up. If the roadbed is cross-sectioned at each station and actual quantities calculated from cross-section notes, there would be no depreciation, but if the grading quantities are calculated from profiles of the line, as constructed some time previously, and for a standard width of sub-grade, with a percentage added for shrinkage, and allowance made where banks have been widened, etc., it will probably be found to exceed the actual measured quantities, because the action of the elements in washing the slopes, the wearing of the shoulders of the embankment due to foot traffic, etc., will show some depreciation in quantities. It is common practice to carry the item for grading over to the present-value column at 100%, or, with no depreciation. This practice, together with the present condition of the ballast due to maintenance, and that part of contingencies which covers washing of slopes, filling of ditches, sink holes, etc., certainly takes care of all adaptation and solidification which should enter into a valuation of physical property.

No appraisal was made of the intangible assets. A great many arguments have been advanced for and against such an appraisal, and in South Dakota it was held that the earning ability of any corporation due to its franchise, strategic location, efficient organization, going-concern value, etc., while perhaps an element of value to be considered in a transfer of the property or if assessed on an income basis, should not enter into a valuation which would be used for determining a just and reasonable return on the investment, because the greater the earning power the greater would be the return, and that this condition would produce a never-ending increase in returns; whereas, when the returns reach a point at which they will not only pay a fair dividend on the investment, but take care of any depreciation in the physical condition of the property and make all needed improvements in roadbed, buildings, and equipment, demanded by the traveling public, shippers, increased traffic, or natural causes, they should be kept to that point. There are several hundred miles of railway in South Dakota which have been built out of the surplus earnings of the parent corporation—in other words, with money supplied by the traveling and shipping public—but which are owned by the railways and on which they may earn another surplus for constructing more extensions, etc., etc.

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The original South Dakota appraisal, as of June 30th, 1908, on forms similar to those used in Minnesota, has been supplemented by yearly appraisals corrected for all additions and deductions made during the fiscal year. For this purpose a new set of forms[29] was prepared, with the various items classed in accordance with the "Classification of Expenditures for Road and Equipment," as prescribed by the Interstate Commerce Commission, and arranged so as to facilitate showing the yearly changes.

R. A. Thompson, Assoc. M. Am. Soc. C. E.[30] (by letter).—This paper is considered by the writer to be the most complete treatise ever written on the valuation of public service corporation property, and the author deserves the sincere thanks of the entire Engineering Profession and all others interested in this most important question. Its presentation is most timely, in view of the agitation, particularly on the subject of railroad valuation, which is now engaging the attention of Congress and the law-making bodies of the several States, as it contains much valuable information relative to decisions of Courts, in addition to clear and concise expositions of the methods in vogue for the appraisement of corporate property, etc.

It is a fact—rapidly coming to be recognized by legislative and judicial bodies—that the prescription and regulation of tolls, charges, and assessments against public corporations cannot be made systematic and intelligent unless there is provided some estimate of the value of the property involved, based on the cost of its replacement or reproduction. Particularly is this true of railroads; and such regulation of the affairs of these corporations as has heretofore been essayed by State and National commissions, has generally been on illogical bases, unsatisfactory alike to the proponents and the companies. Results have been had, it is true, after a fashion, but there have been endless disputes and litigation, with the prime questions involved no nearer solution than before. One has but to contemplate the varied and often antagonistic legislation promulgated by the several States, relating to corporation management, and the many rulings and decisions of the different courts and commissions on the subject of regulation, assessment, and adjudication of corporate rates, revenues, taxes, and tolls, to become convinced of the complicated and tangled condition of the situation, and to realize the necessity for the early establishment of some logical basis on which to establish the fabric of corporate control.

While it is not maintained that an appraisement of the physical property of public service corporations will be the panacea for all such ills, the writer firmly believes with the author that such appraisal, as a beginning, is absolutely necessary, and when effected on some fair and reasonable basis, will contribute largely to the successful solution of many of these intricate problems.

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With the estimate of the physical value of a property before it—which represents money actually invested, together with such accruals to costs as it may be determined that the owner is reasonably entitled to have considered—any Court, tribunal, or commission is in a better position to mete out impartial justice, whether it be the regulation of a rate, the assessment of a tax, or the imposition of a fine.

Although the author's experience in valuing corporate property has been principally in connection with the Michigan appraisal of railroads, and to him is largely due the credit for devising methods for, and carrying forward to successful completion, this thorough and most excellent work, it is refreshing to note his inclination to give credit to the work of others along the same line in other States, which, it is to be regretted, has not always been the case with writers on this subject. There is no doubt that the work of the Michigan and Wisconsin Boards of Appraisal—conducted under the advice and direction of some of the most eminent and talented engineers and economists in the United States, and practically without regard to expense—is the most complete and perfect of its kind heretofore attempted; yet there are many features in regard to the organization and execution of its details about which there may be an honest difference of opinion, as viewed by those who have been similarly employed.

It is but natural—as suggested by the author—to find the "individual" character of the appraiser (which has been moulded by his

environment, training, and former service) reflected in his opinion, and this would be most probable in the organization for, and carrying on the work of, appraising a railroad property, which involves consideration of practically every phase of engineering and economics. The judgment of any man is essentially warped along the lines of his experience, and he is necessarily biased and prejudiced in favor of or against certain practice. As a consequence, therefore, it is not reasonable to suppose that any one man, or set of men, can formulate a system for valuing corporate property which will be perfect in all its details, and be free from objection and criticism.

The writer was employed for a number of years as Engineer for the Railroad Commission of Texas, and had charge of the valuation of railroad property under the Railroad Stock and Bond Law of that State. A paper on the methods used by this Commission was prepared by him and published by the Society.[31] This Stock and Bond Law was enacted in 1893, and the railroads then existing were valued in 1894 and 1895. The average value of 8,860 miles was $15,844 per mile. This valuation was made by Charles Corner, M. Am. Soc. C. E., now Resident Engineer of the Rhodesia Railways, South Africa, and Mr. H. J. Simmons, now General Manager of the El Paso and Southwestern Railway System. The actual cost of this work is not available, but is estimated at about $2 per mile. The engineers making the appraisal secured maps, profiles, and all available information from the offices of the railroad companies, including all the construction records and estimates of quantities which were preserved. Appraisal was made only after one of the engineers had made a personal examination on the ground, accompanied by assistants to aid in measuring structures and estimating quantities.

All valuations made since 1895 have been of new railroads making application for issuance of securities, and in all cases the deeds for right of way and depot grounds, the contracts for construction, the actual quantities of construction of all kinds, the plans and specifications for all structures and construction, and all other information which the engineer desired, were submitted by the railroad companies to enable an accurate appraisal of the value of the property to be made. It is not possible for valuations of this character to be made under more favorable circumstances. Up to October, 1909, more than 3,500 additional miles had been valued, and in all cases the estimates limited the securities which the companies might issue.

Writers on railroad valuation have generally been inclined to discredit the work of the Texas Railroad Commission and the system of appraisal used by it. One writer, of more or less prominence, has referred to it as the "cheap" method. While it may be true that other appraisals have been more expensive, it is a fact that those of the Texas Commission have served their purpose well, and the railroads, as a rule, have made little complaint. As a matter of fact, it is highly probable that the valuations of railroad property made by the Texas Commission have been of greater utility, as far as the public is concerned, than those of all other States combined, and, at the same time, no injustice has been done the railroads.

It appears that those who have interested themselves in investigating the Texas method of railroad valuation—including the author—have failed to construe the real meaning and intention of the Stock and Bond Law. Apparently, it was passed for the purpose of limiting railroad indebtedness—and is referred to by Mr. Riggs as serving only this purpose—but while its effect has been to accomplish this most successfully, its enactment carried with it a deeper significance.

This law was passed at the same time as the General Railroad Commission Act of the State, which gave to this Board absolute control over all freight rates and tariffs, and also other powers not possessed at that time by any other State commission. The decisions of the highest Courts at that time laid stress on the right of carriers to maintain rates which would afford a reasonable return on stocks and bonds outstanding. Hence, to delegate the regulation of rates to any tribunal by any law which did not carry with it also the right to supervise and restrict mortgage indebtedness to some reasonable extent, appealed to the legislators as being essentially ineffective. The effect of the law has been to reduce steadily the average outstanding stocks and bonds of the railroad companies of the State from an average of $40,802 per mile in 1894 to $31,910 in 1909—and this, too, in the face of a recognized increase in the physical value of the properties—thus depriving the railroads of one of their most potent weapons of offense when contending against the Commission's orders. It is a matter of common knowledge that the indebtedness per mile of railroads of other States has increased greatly during this period. It is also a fact that the railroads of Texas have, except in rare instances, contended that injustice has been done them in the enforcement of this law, and the market value of their stocks and bonds has steadily risen. Also their physical condition is on a par with that of railroads in other Southern and Western States, and their incomes from operation are as substantial. The practice of "watering" their securities has been effectually stopped, as regards local issuance, and any interest which might have accrued on such securities has been saved to the public.

It has been contended that the Texas valuations of 1894-95 were too low, and did not, even at that time, represent the fair value of the properties. This is perhaps true to a certain extent, but it must be remembered that the costs of materials and construction then were less than at any time before or since; and, viewed from the present-day standpoint, they seem to have been inadequate. It must also be considered that real estate values throughout the entire State were very low, compared with present values and with those of lands in other States. Although the writer admits that the margin was very narrow, still he is of the opinion that the valuations as made represented closely the cost of reproduction of the physical properties at the time.

The valuations of 1894-95 stand to-day on the Commission's records as "the value of the property," except in cases where there has been application and necessity for re-valuation. The machinery of the law did not provide that these appraisals should be kept "up to date." The mortgages on these railroads are still outstanding, and there has been no call for another appraisal, except in a few instances. The Commission has decided that in its opinion the "present value" of any of the railroads already appraised is represented by the original valuation plus the value of all permanent improvements and betterments added. This principle has been carried out with those railroads which have applied for re-valuation for any purpose, and the Commission has admitted the same in testimony which it has given before the Courts.

Since the appraisals which the Texas Commission makes are primarily for the purpose of limiting indebtedness, and the carriers are entitled to have these at least equal the cost of their property—the investment with certain additions to cover promoters' profits—no consideration can be given to depreciation of structures and equipment, although the application for valuation and process of issuing of securities may be had several years after completion. The writer holds that there is strong argument in favor of not taking into account "depreciation," and of estimating the value of the property as being entirely "new," whatever purpose the valuation is proposed to serve. This is apparent, as already stated, when the valuation is to serve as a basis for limiting the issue of stock and bonds. Is there any logical reason why a valuation for this purpose should not also serve—as far as it pertains—as a basis for taxation or for regulating freight rates? As far as the State is concerned—and to be consistent—should not "one" valuation serve all purposes?

Suppose that a State should create a board clothed with powers of rate regulation, taxation, and authority to restrict indebtedness, and also prescribe that it should appraise the value of the property of the railroads, and use that appraisal as the basis for its acts. Would it be logical for that board to make and apply one system of valuation for one purpose and another system for another purpose? Manifestly, it would have declared that a valuation was a "valuation" for all purposes, at least as far as the physical property was concerned; and, when devising a method for making its appraisals, it should incorporate therein all the elements of value which might apply logically to either purpose. The writer believes that "depreciation" of roadbed and structures would have no place in such an appraisal, on the one hand, nor its negative, but fully as intangible and difficult of concrete estimate, "adaptation and solidification of roadbed," on the other.

It should not be understood that the writer maintains that taxation boards should not go beyond the valuation of physical property to arrive at a final basis for assessment. There are certain intangible elements which should be taken into consideration when taxing property, chief of which is the net income. It is only as far as physical valuations apply in either case that he considers that there should be uniformity.

He does not approve at all of incorporating in an estimate of the physical value of a railroad property such an element as "adaptation and solidification of roadbed," which is credited with so much importance in the Minnesota valuation. In the first place, such an element is incapable of being measured in tangible terms and reduced to a dollars-and-cents basis; second, it cannot be reproduced in the sense that other property is reproduced, and its value does not appear in the capital account of the railroad; and third, it results from the action of the seasons on the one hand, and the working over of the roadbed by the maintenance forces on the other, the cost of which appears in operating expenses. One is constrained to believe that the engineer who insists on incorporating such an element in an appraisal of the physical value of a railroad is hard put to find material with which to swell his estimate. When noting the large difference in value per mile of the railroads of Minnesota, as compared with those of Michigan and Wisconsin—adjoining States—it would appear that undue prominence had been given to this and similar factors.

The writer's experience as appraising engineer for more than 10 years with the Texas Railroad Commission, and for the past 2 years as a construction engineer—having built about 160 miles of railroad in Oklahoma and Texas—confirms his belief that, in the absence of actual figures of cost, right of way and other railroad real estate should be appraised at but little in excess of the market value of abutting property. The practice of the Texas Commission has been to add from 25 to 50 per cent. The conditions under which railroads were built in Michigan, Wisconsin, Iowa, and Minnesota cannot have been radically different from those in the Southern and Western States. In Texas it has been a rare instance when a railroad has had to purchase all of its right of way. Also, contiguous lands have greatly increased in value since the advent of the railroads. It would appear highly illogical to advocate that these increased values should be multiplied by 3—or even 1½—and used as a basis for taxing the railroads on the one hand, or taxing the public on the other, by permitting indebtedness to be issued against it, the interest on which the latter must pay. The railroad recently constructed by the writer traversed fertile and thickly populated areas, already quite well served with transportation facilities. Only a small fraction of the necessary real estate was purchased by the railroad company, and only in a few cases of such purchase did it pay largely in excess of the market value of the land—and these were where the road interfered with houses and other farm improvements. In cities and towns, land was acquired at practically its fair market value. For rural property, the ratios used by Professor Taylor in the Wisconsin appraisal

appear to be quite fair, but in cities they are too high—especially for the Southwest. The Minnesota ratios appear to be unreasonably high.

Any appraisal of the physical value of railroads—in the absence of figures as to their actual cost—is necessarily only approximate, and is correct only within certain limits. Especially with regard to the old roads, where original cost data cannot be had, the values applied to property and construction must be largely speculative. It is impossible to build two railroads in the same territory, on the same specifications, for the same amount; yet, on the basis of cost of reproduction, an appraisal board must apply the same value to each. 206

The writer believes that unless there is more uniformity as to methods of valuing corporation property, as between the States, all valuations will be more or less discredited, as they should be, by the Courts. It is to be hoped that this paper will be generally discussed by the Profession, and will lead to the adoption of more uniform methods.

Charles H. Ledlie, M. Am. Soc. C. E. (by letter).—The following is suggested as a method of procedure for determining the fair and equitable value of a property:

1st.—Examine carefully the statutes governing corporations of the class under examination.

2d.—Form an opinion as to whether or not the locality can support such a property, by inquiry regarding the different businesses carried on, bank clearings, railroad facilities, what the surrounding country produces, etc.

3d.—Find from the archives of the company a general description of the property, from its conception to the date of appraisement.

4th.—By close examination of the minute books, directors and executive committees, there can be ascertained all the details of organization, issuing of stock, bonds, and other forms of indebtedness, contracts for equipment, supplies used in the construction, etc.

5th.—Obtain from the general manager or the superintendents an explanation of the details of operating and maintaining the property, including the different classes of service, rates, etc.

6th.—Go over the property, examine it carefully, and talk to any and all employees from whom it is thought that any information can be gained.

The foregoing will give a general knowledge of the property under examination, and will enable one to begin the real work. The examiner's assistants must be competent and experienced men.

7th.—Examine all the vouchers, from the beginning of the company down to the date it began operation; classify their contents under the respective heads for the different classes of material used in the construction, for example, pipe, engines, cable, etc.; then prepare blank tables for each heading, having columns for size, quantity, prices, and total; and abstract each voucher. Do the same with the vouchers for labor, general office salaries, general expenses, interest, taxes, legal, etc. This, when completed, will give the detailed cost, as shown by the vouchers.

Next check the vouchers back through the books, and draw up a statement, which will show the total book cost and, no doubt, will differ from the voucher total. It is likely that many items will be found for which no vouchers exist, a list of these is made and if the officers cannot give a satisfactory explanation of any of them they are omitted. The total of what remains is added to the voucher total and represents the cash expended for the benefit of the original property, as shown by the books and vouchers. 207

8th.—Take all the remaining vouchers of the company (it is supposed that the examiner has already been informed by the officers, and by his inspection of the records, of the extensions and betterments which have been made), separate the vouchers for materials, labor, etc., from those on operating, etc. Next classify them by years, and then proceed as set forth in 7th, and add the different yearly amounts to the total of the original plant. This will show the amount of cash expended (according to the vouchers and books) on the property, for its physical plant, organization, etc., from its beginning to the date of appraisement.

Every examining engineer should know (or can obtain) the prices for materials, labor, etc., during these periods of original construction, extension, etc. If the prices are the same, or about the same, as at the time of purchase, the above total stands as the cash expended; if there should be much difference—and sometimes there is—take the detail of the materials as found in the vouchers, affix the proper prices, and do the same with labor, etc., and this total will be what, in the judgment of the examining engineer, the plant should have cost. A mean between this latter total and that in 8th is taken, in order to be fair and equitable. This amount, in place of that given by 8th, is then used as the cash expended on the physical property. If no difference is found in prices, then the total cash as shown by 8th is considered as the total to be hereafter used.

9th.—A careful detailed inventory is now made of the physical property as it exists at the date of examination. This often requires some excavation in order to determine sizes, quantities, and conditions. The prices used to ascertain the total of the inventory are made by taking the average of all those paid for materials, labor, etc., of the same class, during each year of the property's existence. (The writer considers it manifestly unfair to use the current prices in this calculation, for they may be very much below or above those actually paid, and in either event an injustice would be done, whereas, if the average prices are used, the examiner cannot be accused of unfairness.) To this total cost, as shown by the inventory, 5% is added for engineering and superintendence; 3% for general office salaries, 2% for general expenses, 1½% for legal and organization expenses, and from 5 to 10% for contingencies. (This latter percentage depends on the judgment of the examiner, who, after studying the local conditions carefully, can determine from his own experience what difficulties have been met in the construction. It is not believed that a hard-and-fast rule can, in equity, be laid down for this latter percentage.) This total represents the value of the tangible property, based on the inventory. The inventory cost and that set forth in 8th (or possibly as modified by prices current when the plant was built) are averaged, and this result, plus the supplies on hand, is the fair and equitable amount of cash which has been expended on the property. This is used in finding the "Fair and Equitable Value." 208

10th.—Next take the inventory of the plant set forth in 9th, affix the current prices at the date of appraisal, and to this total add the same percentages for engineering, etc., as set forth in 9th. This gives the cost of reproducing the property, with the same classes of materials, size and make of engines, etc., as is now in it, to which total add the cost of materials on hand for the total of cash required to be expended at current prices to reproduce the plant as it exists.

It is often found that this latter total is greater than that set forth in 8th, for the reason that the engines, etc., may be of types which are now abandoned or obsolete, and the manufacturing company, having to make patterns, etc., would charge more for them than the original price at the date of purchase.

This reproduction cost at current prices is only to give the examiner information he may or may not require later in the investigation to determine some point that might arise in ascertaining the "Fair and Equitable Value."

The writer considers it unfair to call the reproduction value the cost of a modern plant which will give the same service and output, because one is not dealing with the value of a modern plant, but with that of an existing property.

11th.—From this cost (using the detailed inventory to find the extent of property still in existence), calculate the amount of depreciation for each section of the plant, this being based on the present condition of the different parts and what their future life may be. The total depreciation is then deducted from the result found in 9th, and this remainder is used as the "Fair and Equitable Value" of the tangible property at the date of appraisal.

The intangible value (called by many names) must now be determined. It consists of rights, from the State, county, city, or any one or more combined, which the company must have in order to carry on its business. These rights in nearly all States are taxable, and taxes are collected on them. The Supreme Court of the United States has in the past held that they are property, notwithstanding what State "Courts and Commissions" have set forth on this subject, and in the writer's examinations they will be treated as property until the Supreme Court of the United States decides otherwise.

There are in general three classes of franchises, namely: 209

I.—Those granted by the State to conduct a business, where no county or city franchise is necessary, only requiring the company to obey the ordinances for excavation, etc. The charter of the Laclede Gas Company, of St. Louis, Mo., is an example of this class.

II.—Those granted by the State to carry on a business subject to a county or city franchise.

III.—Those granted by a city to an individual, singular or plural, or a company, to do business within its limits or a section thereof.

In each case the right may be a contract, for it may require a payment for the franchise granted, either in a lump sum or in yearly installments, or in the form of services rendered, such as for light, etc., free service of some kind, or a combination of any two or all of them.

The manner of determining the value of "Intangible Property" is as follows:

(*a*) The gross collected earnings are audited for each year during the period the company has carried on its business. The same is done for all vouchers, *i. e.*, operating, maintenance, salaries, legal, general expenses, interest, insurance, and taxes, and includes every item disbursed. Whatever this latter amounts to, is deducted from each year's gross earnings as already found, and the result is the true net earnings or deficit for each year.

(*b*) The true net earnings are added together and the mean taken; if, in the period from the beginning to the date of appraisement, any

deficits are found, these are deducted from the total of the plus-earnings, the result is divided by the total number of years, and this gives the true average net earnings. This is then capitalized at the legal rate of interest of the State in which the property is located. The result is used as the value of the "Intangible Property."

12th.—The amount given by 11th is added to the result obtained by 9th, and this total is the "Tangible and Intangible Value" of the property, and the "Fair and Equitable Value" of the property at date of appraisement.

If it is found that grave mistakes in design or judgment have been made by not employing competent people, and money has been wasted in construction, the plant is re-designed, for the original plant, and its cost estimated. The same is done for each extension, using the prices paid at the different periods, and this result is used in place of 9th, as the cash cost at the date of appraisement.

In determining the intangible value, if it is found that the management has been careless in order to make large net earnings, at the expense of the physical property, estimates are made of what the property can be operated and cared for (here the practical knowledge 210
of operation, etc., is necessary), and these results, plus taxes, etc., are subtracted from each year's collected earnings. The mean or average of these results is considered as the true net earnings, which are capitalized and added as set forth in 12th.

The writer holds that consumers or purchasers should not pay for avoidable error or ignorance, and the amount of the securities issued on the property is not considered as entering into the matter of "Fair and Equitable Value"; when they do, the method is somewhat different.

The mean true net earnings are used in determining the intangible value, because franchises have average values, as earnings and expenses fluctuate in corporations, and, when intangible values are to be considered, they must not be based on the last year's net earnings, for if they are, they may give a very large result in one year and a small one in the next; therefore, to be fair, the mean true net earnings should be the basis of the intangible value. If the company has been over-capitalized, and no sinking fund or depreciation has been set aside, it is the present owner's misfortune. If the company calls something a betterment, and it is found that the betterment has only replaced something, it is not allowed, but is classed as maintenance; on the other hand, if the replacement is larger, and capable of rendering greater results, such as a larger engine, pipe, cable, etc., the cost, less the cost of what it replaces, is allowed as a betterment, and if the old part is sold the proceeds are deducted from the betterment charge, for if it is credited to maintenance, it increases the true net earnings. This is often done, but is not the correct way to treat the matter, for it increases the intangible value.

13th.—When new rates are to be established for a period of future years, the manner of determining the "Fair and Equitable Value" is the same as has been heretofore set forth. The new rates are based on averages, and the first step necessary is to ascertain what gross revenue the company must have in order to pay all classes of operating expenses, maintenance, depreciation, taxes, interest on the "Fair and Equitable Value" of the property, and a reasonable profit.

To obtain this amount, the procedure is as follows:

(*a*) Find the percentage of increase of the operating expenses for each year over the prior one, for a period of generally five years preceding the date of examination (a longer time may be taken if, in the opinion of the examiner, it is necessary), and then ascertain the average annual increase of the percentages. The result thus obtained is taken as the increase percentage for the operating expenses for the new period of time.

(*b*) In order to determine what the operating expenses will average during the time the new contract is to run, take the amount of the last year's operating expenses as a basis and add to it the percentage found by (*a*). This total is the operating cost for the first year of the 211
new contract. The amount for the second year is found by adding to the cost of the first year the percentage found by (*a*), and so on for each year of the new period. These results are added together and their average is then used as the mean cost of operation for each year during the full period.

(*c*) The same method is followed for maintenance and taxes, in order to find the average maintenance and taxes for the new contract's life.

(*d*) Depreciation on the plant begins from the date of appraisement, and is estimated on the physical property by using for each section the percentages used in determining the "Fair and Equitable Value."

(*e*) Interest at the rate of 6% is allowed on the "Fair and Equitable Value," and 6% profit.

The question of extensions and betterments to the original plant must now be taken into consideration.

(*f*) The amount of the betterments and extensions have already been found for each year of the property's existence, and an average of them is taken as the amount the company will spend on extensions, etc., during each year of the new contract. On this sum 6% interest and 6% profit is allowed, and, for depreciation, the same percentage as used in the original plant.

It will be seen that all the expenses of operation, etc., of these extensions have been allowed in (*b*), where the increase has been added for each year for these extensions and betterments, as they are assumed to increase the cost of operation, etc.

(*g*) The amounts found by (*b*), (*c*), (*d*), (*e*), and (*f*) are now added together, and to the sum 5% is added for interest, taxes, operation, etc., which may be caused by the necessary increase in capital expenditures, for a greater growth than could be foreseen at the time the new rates were established, for losses, etc. This total is used as the basis for establishing the new schedule of rates.

14th.—The next step is to determine what part of the amount found by (*g*) must be paid by the different classes of consumers.

(I) First ascertain the yearly percentage of increase in the output of the plant for the five years before the new contract is to go into effect (or longer if, in the opinion of the examiner, it is necessary); then find the average increase of percentage during the before-mentioned five years. Add to the last year's output the percentage found above, this result representing the output for the first year of the new contract. Continue this operation for each year in the same way as the operating expenses were found in 13th (*b*). The average 212
of these results will be the average estimated output during the life of the new contract.

(II) Next find the amount of the total output each class of consumers used during each of the five years, and then find the average yearly use during this period. Put these into percentages of the amount of the average output for the five years, and then use the percentages as the amount each class of consumer will use of the average output found in (I) during the period of the new contract.

This gives the average amount of the output each class of consumers will use during the average life of the new contract.

(III) Next find the average percentage of the total revenue each class of customers paid during the five years. Take these percentages as the average percentage each class will pay of the average revenue necessary during the time the new contract is to run.

(IV) Having found the average amount of the required revenue that each class must pay, and the average amount of the total output each class will use, dividing the former by the latter for each case will give the rate each class is to pay during the new period.

It is often found in plants that large extensions have been made to supply a special contract for a long period of time, and these extensions are set aside for the exclusive use of this contract. In such cases exclude the cost, etc., of this part of the plant from the "Fair and Equitable Value" in the matter of adjustment of rates.

In determining the operating expenses, etc., in such a case, find the percentage of the total output this special output amounts to; then, using this percentage, find what part of the total power-house expenses of all kinds are caused by this special contract. This result is deducted from the total power-house expense, and the remainder is the power-house cost of furnishing the consumers with their share of the total output. If it is found that special employees are required to deliver this special output, their cost is deducted, and the same for the maintenance material used. Taxes and interest on the cost of this special equipment are found by ascertaining the percentage this cost of the special equipment bears to the whole plant.

