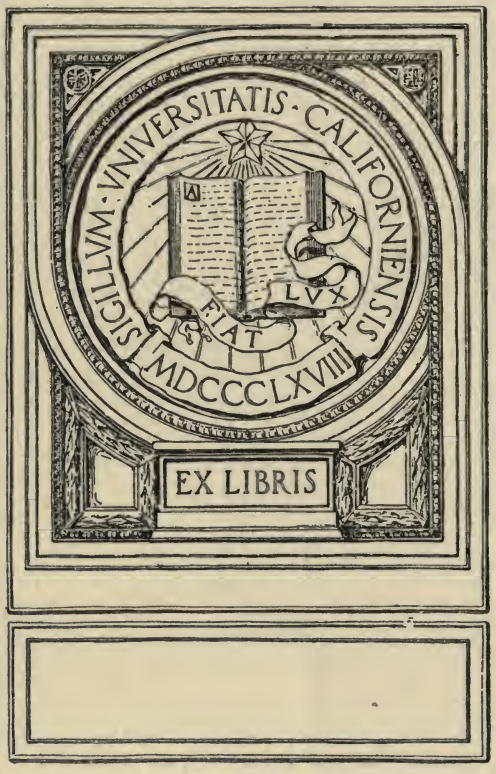
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PUBLIC UTILITIES

THEIR

FAIR PRESENT VALUE AND RETURN

BY

HAMMOND V. HAYES, PH.D.

CONSULTING ENGINEER

AUTHOR OF "PUBLIC UTILITIES: THEIR COST NEW AND DEPRECIATION"

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PREFACE

THE present volume is intended to supplement a previous study, made by the writer, of the methods to be pursued in the valuation of the property of public utilities, by entering into a discussion of the line of reasoning which must be followed by those whose duty it is to ascertain the fair present value of a property after an appraisal has been made and all necessary information has been obtained.

Likewise the subjects of going value and depreciation have been considered at some length with the hope of removing some of the present misunderstanding that exists relative to these two subjects.

It is realized that the sequence of the subjects treated in the several chapters of the present work is not as logical as it might be as, under ordinary circumstances, it would have been better to have explained the full meanings of replacement cost, actual original cost, going value, and depreciation before taking up the discussion of the subjects of fair present value and fair rate of return. It was felt, however, that much of the present controversy on the latter subjects arises from attempts of partisans on the part of the public or on the part of the utilities to advocate the methods of valuation which will produce a value conforming with their personal interests. It is hoped that, by first clearly defining the significance of fair present value, many of the objections frequently raised to certain features of valuation herein advocated may be removed.

The present study advocates the use of a method of valuation somewhat different from those that have been pursued in the past in that the use of overhead charges has been reduced to a minimum. All who have had experience in making valuations to find the replacement cost of a property know upon what little evidence most claims for the percentages added as overhead charges are based. It is felt that nothing has brought greater discredit upon otherwise careful work in appraisals than the arbitrary addition of percentages to represent overhead charges. It is believed that the method, which will be described in the following pages, of caring for the costs usually claimed as overhead charges will tend to greater accuracy and will eliminate much future controversy.

HAMMOND VINTON HAYES

Boston, Mass.,
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CONTENTS

CHAPTER I

The Present Controversy

CHAPTER II

Ascertainment of Fair Present Value

CHAPTER VII

Depreciation

PUBLIC UTILITIES:

THEIR FAIR PRESENT VALUE AND RETURN

CHAPTER I

THE PRESENT CONTROVERSY

1. Purpose of present treatise.
2. The two parties to the controversy.
3. Present confusion.
4. Points upon which agreement is possible.
5. Charges for service fair to the public.
6. Charges for service fair to the undertaking.
7. Property of undertaking.
8. Fair present value.
9. Replacement cost. Definition.
10. Original cost. Definition.
11. Depreciation. Definition.
12. Fair charges for service.

1. Purpose of present treatise. — In a previous study of the valuation of public utilities [1] the methods to be pursued in appraisals as well as the general principle underlying the ascertainment of the fair present value of the property used for the benefit of the public as enunciated by courts and commissions were reviewed.

During the past year this subject has assumed even greater importance. Many engineers and others interested in the problem of ascertaining a fair basis for rates for utilities of this character have expressed most diverse opinions as to what the basis for fair charges for service should be. There seems to be to-day little or no unanimity of opinion on any branch of this subject. In the following pages an attempt will be made to review the present attitude of the public and of students of the sub-

[1] Public Utilities: Their Cost New and Depreciation. H. V. Hayes, D. Van Nostrand, 1913.

ject and to indicate on as broad lines as possible the true relation which it is believed should exist between public utility companies and the users of the service furnished by such companies.

The present discussion will be confined to cases where questions of rates are involved and to the ascertainment of the fair value of the property upon which rates can be based. Whether the same value would be found for a property in a case of condemnation, of sale, of valuation for taxation, or for a validation of securities, will not be considered. Moreover, the entire discussion will be confined to public utilities subject to regulation by state or governmental authorities.

2. The two parties to the controversy. — There are two sides to the present controversy. Users of the service, who will be called hereafter the public, and the utility corporation itself. There is a strong tendency upon the part of the public at large to regard all public service companies as over-capitalized or extravagantly operated. An impression seems to exist that officers of such companies are receiving salaries out of proportion to the value of their services and that the companies have been financed and controlled by those who have made or who are designing to make large personal profits, not by the careful management of the property but by the sale of the securities of the companies or by underwriting agreements.

There can be no question that, in some cases, there has been good ground for this feeling. Unquestionably many properties have been constructed and financed in ways that would not have been tolerated, if full publicity had been given to the financial methods employed. Unquestionably there has been extravagance in the management of many public utilities, an extravagance which would never be tolerated in a well managed private un-

dertaking. Unquestionably some of the officers of public utility corporations are receiving, for some reason, salaries far beyond the value of the service rendered. It must be admitted by both sides to the controversy at the outset that these inequitable and improper conditions must be considered as of the past. On the other hand, due recognition must be made of the fact that such conditions apply not to all but probably to only a few of the many public utility undertakings affected by legislative supervision. With public regulation properly administered, money must be raised and expended by public utilities wisely, large salaries must be paid to those competent to handle enterprises of the size and complexity of many of our large public utilities, but the extravagance of the past in the operation of such properties together with large salaries to incompetent subordinates must cease.

It is unfortunate that the case for the public utilities must be opened with the admission of such past errors on the part of some that serious prejudice is created for all. The prejudice cast upon the case of the utilities can be overcome, at the present time, only by a full disclosure of the exact present condition of each and every public utility and the establishment of some equitable method of handling the finances of such undertakings in the future.

3. Present confusion. — Nothing can be more hopeless than the confusion existing at the present time in the presentation of the case both of the utility and of the more radical representatives of the public. Both sides to the controversy appear to have joined blindly in the acceptance of a valuation as a remedy for all present troubles. Through a misunderstanding of exact present conditions this advocacy of appraisals has been stimulated by the order of Congress for the Interstate Commerce Commission to make appraisals of certain classes of public utili-

ties. There seems to be a too general feeling that, when this work has been accomplished by the Interstate Commerce Commission, there will have been established a definite basis upon which rates for service and, in consequence, the earnings of each company can be predicated for the future.