The above results are deducted from the total operating, maintenance, taxes, and interest disbursements, and "Fair and Equitable Value," and the remainders are used as the cost of the last year's expenses for furnishing the consumers with their share of the product and the "Fair and Equitable Value."

The same method is used in determining the revenue paid by the consumer.

The above result, *i. e.*, cost of operating, etc., is then used as the basis for estimating the expenses for the period of the new contract, as heretofore set forth.

If the charter comes under Class II or III, the city no doubt has incorporated a clause for the adjustment of rates, and the method used 213
above is followed.

15th.—Where the franchise has expired and is going to be renewed, the same method holds.

16th.—Where the franchise has expired and the city has paid a certain amount for service, and is to buy the property, the same method is used, except in determining the intangible value. For determining the latter, the amount the city pays for service is deducted from the gross collected revenue. From expenses is deducted the same percentage as the amount of the city's payment is of the gross revenue; a net revenue is found from this, the taxes paid are deducted, the remainder is capitalized as heretofore set forth, and is the intangible value. Whatever the latter amounts to is added to (or deducted from, in case of deficit) the "Fair and Equitable Physical Value," and the result is the price the city should pay.

Cities generally claim, and so do their "experts," that they should only pay junk value, or the cost of a modern plant to give the same results. This is eminently unfair, because the city buys a property which is in full operation and it receives the full revenue, in addition to obtaining service for itself at a less cost than it heretofore paid. The difference between the cost to the city of furnishing the service itself, and what it paid the company, is profit, but there is a charge against this of loss in taxes. These two latter items, namely, profit and taxes, generally balance each other, although the writer has known of cases where the city was the gainer.

There are many points which can be advanced to establish the fairness of the methods outlined herein, but they would take some time to explain, and therefore the writer has only set out the plan he follows in his examinations, hoping that it may be of some aid in establishing a uniform method which will be upheld by the Courts.

It may be stated that recently this method was used in an examination, going back thirty-five years, and the results were accepted by both sides without question.

The writer has refused a number of examinations when told in advance what result must be found, as well as in "expert" work, where the examiner is expected to help make a case, regardless of his honest judgment, for, by accepting such work, the engineer hurts his reputation and lays the Profession open to such remarks as Judge Lacombe recently made in the case of the Peoria Water-Works Company *vs.* Central Railway Company.

The writer is fast coming to the conclusion that a great deal of legal trouble is caused by the decisions of commissions, the members of which have not had experience in these matters. If a commission consisted of an able lawyer, a financial man, and an engineer who has had a broad operating experience, its decisions would carry weight, and the Courts would not be burdened with so many appeals.

WILLIAM G. RAYMOND, M. AM. SOC. C. E. (by letter).—This is, perhaps, the best paper on the valuation of public service property that has yet appeared. The author's analysis is very clear, and his arguments are convincing. Three points the writer would like to consider; two of them briefly. 214

The item, "going value," even if it is determined on logical reasoning, as suggested by Professor Mead, would seem to be a dangerous item, and one which might result in absurdities when estimated by an unscrupulous, ignorant person. Moreover, the term has been differently defined, and there is no certainty as to just what it means. The writer sees no reason for the existence of such a term, or of such a separate quantity as this term is supposed to represent.

The term, "franchise value," or, "value of the franchise," is used to represent the difference between the capitalized net earnings and the value of the physical property. Of course, there is such a difference, either positive or negative, but there seems to be some objection by the Courts to calling this "franchise value." The writer, therefore, would suggest that, since franchise value is a very elusive item, depending on the life of the franchise, the attitude of the community toward the corporation, the activity of competing corporations, and numerous indeterminate items, the term, "business value," or, "going concern value," be used instead of "franchise value." "Going concern value" is not as good a term as "business value" or "value of the business," because it may be assumed to include both the value of the business and the value of the property. "Value of the business" would presumably include the value of the franchise, and perhaps would not always be represented exactly by the difference between the capitalized net earnings and the value of the physical property, but would be this difference affected by some judgment percentage resulting from a consideration of the probable continuance of the franchise.

Mr. Riggs has truly said that the value of the physical property must not be made to depend on the purpose for which the valuation is made; that, for the business for which it is used, the value of the physical property is the same, regardless of the purpose for which a valuation is desired; but valuations are made for different purposes, and, while there is room for argument as to the proper valuation to be used for capitalization, taxation, or sale, there are perfectly definite methods suggested for valuing property for these purposes. The writer has never seen a statement—that appealed to him as at all rational—of a proper method of valuing property for rate-making. Indeed, the writer has said[32] that "proper traffic rates have no relation to valuation except that the minimum net income should be at least sufficient to pay interest on the physical valuation." The writer is not absolutely certain of the correctness of this position, for a study of the public right to regulate a corporation which is performing a semi-public function seems to indicate that the public has a right to say, not only that rates shall be non-discriminatory, but also that they shall be reasonable. 215

Now, the writer is familiar with three bases for the determination of what constitutes reasonableness of rates. One, which applies to rates as a whole, is this: That the net income should produce not more than a reasonable interest rate on the actually invested capital. Another is the rate that the traffic will bear, and the third is a rate that represents what the service is worth to the purchaser. Of course, a difficulty arises in determining reasonable rates on any one of these three bases.

The only difficulty with the first one is in determining what is a reasonable interest rate on invested capital, and, as far as the writer has read, no Court has yet determined what this is, although some Courts have held that 5% is a not unreasonable return, that 8% is a not unreasonable return, and, if the writer's memory serves him right, that even 15% is a not unreasonable return.

There is great difficulty in the determination of what the traffic will bear. It is a matter of the exercise of judgment and of experiment, and must be applied to a considerable extent to particular rates, for particular commodities, for particular places.

The third basis would seem to be the most difficult to use, although it is one which has recently been established in important Court decisions, and is mentioned by Mr. Riggs. What is a monopoly-provided service worth to the user or purchaser? Suppose that a gas company charges $1.60 per 1,000 cu. ft. for gas, and a very considerable part of the populace living in the city served purchases gas at this price. Presumably the purchasers pay what the service is worth to them, and what they are willing to pay rather than suffer the inconvenience of tallow candles, oil lamps, or to pay a high price for electric lights. Suppose that through a period of five years, by a series of reductions voluntarily made, the price of gas finally reaches $1.15 per 1,000 cu. ft. Is this gas worth any less to the consumer at the end of the five-year period than it was at the beginning? So far as the writer can see, it is, for only one reason, namely, that it can be had for less; but this has been a voluntary reduction on the part of the supply corporation, and who shall say that the service is not worth less than $1.15 to the consumer, or who shall say that it was not worth less than $1.60 at the beginning of the period suggested? The figures here given represent an actual case which has occurred during the last five years, within the writer's knowledge. There seems to be a growing feeling among the people that rates as a whole must be fixed so as to yield only a reasonable return to the corporation, and, apparently only for want of the suggestion of a better method, a reasonable return has been held to mean a reasonable return on the capital invested. Believing that there may be some ground for the claim that rates as a whole should be thus fixed, and that the return should not be unreasonable, let us consider how what is reasonable may be determined. 216

In the first place, it appeals to the writer that the invested capital is not the proper basis for estimating reasonable rates. If it shall be finally established that a corporation is entitled to realize only a reasonable interest rate on the capital invested, there will be no more public service corporations organized; but, if the reasonableness of the return may be based on the capital invested and the business done, there will still be good inducement to capable men to engage in public service business.

It would seem that the rate of return that is reasonable differs for the capital invested and for the business done—that is to say, if the capital invested is $1,000,000, an ordinary investment return of from 4 to 5% may be sufficient; and if the business done with this million-dollar plant amounts to $10,000,000 a year, a reasonable return may be 10% or even 15% of the whole.

Now, as has been suggested by Mr. Riggs, it is manifestly impossible to capitalize the net earnings as a basis for determining reasonable rates, because these net earnings are the result of certain rates already established, the reasonableness of which may be in question; and if, instead of speaking separately of interest rate on capital actually invested and profit rate on business done, it is desired to obtain a value on which to base reasonable rates, the following is suggested as a method: Determine the physical value and the annual interest on this physical value at an assumed reasonable rate, say 5%; determine the annual expense of conducting the business, and assume a business man's profit rate, say 15%, and find the profit that should be earned on the business done. This, added to the total interest charge, should give the net income, over and above operating expenses, that may be considered reasonable, and this sum, capitalized at any given assumed reasonable interest rate, would give a value which might with reason be used as a basis for rate-making, rates being deemed to be reasonable as a whole which furnish from year to year a simple reasonable interest rate on this established value. Of course, there is no necessity for establishing such a value, as the reasonableness of the rates will be determined when it is learned that they produce not more than a fair interest rate on the actual physical value of the property plus a fair profit rate on the business done.

This method is not free from the objection that what is a reasonable interest rate and what is a reasonable profit rate have never yet been fixed, but it is much easier to fix these separately than to fix what is a reasonable return on the capital actually invested or the physical valuation of the property.

W. H. WILLIAMS, ESQ. (by letter).—Before entering upon the discussion of the more essential elements of the problem presented by this paper, it seems worth while to correct one or two misapprehensions under which Mr. Riggs seems to labor, and to call attention to the rather extraordinary temper in which he approaches the grave questions with which he deals. 217

Mr. Riggs' first serious misapprehension is that railway officers, as a class, are, with substantial unanimity, opposed to any official valuation of railway properties, and that this opposition was voiced through the writer's discussion of Professor Henry C. Adams' paper in favor of valuation, at the last annual (December, 1909) meeting of the American Economic Association. Of course, on that occasion, the writer spoke, as he now speaks, only for himself, but, more than that, he then expressly disclaimed any such opposition, undertook to make suggestions as to the manner in which a proper valuation could be obtained, and directed his criticisms plainly at a proposal which

contemplated, as he then observed:

> "An incomplete and misleading valuation bearing the stamp and carrying the weight of governmental sanction, which can be of no practical advantage to the Government, the public, or the railways; but may easily injure the public and the railways by disturbing the confidence of the former and hampering the activities of the latter."

The writer then added:

> "It seems very clear that such a valuation as is proposed would be wholly useless to the Government for any practical purpose, because it would omit so many factors essential to any fair appraisement of the worth of the enterprises as going concerns."

Bearing in mind that the foregoing was addressed to the particular proposal made by Professor Adams, that being the topic on which the writer was invited to speak, a proposal expressly limited to the ascertainment of cost of reproduction less depreciation (the equivalent of cost of replacement with second-hand materials in a condition equivalent to that of the materials in use and hereinafter referred to as "cost of replacement") under the pseudonym of "physical value" (or sometimes "inventory value"), it would seem as though Mr. Riggs should sympathize with the writer's view, rather than with that of Professor Adams. Certainly, Mr. Riggs is fully aware of the inadequacy of mere cost of replacement to serve any useful purpose, for, after saying that:

> "No account may be taken of the purpose for which the resultant figure of value is to be used; and the result should not vary, no matter what the purpose may be."

He says, in another place:

> "* * * it is clear that the worth of the physical property, being the cost of reproduction less depreciation, is not necessarily the value of the property. * * *"

And, defining what he calls the "non-physical or intangible elements of value," says: 218

> "These are those things which, added to or taken from the worth of the physical property, make up the value, and include whatever accrues to the property by reason of its operation, or by reason of grants, contract rights, competition, or location, which at the time of appraisal affect favorably or unfavorably the worth of the property."

The second misapprehension that is worthy of notice seems to have grown out of a curious sensitiveness, on the part of Mr. Riggs, as to any suggestion, other than his own, of criticism of any work undertaken or theories advanced by Professor Adams. As to every reader, other than Mr. Riggs, it is surely quite unnecessary to say that no attack has been made upon Professor Adams by the writer at the New York meeting of the American Economic Association or anywhere else. Certainly, it will be conceded that some difficulty would attend an effort to respond to an invitation to discuss before a scientific body a paper written by one of its members without making any allusion to the author of the paper or to his views or work, and those who have any knowledge of the history of official railway valuations in the United States, and especially of the proposal to undertake a Federal investigation of cost of replacement, are fully aware that Professor Adams has been from the beginning, and now is, the Hamlet of the drama, without whom it would become dull and lifeless. Strangely enough, Mr. Riggs seems to wish to deny to Professor Adams this prominence, for he says:

> "Professor Adams was associated with the Michigan appraisal, but had no connection whatever with the 'physical valuation,' to which such objection is taken, and his appointment was made after the work of physical valuation had been fully outlined and was well under way."

It is true that the scheme devised by Professor Adams, and adopted at his suggestion by Governor Pingree, required the employment of civil engineers for the preliminary work which necessarily had to precede the final "valuation" by Professor Adams, but the bare statement of this fact is utterly misleading. Professor Adams' own testimony in one of the Michigan tax cases happily places his responsibility for the whole plan entirely beyond controversy. He said:

> "In 1900 I was called upon by the Michigan State Tax Commission to determine whether railroads were paying a tax rate on their value equal to the rate on other property. With that problem in view, I formulated this inventory plan. * * *"[33]

Any discussion of the proposal for a National inquiry concerning cost of replacement which omits to show that its most persistent advocate, Professor Adams, has advocated and actually conducted or controlled several successive "valuations," in Michigan, as 219
Statistician to the Interstate Commerce Commission, and as special employee of the Bureau of the Census, made in accordance with other methods than those which he now proposes to apply, is seriously inadequate; as seriously inadequate as it would be to omit to state that, using what purported to be the same method, Professor Adams, by changing the details of its application and decreasing the rates of interest used in his computations, raised his "valuation" of Michigan railways from $152,958,202 to $177,689,292 or 16.17%, each of the two calculations being presented to the public, with assurances that it disclosed the actual taxable value, and there being barely eighteen months between them. The writer is by no means alone as an object of Mr. Riggs' dissatisfaction because of public criticisms of Professor Adams' plan for estimating cost of replacement. Thus, of a statement in which Professor Taylor, who conducted the Wisconsin inquiry, questioned the validity of some of Professor Adams' methods, he writes:

> "Undoubtedly this statement was made in good faith, and has gained currency by not having been corrected, but it is not the fact."

In another place, referring to a statement of comparative costs to the respective States for valuation work, made by the Railroad Commission of the State of Washington, he says:

> "It does not appear to be good taste either to criticize costs of work in other States, or compare the costs in Wisconsin and Michigan with the cost in Washington."

Referring to a paper by Charles Hansel, M. Am. Soc. C. E., who took part in the Michigan valuation, Mr. Riggs says:

> "The one point to which special attention is drawn is Mr. Hansel's astonishing misconception of Professor Adams' plan of work. This misleading statement appears in the first paper and is reiterated in the second."

Again, of the report of the expert of the Washington Railroad Commission, who had the temerity to declare that it found "little value" either in Professor Adams' methods or his estimates of the cost of the work, Mr. Riggs says:

> "Such sentences, and others which, by inference if not by name, reflect on work executed by men of high professional standing, are hardly in good taste, even if true, in a report to a railroad commission of another State."

Yet Mr. Riggs does not fail to criticize the method of "valuation," applied by Professor Adams in Michigan, in terms quite as definite as any used by others.

Thus, he condemns the method used to estimate the value of the non-physical elements appertaining to the Michigan railways, on the grounds (first) that it made this value a mere derivative of the rates existing, and (second) that it made no allowance for negative values 220
when cost of replacement exceeded real value, saying:

> "It will be seen that, in the case of a property in which the surplus earnings depend on excessive rates for service, it will fail as a method of determining a value for use as a basis of rate-making; and it fails, in the form in which it was used in 1900 and 1902, to bring out those negative or subtractive elements which may be determined from the income accounts, in the case of properties which do not earn a fair return on the investment."

Of the published statistics of American railways, compiled in the office of which Professor Adams is the responsible head, derived from annual reports made in accordance with forms prescribed by the Interstate Commerce Commission under his guidance, and containing items selected from and depending on the uniform railway accounting system devised by Professor Adams and imposed on the carriers by the Commission, Mr. Riggs writes:

> "The published statistics are in such form that only the careful student of affairs can understand or analyze them, and but few of the public officials who receive them are able to read the reports of the properties and comprehend them."

Railway officers fall quite generally under Mr. Riggs' condemnation, for, of them he says:

> "As a body * * * it is doubtful if any equal number of men, of equal intelligence, have as limited a knowledge of the fundamental truths of government, or knowledge so colored by bias. It is also doubtful whether any equal number of men have in their ranks so few who bear an active part in the duties and activities of citizenship, or who exercise large influence on their neighbors."

Such assertions as the foregoing need no comment; their intemperance is their most effective refutation; yet a few recent examples may be cited: Paul Morton resigned as Vice-President of the Atchison, Topeka and Santa Fe to become Secretary of the Navy in Mr. Roosevelt's cabinet; Jacob M. Dickinson, General Solicitor of the Illinois Central, became Mr. Taft's Secretary of War; his successor with the Illinois Central, William S. Kenyon, later became Special Assistant of the Attorney-General; Lloyd W. Bowers, General Solicitor of the Chicago and Northwestern, was Solicitor-General of the United States from early in Mr. Taft's administration until his death a few months ago. Thus, within but four or five years, the Federal Government took four of its highest officers from the railway officers located in only one of the country's great cities—Chicago.

Of a recent address by one of the ablest and most public-spirited of railway officers, he says:

> "This address well expresses the spirit of the railway managers and employees toward all forms of investigation, and the complete lack of understanding, on the part of these managers, of the legal and moral relations which they bear to the communities which they serve."

Belonging to this so hateful class, and having also ventured to question whether Professor Adams has said the last and most perfect word on the subject of railway valuation, the writer is neither surprised nor disheartened to find that he, also, has caused Mr. Riggs undisguised dissatisfaction. It is a misfortune apparently inseparable from his profession and his conception of his obligations to his employers and to the public.

As has been already noted herein, the question is not whether railway property shall be officially "valued," but rather (first) as to how the "value" which is to be ascertained is properly to be defined, and (second) how the determination of "value," as properly defined, can be made most accurate.

The essential difference between the view advocated before the American Economic Association by Professor Adams and that of the writer was, and is, that the former now desires to exclude all elements of value which are not physical and tangible, while the writer holds that, if it is worth while to ascertain, on a general scale, at the cost of a necessarily large expenditure of taxpayers' money, and as to a particular date, so unstable a fact as railway value, the kind of value the ascertainment of which could be of sufficient utility to warrant the effort can be nothing less significant than the "fair value" which the Courts have said is a proper element for consideration in fixing reasonable rates of charge. The fundamental difference between these two conceptions of value is admirably indicated by the following quotations, both of which rest on the authority of the Interstate Commerce Commission.

"The present value of a railroad property is necessarily very largely a matter of opinion only; it depends upon a vast number of contingencies and uncertainties, a road apparently of great value to-day may soon become worthless by the opening of a competing line having superior advantages or by the competitive struggles of other lines which operate to reduce the income of all; the value of a railroad largely results from the personal characteristics of its officials; the policy pursued by directors for the conservative and economical or progressive and daring, is a great factor in the determination of the current value of the property; a railroad property is not necessarily worth what it would cost to replace it and, on the other hand, it may be worth very much more than that."[34]

"The bill in question makes use of the phrase 'fair value.' Unless there is some legislative necessity, which we do not perceive, we question the advisability of using this phrase.

"It would seem to us preferable to substitute a phrase which indicates the fact that Congress desires an inventory valuation of railway property. By inventory valuation is meant that the property of the several railways shall be listed in detail, and that each kind or class of property so listed shall have assigned to it a valuation to be determined from the point of view of the contracting engineer, and not from the point of view of a court or board of arbitration which, from the nature of the case, cannot judge of what is 'fair value' except in the light of some specific use to be made of the valuation."[35]

As has already been noted herein, and amply verified by quotations, Mr. Riggs is fully aware that replacement cost and real value can rarely, if ever, coincide, and therefore plainly agrees, as to that elementary and essential point, with the writer and disagrees with Professor Adams, who would ignore or destroy every non-physical element of value in the property of all public service corporations. Mr. Riggs' recognition of the inadequacy of mere replacement cost is shown also by the excellent and convincing example which he cites[36] of competitive railway routes between two Michigan cities which were built and are maintained and operated under such conditions that the far more costly of the two, which inferentially has correspondingly higher replacement cost, has much lower earning capacity, both as to gross and net, and is therefore actually worth much less than its less costly competitor. Mr. Riggs explicitly favors full recognition of the non-physical elements in every valuation; and, therefore, may be ranked as an opponent of any such scheme of valuation as that advocated by Professor Adams before the American Economic Association, or in the letter of the Chairman of the Interstate Commerce Commission, hereinbefore quoted.

Mr. Riggs, however, believes that the determination of the cost of replacement is an essential first step toward the ascertainment of real value. He says:

> "The worth of the physical property is primarily that on which the value of the whole property rests."

The thought which the writer would place in opposition to the foregoing is that: Physical property has no value which is not an expression of its adaptation to economic needs. This is only another way of expressing the inevitable economic law, from which there is no escape, either in theory or in practice, that has been stated and sanctioned by the Supreme Court of the United States, as follows:

> "But the value of property results from the use to which it is put, and varies with the profitableness of that use, present and prospective, actual and anticipated. There is no pecuniary value outside of that which results from such use."[37]

Mr. Riggs' own definition of value is not inconsistent with the foregoing. He says:

> "The value of a property is its estimated worth at a given time, measured in money, taking into account all the elements which add to its usefulness or desirability as a business or profit-earning proposition."

The view of Mr. Riggs is that:

> "While ... the worth of the physical property, being the cost of reproduction less depreciation, is not necessarily the value of the property, ... the physical worth must bear some very definite relation to value...."

And he is, further:

> "Strongly of the conviction that this relation is such that 'value' cannot be ascertained without a determination of physical worth."

It is exceedingly difficult to comprehend just what Mr. Riggs means when he describes the relation between real value (which he recognizes so clearly as value in use) and cost of replacement as "very definite." Certainly, he does not mean that it is a constant relation, or one which can be ascertained until there has been independent determination of both of the aggregates whose relation it expresses. In fact, the emphasis which Mr. Riggs places on replacement cost has led him into the grotesque fallacy of arguing that a correct estimate of real value is only to be attained by ascertaining: (first) cost of replacement, (second) real value, and (third) correcting the aggregate first obtained by applying whatever "very definite" relation (ratio) is necessary to make it agree with the second aggregate, which was from the beginning the only aggregate really wanted. The accuracy of this characterization of his proposed procedure is made perfectly clear by the following quotation:

> "... the true method of valuing a corporate property is first to determine the cost of reproduction of the property and its depreciation, and modify this figure by any applicable positive or negative non-physical elements of value."

It is submitted that the clear meaning of the foregoing is that both replacement cost and real value as derived from use must be separately and independently ascertained, and that, these aggregates having been compared, the former is to be corrected by whatever allowance for non-physical value may be required to make it agree precisely with the latter. The obvious suggestion flowing from this discovery of his theory is that only value in use is wanted, as that is the only real value, and as it must be separately ascertained in any event, no other and *pseudo* value need be taken. The essential character of the method is as described, even when it is applied through determination of the annual value of the use and the assignment of one portion of such annual value to return on the capital value of the physical property and another portion to return on the capital value of non-physical property. The real nature of the method is not even effectually concealed by the capitalization of the income assigned to physical property at one rate and the income assigned to non-physical property at a different and higher rate. In fact, if it is necessary to conclude that a portion of the net annual income of railway property is normally paid to, or in respect of, a portion of capital entitled to a lower rate of return, and the remainder to or in respect of a remainder of capital entitled to a higher rate, the appraisal of the physical property is an excessively costly, cumbersome, and inaccurate expedient for determining the amount or value of either portion of the capital. Yet that is exactly what was done in Michigan by Professor Adams, the "valuation" he then made being completed before he altered his view by deciding that the non-physical elements of value are entitled to no consideration whatever, and that only cost of replacement is worthy of inclusion in an official "valuation."

But is there any real distinction between the "physical properties" and the "immaterial elements," such as the foregoing extract seems to assume? Is not the superficial appearance of such a distinction plausible but deceptive? A locomotive is an entity; so is a railway. The separate parts of a locomotive are most of them independently valuable; so are the separate parts of a railway; but a large share of the value of the locomotive is the result of the nice adjustment of these separate parts to each other and to the work to be done.

Take a hundred different-sized locomotives, each adapted to different work under different conditions, and separate each piece of metal; it would be possible to value all these parts, but the aggregate would be far less than the value of the locomotives from which they were taken. Again, it would be possible to construct from these parts a hundred locomotives of such poor design, their respective parts so out of adjustment and balance, that they would be worth even less than the parts out of which they were assembled. The highest paid intelligence has not yet contrived the perfectly balanced locomotive, but a large part of the so-called "physical value" of every locomotive represents this sort of highly paid intelligence put forth at every stage from the opening of the mine where the ore was obtained to the delivery of the completed locomotive. Take ten railways of a thousand miles each, every one of them efficiently constructed, and equipped with proper terminals, stations, signals, rolling stock, and trained employees, and each properly adapted to the requirements of its territory and traffic; separate them into piles of ties and rails, groups of locomotives and cars, acres of land, unorganized bodies of men of varied capacity and training; what sort of intelligence will it require to build up out of these masses ten railways as efficient and useful as those that originally existed? Why, then, should the "physical value" of the locomotive include the assembling of its parts in proper balance and the "physical value" of the railway exclude the cost of the much more complicated adjustment of its elements of machinery and labor and location to each other?

At an early point in his discussion, Mr. Riggs makes an announcement, highly becoming on the part of one who proposes to deal with the problem solely from the point of view of a civil engineer, that he does not intend to argue the public utility of any sort of valuation, but only the method by which it may best be made, should one be determined upon. He says:

> "This paper is confined to a discussion of the methods which should be used in arriving at a correct figure of cost of reproduction and depreciation—it does not take up questions involving the propriety of those figures when reached. The propriety or legality of using such figures as a basis for an assessed valuation, as a basis for rate-making (rate-making being an art in itself involving complications as great as those encountered in valuation), or any arguments as to the justice or injustice of legislation restricting issues of stocks or bonds, will be conceded no place in this paper. It is assumed that all these questions would have been taken up and a satisfactory answer reached before a valuation could have been ordered."

Two pages after the foregoing paragraph, under the sub-heading "The Relation of Public Service, or Quasi-Public Corporations, to the People," Mr. Riggs proceeds to violate the wise, though self-imposed restriction, and devotes no less than eleven pages to a defense of the project on grounds of alleged public policy. In these pages he concludes that such a valuation as he proposes—not a mere determination of replacement costs, but a real valuation, with proper allowance for all elements of value in use—would be of service in connection with (*a*) taxation, (*b*) public control of rates, and (*c*) public control of issues of capital securities.