It must be appreciated that the figures obtained by appraisals will not establish the fair present value of a property upon which rates can be based. At least as far as railroads are concerned, it is impossible to see how the figures obtained in this way can have any material value as a basis for the ascertainment of specific rates for service or even for the gross income of an individual railway property as a whole. It must be recognized definitely that, even when this enormous work has been accomplished, a large part of the present controversy will remain still unsettled. It is not intended to imply that these appraisals will not be of value as an indication of the correctness of the present capitalization of the companies, but it is well to recognize at the outset that, for many undertakings, such figures will not give a basis for rate making which will be fair both to the public and to the undertaking.

Again, the whole subject is confused by the advocates of one theory or another for ascertaining the value of property. If the extreme views of each side are taken, the claims made by the utility companies are that the value of their property should be made equal to the cost of reproducing it at the present time, regardless of its original cost or of its present condition. Not only this, but that abandoned property, which had been used originally but is not now required although it is in the present possession of the company, should be given its full value. Thus in a comparatively recent valuation of great importance it was said:

"In the development of a railroad system, it not infrequently happens that a portion of the original line is abandoned. The interests of the public justify the reconstruction of a certain portion of the old line, reducing the grades, and perhaps serving new localities, and in the end the old line is abandoned. This old line, however, is represented by capital which has been issued, and upon which a return has been paid since the beginning. It would not seem reasonable to require the reduction of rates on account of the abandonment of the old line. The capital representing this line is still entitled to a return, and if it is held that this capital should be retired out of earnings, the rates should rather be increased, for a time at least, in order to effect this result." [1]

On the other hand, a large portion of the users claim that the value of the property of the utility upon which rates should be based should be the original cost of that property now actually in service and useful to the public, less the loss in value which has arisen from the years that the property has been in service. In other words, the value of the property is to be measured by the sacrifice made by the stockholders in the production of the service. Thus the value of all property not now in use should be excluded from an inventory designed to show the capital of the company upon which the public should pay a return. The difference in dollars between the actual cost and the reproduction cost of the same property will be extremely great in many cases, particularly in those where land forms a considerable portion of the property. As a result the question of whether the so-called "unearned increment" in land values can be included properly as a portion of the value of the property of a public utility upon which the fair return should be figured has been the subject of special controversy. This question is of particular importance to railroads owing to their large holdings of land.

[1] Report of the Joint Commission on the N. Y., N. H. & H. R. R. Co., 1911. Pages 57–58.

The problem before the country is to find some way of removing the present confusion and establishing some method of ascertaining a value for property which will satisfy the public as well as the undertaking.

4. Points upon which agreement is possible. — When this subject is reviewed in the broadest way and all decisions of courts and commissions are examined, there will be found but two points upon which the extremists of each side to the controversy will probably agree. These two fundamental points of agreement are: (1) that the method of ascertaining the fair basis for rates must be one which is fair to the users of the service, i.e., the public, as well as to the corporations, and (2) that the undertaking should be entitled to make such charges for service as will result in the aggregate in earnings sufficient to pay a fair return on the fair value of the property after caring for all necessary operating expenses, taxes, ample reserves for renewals, and enough more to create a working surplus whereby a uniform payment of the fair return will be assured during the years of lean earnings.

Upon these two points there seems little reason to expect controversy.

5. Charges for service fair to the public. — The public is not interested particularly in the various theories of valuation which are being so generally discussed by engineers and economists at the present time. It can make no particular difference to the public whether the property which is now dedicated to their use was produced largely through gifts or through money procured from the stockholders. The public is concerned simply with a desire to pay charges for service no greater than are absolutely necessary, and to the minds of most users the most usual index of the fairness of a rate is the charge for a similar service in other communities.

Whether or not this is a proper criterion for rates is immaterial; it is a measure which has much force in the minds of the public and must be recognized as of importance in any consideration of rates fair to the public.

The country at the present time is practically at the beginning of a period of regulation of public utilities by legislative authority. In the past, to a limited extent, questions of the fairness of charges for service have been before the courts relating to individual companies operating in more or less restricted areas. There has been established, therefore, a certain amount of precedent relative to the rules which should govern in a decision as to the fairness of charges for service. Attempts to reconcile these decisions, bearing upon isolated cases, with the broader problem of the regulation of all utilities have resulted in a somewhat narrow view of the entire subject and an apparent neglect of the fact that the charges for service in one community have a distinct influence upon the charges for a similar service in a similar community elsewhere, even though the companies furnishing service in the two communities are entirely distinct. However, if the charges for service of utilities furnishing similar service in other communities are considered, even a superficial examination of the subject would convince one that the public has become accustomed to consider a more or less definite charge as applicable for each class of service for similar communities. It is necessary, therefore, that definite reasons should be offered to convince the public that any charge in one community in excess of that conceived as standard can be justified by special local conditions.

Leaving out from the present discussion the case of railroads and considering only public service companies which furnish service in restricted communities, such

as gas, water, electric light, street railways and possibly telephone companies, it is manifest that a comparison between the rates charged for service of these kinds to be fair must be confined to communities within the same state. This is true for the reason that each state has its own system of taxation, its own laws governing the treatment of company employees and, in a measure, is affected equally by the cost of the material and labor required in the construction and operation of the property.

Likewise it is apparent that the rates for one community can be compared properly only with those existing in another community of similar size or one demanding substantially an equal service output.

But rates which conform within a state in communities of equal activity are not necessarily fair to the public although such a consistency in rates would go far toward relieving much of the present contention on the part of the public against charges for service.

The public is called upon to pay through the charges for service, taxes, fair and proper operating expenses, and a fair return upon the fair value of the property employed by the several companies furnishing the public with the desired service. The fair value of the property of each undertaking enters, therefore, as an element of some importance in determining whether charges for service are fair.

It is a simple matter to obtain for each class of service in each community the taxes and proper operating expenses and to so group the communities as to find a fair mean figure for groups of enterprises with similar outputs. There is, however, at the present time an absence of any figures, derived by the same authority using the same method of valuation, which will show the value of the properties required for the production

of the different classes of service in the different communities. Until the fair values of all such properties within a state have been ascertained, the average fair charges for service for each group cannot be known. Moreover, there seems every reason to feel that the sporadic valuation of individual corporations will do but little to solve the present misapprehension as to what rates are fair both to the public and to the corporations. The present work of the Interstate Commerce Commission in the valuation of all railroads in the country is a distinct step in the direction of finding the capital required to furnish railroad service. The work that has been done by the Wisconsin Commission has been sufficiently extended to have accumulated a knowledge of the capital required in producing definite classes of service in most of the communities within that state. It will be necessary for the public utility commissions in other states to make valuations of the properties of all utilities coming within their jurisdiction in order that definite knowledge may be obtained of the capital required to produce different classes of utility service in large and smaller communities. Until this work has been completed, decisions as to rates in special cases must be more or less unsatisfactory to the users and possibly to the utilities.

It must be definitely understood that it is not correct to argue that the average charges for service in groups of communities similar in character and in activity are those which are fair to the public; local conditions may modify such charges. Mean charges for service, therefore, are criteria of proper charges and a deviation from such a mean figure for a certain class of service requires careful consideration and explanation.

6. Charges for service fair to the undertaking. — The point, that must be emphasized particularly through-

out the discussion of this subject, is that the public should pay each undertaking the cost to the undertaking of producing the service in an efficient and economical manner and that a portion of such cost is a fair return upon the value of the property used in providing the service. The public has got to pay the cost of producing the service and in that cost is the return to the stockholders.

For communities of the same activity within the same state there should be little reason for variation in the cost of producing service and any divergence can be readily noted and an explanation offered. It is, therefore, the fair value of the property which becomes the point of real issue in the ascertainment of charges for service fair to individual corporations.

7. Property of undertaking. — It is well to call attention at the outset of a discussion of valuations to the fact that the property of a utility does not consist of perishable plant alone but of other assets, portions of which may not be useful in actually furnishing service at the present time, but are useful in that they were obtained by expenditures required in the past to bring the utility to its present operating efficiency or in that they are assets held by the company for the purpose of guaranteeing to the users a high grade of service for the future. The classes of assets here referred to are such costs as are necessarily incident to the promotion of all enterprises and must be incurred in obtaining users, and the reserves which may be held to pay for future renewals of perishable property. In addition to these assets, which will be discussed later under the heads of promotion or preliminary costs, going value, and reserves for depreciation, is the working capital without which no property can be successfully operated.

Attention has been concentrated so much of late

upon inventories of physical property that assets of the kind just enumerated have not been frequently in mind in discussions of fair value for rates. All of these assets may be portions of the fair present value. Reserves for renewals and working capital are as much a portion of the useful property of a company as are the several items of physical property.

8. Fair present value.—The Supreme Court, in the case of Smyth *v.* Ames,[1] has said that the evidences of fair present value of the property of an undertaking are (1) the original cost of the property; (2) the replacement cost; (3) the amount and market value of its bonds and stocks; (4) the probable earning capacity under a statutory rate; (5) worth of service to the public; (6) the operating expenses.

In order that the discussion of fair present value, which will be offered in the next chapter, may be understood, definitions must be given of what is meant by replacement cost, original cost and depreciation. The other evidences of fair present value need no special explanation.

9. Replacement cost. Definition.—The replacement cost of a property may be defined as that amount of money which would have to be expended at the present time to bring into existence a property identical with that of the undertaking being appraised.

In order to obtain the replacement cost, an inventory must be made, in which are recorded all the items of property, belonging to the company under appraisal, which are required in producing service. The replacement cost of most of the items of plant is obtained by multiplying the number of items of the same kind, as shown by the inventory, by the total cost, both of labor and material, which would be incurred should new and

[1] Smyth *v.* Ames, 169 U. S. 546 (1898).

similar items be placed, at the time of the valuation, in the same position in the plant as those under appraisal.

10. Original cost. Definition.—The original cost is the actual cost of the items of property now in service for the benefit of the public.

The actual original cost can be obtained from the same inventory that is required to ascertain the replacement cost. The replacement cost is the cost obtained by multiplying the number of items of the same kind by their cost at the present time. The actual original cost is found by multiplying the same items by their cost at the time that they were purchased and placed in the plant for the purpose of producing service. A full consideration of the actual original cost of a property is given in Chapter V.

The actual original cost does not mean what the original property cost but rather what the present property cost. The items of property are the same in a determination of actual original cost as they are in a determination of the replacement cost. The unit costs — i.e., the cost of each item in place — however, may be different. The increase in costs of land, of material, and of labor has been such in the past that, in most appraisals, the unit costs used in ascertaining the actual original cost will be found to be less than those used in the calculations of the replacement cost. Naturally, therefore, the actual original cost is usually less than the replacement cost. The factor most instrumental in producing this difference will be, in a large majority of cases, the increase in the value of the land of the company arising from the growth of the community in which the property is situated.

Again, the actual original cost as well as the replacement cost are figures of costs alone without any regard to the sources of the money needed to defray them.

The actual original cost is the sum of money that was expended for a present useful property. The replacement cost is the money that would be required should the present useful property be rebuilt under present existing conditions.

Likewise the actual original cost and the replacement cost are not values but are each useful, "among other things," in a determination of value.

11. Depreciation. Definition.—Depreciation is the loss, arising from years of service, in the value of the investment of a company in perishable property. Some portions of the property of a company have a limited life and, when no longer serviceable, must be renewed. The value of the investment in each item of such property is, consequently, constantly diminishing. It is usual, therefore, to say that such property depreciates in value.

Neglecting for the moment any question of appreciation in costs, if the loss in the value of the investment in each item of perishable property is restored to the company by the users in such a way that there will always be available, at the time of renewal, money equal to the original cost of the perishable item, then the total value of the entire property remains unchanged. The values of the perishable items diminish but this loss of value is offset by money derived from the users. If the money, thus obtained from the users, is considered as an item of property, it can be said that, as the value of the original investment in items of perishable property diminishes, due to the increasing age of the items, the item of money received from users augments in a like proportion so that the total value of all items,—that is to say of the entire property of the company,—remains unchanged.

The value of the investment in a single item depre-

ciates. The sums of money obtained from the users to offset this depreciation are commonly termed "reserves for depreciation." The expression "reserves for depreciation" is somewhat unfortunate. The reserves are made for the single purpose of reimbursing the company for property destroyed in producing the service. These reserves are actually "reserves for renewals" of items which can be no longer used. The "reserves for renewals," however, do offset the depreciation in the value of the investment, and for this reason are commonly called "depreciation reserves" or "reserves for depreciation."

Reserves for renewals are obtained from users as a portion of the charges for service. If the cost of an item of perishable property has increased between the time of its original purchase and the time of its renewal, the total cost of renewal is not paid from the reserves for renewals but only that portion of it represented by the original cost. The difference between the original cost and the cost at the time of renewal must be defrayed by new money, obtained from the stockholders of the company. This means that the reserves for renewals must be figured always upon the actual original cost of each item of perishable property. Such a method of creating reserves for renewals must be employed in order to do full justice to the users. If the reserves for renewals were figured on the cost of a new item at the time of renewal, the public would be obliged to pay charges for service sufficiently high not only to amortize the original investment of the stockholders but to supply new money with which to purchase a more expensive plant. The difference between the original cost of old items and the cost of new items which replace them is, virtually, an increase in the capital cost of the property, and the funds required to make

up this difference should be obtained not from the public but from the stockholders.

The above consideration of the reserves for renewals emphasizes the importance of figures showing the actual original cost of property in every valuation. If the replacement cost alone is ascertained, it might be found, in some cases, that the reserves for renewals had been inadequate to meet the loss in value arising from years of service notwithstanding the fact that company and public had conscientiously cared for the reserves for renewals. Reserves for renewals must be figured always upon the actual original cost and never upon the replacement cost.

12. Fair charges for service.—It has been argued, in the preceding pages, that public utility enterprises, producing the same character of service within a state, could be grouped in accordance with their size or output, and that there could be found, thereby, a basis of comparison which would be of value in determining whether the costs of a similar service, furnished by an individual company, were higher or lower than an average figure.