In supporting valuation as an expedient in taxation of railway property, Mr. Riggs seems to rely on a table made up from Professor Adams' Bulletin No. 21, as expert employed by the Federal Bureau of the Census, which table shows that the assessment of the railways of Wyoming for taxation purposes in 1904 was but 7.5% of their commercial valuation, as estimated by Professor Adams, and that this ratio varied greatly throughout the different States, running as high as 114.4 in Connecticut. Of course, nearly every one knows, even if

Mr. Riggs does not, that the relation between the real value and the assessed value of all other kinds of property varies greatly from State to State, and even in different portions of the same State. On account of this variation, no table such as that offered by Mr. Riggs in support of his argument can have any value unless supplemented and explained by data covering the assessment of other kinds of property. It is worth noting, *en passant*, that the so-called "Commercial Valuation," on which Mr. Riggs rests this part of his argument, assigns a value equivalent to $32,054 per mile to the railways of Michigan and one of $45,211 per mile to the railways of the prairie State of Nebraska. Possibly this variation in the estimate of value is partly expressed in the conclusion that Michigan railways are assessed at 70.9% of their value and Nebraska railways at but 18.5 per cent. Obviously, there is no more need of uniformity among the States in the taxation of railway property than in their methods of deriving revenue from other kinds of property.

Also, Mr. Riggs admits that, when the Michigan valuation for taxation was made, it was not diminished, as it should have been, by the use of negative, non-physical value. This is fully equivalent to an admission that the method was unjust to every railway not capable of earning the full return on its replacement cost. He says:

> "The use of a negative or subtractive non-physical value was considered, and advised by Professor Adams....
>
> "Professor Adams and his associates, therefore, applied only positive values, where any such were found, although advocating the use of negative values."

And, of the method then used, he says:

> "... it fails, in the form in which it was used in 1900 and 1902, to bring out those negative or subtractive elements which may be determined from the income accounts, in the case of properties which do not earn a fair return on the investment."

And again:

> "... where the earnings have been fairly uniform and stationary for a period of years, and the property does not earn a sufficient sum to care for depreciation and annuity, it is clear that the value as an earning investment is less than the determined physical value, and that the physical valuation should be reduced by some amount to arrive at the 'fair value.'"

In his argument favoring the use of a valuation in rate-making, Mr. Riggs affords no support to Professor Adams' contention that, for that purpose, only replacement cost should be considered, and that, after fixing the rates on the basis of the least favorably located and least efficient line, so as to afford it a bare return on its replacement cost, the surplus earnings at the same rates of its more favorably located or better operated competitors should be confiscated under the guise of a special tax. This extraordinary proposal, the character of which is so illuminating as to the attitude toward railway property and investments of the most prominent and persistent advocate of so-called "physical valuation," is best stated in Professor Adams' own words, which are as follows:

> "I cannot evade the conclusion that equity, as between various classes of roads, can never be attained until all the excess of revenue over the Constitutional limit be made a contribution to the public treasury, and that this contribution be made as a substitute for all taxes of all kinds and all sorts."[38]

On the contrary, Mr. Riggs distinctly upholds the right to earnings in excess of the bare return, at the minimum rate of interest, upon the cost of replacement, saying, *inter alia*:

> "It is contended that the determination of rates that will be just and fair to all competing companies involves other consideration than the valuation of either physical or intangible properties, and that when all these rate-making problems are properly solved, there will remain large intangible values on the well-designed plants."

Professor Adams has himself admitted that there is no possibility of utilizing any valuation for the purpose of fixing specific rates, as such a task is far beyond the capacity of any conceivable system of cost accounting. Supplementing this admission, Mr. Riggs' opposition to the plan proposed by the former and its gross injustice, so apparent to every one but its author, destroys the last element of plausibility in the suggestion that any sort of valuation could be of utility in that connection. The writer is not overlooking the fact that the Courts, when under the necessity of repelling efforts to confiscate railway properties under the guise of rate regulation, and in view of the form in which this necessity has commonly presented itself, have accepted "fair value" as an element of importance in their inquiries; but if the railways are entitled to charge rates based on the value of the services they perform, it is clear that the question whether a rate or a schedule of rates is reasonably adjusted to the value of the service or services is very different from the question whether a fair return upon fair value has been allowed. Assuming, however, the need of an appraisement in every litigated case involving railway schedules, it is evident that each case would have to have its own appraisement, for value is ever changing and unstable. Mr. Riggs himself says:

> "It is true that the 'value' of a property is an unstable figure, subject to fluctuations due to natural or artificial causes, and that a material change in value may occur suddenly...."

Professor Adams proposed to keep his replacement cost up to date by annual accretions equal to annual expenditures for extensions and betterments; but this plan is illogical and inconsistent, for it proposes to ignore that very essential difference between original cost (less a proportionate allowance for wear and tear) and present worth, which is the very basis of the argument in favor of any valuation at all. Equally obvious objections, growing out of the instability of the ascertained value of any particular date, apply to any plan which does not provide for a re-appraisement every time the aggregate is to be used.

The objections to the use of any valuation for rate-making which have been cited are valid, and should be convincing, but they are insignificant by the side of the fundamental objection that, as Mr. Riggs says, "as a business proposition, the value of any property depends on its earnings," while those who would thus utilize a valuation are attempting to reverse the fact and make earnings depend on the value. Such a reversal is impossible. Ascertain real value and you have a consequence of earnings, past, present, and prospective, nothing else; use this as a basis for a rate schedule and you get, as a mathematical result, the present rates. The only way to derive any other result from this method would be to use as the basis some figure other than the real value, a method which would only be resorted to through moral turpitude or intellectual incapacity. One might almost assume that Mr. Riggs knows this, for he says:

> "Value is given to a property, either by reason of the fact that it is an instrument for earning profit, or that it does earn profit or gives promise of profit."

The substance of Mr. Riggs' argument on capitalization control is that American railways are not often over-capitalized, but such evils do obtain in other industries, and therefore railway issues of capital securities ought to be restricted.[39] Unfortunately, he gives no clue to the methods he would have applied, nor as to how far he would go in interference with the normal action and interaction of commercial forces in determining what securities can and ought to be issued. Railways are not over-capitalized. Table 9, a comparison of official valuations and capitalization, originally compiled by Mr. Slason Thompson, is instructive.

TABLE 9.

State.	Year.	Valuation by commission or tax board.	State proportion of capitalization.
Minnesota	1907	$411,735,194	$334,979,691
South Dakota	1909	106,494,503	108,911,000
Wisconsin	1909	284,066,000	249,299,060
Texas	1909	413,000,000	412,465,743
Washington	1908	186,007,490	153,493,940
Total		$1,401,303,187	$1,259,049,434
		Excess of total valuation over total capitalization	$142,253,753

In view of frequent suggestions, in the public press and elsewhere, which indicate that there is a widespread opinion that the securities of railways have generally been watered, Table 10 is given. It is an analysis of the consolidated balance sheet as given in the reports of the Interstate Commerce Commission for 1908 and 1890.

Table 11 shows the length, in miles, of main and other tracks in 1908 and 1890.

The Commission, in its annual report, shows the securities issued per mile of road (first main track), but does not show the results per mile of main track (*i. e.*, 1st main track, 2d, 3d, 4th, and other main tracks), nor does it show the results per mile of all tracks (*i. e.*, main tracks, yard tracks, passing tracks, and industrial tracks). From the consolidated balance sheet, it will be noted that the securities per mile of road have increased 29%, while per mile of main track they have increased only 24%, and per mile of all tracks they have increased but 14 per cent. However, deducting the investments in stocks and bonds of other corporations, and showing the results only for the securities issued on account of the cost of road and 12% equipment, we have an average per mile of road of $62,388, an increase of 12%; and an average per mile of all main tracks of $56,166, an increase of 8%; and an average per mile of all tracks of $42,864, or a decrease of 0.7 per cent. It will be noted that a considerable part of these increases is due to increased cost of equipment, and the advantageous results obtained from such investment have been clearly shown. Of the investment in the track itself (cost of road), it will be noted that the cost per mile of main track has increased only 5%, while the cost per mile of all tracks shows a slight decrease in 1908 as compared with 1890.

These comparisons are more significant and convincing in the light of the large expenditures since 1890 for the reduction of grades, revision of line, interlocking towers, automatic block signals, increased weight of rail, increased capacity of bridges, improved stations and terminals, elevation of tracks, and the many other items going to make up the additions and betterments, and increasing the book cost of the property. The figures plainly prove that there has been no general practice on the part of the railroads of the country, from 1890 to date, of issuing capital securities without securing full value for the vast amount referred to. Why, then, should any restriction be placed on the form or manner of their future appeal for the very large volume of capital necessary to keep abreast of American industrial development? Why should they be limited as to what form of security they may offer in return for the cash capital which they must obtain if they are to serve the public adequately and properly?

TABLE 10.—Consolidated Balance Sheet for Railroads of the United States. Exclusive of Terminal and Switching Roads.

	Assets.							
	Total.		Per mile of road.		Per Mile of main tracks.		Per mile of all tracks.	
	1908.	1890.	1908.	1890.	1908.	1890.	1908.	1890.
Railroad:								
Cost of road	$12,035,195,403	$7,333,096,430	$56,268	$51,400	$50,656	$48,109	$38,659	$40,033
Cost of equipment	1,178,571,137	422,290,951	5,510	2,960	4,961	2,770	3,786	2,305
Material and supplies	226,250,462	63,785,950	1,058	447	952	419	727	348
Total	$13,440,017,002	$7,819,173,331	$62,836	$54,807	$56,569	$51,298	$43,172	$42,686
Investments:								
Stocks owned	$2,115,313,379	$489,049,859	$9,890	$3,428	$8,903	$3,208	$6,795	$2,670
Bonds owned	1,271,311,512	241,115,665	5,944	1,690	5,351	1,582	4,083	1,316
Total	$3,386,624,891	$730,165,524	$15,834	$5,118	$14,254	$4,790	$10,878	$3,986
Current Assets:								
Cash and current assets	$1,213,575,272	$307,871,188	$5,674	$2,158	$5,108	$2,020	$3,898	$1,681
Sinking, Insurance, and other funds	154,975,409	125,095,987	724	877	652	820	498	683
Total	$1,368,550,681	$432,970,175	$6,398	$3,035	$5,760	2,840	$4,396	$2,364
Miscellaneous	$1,277,458,795	$710,300,536	$5,973	$4,979	$5,377	$4,660	$4,103	$3,878
Grand total—All assets	$19,472,651,369	$9,692,609,566	$91,041	$67,939	$81,960	$63,588	$62,549	$52,914
	Liabilities.							
Securities Issued:								
Capital stock	$7,289,597,964	$4,179,156,990	$34,081	$29,293	$30,682	$27,417	$23,415	$22,815
Bonds	9,441,200,261	4,462,577,079	44,141	31,280	39,738	29,277	30,327	24,362
Total	$16,730,798,225	$8,641,734,069	$78,222	$60,573	$70,420	$56,694	$53,742	$47,177
Current Liabilities:								
Accrued interest		$25,341,994		$177		$166		$188
Other current liabilities	$1,151,233,255	440,513,629	$5,382	3,088	$4,845	2,890	$3,698	2,405
Total	$1,151,233,255	$465,855,623	$5,382	$3,265	$4,845	$3,056	$3,698	$2,543
Miscellaneous	$845,115,552	$394,918,201	$3,952	$2,768	$3,557	2,591	$2,715	$2,156
Grand total—All liabilities	$18,727,147,032	$9,502,507,893	$87,556	$66,606	$78,822	$62,341	$60,155	$51,876
Profit and loss balance	745,504,337	190,101,673	3,485	1,333	3,138	1,257	2,394	1,038
Grand total—All assets	$19,472,651,369	$9,692,609,566	$91,041	$67,939	$81,960	$63,588	$62,549	$52,914

It ought also to be borne in mind, in this connection, that, while there could be no lawful mode for the revision of existing capitalization, should it in any instance be found to be too small or too great when measured by the results of such a valuation, the future issue of securities must be controlled by the necessities of the carriers and the state of the market, and is also practically restricted by the Interstate Commerce Commission's accounting system, which declares what expenditures may and what may not be carried into the capital account. The law cannot compel any company to repudiate any existing security, and if it could it is not to be supposed that Congress would compel such an impairment of contract rights; public policy will not permit in practice restrictions that would prevent the issue of securities to meet the actual needs of the public and the carriers; the accounting system prevents issues of any other sort. Further restrictions would be cumulative and superfluous.

TABLE 11.

Track.	1908.	1890.	Increase.	Percentage of increase.
Single track	213,888.36	142,665.89	71,222.47	49.9
Second track	20,209.05	8,437.65	11,771.40	139.5
Third track	2,081.16	760.88	1,320.28	173.5
Fourth track	1,408.99	561.81	847.18	150.8
Total, all main tracks	237,587.56	152,426.23	85,161.33	55.9
Yard track and sidings	73,728.57	30,750.17	42,978.40	139.8
Total mileage operated (all tracks)	311,316.13	183,176.40	128,139.73	69.9

"The Interstate Commerce Commission in 1908 report that their Balance Sheet covers 'miles of road' aggregating 213,888.36 miles, whereas their statement of mileage represents all roads reporting to the Commission whether or not they furnished a Balance Sheet.

"To analyze the Consolidated Balance Sheet, we have revised the statement of mileage to cover same roads as are included in the General Balance Sheet. The 'miles of road,' *i. e.*, miles of first main track, are actual. The Commission's report not showing separately for each line the miles of other main tracks or yard tracks and sidings, the figures shown in the statement of mileage are *approximate*. It includes mileage of all second, third and fourth tracks. Undoubtedly, practically all of the second tracks, third tracks and fourth tracks are owned, or operated by, roads furnishing the Commission with a Balance Sheet. Mileage of Yard Tracks and Sidings is based on the proportion which the single-track mileage of roads represented in the Balance Sheet bears to the total single-track mileage of roads reporting to the Commission."

Mr. Riggs considers *seriatim* nine objections to the ordinary methods of estimating cost of replacement which were mentioned specifically by the writer, as among the most important commonly omitted items, in an address before the New York Traffic Club, delivered during January, 1909. He concedes that the writer is correct in urging that allowances for "working capital with which to carry on the business" and for "impact and adaptation" ought to be included, and were omitted in Michigan and have been usually omitted. These are two of the nine objections specifically raised. As to five others, Mr. Riggs seems to be in considerable doubt. Concerning the objection that an allowance of 3% for interest during construction is too low, he contends that it was justified in Michigan by the "assumption," that the whole work of replacement would be accomplished in one year, and also "that on long roads partial operation would commence as various sections of the line were completed." He admits that these assumptions "clearly would not be proper" under different conditions, but appears to hold that they were warranted as to the Michigan work.

Another of the writer's objections was the absence of an allowance for "wear and tear of materials during the period of construction." As to this, Mr. Riggs says:

"This deterioration is a necessary incident to any construction work. It has not been customary or usual to take account of it. To add to the amount capitalized on account of this item would be manifestly improper. The only way in which this could be cared for would be in an adjustment of the depreciation reserve when raised to cover that which takes place during the construction period."

Of course, the depreciation account, when there is one, is a charge to operation. Therefore, Mr. Riggs' anxiety to disagree with the writer has led him into a frame of mind in which he is prepared to find that it is "manifestly improper" to charge to capital the real cost of construction, but is quite proper to charge to operation a part of the cost of construction, even though this results in carrying into the operating account items of expense incurred long before operation began or could have begun.

Mr. Riggs thinks that the writer was incorrect in objecting that "a uniform price for earthwork was used, thus ignoring the varying character of soil and length of haul," but he admits that there was "practically no classification in the Southern Peninsula of Michigan, or, in fact, on 90% of the mileage of the State," and his defense goes no further than to assert that "the price * * * was not much out of the way when considered as a fair average for the territory."

His criticism of the objection to the use of a uniform price list for materials, and ignoring the source of supply and the cost of delivery at the point of use, is equally forced, for it admits that "no effort was made to use different unit prices as between counties," and only contends that "in a number of cases" differences in prices were made.

The absence of an allowance for interference by labor troubles, weather conditions (which he admits are "a frequent source of annoyance, delay, and sometimes of expense"), Mr. Riggs defends on the ground that it is "an expense difficult to separate and set up," and therefore ought to be covered by an allowance for contingencies. On the same ground, he could easily carry every item of cost of replacement into the contingent account.

The two remaining objections specifically raised by the writer are squarely attacked by Mr. Riggs. As to one of them, the propriety of an allowance for carrying charges up to the time of attaining a revenue basis, has been admitted by the Railroad Commission of Wisconsin, but it is a broader question than ought here to be discussed. The writer will only suggest, at present, that in some form or other, these 233
charges must be on the whole and in the long run met out of net operating income, and that the cheapest way, for the user of the services supplied, is to carry them into the capital account—otherwise there must be an early amortization of this item, which cannot do otherwise than to throw a heavy burden on the early schedules of charges. The language of the Wisconsin Railroad Commission on this subject merits quotation, and is as follows:[40]

> "But new plants are seldom paying at the start. Several years are usually required before they obtain a sufficient amount of business or earnings to cover operating expenses, including depreciation and a reasonable rate of interest upon the investment. The amount by which the earnings fail to meet these requirements may thus be regarded as deficits from the operation. These deficits constitute the cost of building up the business of the plant. They are as much a part of the cost of building up the business as loss of interest during the construction of the plant is a part of the cost of its construction. They are taken into account by those who enter upon such undertakings, and if they cannot be recovered in some way, the plant fails by that much to yield reasonable returns upon the amount that has been expended upon it and its business. Such deficits may be covered either by being regarded as a part of the investment and included in the capital upon which interest is allowed, or they may be carried until they can be written off when the earnings have so grown as to leave a surplus above a reasonable return on the investment that is large enough to permit it. When capitalized, they become a permanent charge on the consumers. When charged off from the surplus, they are gradually extinguished. (These facts alone, however, do not always furnish the best or most equitable basis for the disposal of such deficits.) Whether they should go into the capital account, or whether they should be written off, as indicated, are questions that largely depend on the circumstances in each particular case."

The other objection that is squarely opposed by Mr. Riggs is the refusal to allow for unavoidable discounts on the securities sold. Here he quotes with complete approval an unnamed writer, who contends that the impropriety of such an allowance is proven because, as between an issue of $10,000,000 in bonds (par value) at 4% and at 4½%, the 4% bonds bringing 90 and the 4½% selling at par, there is an annual saving, in issuing the 4% of $50,000 in interest, and that, if the issue is to be for fifty years, this saving is $2,500,000, or $1,500,000 in excess of the discount. Of course, these figures are correct, but both Mr. Riggs and his unnamed authority seem strangely to have overlooked the fact that if a railway construction requires $10,000,000, it cannot be obtained by issuing $10,000,000 in par value at 90. The comparison, of course, ought to be based on the issue of enough bonds at each rate to obtain equal sums of money. As 234
$10,000,000 in par value of bonds sold at 90 would produce $9,000,000, the following comparison is based on the issue of enough bonds at each rate payable in fifty years to secure that sum.

	Fifty-Year Bonds,	
	4½% sold at par.	**4% sold at 90.**
Amount of capital required	$9,000,000	$9,000,000
Par value of bonds necessary	9,000,000	10,000,000
Annual interest charge	405,000	400,000
If 4% bonds are used:		
Annual saving in interest		$5,000
Fifty years saving in interest		250,000
Loss, original discount		1,000,000
Net loss		$750,000

Of course, the foregoing figures are not absolutely accurate, for the real net loss in the issue of the 4% rather than the 4½% bonds at these prices would be the difference between the $5,000 annual saving in interest and the amounts which would have to be set aside annually for fifty years to produce $1,000,000, the amount of the discount, at the end of that period. But the table is sufficiently accurate to expose the curious error into which Mr. Riggs has fallen. Perhaps it will convince him that it would be better, hereafter, not to stray so far outside the field of civil engineering.

Mr. Riggs has little sympathy with those railway men who venture to express the opinion that regulation ought not to extend so far as to render it impossible to conduct the railway business in a business-like way. His animadversions on railway men in general have already been illustrated herein. He finds nothing worse with which to characterize a previous utterance of the writer's than to say of it:

> "The manifest impatience with all forms of governmental interference with corporations, which so often characterizes the utterances of prominent railway officials, appears in this paper to a marked degree."

At the risk of incurring further displeasure, the writer will not omit now to observe that, in his judgment, the whole question whether railways shall be generally and officially valued, and how and by whom the task shall be performed, is primarily conditioned by the country's need of managing its legislative control of railway methods so as not to restrict unduly the flow of capital into that industry. The steady pressure for legislation during the last five years has so extended legislative regulation that, for the first time, the sturdy, frugal, conservative, "small investor" stands in the forefront of the problem. His views of the stability and future prosperity of the 235
American railway industry now dominate the situation. What they are may be read in the facts attending recent efforts to finance necessary improvements of old and prosperous railways. It developed before the Interstate Commerce Commission during the recent hearings in connection with the proposed partial adjustment of rates to the diminished purchasing power of the money in which they are paid, that one of the greatest of Eastern railway systems, paying 8% annual dividends on its stock, which is very widely distributed, had offered new shares to its stockholders at a premium of 25%, and had found them unsalable at that figure, so that it was obliged to recall the offer and put them out at par. Other testimony disclosed the failure of one great company to obtain an offer of more than 85 for its 4% bonds, while another had been forced to go to France to raise $10,000,000, and many others have been forced to the expedient of issuing short-term notes at relatively high rates of interest. It also appeared that extensive proposals for new branch lines had been abandoned or postponed, in view of the impossibility of obtaining funds on reasonable terms.

Other testimony shows that locomotive shops and car builders are putting out not more than half of their capacity; that the supply trade is receiving no new orders. Never, since the beginnings of the American railway industry, has the American and foreign investor been so reluctant to supply necessary capital, or so doubtful of the future of railway enterprises. This fact is not due to absence of confidence in the industrial future of the American people, but is directly attributable to the unanswered inquiry as to how far the policy of legislative control is to extend. Either this question must be answered in a manner satisfactory to the investor, or the credit of the Government must be made available for the extension and improvement of railway facilities, either through Governmental guaranties of adequate returns to capital, or through Government ownership; for adequate and properly constructed and equipped railways the public must and will have. Thus far, the American public is ready neither for Federal guaranties nor for Federal ownership; it is to be hoped that it will never be ready for either. In this situation, if a Federal valuation is to be undertaken, it is primarily important that it should be under such auspices and by such methods that the investor will not be alarmed as to its consequences. This is not a suitable occasion to attempt to lay down all the considerations applicable to such a valuation, but it ought to be perfectly clear that it must relate to value in use, not to some concept of value limited to replacement cost which excludes some of the most important elements of value (which are also those most worthy of a return, because they represent the highest and most difficult social and industrial services), in order to obtain a means of excluding these same elements from possibilities of adequate reward.

One of the most important items to be considered is the "cost of progress," which is sometimes referred to as "abandoned property," or as "obsolescence." For illustration, in the revision of the grade and line of a road, whereby the capacity of existing track is doubled, the present instructions of the Interstate Commerce Commission require the charge to operating expenses of the cost of that portion of the old line no longer continued in use. If, however, the doubling of the capacity of the line be secured by the construction of a second main track, the entire cost of the new work can be charged to capital account and paid for from the proceeds of the sale of capital securities. The latter method becomes the easier to finance, but what of the comparative results? Say, for example, the original cost of material of existing property, including equipment, stations, yards, etc., was $10,000,000, that the first main track cost $1,000,000, and that to double the capacity of the main track would require a present expenditure of $1,000,000, either for (1) a reduction of the grades and curves of the first main track, or (2) for the construction of a second main track. The increase in capacity is identical, but in the first case the cost of train service to handle the tonnage is decreased 50%, and some reduction in maintenance is secured, while in the second case no economies of operation are effected, but the expenses may be increased. Undoubtedly, Road (1) would be much more favorable than Road (2), yet the Commission says a portion of the cost of perfecting Road (1) must be charged to operating expenses, and cannot be capitalized. What general manager will dare recommend such extensive improvements when the charging of a portion of the cost to operating expenses will show the dividend as unearned, and thus render the securities of the company no longer legal investments for savings banks, trustees of trust funds, etc.? As an alternative, he might permit the old line to remain, and by placing thereon a few cars occasionally, could consider it as still in use, and carry it in his capital account, thus avoiding the charge to operating expenses. Thus, again, is it the method and not the result that is controlled by these instructions. What should be done is to permit the cost to be charged against the surplus accumulated during the years in which the property to be abandoned was used. This would not affect adversely the operating income of the year, and would not impair the credit of the Company.

Plainly, the instructions of the Commission tend to compel a method that is contrary to the economic law.

Obviously, any requirement as to valuation which would impose on the carrier such a result as that shown would compel the continuance of the less efficient service and prevent the progress which such replacements express. The railway business is a continuing one, and an improvement ought to be made whenever it can earn income, not only on its own cost, but on that of the property abandoned, even though it cannot afford income sufficient to wipe out the whole capital charge for the latter in a single year. There is no reason for requiring each item of capital to earn its cost in addition to its interest during its individual life. Such a requirement would cry halt to progress. It is reasonable and proper that such charges to operation should be made as far as the rapid development of the art of transportation permits, and such is the practice of every well-managed railway; but, to make the practice uniform and compulsory, permitting no exceptions and allowing no scope for individual judgment, is quite another thing. When the conditions warrant such a course, the railway ought to be permitted to adjust its accounts in a manner of which the following is typical:

	Replacing.	**Not replacing.**
Capital account	$19,750	$5,000
Additional net operating income attributable to this item	1,000	250
Charge to operation for abandoned property	250	
Operating gain	$750	$250

A valuation adjusted in recognition of this developmental need would include, in addition to the item of $15,000 for the replacement cost of the new locomotive, an item representing "cost of progress" of $4,750 for the former locomotive. It is not to be overlooked that in actual practice it would be easy to obtain this allowance by cumbering the yards and round-houses with obsolete and superfluous equipment. The plan of Professor Adams places a premium on such a course, and there are many conditions under which it could and would be followed where it would be less obvious and more detrimental. For example, it might be that an additional track over a steep grade and a new alignment which would avoid it would cost the same. The new alignment would give greater operating efficiency, but it would require the charging off of the old line; the new track over the grade would be more costly to operate, but would leave the apparent capital unimpaired. It is such possibilities as this that are giving pause to the investors who would otherwise supply funds for the needed development of the American railway system. How far this development has so far required the abandonment of property capable of further use and having genuine capital value is indicated by available records. The aggregate capacity of all equipment has increased much faster than the increase in number of locomotives and cars. The reports of the Interstate Commerce Commission only show this information for the years 1902 to 1908, both inclusive. The average tractive power of locomotives in 1908 was 26,356 lb., as compared with 20,485 lb. in 1902, being an increase of 5,871 lb., or 28.7% per locomotive. The average capacity of freight cars in 1908 was 35 tons, as compared with 28 tons in 1902, an increase of 7 tons, or 25 per cent. Undoubtedly, the average capacity of locomotives and the average capacity of freight cars in 1908 was not less than 60% above the average capacity of 1890.

L. F. Loree, M. Am. Soc. C. E., President of The Delaware and Hudson Company, as Reporter (For United States) to the International Railway Congress, held in Paris in 1900, communicated with all roads in the United States then operating 500 miles of line, or more, relative to the capacity of cars actually in service. The result is shown in Table 12.

As a result of these improvements in roadway and equipment, the average number of tons of freight handled per freight train in 1908 was 351.80 tons, as compared with 296.47 tons in 1902, an increase of 55.33 tons, or 18.6 per cent. The average tons per freight train in 1908 was 351.80, as compared with 175.12 in 1890, an increase of 176.68 tons, or 100.8 per cent.

These improvements have not been solely or mainly for the benefit of the carriers, though there is no question that they have been prompted by railway self-interest. The new car of 40 tons capacity is but 20% longer than the old car of 13 tons, which means a great augmentation of the efficiency of the private sidings and tracks of the manufacturers, as well as the side tracks and terminals of the railway. Who would retrace the steps of progress of the last decade or of the last two decades? Yet the project to tie railway earnings to replacement cost, which makes no allowance for the costly steps in such progress, is in reality a project to tie them to their present state of development and to prohibit future progress. Nor can it be forgotten that it is an inviolable law of Nature that that which does not go forward must go backward—nothing can remain stationary.

The story of the crude millionaire who wanted to know the value of the "plant" of Oxford University, in order that he might duplicate it, is not inappropriate, and ought to have some significance to those who imagine that replacement cost would tell the story of railway values. Do they imagine, because they are ignorant of them, that a great railway organization carries no traditions of loyalty, of persistence in the face of overwhelming difficulty, of generous recognition of public needs and rights, of courageous adherence to the real interests of its shareholders that inspire its personnel and provide a genuine *esprit du corps*? Do they find no superiority in one organization over another, no systematic economies of method, no especial adaptation to economic needs that has value more genuine than any replaceable element, and is at least equally worthy of compensatory return?

TABLE 12.—Classification of Freight Equipment According to the Capacity.

Year.	**No. of Roads Reporting (see note).**	**Five tons and under.**	**Ten tons.**	**Fifteen tons.**	**Twenty tons.**	**Twenty-five tons.**	**Thirty tons.**	**Thirty-five tons.**	**Forty tons.**	**Forty-five tons.**	**Fifty tons and over.**	**Total number of cars.**	**Total capacity, in tons.**	**Averag capaci in ton**
1880	A-7	38,399	131,988	447,270	89,420							53,733	707,077	13
	7	38,399	131,988	447,270	89,420							53,733	707,077	13
1890	A-7	16,450	71,982	182,175	651,740	441,475	548,670		4,000		50	91,281	1,916,492	21
	B-13	16,450	72,082	240,900	933,040	624,125	638,100		4,000		50	119,513	2,528,747	21
1893	A-7	1,145	34,088	144,795	629,780	734,350	842,640		4,000			103,315	2,390,798	23
	C-13	1,145	34,238	255,795	993,840	947,500	1,112,070		4,000			145,440	3,848,588	23
1895	A-7	355	13,978	120,435	589,140	743,975	1,011,030	70,000	4,000		50	104,496	2,652,963	24
	D-15	355	20,863	245,709	1,186,320	1,103,100	1,493,700	70,000	4,000		50	171,307	4,074,217	23
1897	A-7	20	6,462	92,585	555,980	761,150	1,224,030	74,865	4,400	450	150	108,118	2,720,042	25
	E-16	20	9,407	163,189	1,029,756	1,089,300	1,822,530	183,190	4,400	450	150	174,315	4,322,432	24
1898	A-7		1,540	94,275	523,080	721,425	1,314,840	75,320	4,480	270	50,950	108,559	2,786,180	25
	F-27	63,565	9,491	418,551	2,190,360	1,654,850	4,831,170	88,515	8,840	270	104,700	385,765	9,409,918	24

Note:—A—Figures cover only these roads:

Reporting for 1880 and all other years, viz.:

Allegheny Valley
B. & M. R.
C. of G.
G. R. & I.
Penn. Lines W.
Phila. & Reading
Wis. Cent.

B—Includes roads under "A," also:

Ches. & Ohio
C. G. W.
M. K. & T.
N. D. & C.
Phg. & Western
Vandalia

C—Includes roads under "A," also:

Ches. & Ohio
C. G. W.
Mich. Cent.
M. K. & T.
N. D. & C.
Phg. & Western

D—Includes roads under "A" and "B," also:

Mich. Cent.
Southern Ry.

E—Includes roads under "A" and "C," also:

C. R. I. & P.
Seaboard Air Line
Southern Ry.

F—Includes roads under "A" and "B," also:

Ann Arbor
B. & M.
C. R. I. & P.
C. St. P. M.& O.
Grand Trunk
Lehigh Valley
Mich. Cent.
O. R. R. & Nav.
Penn. R. R.
P. B. & L. E.
Seaboard Air Line
So. Pacific
Southern Ry.

TABLE 13.—Statement of Return on Investment in Road, Equipment, etc., for Roads in the Official Classification Territory, for Eleven Years Ended June 30th, 1909, also for the Year 1890.

Year.	Cost of road.	Cost of equipment.	General expenditures.	Material and supplies.	Total.	Operating Revenues.	Operating Expenses.
1909	$4,357,455,101	$686,116,206	$50,586,812	$75,550,135	$5,169,708,254	$1,032,285,890	$700,694,007
1908	4,306,902,038	669,751,320	51,324,157	86,201,748	5,114,179,263	1,049,545,984	746,575,094
1907	4,438,582,438	587,637,733		91,923,338	5,118,143,509	1,141,324,116	794,998,803
1906	4,269,066,800	513,028,004		80,479,333	4,862,574,137	1,044,552,909	714,461,452
1905	4,110,883,904	492,498,488		65,875,071	4,669,257,463	944,805,659	658,337,498
1904	3,906,766,459	461,941,677		72,240,521	4,440,948,657	899,868,519	636,217,217
1903	3,830,580,776	426,822,318		64,458,257	4,321,861,351	871,697,611	601,864,284
1902	3,744,205,552	389,909,755		50,565,290	4,184,680,597	782,975,559	528,681,892
1901	3,682,894,343	378,545,580		47,746,178	4,109,186,101	730,590,144	491,657,899
1900	3,620,630,187	377,156,700		49,940,838	4,047,727,725	698,368,829	467,462,093
1989	3,566,223,557	351,902,957		31,162,907	3,949,289,421	610,724,301	413,390,359
Total 11 years	$43,834,194,155	$5,335,310,738	$101,910,969	$716,143,616	$49,987,556,478	$9,806,639,521	$6,754,340,598
Average 11 years	3,984,926,469	485,028,249	9,264,634	65,103,965	4,544,323,317	891,512,684	614,030,963
1890	$2,927,221,233	$283,407,139		$35,262,205	$3,245,890,577	$524,767,906	$348,388,268
Total 12 years	$46,761,412,388	$5,618,717,877	$101,910,969	$751,405,821	$53,233,447,055	$10,331,407,427	$7,102,728,866
Average 12 years	3,896,784,365	468,226,489	8,492,581	62,617,152	1,436,120,588	860,950,619	591,894,072

TABLE 13. (*Continued.*)

Year.	Net Operating Revenue.	Net revenue	Total Net Revenue.	Taxes.	Operating Income.	Operating ratio.	Percentage to cost of	Mileage of line

		from outside operations.					road, cost of equipment, material, and supplies	owned.
1909	$331,591,883	$2,425,726	$334,017,609	$37,397,973	$296,619,636	67.88	5.738%	56,563.41
1908	302,970,890	3,446,600	306,417,490	36,021,974	270,395,516	71.13	5.287%	56,328.79
1907	346,225,313		346,225,313	35,876,148	310,349,165	69.66	6.063%	56,415.25
1906	330,091,457		330,091,457	34,863,314	295,228,143	68.40	6.071%	55,990.12
1905	286,468,161		286,468,161	27,675,211	258,792,950	69.68	5.542%	54,963.20
1904	263,651,302		263,651,302	28,091,468	235,559,834	70.70	5.304%	54,643.50
1903	269,833,327		269,833,327	26,537,954	243,295,373	69.04	5.630%	53,873.11
1902	254,293,667		254,293,667	25,297,465	228,996,202	67.52	5.472%	52,980.70
1901	238,932,245		238,932,245	28,797,264	215,134,981	67.30	5.235%	52,911.46
1900	230,906,736		230,906,736	22,616,893	208,289,843	66.94	5.146%	52,495.25
1899	197,333,942		197,333,942	21,692,694	175,641,248	67.69	4.447%	52,009.93
Total 11 years	$3,052,298,923	$5,872,326	$3,058,171,249	$319,868,358	$2,738,302,891	68.88	5.478%	599,174.72
Average 11 years	277,481,721	533,847	278,015,568	29,078,941	248,936,627	68.88		54,470.45
1890	$176,379,638		$176,379,638	$14,753,550	$161,626,088	66.39	4.980%	43,094.73
Total 12 years	$3,228,678,561	$5,872,326	$3,234,550,887	$334,621,908	$2,899,928,979	68.75	5.448%	642,269.45
Average 12 years	269,056,547	489,360	269,545,907	27,885,159	241,660,748	68.75		53,522.45

If there were not abundant evidence that the railway industry is not excessively profitable, there would be more reason on the side of those who continually put forward new schemes of restriction; but, not only is such evidence ample, but there is no evidence of any sort tending to establish the contrary. Limiting the inquiry to the region east of the Mississippi and north of the Ohio and Potomac Rivers, commonly known as Official Classification Territory, the statement in Table 13, based on the book cost of railways, with their equipment, supplies, and materials on hand, is instructive. The data are from the reports of the Interstate Commerce Commission. 241

The amounts shown in Table 13 as "operating income" are, as should be remembered, those earned, and not those distributed as interest on bonds and dividends on shares, which were necessarily much smaller. Bearing this in mind, it is significant that the percentage of such operating income to cost of property has not but once in the last twelve years, the most prosperous duo-decade in the Nation's history, exceeded 6%, and then only by a very small fraction; and that the average for the whole period is less than 5½ per cent. Every one knows that the real value and the actual cost of the railway property in this region greatly exceeds its book cost, so that these percentages are undoubtedly much in excess of the real rates of net earnings to value or cost of property.

P. E. Green, Assoc. M. AM. Soc. C. E. (by letter).—It is not often that there is presented to the Society a paper which shows such thoroughness of understanding of a difficult problem, and as much real experience in its solution, as is manifested therein; and the author is certainly to be congratulated on such a logical and forcible presentation of the subject. There may be some points on which engineers who have been engaged in such work cannot agree with him; but certainly it cannot be said that he has not argued very clearly and logically on nearly all the debatable questions.

Those who have not had actual experience in making a valuation of a railway company's property cannot have any idea of the enormous amount of detail and labor necessary to make such a compilation of any real value. It simply means that every detail of every structure of whatever kind must be investigated, together with the various considerations covering "intangible values," which the author has so ably discussed.

The writer was fortunate enough to be employed on the valuation of the Chicago and Northwestern Railway property in Minnesota in 1906, and possibly some details of the manner in which the actual field work of the survey was done may be of interest.

The work consisted of making a compilation from records, or from actual surveys when necessary, of about 625 miles of railway property, including several important terminals. The property had been built between 1860 and 1901, mostly in the early part of this period. The portions which had been constructed during the latter part of the period, say from 1890 to 1906, presented no difficulties, as the records were very clear and complete, but the portions constructed in the Sixties had practically no records. Some had been built by small independent companies, which were acquired later by the Northwestern System. On these old lines the records were practically nil, and those in existence were soon found to be of absolutely no use. Even on the newer lines it was found that many changes had been made within a few years after their construction, and that it was sometimes more economical, as regards time at least, to make a new survey of the property than to use the records. 242

After examining all the old records very thoroughly, and endeavoring to get some order and information out of them, it was decided that the only way to do the work properly was to make a complete survey and valuation of all the physical property. Several field parties were organized and also an office force, about twenty men being put on the work. The parties ran levels for profile purposes, cross-sectioned cuts where necessary, noted evidences of clearing and grubbing, of the character of the cuts, and the disposal of the material, examined the ballast for depth and character, examined the rails for age, weight, and condition, and noted the kind and condition of the fences, gates, farm crossings, planking, whistle and highway-crossing posts, culverts, bridges, and in fact every detail of construction. Advantage was also taken of the survey to re-station the lines, to paint such stations on the rails, and to set permanent posts, so that afterward the stationing could be picked up at any time with little trouble.

In this way there was accomplished much work of value to the railway company, for which there had been a demand by the division officials for years, but which had not been done because of lack of men and money.

No attempt was made to assign depreciation, as regards the rails; this was determined afterward, from the age of the steel in the track. It was necessary, however, to make quite a thorough inspection of the ties, and to note their condition, as they were replaced year by year singly as they wore out. Almost every conceivable kind of timber had been used for ties at one time or another. Treated and untreated ties lay side by side; and thus there was great difficulty in classifying them with regard to the kind of timber. With bridge ties and timbers of frame and pile bridges, there was not so much difficulty, as they were open to inspection, and had been inspected twice yearly by the Division Engineer and the Superintendent of Bridges and Buildings, and accurate records of their condition and renewals had been kept. The depth and condition of the ballast also varied very widely.

In a very short time all the men on the survey became well acquainted with the character of the work they had to do, and, as the work went on, the progress of the party day by day was very much more rapid. At the beginning of the survey, a progress of 6 or 7 miles of single track was considered a very good day's work; at the end of the survey, the parties were making from 12 to 15 miles per day. 243

There was considerable difficulty in setting proper values on the hundreds of buildings, large and small, owned by the railroad. Most of these buildings had never been constructed from plans, and it was difficult to calculate what they had cost originally, and what it would have cost to build them at the time of the survey. However, time books were searched, and the contents of the buildings in board feet were calculated, and, while in many cases their age was not known from any records, it was nearly always possible to find out from somebody just when they were erected.

As intimated before, the railway company derived much actual benefit from the work, outside of the accurate knowledge obtained as to the value of the property itself. Steel charts, bridge records, etc., were established, and profiles, stationing, continuous bench-levels, etc., were all re-run or re-established; thus making the engineering work of the future more consistent and uniform, and enabling more work to be done with a smaller force. New maps of all the station grounds and terminals were obtained, and all the records were put in better shape than they had ever been before.

Examination of some of the old terminals brought to light many strange and out-of-date conditions. Old wrought-iron rails of antiquated pattern, old cast-iron frogs, etc., of a pattern which had not been in general use for fifty years, were found in the track. On some of the little-used sidings, the old wrought-iron rails were so worn that the tread of the rail was entirely gone, only the web remaining to carry the traffic, and such rails were still in use.

In such a valuation, also, many items, some of considerable magnitude, were found which were extremely difficult to classify and assign to their proper place. Such a one, for instance, as a soft, sand rock deposit beside the track, which for many years had furnished engine

sand. Many thousand cubic yards of this material had been excavated, but it had not gone into the roadbed as ballast, or to make fills, or to widen embankments. It would hardly have been proper to classify such excavation as grading, for it was an item of engine maintenance and train operation. This is only one of numerous problems which had to be solved.

After all the survey had been made, most of the work of compilation had to be done. Some of it had already been done in the office by the small office force, but the great mass had to be done by the men who did the work in the field. This task was of almost incomprehensible magnitude. There were thousands and thousands of items, and such a great mass of figures that the ordinary man would become lost in the maze. The data had to be checked and re-checked by men who were not accountants, and sometimes most ludicrous mistakes were discovered. However, it was at last accomplished, and the writer's recollection of the "Present Value" of the Chicago and Northwestern property in Minnesota is that it was somewhat more than $23,000,000 for the entire mileage (about 625 miles), or an average of about $37,000 per mile of track. Hardly any of the mileage would be called high-class or trunk-line track, but most of it might be classed as second-class or important branch-line railway. 244

E. Kuichling, M. Am. Soc. C. E. (by letter).—This paper is a very valuable addition to the literature of a comparatively new subject that is rapidly attaining great political importance, and it gives abundant evidence of deep research and thought by the author. The reasons for determining the true value of such properties, as well as the general principles of making the valuation or appraisal, have been set forth so clearly and convincingly that little can be added in this respect; hence, there is room for comment only about details.

One of the perplexing questions is the determination of the proper value of the right of way and real estate of a railroad. The land was originally acquired at a certain cost, essentially for public use, and in the course of time its value, as determined by reproduction cost, usually becomes greatly increased by the development of the adjacent land by its various owners. Without the railroad, such development and appreciation of land values would probably not have occurred, and, therefore, it has been argued by many persons that, for taxation purposes, the railroad lands should be appraised at only their original cost, while, for capitalization purposes, they should be appraised at a value measured by that of the adjacent land at the present time. This claim is based on the theory that the railroad is like any other piece of public work, such as a canal, highway, or pavement, which is built for the use of the public, and on which no tax is levied by State or municipality. On the other hand, it has been held by some of our Courts that a proper valuation must take into account the appreciation or depreciation of land values; but, as the opinion of a Court is not unalterable, the soundness of this doctrine cannot be regarded as permanently established.

The author states[41] that there can be no serious objection to this doctrine in relation to rights of way in the country and small towns, although he admits that it is subject to exceptions in the case of cities and terminal and dock properties. It will be of great interest to learn his reasons for making such exceptions in the case of the most costly lands, and whether the valuation of such lands should be more or less than that of similar adjacent lands used for other purposes. From the context the inference may be drawn that the valuation should be somewhat higher than that of adjacent similar land in the case of a steam or interurban railroad, because its holdings form a continuous strip; but to the writer this reasoning does not appear satisfactory. The statement of the Court, that "the value of land depends largely upon the use to which it is put and the character of the improvements upon it," does not necessarily involve a higher valuation of the property than its cost, and it is quite conceivable that the actual value of the property after being taken by a railroad may be much less than it was before. The only reason in such a case for maintaining the purchase price is to conserve the general valuation of the adjacent similar real estate. 245

In dealing with the subject of depreciation, the author has been very brief, as he did not consider it essential for the purposes of the paper. This is to be regretted, as depreciation is an important feature in every valuation, and so few trustworthy data concerning it are available. The value of the paper would be greatly enhanced if the author would give the assumed average life of the principal components of a railroad, based on some definite traffic, and normal grades and curves. Much diversity of practice in this respect prevails, and the final judgment of the numerous experts who were engaged in the Michigan valuations cannot fail to be of great interest. The same remarks are also applicable to the unit prices adopted for construction and equipment.

The subjects of expenses for organization, engineering, administration, contingencies, and non-physical values are treated very thoroughly by the author, and particularly interesting is his discussion of the complex question of franchise value. After quoting from numerous judicial opinions, he reaches the conclusion that the franchise simply protects the owners of the property in their enjoyment of the earnings, and that its value merges into the "fair value" of the property and becomes inseparable from the other non-physical elements of value; also, that the aggregate non-physical value of the property depends only on the net income for a period of years. This method of estimation certainly has the merit of being simple, rational, and free from all hypothetical considerations. It is, however, obviously governed by the rates charged for the services rendered, and if these are likely to be altered at any time by governmental action, a corresponding alteration in the "fair value" of the property will take place.

This consideration brings us at once to the intricate question of reasonable rates, which involves the matter of reasonable design and construction of the property. In most cases the working capacity of the plant must be much greater than the average annual demand for the service performed, as so-called "peak loads" of relatively short duration must be provided for. The magnitude of these peak loads, however, varies with the subsequent development of the territory, which is necessarily conjectural; hence it follows that a comparatively large amount of capital is often invested in an enterprise for the purpose of taking care of such anticipated temporary demands, and on this investment a "fair return" should be granted. This condition is particularly noticeable in municipal water-works plants, where provision must be made for supplying water for fire service to an extent which may be several times greater than the normal hourly rate of consumption. In the case of railroads, such demands can usually be met by adding to the rolling stock at moderate expense, while in a water-works the outlay is relatively greater because the entire plant must be adapted in the outset to the anticipated maximum delivery in the course of a comparatively long period of time. 246

The problem of rate-making has been excluded by the author from his present paper on valuation; but, inasmuch as he is so well qualified for the task, and also because the non-physical value of the property depends mainly on the rates obtained for the service rendered, it is hoped that he will deal with this feature in a subsequent paper, thereby bringing out a discussion on the obscure subject of "fair return." It is noticeable that these phrases occur frequently in judicial opinions, but the fundamental principles on which a definite conclusion should be reached are seldom set forth clearly.

Richard T. Dana, M. Am. Soc. C. E. (by letter).—The solution of this problem includes practically all the factors in the general subject of economics, in which engineering occupies a large but by no means preponderant part. Mr. Riggs has done some very valuable and pioneer work in contributing this paper at this time; and the writer, in calling attention to what appears to be a radical error in it, does not wish to be taken as attempting to detract in any way from its great value as a whole. It is most important, in the inception of such an investigation, on the part of the members of this Society, to remove from the subject the stumbling blocks as they appear.

The author makes the following statement:

> "It is true that the 'value' of a property is an unstable figure, subject to fluctuations due to natural or artificial causes, and that a material change in value may occur suddenly, but the 'value' of any given property on any given date is, or should be, from an engineering standpoint, a definite sum which may not be varied or changed to suit the whim or will of the people for whom the work is done."

The fundamental conception of a value is so important in an investigation of this kind that it is worthy of careful and thorough discussion.

The appraisals which the writer has had occasion to make have generally been for one or other of the following purposes, namely:

(I) Taxation, in the interest of the community or corporation taxed;

(II) Bonding, in the interest of the banker or representative of persons who contemplated lending money on the property;

(III) Rate-making, in order to determine what was a fair amount of money that the property should be allowed to earn for the owners.

Now, in general, a proper value for any property for any one of these purposes is different from its proper value for any of the others. This proposition is of immense significance, for the reason that, if the value for the property arrived at, on one basis, be accepted and applied for one of the other purposes, it will inevitably result in gross injury and financial loss to some one. 247

In attacking this problem, one must be careful to take the correct standpoint, which is not necessarily that of engineering. Engineering science is indispensable for a large part of the work, but there are other indispensables, which would not ordinarily be recognized as engineering. The writer takes the view that engineering is a part of economics, rather than economics being a part of engineering.

To illustrate this point, consider two objects, one of which is concrete and simple and the other more complex.

(1) A steam shovel belonging to a railroad, costing $10,000, new;

(2) The entire railroad as an operating entity.

Assume for (1) that the shovel has been purchased recently, is in perfect condition, and that the railroad has some work for it to commence on as soon as it can be properly installed. What is its:

(I) Taxable value,

(II) Bonding value, and

(III) Rate-making value?

(I) The tax assessor cannot properly appraise it at $10,000, because it certainly would not sell for that sum, and if the community should have to sell it for taxes the actual return minus the charges would be so much less than the $10,000 that the community's books would show a heavy loss; and this practice, if largely indulged in, would bring the community into financial straits. The community must be exceedingly conservative in its estimate, for this very reason; and, therefore, it has been customary, almost universally, to tax such articles practically on their sale value at what might be called panic prices. The company which sold the shovel to the railroad would not buy it back two days after the sale for more than the original price minus what that company considers its selling charges, say 20%; so that, in this case, even if a customer were at the door, the shovel would not be worth more than $8,000, and a fair tax appraisal could not consistently be more than $8,000 minus charges of, say, $250, or $7,750.

(II) Assuming that the railroad is a very small one, that it wants to borrow money, and desires to put up the shovel as collateral for the loan. What would be its loan value to the lender? In considering this point, it is necessary to assume that no aid is rendered by the credit of the railroad itself, but that the protection for the loan is to be furnished by the shovel only. Now, the banker will reason that, in the 248
event of the note remaining unpaid, he will have to sell the shovel to reimburse the bank for its loan, and he will be required to consider the matter on a conservative basis. He cannot lend on the shovel up to its full value, for in the first place it is not a "negotiable security." If it were a security, with a free market on some stock exchange, he would probably lend to the amount of 80% of its value, but a steam shovel in a sand bank on a railroad is by no means as convenient of exchange, nor as easy to foreclose on as a stock certificate in a banker's box; therefore he will lend, or he ought to lend, less than 80% of its sale value, minus the selling charges. If he lends more than this, he is lending on the credit of the owner of the shovel rather than on the shovel itself. Granted that the maker of the shovel is willing to buy it back at its full selling price less the selling cost, the maximum loan value of the shovel would be a little less than 64% of its purchase price, or $6,400. To lend more than this on the shovel would not be conservative banking.

There is another bonding or loan value to this shovel, when it is considered as part of the assets of the railroad, the bonds of which are to be held by the banker, under which circumstances a higher value than $6,400 would be admissible.

(III) If the value is to be determined with a view of ascertaining what is a reasonable figure that the owner of the shovel ought to be allowed to earn as a public utility organization, the problem is entirely distinct from the foregoing two cases. Assume that the railroad is entitled to earn at least 6% on its investment in the shovel. Now, its investment is $10,000, because that is the money that it cost; and nothing had been credited to its account, since the shovel had just been purchased and had not yet done any work. The shovel cannot be considered as being worth more than its cost, and it can easily be shown it is not worth less for rate-making purposes.

These three illustrations, which are very briefly outlined, should demonstrate the fact that there is almost no relationship between any two of the different kinds of value which are being considered.

Now, from the standpoint of the railroad as a whole:

(I) Should railroad property be taxed on the basis of what the entire railroad would bring on a foreclosure procedure? Obviously not, because the railroad is taxed in sections. The Town of Squedunk will tax the portion of the railroad that lies within that town, and will have considerable difficulty in putting down as security for its own bonds the locomotives and cars which go through once a week or twice a day at 40 miles per hour. To cover partly the flitting assets, it taxes the railroad on a franchise value. It may tax a railroad's land on the same basis that it taxes land owned by private individuals, notwithstanding the fact that when the railroad buys the right of way it generally has to pay more money per acre than the householder or the farmer. This unit cost to the railroad may be two or three times 249
that to the farmer, yet the writer has never heard of a community attempting to tax railroad property two or three times as heavily as adjoining property used for private or commercial purposes.

(II) On the other hand, this same property is an absolutely sound asset for the railroad, and the railroad probably bought the property from the proceeds of the sale of bonds. If the public service commissions were to rule that the railroad may be allowed to issue bonds only to the amount of the taxable value of the property which is to be held as security for the bonds, the result would be an absolute paralysis of railroad construction. A bond is an obligation to pay so much interest for so many years, and to pay back the principal at the end of its term. The bondholder is interested in the absolute regularity of his interest, and in the security that lies behind the principal, and it is to-day the custom of banking houses to consider a bond well secured when, in a territory of reasonably rapid growth, the principal is earning say twice the interest on its bonds, and when the cost of reproduction is in excess of the amount of the bonds, provided that the property is in good physical condition. If it should be necessary to foreclose on the bonds, it is then reasonable to suppose that some one else will buy it in for at least the amount of its bonded indebtedness. What can this possibly have to do with the taxable value of the track in the Town of Squedunk? One may be 1.5 times the other, or three times the other, depending on a multitude of circumstances.