The use of such mean figures cannot be carried too far without working serious injustice, in particular instances, either to the public or to the corporation under investigation. The public must pay the costs of service, and the costs of service in a particular instance may be larger than the mean figure of all communities within the state using an equal amount of service.

In order that mean figures may be of value the costs of service must be analyzed, and the operating costs, the taxes and those portions of such costs as are dependent upon the capital cost of the property, — i.e., the fair return and the reserves for renewals, — individually compared with the mean of similar expenses for all other similar utilities.

The necessity for such a comparison of individual elements of costs of service must be apparent. The costs of labor may be greater in one utility than in another. Similarly the taxes of a particular company may exceed the mean taxes of all similar localities. The costs of supplies may be greater, possibly owing to transportation conditions. When a mean figure has been established, however, divergences from the averages can be readily noted, explained, and justified possibly by some special local conditions.

When it comes to those portions of the costs of service, however, which are dependent upon capital cost,—return and reserves for renewals,—the problem becomes more difficult, as the return must be based upon the fair value and the reserves for renewals upon the fair original cost of the perishable property. The fair present value is not necessarily either the original cost or the replacement cost; it must be ascertained for each particular case. The correct amount for reserves for renewals must be ascertained from the actual original cost.

The proper amount to be charged yearly as reserves for renewals is, in reality, a simple problem of accounting which, by the use of figures supplied by the officials of the company with the aid of the engineer, presents no difficulties. The theory of reserves for renewals has been greatly misunderstood and, in consequence, will be given some detailed consideration in a later chapter.

The ascertainment of the fair present value is complicated by the necessity of finding such a value at the present time for new as well as for older enterprises. The fair present value of the property of a new company can be determined with relatively little difficulty. The rules, however, which might be formulated for a new company, could be applied rarely to an older company without doing great injustice to the company and

to present holders of its securities. The mutual obligations of public utility companies and the public have been recognized only during recent years. Older enterprises of this character have been financed, in the past, without special regard for the financial interests of the users. The financial methods employed were, in most cases, those which had been accepted as proper for private enterprises and would be probably so regarded to-day. For the future, public utility companies must recognize their special and peculiar obligations to the public and the fair present value of the property of a company must be the basis upon which the charges for service for the future must be formulated. What are now regarded as past errors of public utility companies must be forgotten and a fair value for rates must be established at the time of an investigation into rates for service, which will be a compromise, a compromise which will afford equal justice to both the users and sellers of a utility service. This figure, once found, establishes a new basis upon which all of the financial operations of a company will be carried out in the future.

CHAPTER II

ASCERTAINMENT OF FAIR PRESENT VALUE

13. Value dependent upon earning capacity of property.
14. Regulated public utility not a monopoly.
15. Objections to earning capacity as a measure of value.

Basis for Fair Charges for Service for New Company

16. Capitalization based on cost of property.
17. Return based on capital cost of property.
18. Public must pay cost of service.
19. Apprecation as offset to depreciation.
20. Effect of "depreciation" upon fair basis for charges.
21. Conclusion as to fair present value in the case of a new and successful company.
22. Property purchased with excess earnings.
23. Basis for fair charges for service for a previously regulated company.
24. Fair value for rates is the appraised value plus cost of extensions made with stockholders' money.

Basis for Fair Charges for Service for a Previously Unregulated Company

25. Three classes of previously unregulated companies.

Non-competitive Successful Undertakings

26. General conditions affecting successful companies having no direct competition.
27. Evidences as to value.
28. Fair rate of return.
29. Ascertainment of fair present value.
30. Reward for efficient operation. (1) Increase in fair present value.
31. Reward for efficient operation. (2) Sliding scale of return.
32. Reward for efficient operation. (3) Merit rating method.
33. Reward for efficient operation. (4) Payment of excess earnings to state.
34. Ascertainment of fair present value. Continued.
35. Conclusions relative to successful enterprises.

Non-competitive Unsuccessful Undertakings

36. Over-capitalized companies.
37. Over-built plant.
38. Over-capitalization.

Fair Value of Property of Competitive Undertakings

39. Fair value for railroad property.

13. Value dependent upon earning capacity of property.—The present difficulties in valuations are centered entirely in trying to reconcile "cost" with "value," when attempts are made to find the "fair present value" of a property.

The "fair present value" of a property has not been found even when an inventory has been made and the actual original cost or the replacement cost or both have been ascertained with the utmost care and accuracy. The value of a property can never be measured, in a practical case, by the amount of money which has been invested in it nor by what it would cost to reproduce the same property or its equivalent at the present time. The value of the property of a public utility cannot differ in this respect from the value of the properties of other enterprises. It is, consequently, not only futile but contrary to ordinary business sense to attempt to argue that either the actual original cost or the replacement cost should be assigned as the fair present value of the property of a public utility, as distinguished from the property of other classes of business enterprises.

It is unquestionably true that, when a case arises involving the justness of charges for service rendered by a public utility, the fair value upon which such charges are, in a measure, to be based cannot be predicated upon the earning capacity of the property. This is true for the reason that the earning capacity is dependent upon the charges for service. It is, likewise, unquestionably true that, in this respect, the method of reasoning in ascertaining the value of the property of a regulated public utility must be somewhat different from that which is employed usually in the case of a private undertaking. On the other hand, there must be a greater value in a public utility well planned and well managed than in one which is unsuccessful, in pre-

cisely the same way that a successful private enterprise is more valuable than one that is not earning more than its costs of operation.

14. Regulated public utility not a monopoly.—It is common, at the present time, to look upon public utilities as monopolies and, therefore, necessarily free from competitive conditions. If individual companies in restricted areas are alone considered, there is some reason for holding this view. On the other hand, while the public in such a community may be obliged to obtain a desired service from a certain utility company for the reason that there is no other company which provides the same service in that locality, still, as has been indicated already, the charges made by that company for service will be compared, constantly, by the public with the charges for a similar service elsewhere so that, to a certain extent, competitive conditions do actually exist.

Charges for service can be adjusted by legislative authority so as to bring them more nearly into accord in one community with the charges for a similar service in other similar communities. A company, of which the capitalization or the cost of operation are such that it can earn a proper return and maintain charges for service as low or lower than the mean of the charges in other communities of similar activity, is more valuable than one which is obliged to charge abnormally high rates for its service in order to earn its operating expenses and pay a return to its stockholders. In other words, the company which is able on account of the design or position of its property or on account of the ability of its management to furnish the same class of service more cheaply than a similar company elsewhere and still make ample returns to its stockholders has a more valuable property. It is more valuable owing to its greater earning capacity.