(III) The value of the property for rate-making is a complex one to determine, and, of course, there is no opportunity for a full discussion of it here. One point, however, will serve to establish thoroughly the difference between this and taxable or bonding value. If the community is prosperous and the business is a good one and honestly managed, the railroad ought to be allowed to earn a reasonable percentage, say, at least 6%, on what has been put into it. If the community should decree otherwise, then people will not build railroads for investment purposes, and all will lose money. Now, it is a well-known fact that a new railroad's earnings have to grow for several years before they are on a normal basis, and part of what the owners of the property have put into it is, for example, the interest on its cost before its earnings are on a normal basis. This may amount to a considerable percentage of the original construction cost of the property, if the business is several years in developing. Granted that the community ought to allow the property to earn a reasonable interest on what has been put into it, then the rate-making value will be very much larger than the sum of the taxable valuation of all its different parts. It will also be much greater than its bonding value, because, as a bond proposition, it can borrow money up to a limited percentage of what it is actually worth.

George T. Hammond, M. Am. Soc. C. E. (by letter).—The engineer called on to fix the valuation of public service corporation property has so 250
little engineering literature on this special subject to guide him that he must feel grateful to the author of this excellent paper for adding so much of a kind that is very desirable.

Estimating the cost of an engineering structure in advance of its construction is one of the most ordinary professional duties, but how difficult it actually is, and how much engineers differ with one another in their estimates on the same structure! Perhaps there is no professional duty which calls for so much study and so much experience, or which tests so closely the ability and capacity of the engineer. How seldom professional estimators agree with each other; or designing engineers with contracting engineers; as witness the bids received at the public lettings of contracts when compared with the engineers' estimates of cost; and, if this is true, which no one will attempt to deny, how much more so is it probable that estimators will disagree when they attempt to place a value on works already completed, and in service, perhaps, for many years, in which various changes in value have occurred, and in which questions of fact are mixed with legal questions involving legal rights, as well as financial questions.

The tendency in all such valuations appears to be a mixing up of things in general—like the witches' stew. Everything goes into the pot and is boiled together until all becomes soup, at least until the official commission, like the witches, considers it done and ready to be served up in the form of a report. It is then observed that the substance served out is of a complex nature; that the valuation of engineering structures has become mixed with other and uncertain values; that the whole value, as stated, is, after all, little better than the commission's opinion of the value; and that another commission would reach a different conclusion.

The author states that the valuation of corporation property:

> "Should be the honest judgment of the men composing the commission, as to the actual cost of reproduction, present physical value, or 'fair value,' and should be ascertained by a systematic and scientific method which takes into account all the facts concerning the property, its physical value, its strategic location, its operating revenues and expenses, and its franchises, rights, competition, opposition, and all other tangible or intangible elements, which would affect values. The method of valuation should be such as to minimize or entirely eliminate all differences due to errors of personal judgment."

This, it seems, complicates actual present values with conditions which might, or might not, continue. Outside of the physical valuation of the plant, which offers the easiest problem presented, how can one fairly put a value on operating expenses and revenues, which might be affected favorably or advisedly by good or bad management, and by numerous other complex and almost incomprehensible 251
circumstances.

The tendency of all such commissions seems to be to confuse together and mix up some things which are logically separate. Thus, the value of the plant and franchise, good will, and present investment or income value, etc., are too often taken together. The value of the plant is dependent on the cost of reproduction, and also the depreciation of the structures, as engineering structures, and should be based on present prices for which the work could be replaced, minus the depreciation, which is a question of engineering judgment and experience. The other items of value are largely dependent on the situation of the plant and its prospects as an income-producing property, and this again is a matter of opinion, in which the opinions of financiers and investors are sometimes of more moment than those of engineers. The opinion of lawyers as to the value of the franchises and the cost of the legal complications possible or probable must also enter into any seriously worthy opinion as to value.

The few salient lights in the picture of valuation, presented by the author, serve especially to reveal the darkness which involves the

whole subject of valuation, estimating, and the use of cost data for such purposes, and to suggest that, with all the wonderful progress on the theoretical side of the profession, engineers have as yet advanced but little in this division of the practical side—cost data, valuation, and estimating. Engineers cannot compare the results of different estimators and appraisers without sorrow and even shame for their ignorance, or their incapacity to agree in the application of scientific principles and the results of practical experience to this branch of their work.

At present we would seem to be a long way from a method of valuation, "such as to minimize or entirely eliminate all differences due to errors of personal judgment."

The method described as having been used by Professor Adams seems to be at least an advance toward a logical and rational method of getting at the value of corporation property, but it must be acknowledged that we are as yet a long way from a perfect method of appraisal, even of the physical values, to say nothing of the non-physical. He held that as nothing visible or tangible gave support to the latter value, it must be determined on the basis of information secured from the income accounts of the company. This method of measure, it would seem, is not unlike the celebrated dictum on the length of the Chancellor's foot, "some Chancellors have a long foot, and some an indifferent foot, and some a short foot"; therefore, a great English Chancellor says, "the length of a Chancellor's foot should not be taken as a measure of rights in equity." Thus, if the income of the company is to be taken by the appraising engineers, or the gross income, it may have to be given a different interpretation from the net income, and if the surplus earnings depend on transient causes or on excessive rates for service it will lead to a totally erroneous conclusion. The same may be said if the rates for service are too low, or if the company is badly managed, or is carrying a great deal of "dead wood," either in the form of property or of servants. Therefore, it seems evident that he who attempts to follow this method of appraisal must possess almost superhuman judgment of present conditions, and prescience to forecast the future, as well as a grade of wisdom and knowledge of existing conditions of trade and industry which may be also characterized as superhuman. In order to apply Professor Adams' method justly, we must know whether the company is wisely managed, whether its income is a fair income, whether its physical property is all useful and needful, whether its service is what it ought to be as to efficiency and economy, etc. We must assume an ideal condition of commerce and industry, and of property value and management, and then appraise the company's property by comparing it, consciously or unconsciously, with this ideal. Possibly this is the best method devised so far, but surely it leaves a great deal to be desired; and it is difficult to see how different engineers, on different sides of the question, representing different interests, can find any common ground of agreement in Professor Adams' method. Under such circumstances, engineers are likely to differ in their results as much as the length of the different Chancellors' feet. 252

Leonard Metcalf, M. Am. Soc. C. E. (by letter).—Mr. Riggs has done engineers, and more particularly those interested in valuation works, a genuine service in presenting to the Society this admirable paper.

No shrewd observer can fail to recognize the increasingly insistent demand of the public for greater publicity in the accounting, and a larger measure of governmental control in the operation, of public service corporations. In its best form, such control will be welcomed by the corporations, as giving greater stability to investment in such property; in its worst, it may prove a serious limitation to prompt development of the best standards of service. In the water-works field, the anti-corporation movement has resulted in taking over by the public many such plants. It does not seem likely, however, that we are ready to go farther in the railroad field of operation than to demand reasonable regulation of such corporations.

While the writer has had no experience in railway management or valuation, he has devoted much time and thought to the valuation of, and determination of fair-rate schedules for, water-works properties; therefore, what he may have to say in comment on this paper may be assumed to have direct application to water-works valuation, and to railroad valuation only as the similarity in the public service rendered by these corporations may imply.

In the main, the writer subscribes heartily to the views expressed by the author and the temperate way in which he has expounded them. Space forbids discussion in detail of all the matters alluded to and so well covered by Mr. Riggs. On one important subject, however—the inclusion of the going value, or going concern value, of public service corporation property, in the intangible property values, rather than in physical plant value, and the consideration of it as an intangible value rather than as a real and substantial item of cost to the public service corporation—the writer differs from the author. It is clear, from what Mr. Riggs has said, that this is debatable ground, and, from the care and fairness with which he has expressed his views on this subject, one might almost be led to infer that he invites attack on it. It is in no carping spirit of criticism, however, that the following views are expressed. 253

As the writer has recently submitted to the Publication Committee of this Society a paper on the "Going Value of Water-Works," written by him in collaboration with John W. Alvord, M. Am. Soc C. E., in which a detailed discussion of this subject will be found, only enough will be said to outline clearly his point of view.

The author says:

> "The physical property is that which enables the corporation to do business. Without physical property it could not produce the commodity which it sells. The amount of money actually invested in acquiring that physical property represents the measure of capital on which it is morally entitled to earn interest and profit; and, in the stage of promoting and financing the enterprise, all hope of earnings is based on the amount of money required to construct the property."

He also says:

> "It would seem reasonable to say that this difference between the physical value and the value based on earnings represents the 'good will,' 'established business,' or 'going value,' and all other non-physical elements of value."

In referring to going value, he says:

> "* * * Yet, to fix a value on it by the method described by him [Mr. Alvord] involves going into the realm of conjecture and speculation to a degree that could never be sustained. * * * It can be readily seen that the physical present value is not always—indeed, is not often—the 'fair value.' The 'fair value' may be more, or less, than the present value of the physical property."
>
> "* * * Is it not, then, proper to conclude that the non-physical or intangible value, composed of all these various elements of value, can only be determined absolutely by a study of the earnings and operating expenses? * * *"

He also says:

> "The contention that all the different elements of non-physical value merge into one intangible value, not capable of separation, will doubtless be objected to by many engineers and corporation managers. * * *" 254
>
> "The writer does not concede that 'going concern' is a proper element to consider in the physical value, as it does not represent any part of the cost chargeable to capital, and the physical valuation should be confined to the determination of capital invested."

Quotations might be multiplied. Those cited, however, will suffice to recall the author's view, and to make clear the point with which issue is taken.

Is Mr. Riggs right in his contention that going value is in fact an intangible value; that going value is not an element of real cost to the company, involving investment of capital; that going value, therefore, should not be included in physical plant value; and that the company is not morally entitled to earn interest and profit on it?

The writer contends that going value is as real an element of cost, in the property of any public service corporation, as is the cost of any portion of its physical plant. It pertains, however, to the business, rather than to the physical plant, of the corporation.

Whatever the difficulties of its computation may be, whatever the methods used—whether that adopted by the Wisconsin Public Service Commission (which is essentially one of determining the original cost of the going value and not its reproduction cost), or whether that perhaps first outlined by Mr. Benezette Williams and George H. Benzenberg, Past-President, Am. Soc. C. E., in the Middle West, and by William Wheeler, M. Am. Soc. C. E., in the East,[42] a method which seeks to determine the reproduction cost of the going value, rather than its original cost—the going concern value has come to be recognized, by water-works appraisers at least, as a substantial element in the cost of the plant, and hence as differing essentially from the franchise element or so-called unearned increments of value.

Is not going value in a "between" class—a middle ground between tangible and intangible values—tangible in that it has involved real cost and expenditure of money; intangible in that it is not as readily calculated as are other reproduction cost items, is dependent fundamentally on the earnings of the company, and that there is no tangible equivalent to show for the expenditure, except the existing income of the corporation? Surely its character is quite different from that of the franchise, as ordinarily found, the value of which, while real, from the rate-payers' point of view, seems to be made out of whole cloth; in short, seems to be of fictitious value.

Certainly, the conjectural and speculative character of the computations—as referred to by Mr. Riggs—involved in the determination of going value is no excuse for failure to recognize going value as a real element of cost, rather than as an intangible value. As a matter of fact, the variation in the views on going value, by engineers who have given this subject particular study, while greater than the variation in their estimates of the reproduction cost of the physical plant, is still far less than the variation in their views on franchise value. 255

As bearing on the proper basis for rate-making, the author's statement, that the "* * * physical property represents the measure of capital on which it [the public service corporation] is morally entitled to earn interest and profit * * *" cannot be admitted, equitably or legally; and it is not to be assumed that Mr. Riggs desired to imply that this sentence summed up his final views.

Are we not, however, approaching a basis of rate-making, predicated on the earning, by public service corporations, of operation and maintenance expenses, depreciation allowance, and return (*i. e.*, interest and profit) on reproduction cost of the property, less accrued depreciation, plus going value, plus a nominal allowance for the franchise and other intangible values of the corporation? Is it not possible that the recent depression in the business world has been due, in considerable measure, to the shrinkage in the values ascribed to franchise and other intangible value in public service corporation property?

If we are approaching such a limitation, it is the more important that the public should be educated to the fact—not theory, for it is a fact—that going value, or going concern value, is a real element of cost, covering an outlay in effort and money on the part of the corporation, and as such is as much entitled to earn a return (interest and profit) as is the other capital invested in plant. It is not on any items of real and necessary cost to the corporation that the public objects to paying tribute, but on the "unearned increments" and the virtual monopoly "privileges" enjoyed by the corporation and created, in large measure at least, by the public itself and by normal conditions of growth and development for which the public, rather than the corporation, was perhaps responsible—though in many cases it may be urged truly that the corporation itself, rather than the public, has been responsible for the development.

Such a basis of rating, while still dependent on sound judgment and judicial treatment, is nevertheless not beset with the speculative element involved in the capitalization theory, which, Mr. Riggs himself admits, fails as a basis of rate-making except when predicated on fair rates.

If the writer's contention, that going value is a real element of cost in the property of any public service corporation, is sound, Mr. Riggs' statement that, "It appears to be doubtful whether the Court can be construed as approving such an element of value in rate cases," and his interpretation of Judge Tayler's ruling in the Cleveland Street Railway matter,[43] must be challenged.

Certainly, as applied to water-works valuation, Mr. Riggs' statement is not justified. The Maine cases clearly include going value as an element of value on which rates should be predicated; by inference, so does the Kansas City case. In the Knoxville case it was in fact allowed by the Master. 256

In equity it cannot be doubted that going value should be included in the base on which the returns are predicated, if, as contended, it involves real cost to the company; for the company must be permitted to earn a fair return on this cost, or to liquidate it in some way, as otherwise the corporation would suffer substantial property loss—from 10 to 20%, more or less, of the reproduction cost of its property. This would be contrary to public policy, for, with such an outlook, capital would not enter this field of enterprise, except at increased rates of return, commensurate with this added hazard. To assume such increased rates of return is to provide another means of liquidating such a loss.

As to "good will," it has seemed to the writer more proper to use this term in private competitive corporation enterprises, as applied to the element of value corresponding to the going value of the quasi-municipal or public service corporation enterprises, which latter are in effect controlled monopolies. If the term is used in its more colloquial sense, such as the effect on earnings of having, in the office of the corporation, men who meet the public pleasantly, who are good "mixers," and who are active in getting business, the value is substantially included in the consideration of the income, in the manner involved by going value determination and franchise valuation.

The depreciation question has been discussed so fully elsewhere that the writer only calls attention to the fact that, while physical and functional depreciation only are to be considered in a review of the present physical condition of any plant, in considering a fair-rate schedule, provision should also be made for contingent depreciation, covering such items as cost incident to change in street grades or construction of subways; placing structures under ground, which were previously above ground; serious loss due to injury by electrolysis, the distribution of which over a period of years rather than inclusion in the operating cost for one year, is to be preferred, alike from the public and from the corporate point of view, from the fact that it spreads the burden to be borne by the rates, and prevents violent fluctuation in prices or valuation of the public service corporation's property. The public pays dearly for all hazards. It is wise, therefore, to pursue the conservative course in providing adequate funds to meet extraordinary conditions, and to give stability to the investment of the corporation. Moreover, such funds can be carried in a separate account which can readily be watched; any excess can be credited to future reduction in depreciation account requirements, while a prolonged deficit cannot perhaps be recovered by the corporation, in the light of the Knoxville decision. 257

The comment that no hard-and-fast rule can cover determination of proper depreciation allowances, is amply justified. In its final analysis, it is a matter of good judgment, experience, and judicial temper.

The author's statement that the organization, legal, engineering, administration, and general expense accounts, "should not be considered as affected by depreciation, as long as the property is a going concern," is not quite clear. Obviously, this is true with regard to all the early organization expenses, as these expenses are incurred once for all, and constitute a continuing asset similar to other elements of plant cost. If, however, the author refers therein also to the engineering and contingent item added to many of the reproduction cost items making up the physical property, exception must be made; for when an old structure, the life of which is gone, is replaced with a new structure, new engineering costs are incurred, and the engineering element of cost incident to the installation of the original structure no longer inheres in the plant. It, too, has passed away with the life of the structure, and, therefore, its cost should be liquidated, or provided for in the depreciation account, as well as the cost of the structure to which it was incident.

In the same way the "interest-during-construction" item is not a continuing asset, but should be liquidated with the complete depreciation of the portion of the structure to which it relates. The replacement of the structure will involve new "interest-during-construction" charges, commensurate with the time required for construction. The value of the initial "interest-during-construction" costs will have disappeared with the original structure and, therefore, should be taken care of by the depreciation account.

The method of making allowances for interest during construction, suggested by the author,[44] accords closely with that used by Mr. Alvord and the writer in a recent valuation of a large water-works property, in which the "interest-during-construction" charges were limited, and the contributions to depreciation account were begun, at the date on which any workable unit of the property was assumed to be available for service and to begin to earn a return on its investment cost, even though the structure, as a whole, was not assumed to be completed for a considerable period of years thereafter. Thus, for instance, it might be assumed that as soon as the supplying works in a water-works project were in operation, the investment in them and in the distribution pipe system laid up to that time, would cease to be credited further with "interest-during-construction" allowances, and would be compelled to earn interest through the water rates or income from water supplied to consumers—the fact that the interest charge could not be wholly met, immediately at this time, being taken care of in the resulting increment in going value. 258

Such a theory, of course, does involve a determination of the probable order and rapidity of construction of the component parts of the property, and this is usually made, in water-works valuation, in the estimate of the reproduction cost of the property.

For the sake of completeness, in reference to the legal decisions of importance in valuation proceedings, attention is called to the Pennsylvania case, Brymer *vs.* Butler Water Company (179 Pa., 231), referred to in the closing discussion on the writer's paper on "Water-Works Valuation."[45]

In this case Justice Williams, speaking for the Supreme Court of Pennsylvania, says:

> "By what rule is the Court to determine what is reasonable and what is oppressive? Ordinarily, that is a reasonable charge or system of charges which yields a fair return upon the investment. Fixed charges and costs of maintenance and operation must first be provided for. Then the interests of the owners of the property are to be considered. They are entitled to a rate of return, if their property will earn it, not less than the legal rate of interest; and a system of charges that yields no more income than is fairly required to maintain the plant, pay fixed charges and operating expenses, provide a suitable sinking fund for the payment of debts, and pay a fair profit to the owners of the property cannot be said to be unreasonable."

The Pennsylvania Court, therefore, in the words of William S. Wallace, Esq., recognizes the single standard:

> "The Single Standard, according to the Brymer case, while acknowledging the full right of the public to regulate such public corporations, also recognizes as a prime factor its private character and the rights which accrue to it in that capacity, ... and holds to what seems to me the only rational and practicable basis, that a fair return, after deducting the charges above enumerated, *is* a reasonable rate"; whereas, "the Double Standard basis of fixing a reasonable rate seems to accentuate the public side of the corporation and rather ignores the private element."

As to the propriety of the inclusion of a substantial recognition of franchise value as a basis for rating, the layman may well confess to perplexity, in the light of the conflicting nature of the two important recent United States Supreme Court opinions referred to—the Knoxville case, and the Consolidated Gas Company case—for, while substantial allowance was made for franchise value, in the Consolidated Gas Company case decision, in large measure apparently on account of its earlier recognition by the legislature, in the Knoxville case, in spite of legislative recognition of such value, and similar approval of the issue of securities predicated on such recognition, the United States Supreme Court failed to make similar allowance for franchise value. 259

The author's treatment of the unit price question and the contingency item is intelligent and creditable. Engineers are prone to make valuations based on "hindsight" instead of "foresight," on the assumption that no substantial difficulties in construction were encountered, when, in fact, substantial difficulties should perhaps have been anticipated, and may actually have been encountered in the original construction, record of them having been obliterated, however, with the lapse of time.

The author's definition of the value of a property, as the "estimated worth at a given time, measured in money, taking into account all the elements which add to its usefulness or desirability as a business or profit-earning proposition," suggests the advisability of recognizing the other side of the ledger by modifying his statement so as to read: "* * * all the elements which add to, 'limit, or detract from' its usefulness or desirability as a business or profit-earning proposition."

While recognizing the author's view, that there is no separate and independent method of determining franchise value, which is not based on the determination of the value of the property as a whole, by capitalization methods, it must be recognized that going value may be determined independently, and may have a positive value, even though the property as a commercial whole is worth less than the sum of the physical value and the going value.

The Court, appraisers, and the author, alike recognize that there is no one method of valuation of universal application. First cost, reproduction cost, reproduction cost less depreciation, commercial value determined by capitalization, worth of the service to the consumer, and market price of the property, if such exists, all have their weight, in varying degree in different cases. Whatever may be said of, for, or against, these several methods of valuation, relates rather to their significance, and the weight which should attach to the results obtained by them, as evidence of value and of the effect of the modifying local conditions, than to the soundness of the methods themselves.

In this connection it may be of interest to refer to a recent valuation of a water-works property, in the appraisal of which the writer chanced to participate, in which there was finally placed before the board of appraisal a summing up of:

1. The original cost;
2. Reproduction cost less accrued depreciation, plus going value;
3. The worth of the service to the consumers, based on a stated assumption of reasonable increment in value in excess of actual cost, upon which a return (or interest and profit) should be earned;
4. The commercial or capitalized value, on certain assumptions based on present conditions, and also on possible future conditions which might be involved in a renewal of the City contract, which was to expire within two years.

That these determinations of value, from different points of view, had an influence in moulding the opinion of the individual appraisers, there can be little doubt; yet it is probably equally true that in no case was like weight attached to the several items or bases of valuation. Nevertheless, in the final valuation, the consensus of opinion as to the value of the property, as a whole, was remarkably close, the extreme variations in opinion being approximately 8%, more, or less, than the final appraised valuation.

Attention should also be called to the necessity, in any valuation by capitalization of income, such as that outlined by Mr. Riggs and used by Professor Adams in the U. S. Government Valuation of Railroads,[46] of determining whether the plant or property is in what might be termed an over-built, normally developed, or under-built condition; in short, whether the investing public has correctly gauged its momentary physical condition with reference to its bearing on the rates, and whether the earnings are in fact inadequate, commensurate with the service rendered, or excessive. In the long run, due weight will be given to these facts; in a brief period, they may be incorrectly gauged. In water-works properties, unfortunately, there is rarely, if ever, a market price of the securities which can be said to be credible or significant in valuation. Therefore, in the valuation of water-works properties, it is the more important that the appraisers should weigh carefully the present character of the service furnished and the momentary adequacy or inadequacy of the rates as predicated on such service, on the needs of the community, and the existing standards of the day, if full justice is to be done.

In conclusion, the writer reiterates his statement, that he has taken issue with the author in no carping spirit of criticism, but with a recognition of the difficulty and complexity of the work of appraisal, and the conviction that engineers are under a moral obligation to do an educational work in pointedly calling attention to the fact that the going, or going concern, value, of a public service corporation's property is not an intangible value representing an unearned increment, but a very real and substantial item of cost in the property as a whole. While the difficulty may be met by placing going value, as suggested by the writer, in a middle class between physical plant and intangible values, the placing of it in the same class with franchise and other intangible elements of value, as suggested by the author, may, in the judgment of the writer, do a serious injury to corporations, in failing to give expression, in such a manner as shall be clearly within the grasp of the popular mind, to the fundamental idea of the cost of developing going value. While the writer has no personal interest in the matter, on one side or the other, having served both municipality and corporation in water-works valuations, he feels, nevertheless, that engineers can do a genuine service, alike to the public and to the public service corporation, in laying stress on the fundamental elements of cost and value, and particularly those on which rates should be predicated, in public service corporation property valuation and rating.

Charles Hansel, M. Am. Soc. C. E.—So much has been said on the subject of valuation of public utilities that, although the speaker has thought on the subject for ten years, and has done considerable valuation of railroad properties, he finds that he is considerably confused, for the reason that the discussions seem to cover the whole field of engineering, accounting, taxation, and economics; therefore he suggests that, in order to get down to a basis of usefulness, a special committee should be appointed to take this question under consideration.

The speaker had the honor of being associated with the Michigan Commission, as a member of the Board of Review. Professor M. E. Cooley was selected by the State of Michigan to take charge of the work of organization, and Mr. Riggs was the engineer who organized the office and field forces. Both these gentlemen were eminently successful in that very difficult work. Mr. Cooley did this Board the honor of saying that there were so many problems coming up in actually carrying out the work (aside from the theories of taxation, rate-making, accounting, and several other things, which could be found more readily in the Auditor's office than in the Engineer's), that he had asked for the appointment of this Board of Review, to sit as a Court, and to pass on the many complex questions arising from day to day; and he had the satisfaction of coming to the Board every day and saying: "Well, now here is a condition, and how will I handle it?" Of course, actually, he knew more about it than the Board, but he was kind enough to say that he would ask for the Board's opinion. That Board adjudicated all these various questions to the best of its ability, and the speaker has the satisfaction of knowing that the valuation has stood in the Federal Courts. The subjects are so fugitive and so illusive that very much depends on the point of view.

The speaker is now engaged in the actual task of trying to place a valuation on some $300,000,000 worth of property in New Jersey, involving the most important terminals in the United States.

The valuation of public service utilities is the most profound question which has ever been before the Society, and it includes a great deal which is outside of strictly engineering questions; in fact, the discussions do not throw much light on the methods which should be followed in making valuations.

The terminology of a subject is very important; in fact, the speaker has found it so important that in his discussions with the Attorney-General of New Jersey, in reference to the Railroad Tax Law, which he has been asked to re-draft, that draft will be accompanied by a glossary, so that the meaning of certain terms used in that particular Act will be clear.

In this New Jersey work some eighty-seven engineers and assistants are employed, and for their guidance the speaker has prepared thirty-five pages of very carefully considered instructions. These instructions are accompanied by blue prints showing exactly how all field notes must be recorded, with diagrams of trusses, culverts, and the like, and all the elements of railroad construction.

The Tax Law of New Jersey states that, first, the true value of the real estate shall be ascertained; second, the true value of the tangible personal property; and the first law of 1884 stated: "and third, the value of the franchise"; but somebody discovered that there was something besides the value of the real estate, the tangible personal property, and the franchise. They did not know what it was, but there was something else; therefore, in the 1888 law they changed the third division of value to read: "the remaining property, including the franchise."

As an example of one of the difficulties of determining classification, attention is directed to the term, Real Estate, which is broadly, but seldom accurately, understood.

The Interstate Commerce Commission is the highest tribunal in the land, in the matter of railroad accounting, but it affords no help in many important elements of value; for instance, under the Interstate Commerce Commission, real estate includes only such real estate (land) as is not required for railroad purposes. All land actually used for railroad purposes is classified under "Right of Way and Station Grounds."

When the engineers on the New Jersey valuation were sent into the field, it was necessary to specify exactly what elements must be described as real estate, and what as tangible personal property. The division line had to be defined accurately for the reason that all personal property is assessed permanently to the State, while, in the case of real estate, the State receives the taxes on a strip not exceeding 100 ft. in width, and the tax on all property used for railroad purposes outside this strip reverts to the taxing district wherein it is found.

The vexatious question as to whether machinery is to be considered as real estate or personal property was settled by the New Jersey Law, which says that tangible personal property shall include all machinery; but it left unsettled the question: what is machinery? After careful consideration, real estate was divided into 74 classes, and all other tangible elements were classified as personal property. Some of the items of real estate are: ash-handling machinery and the like, chimneys, cisterns, conveyors, dams, locks, lock machinery, electric wiring, piping, heating, interlocking, signaling, pavements, reservoirs, shop fittings, tanks, telegraph lines, track, track scales, transfer

tables, water-works, etc., etc. Generally speaking, all items of a fixed character were included in the 74 divisions of real estate.

The difficulties of determining all the elements of real estate are mentioned simply to call attention to what at first glance seems quite simple, but on close examination is found to have great complexities.

The question of useful life depreciation, direct and indirect, due to decrepitude or obsolescence, or both, is one of the illusive questions; and then comes the value of the franchise.

The valuation of railroad property in New Jersey is further complicated by the requirements of the State Tax Law, which specifies that the value of the remaining property, including the franchise, shall be determined after the "true value" of the real estate and tangible personal property have been determined.

The speaker will not attempt a discussion of franchise values, as it is a subject which requires the most profound study.

The author states that he is appalled at the speaker's misconception of the method of determining non-physical value used by Professor Adams in Michigan. The speaker is perfectly familiar with that method, and, although having the greatest respect for Professor Adams' opinions, is compelled to draw attention to two important elements of that formula which are open to objection.

Professor Adams establishes his annuity on the depreciated value, rather than on the cost, or the reproduction cost, which, in the speaker's opinion, does not determine the proper annuity or reasonable fixed charges to be deducted from net income before net surplus is established. Bonds are generally sold at a considerable discount, and represent the full cost plus this discount, consequently, the interest on bonds or fixed charges will be greater than an annuity established on cost, "reproduction cost," or "present value." Would it not more nearly establish fixed charges or annuity, to take the cost plus discount and commissions as the basis on which to apply the annuity rate?

While Professor Adams' formula establishes a larger net surplus for capitalization than the method suggested by the speaker, he in effect destroys this net surplus by charging against it all betterments chargeable to income. It is quite clear that this gives the railroad company a chance to absorb all net income into betterments, and thus wipe out all net income, in which case there would be no net surplus to capitalize, consequently, no non-physical or franchise value, and the total value established under this plan would be less than if the property had not been improved by the betterments—*reductio ad absurdum*.

In reference to the question of whether or not the method of valuation should be the same, regardless of the purpose to which the value is to be applied, the speaker cannot agree with the author, and believes that it is quite consistent to establish different values for different purposes. 264

The completion of a large public utility, planned on such a scale as to provide for the requirements of many years to come, utilizing but part of its capacity, and earning less than its operating expenses and fixed charges, with its rates of toll fixed by law, must be considered in a different way than a well-established public utility, with business forcing it to its utmost capacity, and with tolls not fixed by law. There are many important elements bearing on this consideration of value, and the purpose of the valuation should be known before attempting to establish the value.

In New Jersey the work is complicated further by the necessity of establishing the value of 122 separate railroad corporations, and the assignment of all property outside the 100-ft. strip to each of the 450 taxing districts through which the 122 corporations, with their many branches and spurs, are operating.

In order to determine the quantities and materials in the permanent way and structures, nine engineer corps were organized, each corp consisting of six men. With this force the center line of the main running track was measured, and the exact distance in each taxing district recorded. Cross-sections of the roadbed were made as often as changes in the natural surface required, and accurate measurements and notes were made of all structures; and, although in many cases the engineers were able to secure the plans of the more important steel structures, the field parties were required to obtain sufficient data to compute the tonnage in case it was impossible to get these plans.

The field parties were also instructed to note the character of the land and improvements adjoining railroad property, and record such other information as was necessary for a comprehensive understanding of the conditions attendant on the construction of a railroad in that locality.

The time allotted for the completion of the work is one year, and although this is a comparatively short period in which to introduce a premium system in field work, it was decided to inaugurate such a system as would be as nearly satisfactory as possible under the conditions. A record of each field force for each day in each month was made on profile paper, using the horizontal lines to represent the number of tracks, and the vertical lines to represent distance. Two horizontal lines were allowed for single track, four for double track, and so on. One mile was allowed for each vertical division of the paper, and, in awarding the premium, there was taken into consideration, not only the extent of territory covered by each field party, but much consideration was given to the field notes, and a cash prize was awarded each month. 265

The results of the organization and encouragement to the field parties are shown by the very great increase in the amount of work per man of the field parties, which was nearly 300% during the time the parties were in the field.

A great many questions hinging on interstate commerce, and involving Fundamental, State, Federal, and International Law, are embraced in the broad view of the valuation of railroad properties. The movement of rolling stock through various States, and between the United States, Canada, and Mexico, and the determination of the situs and domicile of floating equipment, are subjects which, not only require considerable knowledge of railroad operation, but involve many questions not clearly determined by the Courts.

The subject is of such great importance that steps should be taken to formulate methods of procedure, and, at the Annual Meeting of the Society, the speaker will offer a resolution requesting the appointment of a Special Committee to determine the proper methods to be used in the valuation of public utilities.

J. Martin Schreiber, M. Am. Soc. C. E.—Engineers and those generally interested in the valuation of public service properties are fortunate in having the valuable information embodied in this paper. Although there are some points on which the speaker differs with the author, the following remarks are only offered in order to bring out, from experience, some further phases of the subject, rather than as an attempt to criticize.

A great deal is heard about the exact cost of reproduction, also arguments in reference to the proper allowance for contingencies, probably only involving a small percentage. The speaker questions the propriety of advocating the exact cost figures. The carefully checked cost figures of reliable contractors, with first-class engineering organizations, submitting proposals on the same construction, are often found to vary from 5 to 15% from the total cost. Different organizations will sometimes be the cause of figures varying 5% or more, depending on the efficiency and experience of the corps. A clever purchasing agent will reduce an apparently precise estimate on equipment or supplies as much as 10%; on the other hand, the condition of the market may be such that the actual price paid exceeds the estimate by the same percentage. Engineers who are responsible for estimating on, and the execution of, construction projects generally add more than 10% for contingencies, as it is practically impossible to anticipate them, and a precise estimate is almost certain to fall short. It is unfortunate that it is almost impossible to sustain contingency figures on the witness stand; for that reason, probably, it would be more satisfactory to the lay mind, and to the various courts, boards, etc., which are required to pass on valuations, and do not thoroughly understand the technicalities of the situation, if engineers would drop the contingency item and modify the quantities or the unit prices. 266

If it is possible to estimate the exact cost of reproduction, certainly considerable variation may be expected from independent sources in computing depreciation and present values. Yet there are reputable engineers who would have one believe (assuming that they know the cost of reproduction) that by a simple field inspection they are able to compute the exact present value.

Some time ago, the speaker heard an expert testify in the interest of a certain city, for tax purposes, with reference to the value of a piece of street-railway track. He first stated the valuation for reproduction, and then the definite present value. The latter was greatly in excess of the actual value. The expert, who was an engineer of considerable standing, on cross-examination, did not know the height of rail from top of head to bottom of groove, either at the joint or any other part in its length; he did not know the exact depth of flange of the car wheels which operated over that track, the headway, or the exact weight of the cars used. He had assumed the condition of the ties, and that the track was ballasted. Finally, he was compelled to admit that his determination of the depreciation, by simply a field inspection, was a very rough approximation. Now, it is not in every case in the past that a corporation attorney, even with engineering assistance, has been able to point out unfair testimony. Many times the speaker has heard incompetent testimony admitted, on the general principle that the witness was an engineer of note, even though his record had been made in other specialities. Too much stress cannot be put on this phase of the subject, and the speaker is glad that the author has mentioned the fact that the personnel of those doing appraisal work should be of the highest order. In the past it is probable that the failure to discriminate properly in accepting incompetent testimony (not to mention prejudiced testimony) was automatic, and this is the most important reason for much of the hostility of officials of public service properties toward all forms of investigation, as the author mentions.

Company officials know that they are often compelled to employ and train specialists to furnish, within fairly accurate limits, the very information which is being sought, and naturally they are skeptical about the data presented by those who, though not intimate with the property, purport to give exact cost figures. Any one who is able to point out a consistent method whereby these exact figures may be

obtained surely will obtain credit for a valuable contribution toward the solution of the complex subject of valuation.

Referring to the valuation of the property of the Detroit United Railroads, mentioned in the paper, the Director of Appraisals for the city estimated that the cost of the complete appraisal of the property, which includes about 220 miles of single track, would be from $3,000 to $4,000. Approximately, $25,000 has already been spent, not including the expense sustained by the company, which furnished a large proportion of the information. 267

Probably correct present value estimates which include depreciation may not be even fairly approximated without intimate knowledge of the particular property, and this should embody operation, policy of management, past performance, study of historical cost (as far as the records will permit), estimated cost of construction, and actual cost of maintenance. The life of a piece of track or equipment, disregarding obsolescence and extraordinaries, generally depends on the type and details of construction, the service it has done, and the service that will be required of it. Renewals should be made when the cost of repairs reaches a certain figure, other conditions being favorable. It is a fact that able engineers, intimately acquainted with the case at issue, and employed on the same property, often have conflicting ideas in reference to the life of track or equipment, one recommending immediate renewal and another advocating longer operation.

The speaker does not intend to argue against the possibility of placing fairly accurate values on reproduction or present value, but wishes to bring out the fact that it is not as simple as the lay mind is often led to believe. Further than that, he is of the opinion that the following is essential for economical and satisfactory valuations for all concerned:

(1) There should be co-operation of the appraisers with the public service property officials, including operators, engineers, and their records.

(2) Present values should be determined by:

(*a*) Cost of reproduction,

(*b*) Mortality tables,

(*c*) Data of performance,

(*d*) Field examination.

(3) The organization for the appraisal work should be of sufficient scope, and should be allowed the time and funds which the project reasonably requires.

(4) The appraisers should be carefully selected, the personnel including men who have had wide experience in the particular class of operation; and specialists should be obtained if necessary.

Mr. Riggs states that the valuation should be the same, regardless of the principles at issue. It seems questionable to consider the fair value which involves the non-physical value in costs or tax regulations. Certainly, in the case of street railways in cities, where a percentage is levied on the gross receipts, the non-physical valuation, only representing present value, is necessary. Again, a physical present value for taxation should not include the value of paving in the street in the strip occupied by street-railway tracks. That the street-railway company often pays an arbitrary assessment tax and keeps the paving in repair, though it is in no way responsible for the wear, should be sufficient to offset any obligation for other taxes. In some States this is fixed by the Courts. The physical valuation, however, intended to be used in connection with rates, cost, or capital regulation, should include the cost of paving the railway strip. Referring further to the question of including the paving in the physical valuation of street railways, in the case of a decision of R. W. Tayler, Arbitrator, in the proceedings between the Cleveland Electric Railway Company and the City of Cleveland, on a basis of a renewal of franchises, Judge Tayler said: 268

> "Paving represents actual money expended. It belongs to capital account, and in its depreciated form is worth all the allowance that I have given it."

Also for rate-making and the capital regulation some consideration is certainly due to obsolescence and change of art, while in taxation they should not be included.

In conclusion, the speaker is optimistic enough to believe that the problem of physical valuations will be solved satisfactorily for all concerned. Co-operation of officials of the public service properties, reliable testimony, with a better understanding by the Courts, will certainly tend to clarify the situation. Non-physical values are very difficult to determine, and their intelligent treatment will require some well-defined procedure. Mr. Riggs' valuable paper will go a great way toward producing a correct idea of the general proportion, and will, no doubt, assist in the formulation of proper methods for valuation.

Clinton S. Burns, M. Am. Soc. C. E. (by letter).—The author is to be congratulated on the detailed care shown in the presentation of this subject. Perhaps few engineers who have not been called on to cope with the subject of valuation of properties, realize or appreciate the real complexity of the many varied problems encountered in work of this class. To those who are engaged directly in appraisement work, this paper will be a welcome contribution to the literature on the subject.

The author's statement that if a commission of engineers is directed to report the true cost of reproduction, depreciation, or present value of a certain property, the final figures should not differ, whether the report is to be used as a basis for reorganization, sale, rate purposes, or taxation, is open to argument. It seems proper that, if a property is appraised in order to fix a selling price to a Government or municipality exercising its right to purchase, the final figures should be based on current prices of labor and material, because this does no injustice to either party. It is evident that if the seller secures payment for his property based on current prices, he may, if he desires, reinvest the proceeds of the sale in similar enterprises at current prices, so that thereby he secures the same benefits, whether prices are high or low. 269

It is equally evident that if the purchaser (the municipality) chooses to purchase the property, the right to purchase must be exercised at the particular time permitted by the franchise. If prices chance to be abnormally high at that time, the municipality is exactly on a par with what it would be if compelled to build its own plant at that particular time; while, if prices be abnormally low, the same relative situation still exists. There seems, therefore, to be no possible injustice to either party in using current prices, when the object is a sale or transfer of the property. However, in determining a proper value as a basis of rates, another factor must be considered. It is inexpedient and against public policy to make frequent changes in the rate charged for such commodities as water, gas, or electric current. Theoretically, the rate could be fixed each year, based on an annual valuation of the property, thus permitting a high rate one year and perhaps an abnormally low rate another year; but, practically, this is impossible, for, aside from the inconvenience of such a cumbersome system, no community is well enough informed as individuals to comprehend any reason whatever for ever raising rates. Raising rates is invariably accompanied by a wave of indignation. However, it is apparent that a series of rates based on an annual current price valuation of the property would average exactly the same, during a term of years, as though the property were valued once for all on the basis of the average prices of labor and material for the same term of years, and the rate based on the one valuation thus determined.

If the object of the valuation is to afford data for taxation, the same argument applies as in a case of fixing rates. It thus seems proper that the object of the appraisement should be taken into consideration before it is determined whether to use average prices, or current prices, of material and labor; and, if this is correct logic, the final figures must differ according to the object in view; but, having determined the proper unit prices to be used throughout any appraisement as being the most equitable for the object in view, then, as the author well says, the appraiser must not allow personal prejudices or fancied conditions to influence his course. Above all, an appraiser must not be afraid of his client. He must not allow his personal judgment to be swerved by the latter's desires. It perhaps seldom if ever occurs that an appraiser, representing a municipality, or State, is subjected to this unconscious influence, inasmuch as his employer is merely a temporary public official, and consequently he has no client to fear. He goes into the work with a full knowledge that his employer knows little or nothing of the subject, and his only desire is to reach results which will be unquestionably fair to both parties. 270

On the other hand, the appraiser who is chosen by the owner of a plant takes hold of the work with a feeling that he is expected to report a value as favorable as possible to his client, and this feeling is reflected in the report, regardless of how sincerely or conscientiously he tries to avoid it.

One of the most intricate and yet interesting problems in appraisement work is the computation of the "going value," or "business value" which should be allowed in addition to the physical value.

In considering a competitive enterprise, such as a railway serving a community in competition with another independent railway, this problem must be treated in a different way than in a non-competitive business, such as a water-works, gas-works, electric plant, street railway, or similar enterprise operating under the protection of an exclusive franchise, or under natural conditions equivalent to an exclusive privilege.

In considering competitive enterprises, it is manifest that a railway operating under conditions more advantageous than its competitor possesses an intangible value equal to the measure of that advantage. It is not clear, however, whether it is more proper to say that the railway possessing the advantage has a positive going value, or whether the less fortunate one has a negative going value. Using the rule formulated by the author, being that of Professor Adams, with some modifications, it is evident that many properties would show

negative going values; but, as pointed out by the author, the Courts hold that public service corporations are entitled to earn:

(*a*) Operating expenses;

(*b*) Expenses of maintenance and running repair;

(*c*) Taxes;

(*d*) A sinking fund to cover depreciation and obsolescence;

(*e*) A reasonable profit on the fair value of the property.

It is improbable that a reasonable profit on the fair value of the property could be construed to mean less than the interest or revenue from a like amount of Government bonds or other non-taxable securities.

This ruling of the Courts fixes the rates at such a figure as to preclude the possibility of a deficit; from which it must follow that a negative going value cannot be created by a compulsory reduction in rates, for such action would be confiscation of property to the extent of the negative intangible value thus created; that is to say, if the Courts are right in the above ruling, then all intangible or going values are positive, and must be determined by using the most unfavorably situated railway as the basis of computation in determining the question of reasonableness of rates; and the rates in turn must be reasonable and proper before they can be applied to determine the intangible value. This raises an interesting and far-reaching query. Assume that a negative going value is the result of real competition between two roads such that the "fair value" of the less fortunate competitor is 20% less than its physical value. 271

If rates are based on this valuation, are they really fair rates? For, suppose the rates had always been maintained at a point where the less fortunate road could just support its physical valuation. Clearly, no rate could then be enforced which would compel it to operate for less than a reasonable profit on the fair value of its property, and the fair value under this assumption is 25% greater than before, due to no effort of its own, but simply to the fact that its competitor has not cut rates, and has thereby preserved the original "fair value" of the less fortunate road, and at the same time increased its own positive going value by an equal amount.

In view of this analysis it is doubtful if it is ever proper to consider the existence of negative intangible values, although it is true that the commercial value does fluctuate, and may be less than the physical value, due to rates which are too low, perhaps, or due to other temporary causes.

The method quoted from Mr. Alvord for determining going value applies to non-competitive enterprises only, as was stated by Mr. Alvord in his paper before the American Water-Works Association. This method is open to the criticism that the forecast of the business of the older works, and of the new hypothetical works as well, is reduced to a monetary value, based on the present rates, regardless of whether or not such rates are reasonable. Rates are subject to legislative control in many States, and there is absolutely no assurance that any other State may not adopt legislation at any time permitting regulatory ordinances to be enforced. Therefore, any forecast of the value of future business must be based on reasonable rates, for otherwise it is merely an unwarranted estimate based on a fond hope.

Taking into consideration the fact that rates must be reasonable, either by virtue of present laws or laws which may become effective at any time, perhaps in the immediate future, going value may well be defined as the present worth of the amount by which the anticipated profits of a going plant, operating at reasonable rates, exceed the present worth of the anticipated profits of a similar hypothetical starting plant, operating at those same rates. With this conception of going value, it is impossible for a non-competitive property to have a negative going value, and every operating plant has a positive going value, even though operating at a loss.

The whole problem hinges on the question of "what is the reasonable rate or proper return," and this should be determined in the aggregate as the starting point. The Courts have persistently dodged the issue, and properly so, whenever that question has arisen, leaving it for consideration in each particular case, depending on the stability of the business, the hazard involved, and various other local factors. 272

It may safely be conceded that this fair profit is something in excess of the return from Government bonds, and for the purpose of this discussion it matters not what figure is assumed as the fair profit—whether 5, 6, or 10%, or what-not—the theory is the same in any case. This is perhaps best explained by a practical illustration:

Take, for example, a water-works system, the physical present value of which has been determined by the method of reproduction to be $1,000,000, and denote the going value by the unknown quantity, x; suppose, further, that 6% is considered a reasonable return on the "fair value"—not yet determined, the "fair value" being $1,000,000 plus the going value, x. Therefore, the rates must be such as to produce in the aggregate an amount equal to the operating expenses, maintenance, taxes, sinking fund, and depreciation, and still have a profit of 6% on the fair value of the property. The anticipated profits of the going plant, therefore, are exactly 6% of ($1,000,000 + x) = $60,000 + 6$x$/100 per annum. The anticipated profits of the hypothetical starting plant will be negative at the start, and gradually increase, finally reaching a maximum of $60,000 + 6$x$/100 per annum.

It must be remembered that, in estimating the operating expense and income of the starting plant, as well as the going plant, the figures must be confined rigidly to the plant as it is found at the date of valuation, and in no case should any account be taken of income or operating expenses due to probable future extensions of the distribution system. Many appraisers overlook this point, and predicate the anticipated profits of the going plant on the past growth of the income account, forgetting that a considerable portion of this growth is due to extensions into new territory, and not to any material increase in revenue from the territory already served. To include income from new territory in the forecast of income is just as fatal an error as to include the anticipated expenditure of new capital in the present physical valuation. Either of these procedures is really an estimate or appraisement of some other plant, rather than the one actually under consideration.

To complete the numerical illustration, suppose it is determined that the time required to construct the hypothetical starting plant is 3 years; that a portion of the plant is put into operation at the end of the second year, taking over fire-hydrant rental equivalent to $20,000; that the revenue from private sources aggregates $20,000 during the last year of construction; that the expenses of operation, maintenance, taxes, and depreciation amount to $30,000 during this year. After the time of completion of the plant has elapsed, it has the total credit for fire-hydrant rental, and it is assumed that the revenue from private sources and the cost of operation, maintenance, taxes, and depreciation increase as shown in Table 14, which illustrates the method of computing the going value, and gives the resulting value for the case just stated. 273

Therefore, 171,005 + 0.2597x = x; hence, x = $231,000. This result is based on the assumption that the starting plant earned no interest during the construction period. If an allowance for lost interest during construction has been made and added to the capital account already being included in the physical appraisement of $1,000,000, then this must be charged back against the going value found above. This is clearly evident, because the calculations to determine going value date from the beginning of the construction period, and the lost interest during construction, therefore, is provided for in the result. Most appraisers allow an item for lost interest amounting to the legal rate of interest running for half the construction period, which, in the illustration under discussion, would be $90,000; deducting this sum, if previously included, gives $141,000 as the going value.

There seems to be no good reason for allowing lost interest during construction as an item in the physical valuation of a property, any more than for allowing all of the lost interest, up to the time when the property begins to yield a return equal to the rate of interest. It is one of the problems in finance, and is much better treated as an element in the going value, as shown in the above illustration.

One of the most difficult factors on which to agree in computations of this nature is the element of time required for the hypothetical starting plant to acquire the business. Were it not for this uncertainty, going value could be computed with mathematical precision by the method suggested.

In determining the physical valuation on the basis of cost of reproduction, such items as cost of taking up and replacing street paving over the pipe lines, cost incurred by reason of sewers and drains encountered, interference due to electric wires and conduits, interference of traffic, and other metropolitan conditions which add greatly to the cost of construction, must be allowed. Wherever such metropolitan conditions exist, there must also be present a corresponding necessity for the use of water under pressure. People use water because of necessity or convenience, and not on account of any feeling of obligation or loyalty to the water company.

TABLE 14.—Computation of Going Concern Value, Based on Reasonable Rates. 274

Year, dating from beginning of construction.		Legitimate profits of the going plant.	Hydrant, rental taken over by starting plant.	Domestic revenue of starting plant.	Interest on the starting plant.	Operation, maintenance, taxes, and depreciation on starting plant.	Total difference in anticipated profits of the two plants.	Present worth factor.	Present worth of the excess of anticipated profits of the going plant.
Construction period.	1st	$60,000 + 0.06$x$	0		If the physical validation contains an	0	$60,000 + 0.06$x$	95.2	$57,120 + 0.0571$x$

					item for lost interest during construction, the same amount must be credited to the starting plant as interest earned.				
	2d	60,000 + 0.06x	0			0	60,000 + 0.06x	90.7	54,420 + 0.0544x
	3d	60,000 + 0.06x	$20,000	$20,000		$30,000	50,000 + 0.06x	86.4	43,200 + 0.0518x
Business	4th	60,000 + 0.06x	40,000	55,000		50,000	15,000 + 0.06x	82.3	12,345 + 0.0494x
development	5th	60,000 + 0.06x	40,000	80,000		65,000	5,000 + 0.06x	78.4	3,920 + 0.0470x
period.	6th	60,000 + 0.06x	40,000	90,000 + 0.06x		70,000	0	74.7	

Total going value = 17,005 + 0.2597x
x = $231,000

If highly developed metropolitan conditions are present, new business will be acquired in the hypothetical starting plant much more rapidly than where such conditions are yet to be developed. For this reason the problem cannot be based on the early growth of the same plant, and, there being no exact duplicate of conditions in existence elsewhere, the estimate of time required for the business development period is purely speculative, and must be assumed with great care and judgment, else injustice may be done to one party or the other in the resulting going value.

It is interesting to note that, in the Michigan appraisal, the allowance of a percentage for contingencies was bitterly contested by the railroads as improper. Probably every appraiser who has been connected with rate cases has seen this same item strenuously insisted on by the corporations.

The author's query: should a corporation which is compelled to abandon appliances while yet serviceable, in response to public clamor, be allowed any item of value in the appraisal on account of such appliances, seems to be best answered in the negative. If the appraisal is for the basis of making rates, the corporation is fully compensated by the fact that its depreciation account provides for all abandoned machinery, and the average past depreciation is usually considered a fair criterion of the future. If the appraisal is for purposes of taxation, it would seem improper to levy tax on abandoned or rejected machinery or equipment. If the appraisal is to determine the present value of a property for sale under condemnation proceedings, it is likewise difficult to conceive any reason for allowing any present value on account of property abandoned or rejected, and, indeed, if such abandoned material had any value at the time of its removal, it is more than likely that such value was converted into cash at that time.

The statement that no appraiser would be justified in placing a going concern value on a property 3 years old, or 10 years old, unless the net earnings were such as to indicate that the property had a commercial value in excess of the physical property, is questionable. "Commercial value" is not exactly synonymous with "going concern value," for, as usually considered, the term "going concern value" represents the difference between a dead structure and a live one. A property might be compelled to operate temporarily at rates insufficient to return the legal rate of interest on the physical value of the property, and while this condition continued, its commercial value would be less than its physical value, and yet this same property is worth more while running than if operation ceased and the business was allowed to die.

Halbert P. Gilette, M. Am. Soc. C. E. (by letter).—In common with others who have written on the subject of appraisals, the author omits consideration of one of the most important elements of the cost of producing the property of a public service corporation, namely, the development expense.

Development expense is the deficit in "fair return" on the investment during the early years of operation, while the business is being developed to a point that will yield a "fair return" on the investment. Unless this development expense is charged to the capital account as fast as it occurs each year, it should draw compound interest up to the end of the development period. Development expense might be regarded as a part of the non-physical value of a plant, and a few years ago the writer so regarded it. Latterly, however, he has come to see that it does not differ one iota in principle from "interest during construction," and, therefore, is properly a part of the cost of production or of reproduction of the property. During the construction period, interest on the investment is charged, and properly so, as a part of the physical cost. Does this interest cease the day after operation begins? Not a whit. The owners of the property are entitled to a fair interest—a "fair return"—on their money, from the day it is invested. At first they receive it in the form of "interest during construction," which is charged to capital account. After operation begins they must either be allowed to earn more than a "fair return" during the fat years following the development period, or the deficit below a fair return incurred during the development period must be treated exactly like "interest during construction" and added to the capital account. If public service corporation managers have chosen the first of these two methods, it does not relieve the appraiser of the duty of adopting the second method; for the object of appraisals for rate-making purposes is to limit capital to a "fair return" on the investment. In brief, if there are to be no "fat years," then every "lean year" must be credited with its deficit as fast as it occurs.