15. Objections to earning capacity as a measure of value.—Such a line of reasoning is contrary to the present interpretation of laws by the more radical partisans for the public and for the public utilities. The partisans for the public argue that, if the original capital cost of a particular property was less than the reproduction cost and if the property was obsolescent, the fair value of that property would be the actual original cost less the depreciation and that on this so-called "fair value" alone could be established the fair return to the stockholders. Any such line of reasoning is unfair to the undertaking. On the other hand, the partisans for the public utilities contend that the fair value of a property should be measured by what it would cost the public to-day to create the same property. It is argued, moreover, that as the property, although not new, was furnishing as good service as a newer property, it could have suffered no loss in value on account of age and, therefore, its reproduction cost should not be reduced by depreciation. The partisans for the utilities, therefore, contend that the fair value upon which rates should be based should be the reproduction cost-new. Such a contention if accepted and applied to all particular cases would be unfair to the public.

The problem before this country to-day is to reconcile these two divergent views and find what line of reasoning should be followed in order to ascertain the fair present value for all cases as a basis for rates.

Some light, as to what line of reasoning should be adopted in a consideration of this problem, can be obtained by a study of the case of a new undertaking starting at the present time and furnishing a new service, all of its operations being subject to regulation. If an agreement can be obtained as to the proper methods of treating the financial operations of such an ideal case,

some light will be thrown upon the treatment that should be accorded to the finances of previously unregulated undertakings.

Basis for Fair Charges for Service for New Company

16. Capitalization based on cost of property. — In the case about to be discussed it will be assumed that the company is to furnish service in a district free from competition. It will be assumed, moreover, that earnings will begin upon the completion of portions of the property and that, after a reasonable time, earnings will be sufficient to pay a return to the investors.

In such a case money will be expended in making preliminary plans, obtaining franchises, and in similar expenses which may be treated as the cost of promotion. Money will be expended in the purchase of material for construction of the plant, in the labor required to place such material in position, and in the engineering necessary for the proper disposition of the several portions of the plant. The sum of all such expenses will be the cost of the physical plant. In addition to this, money will have to be expended, from the time of the initiation of plant construction, to bring together an organization capable of supervising the construction of the plant, to perfect an organization which will get in touch with the public, will solicit business by advertising and canvassing, will gain a knowledge of the probable present and future requirements of the business and will so coordinate organization and plant that good service can be produced with the least cost. All of these expenditures require the money of the stockholders of the enterprise and, consequently, form properly a portion of the capital of the undertaking.

Neglecting for the present any questions of discount

in the sale of securities, the expenditures, legitimately made in the production of the plant and service, should equal the capital represented by the securities of the company.

Should, in such a case, the company acquire property by gift, the value of such property should not be added to the capital of the company for the reason that no money was expended in acquiring it. The capital stock of the company, under such theoretical conditions, would be the measure of the sacrifice of the stockholders in the production of the enterprise.

17. Return based on capital cost of property. — The most extreme advocates for the public's side of the case would agree that a company, started and financed as above described, would be entitled to earn a fair return — a return commensurate with the hazard incurred by the undertaking in the operation of its business — based upon the capital of the company. They would agree that the charges, made to users for the service rendered by the company, should be sufficient not only to pay such a return upon the capital cost of the enterprise but also to defray all costs of operation, to return to the company the cost or portions of the costs of the property which has become unserviceable, and to create a sufficient surplus with which the payments of returns can be equalized during years of lean earnings, thus forming, practically, a financial balance wheel. The users and the most extreme partisans for the rights of the users can raise no valid objections whatever to charges for service obtained in this manner.

Likewise, the utility companies and those acting for the interests of their stockholders would not demand, in most cases where such conditions as have been described above are found, higher charges for service obtained by requiring a return upon an enhanced value

of their property. It is impossible to see any justice in a demand for higher charges for service so long as the costs of operation and proper reserves are paid by the users together with a fair return to the stockholders for the use of the money invested by them in the enterprise.

18. Public must pay cost of service. — When, however, costs of renewals are increasing and costs of labor, taxes and operating expenses as a whole are growing faster than the income, then the utility company will be obliged to demand from the public the fulfillment of their obligations to it, i.e., to pay to the company the actual cost of the service rendered, in which cost must be included the fair return.

When users of service are not paying its cost, the utility companies can show in support of their demand for full compensation the present increased costs of operation, the increased taxes, the increased demands of users for new construction and more luxurious equipment, and can cite an unbroken line of rulings of the higher courts to prove their right to demand that the users of their service should pay the full cost of producing it.[1]

The users of the service and the advocates for their rights can raise no legitimate objection to a reasonable demand of this kind from the utilities. The users must pay the cost of service. It is difficult to persuade any one that he must pay more to-day for an article or for a special service than he has paid in the past. He may recognize the principle that he must pay the cost of what he uses, but he will question whether the costs are actual and necessary. In the case of a public utility the users of the service will question the economy with which

[1] Chicago, Mil. & St. Paul Ry. Co. *v.* Tompkins (1900), 176 U. S. 167, 177; Knoxville *v.* Knoxville W. Co. (1911), 212 U. S. 1–13; Cumberland T. & T. Co. *v.* Memphis (1908), 183 Fed. 875, 877.

the utility has been operated, whether salaries paid to officials have not been and are too great, whether the plant used in giving service is not poorly designed and located and, consequently, abnormally expensive to operate, and whether a more modern substitute plant would not give cheaper service.

In reply to any such line of attack, the utilities can show that economies have been or will be made, that if salaries are abnormally large they can be but an insignificant portion of the total cost of operation in many cases, in others that the services rendered by its highly paid officials are worth such rewards or that any excessive salaries will be reduced. A plant which is abnormally expensive to operate must be obsolescent, and, consequently, subject to renewal at an early date. The exact time when such replacement should be made is known more accurately by the company than by the public. The cost of the original plant must be returned to the undertaking by the users of the service as a portion of the cost of service under the head of reserves for renewals. The shorter the life of a unit of property the greater the reserves must be made each year and, consequently, the greater will be the legitimate charges for service. It requires expert knowledge of a high order to ascertain the time when renewals for obsolescence or inadequacy can be made with the greatest economy and fairness to both the undertaking and to the users.[1]

The utilities must recognize that it is their duty to give a required standard of service at the least cost and a failure to do so must be corrected. Moreover, the public service commissions have the right and, in most cases, the power to see that good service at reasonable charges is maintained. But if the legitimate cost of

[1] See Public Utilities: Their Cost New and Depreciation. Chap. X.

service increases for any reason, the public is bound to pay the cost of what it is using. It is likewise the duty of public service commissions to see that proper charges for service are established even though their actions may result in increased costs of service to the users.

19. Appreciation as offset to depreciation. — Public utility companies, which have failed to convince the public that the users are not paying the full costs of service and, possibly, others which seek to obtain a larger return, have attempted to prove that the present values of their properties exceed their costs and will cite another unbroken list of rulings of the courts to prove that a public service company is entitled legally to demand for its stockholders a fair return not upon the investment of the stockholders in the enterprise but a fair return upon its "fair present value." They contend that the "fair present value" must be what it would cost the public to construct a property to-day with which to furnish the same service. In other words, the "fair present value" must be the replacement cost of the property.[1]

The users and their supporters have a logical defense against such a claim on the part of the public utility companies. The users will admit that it is the duty of the public to pay charges for service sufficiently great to amortize, through reserves for renewals, the original cost of the perishable property, but as the increased value of the property of the undertaking arises mainly from the unearned increment in land, this increment for a given year should be made to offset the amount required to be paid for that year by the users as reserves for renewals.[2] They will argue that the

[1] Simpson *v.* Shepard (1913), 230 U. S. 352, 454; Stanilaus County *v.* San Joaquin & K. R. C. & L. Co. (1904), 192 U. S. 201, 214.