This, the writer concedes, is a radical departure from such precedent as already exists, but we must not overlook the fact that we of to-day are establishing the precedents for appraisals in the future. The whole matter of valuations for rate-making purposes is still in a nebulous form, as far as the public, and indeed, as far as the Courts, are concerned. In the end it will devolve upon engineers to establish logical methods of appraisal. To do so, they must be able to look on the problem both as engineers and as jurists. Up to the present, however, this broadness of vision has not characterized most engineering appraisers, nor is it to be wondered at when the Courts themselves are in a maze.

A great deal has been heard lately about "going concern value." Ultimately, the Courts will hold that, as far as rate-making is concerned, there is no such thing as "going concern value" in the present meaning of the term. "Going concern value," in the final analysis, consists of two elements: First, development expense (as previously defined), and, second, capitalized surplus earnings. Surplus earnings are ascertained by deducting from net earnings both taxes and a low rate of interest on the investment, equivalent to interest on bonds. Many factors may affect surplus earnings; but, that "going concern value" consists largely of capitalized surplus earnings, cannot be denied. What are surplus earnings? The public replies that they are mainly the result of extortionate charges. This is doubtless correct in many cases; hence, any investigation of costs which has for its object rate-making must inevitably lead to repudiation of that part of "going concern value" which is based on surplus earnings, if the surplus is at all large. In a word, we reason in a circle if we capitalize surplus earnings, calling the result "going concern value," and then undertake to use "going concern value" as one of the factors in judging the fairness of rates. To express the problem mathematically, we cannot solve for a variable when the variable is allowed to exist on both sides of the equation. Yet that is precisely what some rate-making bodies are trying to do, and it is precisely what the Courts have often attempted to do.

To escape this confusion there is but one possible step, and that is to eliminate "going concern value" entirely. We must first determine the element of cost, which the writer terms development expense, and we must regard this item as a part of the cost of reproduction. We must next cease to consider small rates of interest as being a "fair return" on this cost of reproduction. When first-class mortgages draw 5%, it is folly to talk of 6% as being a "fair return" on capital invested in a business enterprise, especially when this 6% is figured on the actual cost of reproduction of the property. It may be that 7% is an ample "fair return" in some cases, but in others 10% will be found none too much, considering the small size of the business and the risks involved.

The writer will not at this time discuss methods of determining how a "fair return" should be estimated, but, in general, the process should be as follows: From the gross earnings deduct the operating expenses and taxes to obtain the net earnings. From the net earnings deduct a small rate of interest (equivalent to interest on bonds) on the cost of reproduction. The remainder is profit, and should be expressed as a percentage of the gross earnings. This percentage of profit can then be compared with similar percentages made by merchants, manufacturers, farmers, and other capitalists, and then it can be determined logically by comparison whether or not the profit made by a public service corporation is "fair." We must adopt this method of attacking the problem or we shall inevitably drive capital away from railway and other fields of public enterprise.

The writer estimates roughly that a profit of 10% on gross earnings, as above deduced, is about the same as a direct return of 7% on the

cost of reproducing the average steam railway.

In a recent appraisal of a street-railway system, the writer determined the actual development expense of the property, deducing it from the accounting records. It was an astonishingly high sum, even assuming only 7% on the cost of reproduction as being a "fair return." During his appraisal of all the railways in the State of Washington, for the Railroad Commission, the writer made a similar study of development expense, but this was not included in his estimate of the cost of reproduction, as it was then regarded as being a part of the "going concern value" and he was not commissioned to ascertain the "going concern value" of the railways. Not a single railway, as far as he knows, has ever presented to a State Railway Commission, or to the Interstate Commerce Commission, an estimate of its development expense along the lines indicated. Instead, the railway companies have talked in general terms of long construction periods—often claiming 20 years or more—and of great expense incurred in building up the business, and of franchise value, and of a score or more of non-provable costs. The consequence is that they have frequently lost entirely the one great item that they are clearly entitled to, namely development expense, which is an item which can be absolutely proved from their accounting records, and, therefore, rests not on the "hot air" testimony of experts, but on facts that are incontrovertible. In like manner, other public service corporations have often signally failed to prove the full worth of their properties, because their claims for "going concern value" have been ignored entirely. When a franchise expires, the "going concern value" is usually looked on by the public as worthless, nor is this view to be wondered at. 278

Mr. Riggs proposes adding to the physical value a minus "going concern value," and he is logical in doing so, if it is conceded that values for rate-making rest on profits; but this the writer does not concede for an instant. Values for rate-making cannot rest on the very thing that it is aimed to regulate, to wit, the rates charged. Until engineers and public service commissions and Courts free themselves from this confusion of cause and effect, there can be no rational theory of rate-making.

Values for rate-making must rest primarily either on the actual costs of the production of a property or on estimated costs of reproduction, including therein both interest charges during construction and the sequel thereto—development expense.

Of almost as great moment as the item of development expense is the question of depreciation. The author, in common with most engineers, holds that depreciation should be deducted. This is a consequence of regarding a public service plant as if it were a machine bought in a second-hand store. A public service plant is a device which is intended to perform a given service forever. It is true that its parts are subject to wear, and must be renewed from time to time; but the plant as a whole is everlasting, or practically so. Managers of public service corporations, perceiving this fundamental truth, have rarely established sinking funds for the redemption of any considerable part of the plant. In a great railway system the renewal of a freight car is not a proportionately larger item of expense than is the renewal of a tooth in a steam shovel bucket owned by a contractor. This fact, coupled with the permanence of the railway plant as a whole, has led railway owners to make no provision for a return of the money lost in depreciation. Railway ties in a large railway system inevitably reach a condition such that their average age is exactly half the life of the average tie. Shall a sinking fund be provided for ties? If not, where does logic place a line of demarcation? When does an element of the railway plant attain a condition of sufficient importance to warrant "writing off" some of its value from the capital account? The facts are that railway managers have not "written off" anything worthy of mention for depreciation, and, in the writer's opinion, they have been perfectly logical. Consequently, the operating expenses have been much less than they would have been during the early years, had a sum been placed annually in a sinking fund. Therefore, the development expense, as deduced from the accounting records, is less than it would be if a sinking fund were provided; and the amount of this difference is precisely the amount of the depreciation. In other words, if depreciation is to be deducted from the cost of reproduction, it must be added to the development expense ascertained from the accounting records; so that, in the final analysis, depreciation should be ignored entirely in any appraisal of a public service corporation where the object is either rate-making or purchase of the corporation by the public. One qualification to this statement is needed, however, and that is that the depreciation shall not have gone far enough to result in an average age of plant less than half the life of the plant—that being the ultimate normal operating condition. 279

Engineers have a duty to perform, in making an appraisal of the sort under consideration, which is judicial in its character and should not savor in the least of the pawnshop. The engineer engaged by a public service commission should not for an instant make it his object to "beat down the price," no matter by what far-fetched theory he may effect the result. Nor are engineers inclined to do this, except when they regard themselves merely as agents of the public by whom they are employed. Unfortunately, many appraisers have as yet failed to realize that there is a vital distinction between the dealings that should exist in public affairs and those that actually exist in private matters involving the purchase and sale of property. In the latter case, the buyer usually takes every possible advantage of the helplessness of the seller. Is the seller ignorant? See that he remains so. Is the seller hard-pushed for money? Grind down the price accordingly. Does the seller offer goods which are a bit shop-worn? Dwell on that fact, to the exclusion of all else. Such are the tradesman's arts, and such, the writer fears, have been the arts of some appraisers of public service property. 280

The writer believes that, under one form of agreement or another, nearly every kind of public service can be more economically and better performed by a public service corporation than by the public itself through employees directly hired. But if America is not to pass speedily into Government ownership and operation of all public utilities, there must be a pronounced change of attitude on the part of the public toward capital now invested in public service corporations. Even as engineers, we are apt to be unconsciously influenced in our attitude toward public service corporations, not only because of the present public attitude, but because we are often put to great inconvenience by the ill-considered resistance of the corporations whose property we are called on to appraise for the public. Our duty plainly consists, first, in regarding a public service corporation as a public agent, and, second, in allotting such values that this public agent will receive a full and fair return for every dollar judiciously and honestly spent in building and developing its property. In carrying out this plan, the writer finds it wise to study the entire financial history of a corporation, going carefully through both the construction accounts and the operating accounts from the beginning.

The desirability of analyzing the actual costs of construction, betterment, and operation of public service corporations, preparatory to estimating the cost of reproduction, cannot be too strongly urged upon appraisers. Unfortunately, many corporations refuse access to their records, or claim that the records are too incomplete to be of value. However, when they realize that from those very records can be deduced one of the largest items of cost of reproduction, namely, the item of development expense, they are certain to show as much willingness as they now show aversion to disclosing their records.

The writer has recently completed an appraisal of a street railway system, the managers of which placed at his disposal the entire accounting and engineering records. From these the development expense was deduced, and forms an item which can be demonstrated in Court, if need be, instead of being the subject of unsupported "expert testimony." As far as the writer knows, this is the first time that a street railway corporation has voluntarily opened all its books for use in an appraisal which may be made public. May it not be one of the harbingers of a far-sighted action on the part of public service corporations, which will result eventually in eliminating entirely the hostile attitude of the public toward its accredited agents?

Reverting again, and finally, to the question of development expense, it will be seen, after study, that the method of deducing it from the accounting records provides for every possible item. The cost of advertising, the cost of colonization, and canvassing by agents engaged in building up the business tributary to the corporation, the cost of developing an efficient business organization and an efficient plant—every possible item of developing the business finds accurate record in the development expense deduced from the accounting records as outlined. This may not be apparent at first glance, but a little consideration proves it to be so. If, for example, $20,000 has been spent annually for ten years in advertising to secure business, the operating expenses have been increased exactly $20,000 for each of the ten years. Consequently, the annual deficit below a "fair return" on the investment has been made $20,000 greater each year than it would have been had no expense for advertising been incurred. In other words, the deficit below a "fair return," which is the development expense, shows automatically the amount spent for every such item as advertising. The writer regards this automatic register of development expenses as being one of the most important features of his method for determining such expense. It removes the entire problem from the realm of guess-work and expert testimony, and makes it a problem in engineering economics. It involves no question as to whether or not the existing rates charged for freight, or for any other service, are fair. 281

Arthur L. Adams, M. Am. Soc. C. E. (by letter).—This paper, in spirit, diction, and contents, is a masterly presentation of the best thought and argument, by engineer specialists and the higher Courts, concerning this difficult subject—a presentation which only one intimately associated with the question for years, as has been the author, could hope to make. It is of special interest, too, because it deals fundamentally with the Michigan railroad valuation, now ten years old, and deservedly considered somewhat ancient in the evolution of what may be termed the logic of valuation methods. The frank acknowledgment of the now apparent deficiencies or errors of that work, notably in the defective method and resulting under-valuation of real estate, as well as the upholding of that which still appears to the author to be sound in principle, are excellent manifestations of the constructive and judicial spirit so necessary to the making of any substantial contribution to the art.

Unanimity of opinion in matters of detail, even among those specializing in this line of practice, cannot be expected, especially in a general discussion. Details must receive their emphasis from local coloring and local conditions. Making allowance for these local conditions in Michigan and other contiguous States—notably conditions of population and flat topography—and remembering that the basis of the paper is a railroad valuation for purposes of taxation, and not a water-works appraisal for annual rate-fixing in a semi-arid region of rapid development, or some other widely differing utility, it seems to the writer that the author has been singularly fortunate in giving expression to views with which specialists will for the most part agree.

The limitations of the logical application of the methods suggested, however, are not sufficiently defined. Early in the paper an effort is made to avoid the necessity for this, and to simplify the treatment by limiting the scope of the paper, in the following language: 282

> "This paper is confined to a discussion of the methods which should be used in arriving at a correct figure of cost of reproduction and depreciation—it does not take up questions involving the propriety of those figures when reached. The propriety or legality of using such figures as a basis for an assessed valuation, as a basis for rate-making, ... will be conceded no place in this paper."

Such a restriction, however, seems to the writer to leave the subject much confused. It is impossible to judge of the propriety or soundness of a method of valuation while ignoring its purpose and failing to point out the limitations of its logical application. To confine discussion to a consideration only of cost of duplication and depreciation of physical properties is presumably an attempt to avoid the difficulties incident to the application of such results to specific purposes, and is in line with the frequent argument of some attorneys in litigated valuations, that the engineer must not encroach on the province of the Court by having, much less expressing, any idea relative to the application of his figures to the final solution.

With this doctrine the writer has no sympathy. The engineer is essentially an economist, and no one is more fully qualified to aid, either directly or as an adviser to the Court, in the final determination of value for specific purposes, provided he is trained in the construction, operation, and valuation of such properties as are under consideration. To accept any less responsibility than this is to become party to inferior measures leading to popular misconception, and is justified only as a practicable first step toward the final realization and acceptance of the larger duty.

All suggested methods of valuation should be subjected to close logical analysis, with a view to their purpose. The unsuitability of the method used in the Michigan appraisal to many classes of appraisals is apparent, and can be readily indicated. Much space is given to justifying the appraisal of all so-called non-physical elements by the capitalization of the residue of net earnings after allowing interest on the investment in the physical properties. This the author refers to as Professor Adams' method. The addition of the physical to the non-physical values, as thus determined, is supposed to give the value of the property as a whole. It is evident that it gives, by indirection, the same total valuation as would be obtained by the direct capitalization of net earnings without any determination of physical values, *per se*, and, as a method, is therefore not what it purports to be. Since value, by this method, is in reality dependent on earnings, it follows that where rates are fixed by governmental authority, with the property value as the base, as is done annually in California in cases of privately owned water and lighting plants, the method suggested is without logical application, and the property values of such corporations must be determined and justified on other or modified grounds. Hence the necessity for dealing with such elements as so-called "going concern," franchise, and other possible assets, each independently, as is usually done in water-works appraisals, instead of collectively, as in the Michigan appraisal. 283

It should be made clear, therefore, that the method used in this railroad appraisal, for the determination of non-physical values, simply reduces the whole to one of capitalization of net earnings, and presupposes no governmental regulation of rates with the value of the property as the base; and, unmodified, has a comparatively narrow range of application.

The author seems to see difficulty ahead in dealing with rate-making by this method, for he says, near the close of his paper: "There are many intricate problems in connection with a valuation for rate-making or taxation which really belong to these undertakings, not to valuation," but, in stating some of these difficulties, he does not point out the impropriety of determining value by capitalizing that (earnings) which it may be the object of the valuation to determine and fix.

Regulation of rates by governmental authority, which means their limitation to that which is reasonable and just, will probably in the future be the purpose in the making of most valuations of the property of public service corporations, and no methods or rules for the making of appraisals can be considered as being at all complete or fairly comprehensive which do not meet the logic of such an end.

If capitalization of net earnings is to determine railroad values for rate-fixing, whatever the process, it must presuppose a fair and equitable rate, thus following the rate, instead of the rate following the property value. This is but a shifting of the difficulty; for, what constitutes a fair and just rate, irrespective of the value of the property used, is at least as difficult of determination as is the property value, irrespective of its earnings. Valuations, to be useful, must have their purposes carefully predetermined, that the right application of principles may be made.

Perhaps nowhere more than in California has thought been directed along this line, for the organic law of the State for thirty years has required the annual fixing of rates for water and light companies by public official bodies, and many important cases involving rates and valuations of large properties, chiefly in later years, have been tried. Unfortunately, the most important and best tried of these have not yet reached the United States Supreme Court. The result, thus far, is too long a story to be told now, but it may be said that capitalization of earnings in any form is not regarded as a logical basis of value under such conditions. Franchises, as they exist here, are not regarded as having value, unless from unusual circumstances. "Going concern" value is recognized, but its money measure is sought through other channels than present net earnings. 284

The author's emphasis on the necessity for eliminating the personal equation, as far as possible, is commendable, but a large exercise of discretionary judgment is inseparable from the process of appraisal. The fullest investigation of all pertinent facts should be made. Too much must not be expected from rules and formulas. They are education only. Governing principles must be understood, and subsequent procedure the writer cannot better express than in the words substantially as used on a former occasion:[47] Having considered the various factors likely to influence the value of any property under consideration, and having summarized the results, it will remain to determine the varying degrees of importance and weight to attach to each, and to decide, in view of all the attendant circumstances, what the amount is on which the company is entitled to receive a suitable return. This final solution can never be reduced to a mathematical formula applicable to all cases. The inquiry will have established approximate limitations, both as to maximum and minimum, but there will then usually be found remaining quite a wide intervening field for the exercise of discretionary judgment.

That the final result will depend to some extent on the personal equation, does not of necessity detract from its worth. It only shows the greatness of the problem, which requires for its solution the exercise of faculties higher than the application of mere formulas and mere routine, faculties which are rooted in laborious thought, in ripe experience, in moral worth.

A word concerning the use of experts on work of this class: Most valuations grow out of or grow into cases at law. Under the prevailing order, the litigants secure the services of the necessary expert appraisers, who, in the course of examination, are subjected to processes usually much better calculated to magnify than to harmonize differences, and to cloud rather than to clarify issues, to the detriment of the record, the confusion of the Court, and the attempted discredit of the witnesses and their profession. Self-defense is calculated to lead witnesses into undue reliance on rules and mathematical formulas, as direct means of obtaining the desired result, instead of aids for the final exercise of a right judgment as to the real value of the property for the purpose intended, simply because it is easier in dealing with attorneys to justify mere mathematical processes than to support opinion resting on considerations of a general character, not always readily measurable in figures. This tendency leads also to under-valuations. A change in the process of Court procedure relative to such expert evidence is needed, and the influence of the Profession, both individually and collectively, might be used to secure the appointment of such witnesses at the instance of the Court, instead of the litigants, to the great advantage, both of society and of those more immediately concerned. 285

C. D. Purdon, M. Am. Soc. C. E. (by letter).—A comparison of some of the more important items in the Minnesota valuation may be of interest. In the "Cost of Construction of Roadbed and Track," the principal items are:

Land	25.46%
Clearing and grading	21.49%
Rails	12.72%
Bridges	7.01%
Ties	6.72%

These five items amount to 73.40% of the total cost, and "Adaptation and Solidification of Roadbed" to 4.53%, the other twenty-three items amounting to 22.07 per cent.

The estimated value of "Adaptation and Solidification of Roadbed" ranges from $543 to $1,542.80 per mile, averaging $1,231.92, which includes 4½% for engineering. If engineering is omitted, the average for all roads is $1,124.95, and for "Carrying Roads"[48] $1,128.16.

The "multiplier" for cost of right of way was ascertained from the market value of land in the vicinity, as shown by late transfers, and the prices paid for right of way at about the same time; this cost ranged from 195 to 891% of the market value. Taking "all roads," the cost of land for terminals was 71.05% of the total cost of land for all purposes, but only 3.78% of the quantity.

A. Mordecai, M. Am. Soc. C. E. (by letter).—Mr. Riggs has done a valuable service in preparing this very able and painstaking paper, as the subject of the proper value of Public Service Corporation property is one but lately demanding attention. When the country was undeveloped, and the railroad companies struggling for existence, and often ahead of the needs of the people, no criticism was made; but, during the last few years, securities have increased so largely, the increased issue often being manipulated so as to accrue to the benefit of a few individuals in place of the great mass of original security holders, rates have been made and defended on the plea that the increase was necessary to pay a fair interest on the capital invested, and increases in assessments for taxes were fought and criticized to such an extent by the companies that the public seems to think it absolutely necessary to have some investigating and regulating power. It argues that the history of the past shows that we cannot depend on the officials themselves, not from any desire to be dishonest or unfair, but merely that they cannot reach the proper point of view. After years of struggling, they cannot see the justice 286

of being obliged to show their books or have their incomes disturbed, while they see a neighboring factory, owned by a like chartered company protected by patents and copyrights, greatly enlarged, and the company paying a very handsome return on an ever-increasing capital, without investigation of any kind.

No one supposes that any body of legislators or a committee selected from one should understand the situation better than the managers themselves, but the public, forced to look somewhere, demands that its representatives try to regulate these matters and see that no abuses occur, fully aware that the machinery is not perfect. It asks:

As to Capital: that the company can show proper value for the securities issued, and, if an increase is made, the sum obtained should be used for the betterment of the property;

As to Rates: the Courts have said that what the company is entitled to ask is a fair return on the value of that which it uses for the public convenience;

As to Taxes: what is the true value of the property of the company, treating it with absolute equality, as compared with that of other taxpayers?

It is to determine what these values are that the Engineer among others has been called on. The literature on the subject is increasing, and there are some decisions of the Courts which help, but there are yet perplexing and intricate questions to be determined; not to be answered by captious criticism and indignant retort, but by an honest effort to arrive at some common ground of fairness to both State and Corporation; for, after all, the Corporation is a part of the State, a great distributor of money, a large taxpayer, its stockholders men of worth and capacity, and there should be no desire to penalize it or interfere with its legitimate prosperity. The Corporation is surely dependent on the State and the good will of the people for its welfare. Mistakes have been made, no doubt, just because this common ground has not been reached, and the writer thinks that it is largely within the province of the Engineer to establish it.

In arriving at either of these values, the chief tangible asset is the value of the physical property. This can be determined with a great degree of accuracy, and though by no means alone representing any of the values, it seems to be indispensable as a basis and starting point. The balance sheets of the Corporation commence with a statement of the cost of road, plant, etc., and must be checked to permit correct deductions from the results of operation shown in them; and, for purposes of taxation, they would seem to be particularly reliable. 287

The Engineer called on to make such a valuation for whatever purpose should, under like conditions, value each item the same for all, but it does not follow that every item, including the percentages added, should appear in the total valuation for all purposes. There are legitimate charges in valuations made to determine capital which should not appear in one made for assessment for taxes. Unit prices should not change, but the purpose for which the valuation is made should properly be considered in arriving at the final figure.

To or from this valuation, especially if made to determine proper capital, there must be added or subtracted certain values for intangible property, often found by a study of the income account of the Corporation. This makes the official ask: Why make a valuation of the physical property at all if your final result depends on the income? Because it is one item which cannot be manipulated; it does not change materially from year to year; it is not dependent on rates or income; it forms a very large item in the assets of the Corporation; and it is a sound basis on which to stand.

For the purpose of determining the proper amount of securities, the cost of reproduction at present prices would seem to be the value sought; whereas, for taxation purposes, or to determine a proper selling price, the present value is what is required, allowance being made for depreciation. A railroad, for instance, might be considered as an instrument for transporting passengers and freight, and, though the ties are not new, the rails worn, and the locomotives of an old type, they do their work just as safely and expeditiously, and, if no account is to be taken of the cost of maintenance, the road might be considered to be worth as much as if new.

The officials of the Corporation are generally perfectly willing to give any facts or to furnish access to any records they may have, but are not willing to state their opinions as to prices, depreciation, etc. The Engineer is making the valuation, not they; and they reserve the right to criticize, at the proper time, both the results and the conclusions drawn from them. The Engineer should be absolutely fair and just, not using improperly the information obtained, but endeavoring to reach results which appear to be unquestionably correct. He must divest his mind of the innate desire to minimize the consequences of his decision to the Corporation, on the one hand, or to favor the State or his employer, on the other; it may be difficult, but on his ability to do this depends the success or failure of his work.

Considering the subject generally: in making the valuation of the physical property, the organization should consist of one man in charge, and under him a field organization and an office organization. The property, if large, should be divided into convenient districts, with a division engineer and necessary assistants in charge of each. Care should be taken that these assistants are competent men, though they are often hard to obtain for temporary work of this character, and there is not sufficient time in which to weed out and perfect an organization. They should be men of experience on the particular class of work to which they are assigned, and should be tactful and courteous. Stress should be laid on keeping plain, neat notes, not too crowded; on watchful care of the party working in the field, to prevent accidents, and on the necessity of absolute correctness in calculations and figures, in the multitude of which it is surprising how many mistakes will creep in unless special care is taken to check every step thoroughly. The office engineer should be equally competent, and accustomed to systematizing and analyzing, so that the results will be arranged systematically, not only as considered by themselves, but as far as possible according to the classification of the Interstate Commerce Commission, so that, no matter where made, they can be easily compared. 288

The work, if large, should be standardized. Everything to be reported should have a form for the purpose. These should be as concise as possible, calling attention to the essential information, but not in too much detail. Unit prices should be established after proper consideration.

Reproduction Value.—In ascertaining the reproduction value, the aim should be to obtain prices for which the material could be purchased and the work let to responsible parties at the date of the valuation. Real estate and depreciation are probably the two items in which there will be the largest differences in opinion as to values, and both should be determined by the personal examination of experts, following some prearranged system. One founded on the Somers system might do for the land, and certain percentages of depreciation per year, varying for the three conditions of good, fair and poor, for the structures and equipment, but the results in any case should be examined and passed upon by some one person so as to eliminate the individual equation as far as possible.

It is when the figures thus reached are before him that the Engineer finds himself confronted with many perplexing problems. To what items should percentages be added, and in what amounts? A small change in such items often makes a large difference in the total. There is not much trouble about general expenses, legal expenses, engineering, etc., as these are undoubtedly proper items to be added, and the amounts of the percentages are not difficult to determine from sufficient study of the property. Opinions on such matters will not vary greatly, but there is a difference with regard to such items as leasehold interests, solidification, contingencies, interest and taxes during construction, commissions and discounts on securities, working capital, value of the good will, and considering the property as a "going concern," about which opinions will differ much more widely. 289

Leases from the company are like any other book asset. Leases to the company should be considered as the land is considered. What is the present value of the leasehold interest for the remainder of the term for which the rental is fixed?

Present Value.—In ascertaining the present value, it would seem that something should be allowed for solidification, the amount depending on the manner in which the work was built, its age, the likelihood of damage by the elements, etc. Possibly a percentage of appreciation on the value of the earthwork and masonry would be the fairest manner in which to consider it. Due care must be taken, however, to give proper credit to good work and not put a premium on inferior construction.

A percentage should be allowed for contingencies in all cases, but this is not necessarily the same for every piece of property. The estimate is made on a completed piece of work, consequently, if done with proper care, this item should not be as large as if the estimate were made for work to be constructed; but there are many things, not seen by the estimating engineer or disclosed by available records, which must be covered by this item, such as buildings bought with the land and afterward destroyed, damages paid for reasons not now apparent, difficulties encountered in excavating wet or hard material, amounts spent in dredging, in artificial and difficult foundations, losses during construction on account of strikes, washouts, etc. These are perfectly legitimate charges, and are likely to have occurred, and proper allowance should be made for them.

It would seem that interest and taxes during construction is a legitimate charge, and therefore, in the cost of reproduction, sufficient amounts should be added to cover it. Care should be taken to make the time long enough, as engineers are often too sanguine as to the length of time necessary to complete a certain piece of work. It is true that a part of a railroad, for instance, may be completed and opened for operation, but the net revenue derived would be very different from that of the completed road with its terminals and connections.

A new corporation can rarely market its securities at par, not only on account of the chances taken by the investor, but also because, being human, he likes to think he is buying at a bargain, getting something a little below its value; consequently, inducements vary from a small discount on bonds to a share or two of stock thrown in. To what extent a reasonable discount is a proper charge against construction may be considered an open question. It might seem fair that a certain fixed percentage be allowed in valuations, to determine capital for commissions and necessary discounts, varying according to the amount of the securities. This need not cover the whole amount of the discount, but only that portion which experience would consider essential in marketing unquestioned securities. 290

Consideration of the items working capital, good will, etc., may not properly belong to the Engineer, but rather to the Statistician, except as the former hears of such items being used as an argument against the necessity for a valuation of the physical property of a corporation. It is often asked, for instance, how can a value be placed on the property of the Pennsylvania Railroad Company, with its great commercial position, its magnificent terminals, and its splendid organization, all the result of the expenditure of much time and money? It is certainly a difficult problem, but the Pennsylvania Railroad is one of the greatest properties in America, possibly in the world, and because the proper valuation of this property is surrounded with difficulties it does not follow that the valuation of the properties of all other public service corporations are equally troublesome. The very difficulty of the task shows the importance of having firm ground for the first step. Having that, it may not be as hard as imagined to take others.

Thus it is seen that there are many perplexing questions for the Engineer to consider, and many details for him to work out, in doing which Mr. Riggs' paper will materially help. Above all, the Engineer must aim to be impartial; he must arrive at such a point of view as to see both sides with equal distinctness, and judge fairly and justly, trying to determine some well-defined laws and formulas which will serve as a basis in ascertaining the values desired.

W. B. Ruggles, M. Am. Soc. C. E. (by letter).—In his discussion Mr. Lavis quotes the case assumed by the *New York Sun*, of two bridges over the Ohio River—one between Cincinnati and Newport and one 20 miles below, between villages, etc.

In 1898 the writer was employed by the Board of Supervisors of Cincinnati to put a valuation on its Ohio River bridges for purposes of taxation, and the many points of view, as to their cost and their actual value to the owners and to the communities, were at that time, and have been frequently since, considered by him. In this particular valuation the duties of the Engineer were comparatively simple and plain, for, as there were sure to be controversies on two points at least, first, as to the right of the city to levy any tax on the bridges as such, and second, as to whether any control by the city extended to the center of the river, informally but generally recognized to be the division between the cities for police and similar purposes, or only to the northerly low-water mark, the limiting boundary to the "Territory Northwest of the River Ohio," as recognized by the ordinance of 1787, it appeared to the Board to be advisable, in the earlier stages of their efforts, to avoid, as far as reasonable, any controversies concerning details of the valuation, and the writer was instructed to give the bridge companies the benefit of any doubts. 291

The railroad bridge of the Cincinnati Southern Railway, the one lowest on the river and having the little village of Ludlow at its southern end, and thus most nearly filling the conditions of one of the assumed structures of the *Sun*, is, with its railroad, the property of the city, and the Supervisors believed that, under the terms of the lease to the operating company, it should not be taxed.

Of the other four bridges, the Cincinnati and Covington Elevated Railway and Transfer Bridge—commonly known as the Chesapeake and Ohio Railway Bridge—the Covington and Cincinnati Suspension Bridge, the Central Railway and Bridge Company's Bridge, and the Newport and Cincinnati Bridge, commonly known as the Pennsylvania Railway Bridge (all noted in the order of occurrence, passing up the river), the writer had official or semi-official reports giving such details of at least the principal features of the structures that in a measure they supplied quantities, weights, and some prices; those lacking were either calculated from actual measurements taken on the structures or supplied from plans furnished by the companies, since, as the several companies relied on defeating the efforts of the supervision on legal grounds, they conceded values which otherwise might have been strenuously contested. As long as the writer knew anything of the results, the Board of Supervisors was unsuccessful in its purpose to get the bridges, as such, on the tax duplicates; but that has no particular bearing on the points raised in this discussion. Of the five bridges, three are primarily railroad bridges. The Cincinnati Southern Bridge has one footway only, on which it formerly collected tolls; all the others have footways and wagonways, and the three above the Chesapeake and Ohio Railway Bridge carry electric railways. The Newport and Cincinnati (Pennsylvania Railway) Bridge has all the features of steam and electric railways, wagonways and footways. In some particulars these bridges differ greatly, for instance, the bed-rock of the river lies at the surface of the most easterly (Pennsylvania Railway) bridge, and for each successive bridge is found deeper, as the river is followed westward, the river-span piers of the Chesapeake and Ohio Railway Bridge being 54 ft. below low water and those of the Cincinnati Southern Railway Bridge being likewise very troublesome.

The two bridges with exactly the same uses—double footways, wagonways, and electric lines—are the adjacent Suspension and Central Bridges, one having the City of Covington and the other the City of Newport at its southern terminus, but these differ most widely as to valuation. The Suspension Bridge, as reported to the writer by the late W. Hildenbrand, M. Am. Soc. C. E., with the consent of his company, was valued at only a little short of $1,000,000 as reinforced; that of the Central Bridge Company, as reduced from the reports of the engineers, was very nearly one-third, only, of that amount, both without any right of way, as real estate was in all cases listed separately. At that time, however, the traffic over the Suspension Bridge, counted in persons and vehicles passing over its several lines, was not far from as relatively greater than that of the Central Bridge as its valuation was higher, and it was more indispensably necessary, as the writer views it, than either the Central Bridge above, or the Chesapeake and Ohio Bridge below it, for in the thirty odd years of its use (it was completed in 1867), the adjoining communities had adjusted their lines of traffic to it, while that passing over the other two bridges occurred more because of little differences of convenience (not, however, to be considered otherwise than an important provision in traffic of such magnitude). 292

Disregarding other differences, such as the unit prices of 10 or 11 cents per lb. for iron paid by the Suspension Bridge Company in the time of the Civil War, compared with 4.47 cents per lb. for the new cable wire or 3.32 cents per lb. for the new structural steel, it appears to the writer that the element of more or less indispensable use by a community, as well as the greater freedom of movement in the river below by reason of there being no piers in the stream, are elements of value; but that they are items to be reduced to figures for the purpose of taxation is not so clear, any more than that there is equity in any demand that might be made that the New York Central and New York, New Haven, and Hartford Railroad Companies should be taxed on the additional $22,000,000 expended in the electrification of their lines about New York City for the comfort, convenience, and edification, not of the patrons of the roads alone, but of the public at large, without—as just concluded by an eminently able board—any marked economies in operation. There is no question in the writer's mind that any one line of railroad is several times more valuable to each individual in inland regions, such as Mexico and Arizona, than an equal mileage in Connecticut with its Sound harbors, steamship lines, good wagon roads, and numerous but non-competing railways, partly because of the relative usefulness, for which no practicable substitute could be found, and partly because these newer States have not entered on all these multifarious lines of governmental activities, such as policing and safeguarding for public health and the like, and, much as funds are everywhere desirable, could possibly defer for a time some of these developments of civic zeal. It does not appear, therefore, that the discriminations in valuations disclosed by the author's Table 1 are altogether without a good basis in relative convenience, although clearly extreme; but, as the law of most States is understood by the writer, such discriminations may not usually be made with strict regard for the legality of tax assessments.

It is true, as remarked by Mr. Riggs, that a bridge is, of itself, not usually a desirable feature of a railroad, but it must be clear that if there were no river between Cincinnati and her sister cities in Kentucky, communication between the two States might be entirely free, and the business opening for toll bridges would not exist; consequently, in these particular cases, the bridges cannot be considered undesirable. 293

One other consideration bearing on values has been at least suggested by the study of the Cincinnati Suspension Bridge. It is, as indicated, the oldest river bridge at Cincinnati, the second or third oldest over the Ohio River, and, though repaired and strengthened, it has never been supplanted by an entirely new superstructure. The next oldest bridge is the pin-connected Pennsylvania Railway Bridge, built five years later than the Suspension Bridge, but, at the time of this valuation, it had been entirely replaced by quite a different structure—even the masonry was largely rebuilt. In a degree this comparative facility with which provisions for the greater loads can be provided without condemnation of the leading features of the structures has been shown in the Brooklyn and Niagara Bridges, though not by any means perfectly, but the point the writer would make is that this element of ease of reinforcement, or with which provision can be made for greater loads, is to be considered in the author's "Physical Property Elements of Value," as doubtless he has concluded.

Henry Earle Riggs, M. Am. Soc. C. E. (by letter).—The discussion of this paper has been so full, and so much of it is devoted to bringing out methods of valuation not fully covered in the paper, that it does not appear to the writer desirable to do more than to clear up one or two matters which may have been left somewhat ambiguous in the paper, and to review the main points on which there is apparent disagreement among engineers who have engaged in valuation work.

The writer wishes to express, to those who have added so materially to the value of the paper by their discussion, his sincere appreciation and his thanks, and he regrets that, owing to the length of the paper and the extent of the discussion, it will be impossible to review all the points raised.

It would appear that there are a few matters in regard to which the writer did not succeed in making his views entirely clear; consequently, a few words on these items may not be amiss.

Overhead Charges Versus Unit Values.—The point raised by Mr. Higgins, that the determination of any percentage figures to be applied to cover overhead charges must be carefully considered in connection with the unit prices that have been adopted and applied to the items of the physical inventory, is well taken. On all valuation work with which the writer has been connected the various local conditions were taken into account, and, for each item a figure was used which, it was believed, would fairly represent such price as would be named by a contractor for the work under the existing conditions. Therefore, all elements of hazard to contractors, and contractors' profits, have been included in the unit price, leaving to be treated under overhead charges only those elements of cost which the corporation under investigation would be compelled to bear. 294

The determination of a proper set of unit prices for a valuation involves a very careful study of prices and local conditions, so that it

would appear to be impossible to establish any fixed rule which would be generally applicable to all appraisals. If the unit prices adopted be the cost to a contractor, then the overhead charges must be made large enough to cover the contractor's hazard and profit. Every appraisal should be accompanied with a report or statement, showing clearly what has been done in this matter.

Items to be Inventoried.—In reference to the items to be inventoried, the construction placed on one sentence by Mr. Newton is entirely foreign to the meaning which the writer intended to convey. Mr. Newton's statement of his own views is entirely in harmony with those of the writer.

Discount.—Messrs. Henry C. Adams and W. H. Williams have both discussed discount, and both take exception to the conclusions of the writer. This would appear to be a subject on which there is disagreement in all professions. Very able and experienced railway managers and accountants will be found on both sides. Since the paper was written, the writer has been engaged on the appraisal of a comparatively new property which was defendant in a condemnation suit. In this case, 20-year bonds were issued in 1905, and sold at an average discount of 15 per cent. The discount has been treated as an interest charge on the books of the company, and was being written off from year to year. The question arose: Should the discount balance (approximately three-quarters of the discount) be added to the physical value and paid by the parties acquiring the property; or should the loss be sustained by the owner? The treatment of the account on the books of the company was in exact accord with the writer's first contention, but a careful study of the case in hand led to the conclusion that equity demanded inclusion of the unamortized discount in this case. Had the condemnation taken place in 1925, after all the discount item had been charged against operation, no part of this amount would appear to be proper in an appraisal. This case is cited as being the only one which has come up in the writer's practice in which he has been inclined to recognize the propriety of including the item. The writer is not yet convinced that his first conclusion was in error.

Professor Adams suggests several different claims made as to the discount item. If any one of them be adopted, has suitable agreement 295
been advanced for treating the item as a capital charge? Clearly, the amount of money involved in the discount item is not paid by the company until the maturity of the bond. It is not invested in the physical property of the company until it is paid. If written off from year to year and charged against operation, or treated as a deduction from earnings or from surplus, it would hardly seem proper to include it in capital at the end of the period. The writer is open to conviction, but he has not yet been convinced of his error on this point. Happily, this is an item, the amount of which may be exactly determined from the books of any company under investigation; so that, whatever the final determination may be as to the propriety of its inclusion in an appraisal, the amount to be treated is not a matter of estimate.

One Value Versus Several Values.—The writer has called forth discussion on this point from several members, and, in view of some of the discussion, he believes that a few sentences may tend to clarify his views:

(1) An appraisal should be in complete detail, and should show fully, not only all schedules of physical property and of unit costs and depreciation percentages on which physical values are based, but should completely detail all schedules based on an examination of the books.

(2) The final summary should include every element of value which enters into the property, and which should enter into the "fair value" or "true value" of the property, if valued for any purpose whatsoever.

(3) An assessed value for taxation purposes should not necessarily include all the items in the engineering valuation; but an assessment can be made with absolute fairness if all the facts are at hand and in such form that non-taxable items are separable.

(4) If rate-making or the sale of the property be the ultimate object, the work of making rates or of negotiating the sale can be carried on to better advantage with a complete appraisal than with an incomplete one.

(5) The work in the States of Minnesota and Washington was done with one object in view. It was ultimately used for another purpose. If a low valuation is deliberately made for taxation purposes, serious embarrassment is likely to arise when rate legislation is contemplated. It will be very difficult for an engineer to sustain his position when he submits one "true value" or "fair value," with the expectation that it will be used as a figure for assessed valuation, and another and radically different one as a basis for rate-making. It would appear to be much easier to submit a complete set of schedules, showing the cost of reproducing the physical property, depreciation, present physical value, together with all other elements affecting the final value, and then to point out that certain modifications would appear to be proper in an assessment for taxes.

(6) The actual making of rates or of assessments for taxation is not a duty usually assigned to a body of engineers. 296

Mr. Dana's discussion is directed to this phase of the subject, and brings out a number of points which are suggested above very fully.

This is a matter on which engineers have radically differed in practice, and it involves a principle of valuation which should be finally determined as soon as practicable. Further discussion in connection with this paper would hardly accomplish any definite end, therefore it is left, with emphasis on the fact that there are radical differences of opinion regarding it.

Going Concern.—The discussion of this paper, taken in connection with the paper by Mr. Alvord before the American Water-Works Association, and the recent paper by Messrs. Metcalf and Alvord,[49] brings out clearly three points of view:

(1) That of Professor Henry C. Adams, stated by him in various publications, and advocated by the writer in the paper: That there is no going concern value, as such, but that all intangible elements of value merge into one non-physical value, which may be determined by a study of the income accounts of the particular property under investigation.

(2) The "Wisconsin Method," sometimes called the Cooley Method. The general principles of this are described so fully and so clearly in Mr. Gillette's discussion, under the head of Development Expense, that further explanation is unnecessary.

(3) The method advocated by Mr. Metcalf in his able discussion of this paper, and by Messrs. Metcalf and Alvord in their paper.

The writer cannot concede the accuracy of the position of Mr. Burns, that interest during construction should be eliminated from the physical valuation of the property and included as part of the "going value." Interest during construction is no less a part of the actual cost of constructing the property than the rails in a railroad or the water pipe in a water-works plant. Nor can the writer accept Mr. Metcalf's optimistic view of the probable action of the Supreme Court when it will be called on to pass squarely on the "going concern" value in a rate case. Mr. Metcalf says:

> "Certainly, as applied to water-works valuation, Mr. Riggs' statement is not justified. The Maine cases clearly include going value as an element of value on which rates should be predicated; by inference, so does the Kansas City case. In the Knoxville case it was in fact allowed by the Master."

This is all true. The Knoxville case, however, reached the Supreme Court, and the Supreme Court squarely side-stepped "going value" in the following words:

> "We express no opinion as to the propriety of these two items ['organization promotion, etc.,' and 'going concern'], in the 297
> valuation of the plant for the purpose for which it was valued in this case, but leave that question to be considered when it necessarily arises."

Judge Lurton, in upholding an intangible value in the Omaha case, and quoting among others the Kansas City case and the Gloucester and Norwich cases, which approved and followed the Kansas City case, significantly adds:

> "No such question was considered on Knoxville Water Co. [212 U. S., 1] or Wilcox *vs.* Consolidated Gas Co. [212 U. S., 19]; both cases were rate cases, and did not concern the ascertainment of value under contracts of sale."

The writer quite inclines to the views expressed by Mr. Gillette, and fails to read any approval of "going concern" or "going value," as advanced by our water-works brethren, when the determination of a value on which to base rates is the issue.

That there is sound logic in Mr. Gillette's argument for development expense—which differs in the last analysis but little from Mr. Metcalf's presentation of "going value"—the writer will admit. There are many corporations in existence to-day which have made substantial investments in creating a successful business after the physical plant was completed and in operation. It hardly seems equitable that such an investment should not be taken into account in fixing a value. The real difficulty lies in drawing the line between the really valuable property, and one which is truly a profitable investment, and that property which, by reason of poor business judgment in its creation, faulty or uneconomical construction or bad management, is not earning a reasonable profit.

The writer has given some study to the theory advanced by Professor Cooley in the Milwaukee Street Railway case, and later adopted by the Wisconsin Commission in the Antigo Water case, but is not yet ready to accept it. The hypothetical curve appears to be acceptable and reasonable, but the actual application of the formula to cases which have come under the writer's attention, fails to show a profit at the end of a period of years. If the rule be stated: "the greater the deficit in earnings the greater the value," then this method may be of general application, but it does not appeal to the writer as sound business to advocate the assigning of any non-physical or "going" value to a property unless the property has, for some years, actually been earning a return on the investment which is large enough to justify fully the claim that it is worth more than it cost, or more than its present physical value. If, during the first few years, there was a deficit, due to the expense of creating the demand for the commodity produced and building up the business to a profitable condition, it may be sound to include this element in an appraisal. The actual cost may be determined, but the cost of reproduction is pure speculation. The 298
actual cost of a ton of rail, a locomotive, a boiler, or the copper for a transmission line bought fifteen years ago may be radically different from the cost of reproduction of the same physical things to-day; but that cost of reproduction is radically determined as the things are

being bought and sold in the open market. Not so, however, with the development charge, or cost of creating a business. Conditions are not the same, they may not be at all similar.

Without arguing the subject further, the writer submits that this is a matter that requires the greatest of care in its treatment. The adoption of any rule which will assign a "going value" to a property which has been managed so that it not only has never earned a large return on the investment, but has not taken care of depreciation—a property which would not appeal to financial men as a sound investment at its physical valuation—will not only be difficult to sustain in the Courts, but will tend to discredit the entire subject of valuation.

The writer's present feeling is that the term "going concern" ought to be eliminated from the nomenclature of valuation practice, and that scant consideration ought to be given to any attempt to include anticipated profits in any manner in a valuation.

Mr. Kuichling has suggested that some further data as to the Michigan Appraisal might be of value. Unfortunately, the writer has not in available form information as to different classes of railroads. Table 15, based on the average of all the roads in Michigan, was prepared by James Walker, Chief Engineer of the Michigan Board of State Tax Commissioners, after the completion of the Michigan Appraisal. Column 2 gives the percentage of each item to the entire cost of reproduction. Column 3 gives the average percentage of conditions. The remaining four columns give the average cost of reproduction per mile on various mileage bases.

It must be borne in mind that Michigan is geographically unlike any other State in the Union, that the mileage of high-class main-line railroad is relatively small, and that there is a large mileage of cheap branch lines and logging roads. As a result, these general averages are of little value for comparison with similar figures in other States, where trunk-line mileage forms a greater percentage of the entire mileage.

In closing, the writer believes that it is but justice to himself to correct a few misleading statements in Mr. Williams' discussion which might cause serious misunderstanding of the writer's views.

Mr. Williams refers to his discussion of Professor Adams' paper before the American Economic Association in December, 1909, he also again refers to the same paper, and conveys the impression that the writer discussed this particular article in the paper before this Society.

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Reference to page 105 will show that the writer did not refer to this paper (which, in fact, he did not see until his own paper was in print), but to one written by Mr. Williams in January, 1909, and given the widest publicity, not only by its distribution in pamphlet form, but by publication in the columns of *Railway Age Gazette*.

TABLE 15.

Item.	Percentage of each item to entire cost of reproduction.	Present value. Cost percentage.	Cost per Mile, on Basis of:			
			Main track. 7,082 miles.	Main track and branches. 7,813 miles.	Main track, branches, spurs, and sidings. 10,718 miles.	Main track, branches, spurs, 2 sidings, and second track. 10,883 miles.
1. Engineering	2.7	100	761	689	503	495
2. Right of way	13.7	100	3,918	3,551	2,589	2,542
3. Real estate	0.4	100	122	110	81	79
4. Grading	10.7	99.9	3,064	2,777	2,025	1,994
5. Tunnels	0.6	95.2	162	147	107	100
6. Bridges	4.0	78.9	1,133	1,027	749	738
7. Ties	5.5	55.2	1,578	1,426	1,040	1,024
8. Rails	14.1	76.2	4,052	3,673	2,678	2,637
9. Track fastenings	1.9	77.7	543	492	359	353
10. Frogs, switches	0.7	70.7	207	188	137	135
11. Ballast	1.8	100	525	477	347	342
12. Track laying	3.2	97.6	926	839	612	602
13. Fencing	1.4	58.9	390	354	258	254
14. Crossings	0.3	70.5	86	78	57	56
15. Interlockers	0.2	89.4	71	64	47	46
16. Telegraph	0.1	52	36	33	24	24
17. Stations	0.2	75.7	580	526	384	378
18. Shops	0.1	68	305	276	202	198
19. Shop machinery	0.5	79.6	156	142	104	102
20. Water stations	0.4	71.9	103	93	68	67
21. Fuel stations	0.1	66.4	43	38	29	28
22. Elevators	0.6	75.5	189	171	125	123
23. Warehouses	0.1	71.1	37	35	24	24
24. Docks and wharves	2.7	69.3	781	708	516	507
25. Miscellaneous structures	0.6	69.4	174	158	115	113
26. Locomotives	4.4	56.4	1,274	1,154	342	829
27. Passenger equipment	1.6	71.2	452	409	299	294
28. Freight equipment	9.7	69.4	2,787	2,525	1,841	1,813
29. Miscellaneous equipment	0.3	60.3	99	90	66	65
30. Ferries and steamers	0.8	63.5	244	221	161	159
31. Electric plants	0.004	96.6	13	12	9	9
32. Terminals						
33. Legal expenses	0.3	100	95	86	63	62
34. Interest	2.6	100	747	677	494	486
35. Organization	1.3	100	373	339	247	243
36. Contingencies	9.1	82	2,602	2,358	1,712	1,695
37. Total cost	100	82.1	28,623	25,945	18,914	18,627

The writer does not care to permit to go unnoticed the imputation that he has attacked railroad officials as a class. If such inference is to be drawn from this paper, he desires to correct it.

The writer was in railway service for some years, for six years in an official position. For the past fifteen years he has been, at frequent intervals, on special service for railroads. He is at present under employment by two of the principal railways of the country. He has many warm friends in the service, many in official capacities, and he is fully cognizant of the high ability, integrity, and loyalty of railway employees, and by employees he means to be understood as including all classes, from the highest officials down.

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Inasmuch as our railroads form our greatest industry, and inasmuch as the active heads of the large roads have under their control such properties as but few in other fields are called to administer, it follows that there are hundreds—yes, thousands—of men in railway service, competent to fill any office in the land. The writer repeats: it is a pity that the demands of their work are such that they cannot give more of the benefit of their highly specialized training to the public service, and that they have so often apparently misunderstood or misconstrued the perfectly honest attempts of public officials to find a remedy for real evils.

In closing, the writer desires to say that he regrets the impossibility of treating the subjects of depreciation and fair return in a satisfactory manner without unduly lengthening this discussion.

It may not be out of place to say that, in the writer's opinion, a fair return on the average public service corporation property should be considerably in excess of the figures usually named. There is but little incentive to invest in railways, street railways, or other public service corporations, if the limit of return is to be 7%, or 8%, or even 10%, on the actual investment. This is especially true where the

hazard of investment is increased by term franchises under which the companies are operating. The writer has the most absolute confidence in the ability and integrity of our Supreme Court, and is led to believe that, on a proper showing, confiscation will not be permitted.

He also believes that, in general, the great mass of intelligent people wish only absolutely fair dealing with the corporations.

On making a full and frank showing of facts and conditions, the public service corporation which is honestly financed and honestly operated, need have little fear of ultimate justice.

The public service corporation which is administered, not to render service to the public, but to permit stock speculators to reap a harvest, can hardly hope for the same brand of justice, and it is hardly to be expected that such a corporation will welcome publicity.

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19. *Electric Railway Journal*, January 8th, 1910. p. 76.

20. December 4th, 1910.

21. *Railroad Age Gazette*, July 24th, 1908. p. 587.

22. *Engineering News*, June 16th, 1910, p. 697.

23. March 4th, 1910.

24. *Railroad Age Gazette.* July 31st. 1908, p, 627.

25. *Engineering-Contracting*, May 25th, 1910, p. 468.

26. *Railway Age Gazette*, March 4th, 1910, p. 437.

27. *Electric Railway Journal*, January 15th, 1910, p. 110.

28. Professor of Political Economy and Finance, University of Michigan.

29. For convenient reference, a set of these forms is filed in the Library of the Society.

30. Now M. Am. Soc. C. E.

31. *Transactions*, Am. Soc. C. E., Vol. LII, p. 328.

32. "Elements of Railroad Engineering."

33. Michigan Central *vs.* Powers Record, p. 500.

34. Second Annual (1888) Report of the Interstate Commerce Commission, p. 64.

35. Letter of Hon. Martin A. Knapp, Chairman of the Interstate Commerce Commission, to Hon. Stephen B. Elkins, Chairman of the Senate Committee on Interstate Commerce, covering a then pending bill providing for railway valuation, March 25th, 1908.

36. Pages 18-19.

37. C., C., C. & St. L. Ry. *vs.* Backus, 154 U. S., 445.

38. *Proceedings* of the 22d Annual Meeting of the American Economic Association.

39. Page 11.

40. Decision and order of the Railroad Commission of Wisconsin, issued August 3d, 1909, in the case of Hill *et al. vs.* Antigo Water Company, pp. 84-85.

41. Page 139.

42. Shortly after the Kansas City Water Company case and the classic decision of Mr. Justice Brewer, and since developed by the suggestions of a number of engineers, among them John W. Alvord, M. Am. Soc. C. E., whose admirable article on "Going Value of Water-Works," presented at the Milwaukee Convention of the American Water-Works Association, held in 1909, is familiar to all students of water-works valuation.

43. Page 155.

44. Page 144.

45. *Transactions*, Am. Soc. C. E., Vol. LXIV. p. 94.

46. Bulletin 21. Department of Commerce and Labor, U. S. Bureau of the Census.

47. "The Principles Governing the Valuation for Rate-Fixing Purposes of Water-Works Under Private Ownership." By Arthur L. Adams. *Journal*, Assoc. of Eng. Societies. Vol. XXXVI, No. 2.

48. The Minnesota Commission classified all roads as "Carrying Roads" or "Switching Roads," the latter being mostly Union Depots.

49. This paper will be published in a subsequent volume of *Transactions*, Am. Soc. C. E.

TRANSCRIBER'S NOTES

1. Used a comma instead of a space after every third digit from right to left in numbers of more than three digits in keeping with authors preference.
2. Table 9 on p. 228 has an error in the math. The total of the second column is $1,259,149,434 instead of $1,259,049,434. The latter does agree with the difference arrived at in the next line.
3. Added "Grand total—All assets" to last line in Table 10 on p. 230 as this description agrees with the actual totals provided.
4. Silently corrected simple spelling, grammar, and typographical errors.
5. Retained anachronistic and non-standard spellings as printed.

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