[2] Consolidated Gas Co. *v.* City of New York, 157 Fed. 855.

"Upon reason, it seems clear that in solving this equation the plus

increased value of land does not come to a utility because it is a utility but as a holder of land which has been dedicated to a public use; and being so dedicated, the increment added thereto from year to year by communal growth should not necessitate an imposition of additional rate burdens upon the public.[1]

The intent of the advocates of the plan of making appreciation offset depreciation is that, by such a plan, the annual costs of service will not be increased by the return claimed by the undertaking on the appreciated value of its property, and that what the undertaking may claim as its right to increased earnings will be offset by the reduction made in the annual reserves for renewals. Any such scheme will not operate, practically, so as to attain the object of its advocates.

The users must pay, as a portion of the charges for service, the costs of replacing items of property which become unserviceable. These reserves for renewals — usually called reserves for depreciation — necessarily increase the cost of service. If the amount, paid each year by the users for reserves for renewals, is reduced by the amount of appreciation in the value of the property, it would seem, at first thought, that the costs of service would be reduced. A careful consideration of such a plan will show, however, that such would not be the case.

Much of the physical property of an undertaking must be replaced from time to time. The reserves for renewals are paid to an undertaking each year for the sole purpose of restoring to the company its original investment in items of perishable property. The company uses such funds to pay for new items which replace those

and minus quantities should be equally considered, and appreciation and depreciation treated alike."

[1] *In re* Advance in Rates — Western Case, 20 I. C. C. 344.

no longer useful. If the reserves for renewals are reduced by the appreciation in the value of its property, then there will not be available funds sufficient to pay for the cost of renewals. The full value of the original investment will have been maintained, however, by the appreciation in the value of the property rather than through the reserves for renewals. The company will be obliged, in such a case, to pay for renewals with new money obtained from the stockholders. This would increase the capitalization of the company, increase the return that would have to be paid by the users and, consequently, augment the charges for service to practically the same extent as would have been the case had the appreciation in the value of the property been allowed without a change in the amount which should have been set aside properly as reserves for renewals. Charges for service will be reduced to present users by throwing a portion of costs, which they should bear, upon users of the future. Such a plan would be unjust, therefore, as between the users of the service. It fails to accomplish the object sought by the users of preventing a rise in the cost of service due to the appreciation in the value of the property. Such a plan does prevent the undertaking from obtaining a larger return upon a present capitalization and obliges the undertaking to place new money in the enterprise, thus raising its capitalization by an amount equal to the appreciation in the value of the property, that is to say, equal to the unearned increment.

The issue raised by this contention between the public and public utility companies must be met even in the ideal case under present consideration. The companies demand that the unearned increment in the value of their property should earn a return similar to the return paid upon their actual investment in useful property.

The public resents this demand and endeavors to establish a value as a basis for rates equal to the actual sacrifice made by the investors in the enterprise.

Public utility companies demand that the unearned increment be made a portion of the value of their properties for two possible reasons: (1) in order to obtain, in cases where the users will not pay the full cost of service, a fair return on the capital actually invested, or, (2) in order that they may obtain a profit, similar to what it is claimed is made by others, in the enhancement in the values of real estate.

Relative to the first possible reason for the demand for recognition of the unearned increment in land values, it is clear that the fundamental error lies in the fact that the users are failing to carry out their unquestionable obligation to the company. Likewise, when the users are not paying the legitimate costs of service and the charges are not raised by the public service commissions, then the fundamental object of legislative control is not obtained and gross injustice is done to those who have trusted to the good faith of the public and of the government. If an undertaking is not seeking a return upon its investment greater than that produced by what has been established as the fair rate, then its position is much stronger than by introducing a claim which can be interpreted only as a demand for an increased capitalization — a capitalization in excess of the sacrifice made by the stockholders in the enterprise.

If, however, the claim for the value of the unearned increment arises from a desire to obtain a profit greater than that included in the fair return upon the actual investment, the problem becomes one of finding whether the inclusion of such value does equal justice to the producer and to the users of the service.

A company providing a service for the public is given

its franchise, the right to acquire property, and, in many cases the exclusive privilege of furnishing the service within a community. The company agrees to furnish a service of a standard degree of excellence at the lowest reasonable cost. In return for the use of such service the public agrees to pay its cost and in that cost is to be included a fair return upon the value of the investment in the property required to produce that service. The public understands that the fair return is to include the profit necessarily inherent in the return upon the money invested in an enterprise of such a character. The public utility company, by claiming the value of the unearned increment, demands that the profit be increased and that the charges for service be enhanced.

The undertakings claim that they are entitled to the increased value of their land to precisely the same degree as is a private owner. They unquestionably are. The claim thus made is based, however, on a false line of reasoning. If the undertaking cites the case of a private owner of unimproved land, which is held by him to obtain the benefit of the enhanced value arising from the development of the community in which the land is situated, the owner of such land in case of sale is entitled unquestionably to the unearned increment. The private owner of such land has been obliged to pay all of the taxes and assessments upon his land from his own resources. Furthermore, he has lost all return, both interest and profit, upon his investment in the land during the years that he has held it. When he sells the land, he obtains the original cost of the land plus the unearned increment, which is partially or wholly offset by the amounts previously paid in taxes or lost in foregone returns. Such a case is not at all parallel to the case of a public utility owning land. The case is not relevant primarily for the reason that land held by a public

utility, which is not improved, cannot be included as a portion of the property useful to the service and must be excluded in any valuation designed to ascertain the fair present value as a basis for the fair return. Again, the case is not parallel for the reason that the land is not to be sold but is to be retained in use for the benefit of the public.

A case which would resemble more closely that of a public utility would be that of a private owner who had improved the land, let us say, by a factory engaged in a competitive enterprise. In such a case, the owner would be obliged to obtain a price for the goods manufactured and sold sufficient to pay the taxes, and the interest upon his original investment in the land, but he would not figure that the price of his goods should be increased each year to meet the increasing market value of his land. In figuring his assets, at a time of appraisal, the increased value of the land would be included, unquestionably, but the increment in value would be treated as a surplus to be realized only in the case of a sale and not as a basis for the charges for the product of his enterprise. The case is precisely similar when land is owned by a public utility. The users pay the taxes and a return upon the original investment so long as the land is serviceable. If the land becomes unserviceable and is sold, the increment in its value is the property of the company to be treated as a surplus. This surplus belongs to the stockholders and can be given to them or can be invested in the property and the capital thereby increased.

The only conclusion that can be reached after a careful consideration of the problem of the unearned increment in land is that as long as land is used by a utility in the production of a public service its value, in such a case as is now being considered, is what it has cost the com-

pany to acquire it. The utility cannot dispose of the land, for the reason that its business requires that the land now in use must continue, for some time to come, to form a portion of the plant required in the production of service. Any rise in the market value of surrounding property does not actually augment the value of that owned by the company because the company cannot sell it. There is a potential rise in value, however, and when the time comes that the land can be sold, the owners can obtain their desired profit but not a profit obtained from users to whom the company is bound to furnish service at its cost, in which cost is the fair rate of return.

Again, it must be emphasized that there is no weight to the argument that the unearned increment must be recognized in the value on which the return is to be figured as it is included in the value upon which the taxes which the company is obliged to pay are figured. Taxes are not actually paid by the company but by the users, as a portion of the operating costs. It is immaterial to the company whether the taxes are assessed on a high or on a low valuation, provided the public performs its duty in paying the cost of the service.

What has been just said relative to the unearned increment in land is equally true of the increased cost of materials and labor. So long as the items originally purchased can be retained in service, their value does not increase, as they are dedicated to the use of the public. Could they be sold at a price exceeding their cost, they might have greater value than that represented by their cost, but so long as they are in service they cannot be sold.

20. Effect of "Depreciation" upon fair basis for charges. — A considerable portion of the investment of most public utility companies is in property which can

be used a limited time only. The value of the investment in such perishable property is, consequently, gradually diminishing with its increasing age. This loss in value is usually termed "Depreciation." The full value of the investment can be maintained, however, provided there is restored to the company each year such sums of money that, when each item of plant can be no longer used, there will be in the possession of the company property — either money and useful plant, or useful plant alone — equal in value to its original cost. These sums of money, which must be obtained each year by the company in order to maintain the full value of the original investment, must be derived from the users as a portion of the annual charges for service. They are proper charges for service as they represent the costs of material consumed in the production of the service. These annual payments of users will be termed "Reserves for Renewals." The subject of "Depreciation" and methods that can be employed in creating "Reserves for Renewals" are discussed at length in Chapter VII.

It has been shown in the preceding pages that for a company starting new and operating successfully, the actual capital cost — in the production of the plant, organization and service — is the fair basis upon which the fair rate of return can be earned. This is true, however, only when the loss in the value of the investment in perishable property arising from depreciation has been restored by the reserves for renewals. What may be done with the reserves for renewals until such time as items of plant become unserviceable and must be renewed makes no difference whatever provided they are retained as a portion of the property of the company; they may be held in a bank or trust company subject to check, they may be invested in the securities of some other company, or they may be used to defray the cost

of extensions to the company's own property provided such extensions are needed by the public. In each case the reserves for renewals are a portion of the property of the company and when added to the depreciated value of the perishable property would maintain a value equal to the original cost. When a portion or all of the reserves for renewals have been invested in needed plant extensions, the total cost-new of the property will exceed the stockholders' investment — in the present case the capital cost of the property. The capital cost, however, would be the cost-new less depreciation or, what is the same thing, the cost-new less the unexpended balance of the contributions of users as reserves for renewals. In such a case the capital cost, the stockholders' investment, the cost-new-less-depreciation, is the fair present value upon which the company is entitled to earn a fair return.

If the above case is carried still farther and it is found at any time that there are no funds with which to defray the cost of renewals, when renewals must be made, for the reason that all reserves have been invested in the company's property, then new money must be obtained from the users to pay for renewals. This new money is a capital expenditure and becomes a portion of the capital cost even though this new money is actually expended for renewals. This method of treatment is proper for the reason that the money required for this renewal had been contributed by the users but deflected from the purpose for which it was intended and used to purchase new items of property which otherwise would have had to have been purchased with money obtained from the stockholders. The new money actually expended for a renewal is, therefore, virtually a return to the reserves for renewals of the amount which had been borrowed by the company from the reserves, and the

item or items paid for with the reserves may then be said to represent the investment made with the stockholders' money.

21. Conclusion as to fair present value in the case of a new and successful company. — The conclusion which must be drawn from a consideration of the above ideal case is that the fair present value of the property of a public utility undertaking — the value upon which the company is entitled to receive the full fair return — is the investment made in good faith in the property required in the production of the service sold to the public. This fair present value is no greater than the money actually expended. It might have greater value if sold; but so long as the property remains in the public service its fair value for rates does not increase. The value of the original investment might decrease, however, owing to the fact that much of the investment may be in plant of limited life; but the decrease, thus arising through depreciation, is offset by money received from the users as reserves for renewals.

22. Property purchased with excess earnings. — In the case under present consideration it is assumed that the charges for service are such as will pay the costs of producing the service and that in such costs are included the fair return upon the fair present value of the property. In a case like the present, therefore, there could be no excess earnings. But a company may have found it best, in some special instance, not to pay to the stockholders the full return but a portion only and with the remainder of the return to purchase property useful in the service. Where this has been done, the extensions are made with the stockholders' money and the additions to the property are capital expenditures upon which the company is entitled to earn a full return. The fair present value, in such a case, may exceed the issues of

the stock of the company but the capital cost and the fair present value will remain equal.

"In determining the amount of the investment by the stockholders it can make no difference that money earned by the corporation, and in a position to be distributed by a dividend among its stockholders, was used to pay for improvements and stock issued in lieu of cash to the stockholders. It is not necessary that the money should first be paid to the stockholder and then returned by him in payment for new stock issued to him. The net earnings, in equity, belong to him and stock issued to him in lieu of the money so used that belonged to him was issued for value, and represents an actual investment by the holder." [1]

23. Basis for fair charges for service for a previously regulated company.—The above discussion was confined to new companies operating under favorable conditions. The companies to be considered under the present heading are older companies that had been in operation for some years and later had been appraised by the rate regulating authorities, who had found and established the fair present values of their properties. When once the fair present value of the property of an undertaking has been established, that value becomes the fair capital cost, and the increase that may arise in future in such a figure can be due only to the new money invested in useful property by the stockholders. The discussion of this class of cases is, therefore, simply a corollary to that given above.

24. Fair value for rates is the appraised value plus cost of extensions made with stockholders' money.—The fair present value in cases of the present kind has been established by the rate making tribunal and it is assumed that all financial transactions of the company will be made after such appraisal in accordance with the general principles recognized to-day as proper

[1] Brymer *v.* Butler Water Co. 179 Pa. St. 231, p. 251.

for public utility undertakings. When money is needed for extensions to the property, it is obtained from the stockholders and made a portion of the capital. This increment plus the fair value established by legislative authority becomes the new fair present value. The fair present value will be equal always to the appraised value plus the stockholders' later investments if the reserves for renewals are properly made and conserved as the property of the company. Charges for service will not be increased by reason of the increasing return required on increasing capital for the reason that the increasing capital is used to extend the amount of service sold. Charges for service may increase for other reasons, such as may arise from improvements in the grade of service furnished or the increased cost of materials and labor, but the return must be the fair return upon the fair present value.

In this case, as in that above considered, there will be no change in the fair present value arising from appreciation or from successive appraisals establishing new fair values. The object of a valuation is to establish a fair present capital cost; it is made only when there is doubt as to the wisdom of previous capital expenditures or as to the actual investment of the stockholders. When once a valuation has been made and the fair present value established, that figure becomes the capital cost upon the books of the company; future capital expenditures will be added to it so that at all times thereafter the books of the company will show the fair value of the property. Thus theoretically, at least, and practically, if the books of the company can be accurately kept, there will never be required a second appraisal. There is no appreciation which can be entered as a portion of the basis of rates, nor can there be depreciation if the reserves for renewals are made in a proper manner.

Basis for Fair Charges for Service for a Previously Unregulated Company

In the preceding sections the question of fair present value has been discussed in its application to the simplest possible cases and certain principles have been laid down which will operate to do full justice to the company and to the public. It is felt that there would be little room for disagreement between utility companies and the public if these principles had been recognized in the past and were faithfully followed in the future.

Cases similar to the above are probably rare at the present time and the difficult problem before rate making tribunals to-day is to find some method whereby a fair present value can be found for companies which in the past have been financed on principles radically different from those above enunciated.

25. Three classes of previously unregulated companies.—There can be no hard and fast rules laid down for the guidance of those whose duty it is to ascertain the fair present value as a basis upon which to apply the fair rate of return for a previously unregulated enterprise. There is but one general rule that can be given, the present value assigned as the value of the property of a public utility company must be *fair*, fair both to the users and to the undertaking. The basis of rates is not *value* in the sense of market value for the reason that in a rate case there is no question of sale involved and, consequently, no *value* in that sense. It will be held throughout the present study that *value* in the ordinary acceptance of the word is not the essential consideration in the establishment of the basis for charges for service but the *fair* value is. If value in a rate case is not exchange value, then the value of the property must be found in some way through its earn-

ing capacity. It has been usually held that value in a rate case cannot be found through the earning capacity, owing to the fact that the earning capacity of a property is dependent upon the charges for service and the question at issue is whether the company's charges for service are proper. If, however, the earning capacity of a property is found not by the use of the company's present charges but by the use of charges equal to the mean of the charges for the same class of service in all communities similarly located and using a corresponding amount of service, a satisfactory measure is afforded of the earning capacity of the property. If the net earnings thus found are capitalized at the fair rate of return, a measure is established of the value of the property based on its earning capacity. This figure is a measure only of the present value; it cannot be the *fair* present value sought in a rate case until it has been compared and coördinated with the actual original cost, the replacement cost, the loss in value of the property due to depreciation, and other special conditions affecting the property. It is only by a judicial consideration, with judgment well informed by these facts and figures, that the *fair* present value can be ascertained.

Before entering upon a discussion of the methods to be employed in finding the fair present value, it is necessary to recognize that most of the valuations which will be made in the immediate future will be of companies which have been operated and financed in the past as if they had been private undertakings working only in the interest of their stockholders. There has not been a full recognition of the mutual obligations of the users and the undertaking until within comparatively recent years. Neither the public nor the companies should now be penalized because the financial methods of the

past — methods still accepted as proper for private enterprises — differ from those now regarded as obligatory upon public service companies. The fair present value must be *fair* to both users and company in view of past and present principles of business conduct.

Again, some companies have been started but recently, whereas others have been many years in service. The method of ascertaining fair present value must be one which is fair both to a new and to an old company.

Again, some companies have made large profits and are successful whereas others have been less fortunately situated, or are of inferior design and, in consequence, have been less successful. The fair present value must be established in a manner that will be fair to both classes of enterprises and to the users of their service.

And lastly, some public service enterprises are in direct competition with others, as is conspicuously the case with railroads. The methods of ascertaining fair present value must be equally fair to the competitive and to the non-competitive enterprise.

In order to consider these widely varying conditions affecting the public service companies of which the fair present value must be established, it will be desirable to divide them into three groups, as follows:

1. Successful companies unaffected by direct competition.
2. Unsuccessful companies unaffected by direct competition.
3. Companies in direct competition with others.

Non-competitive Successful Undertakings

26. General conditions affecting successful companies having no direct competition. — The most typical companies which can be included within this group are many water, gas, electric light, street railway

and similar enterprises which alone are furnishing a particular kind of service within a community of limited size. Only companies of this kind are included within this class which are successful, that is to say, have been and are able under past and existing charges for service to maintain their property, to give a service of a required standard of excellence and to pay to their stockholders dividends as large as might now be considered as a fair return upon their capital, or larger.

When such a company is investigated to find the fair present value of its property, the actual investment of the stockholders in the property of the enterprise will usually be unknown and impossible to ascertain. The present company may have been formed by the combination of several smaller companies. Much of the earlier plant may have been replaced and it may be impossible to ascertain whether the cost of discarded plant has been removed from the capital cost of the existing property. Much of the present property, likewise, may have been acquired by excessive earnings of the past and in no way by the sacrifice of the stockholders in building up the property. The fair present value cannot be found in such cases from the books of the company but recourse must be had to appraisals showing the replacement cost and the actual original cost of all of the property of the company, as well as the depreciation of that portion of the property which is perishable.

Theoretically the present case differs in no way from the ideal case above considered as far as the principles governing the fair present value are concerned. The fair present value should be the money of the stockholders invested in property at present useful in the production of the service. But the conditions in the present case differ in two respects from those of the ideal

case: (1) the stockholders' investment is unknown and cannot now be found, and (2) the financial management of the company in the past may have differed from that which would have been pursued had proper recognition been made of the full obligations of a public utility company to its users.

27. Evidences as to value.—The Supreme Court, in the case of Smyth *v.* Ames, has said that the evidences of fair value are: (1) the original cost of the property; (2) the replacement cost; (3) the amount and market value of bonds and stocks; (4) the probable earning capacity under a statutory rate; (5) worth of service to the public; (6) the operating expenses. At the time of a valuation of a particular property, figures representing each of the above evidences of value must have been obtained and be before the tribunal whose duty it is to assign the fair present value. In addition to the above figures prescribed by the courts, there must have been obtained mean figures showing the costs of operation, charges for service, actual original cost and reproduction cost of all utilities within the state furnishing an output substantially equal to the output of the company under investigation.

28. Fair rate of return.—The courts have held that, in fixing the rate of return, regard should be had to the character of the business, the locality, and the risk; as to whether the return was uniform and secure; as to whether the patronage was steady or fluctuating and quickly responsive to financial and commercial changes; as to what interest rates, legal and contractural, were customarily sought and required for like investments in the same locality. The return should be a fair, just and reasonable one and not so meager as to repel investments in the property or to embarrass the owner in operating it.[1]

[1] Missouri, Kansas & Texas R. R. *v.* Love, 177 Fed. 502 (1910).

The subject of "fair rate of return" is treated at some length in the following chapter. It is only necessary, at this point, to say that the fair rate of return is a figure, assigned by the rate regulating authorities, which will meet the above requirements in the case of the particular company under appraisal.

29. Ascertainment of fair present value. — The charges of a particular company for service depend upon three factors: the operating costs, the reserves for renewals, and the return to the stockholders. The operating costs may be assumed, for the present discussion, to be normal. The reserves for renewals must be figured on the actual original cost; on this point there need be no controversy or discussion. The fair rate of return — a rate of return fair under all conditions affecting the particular concern under investigation — may be assumed to have been fixed by the rate making tribunal. Then on these assumptions, the fair value of the property upon which the fair rate of return can be earned is the only unknown figure.

In the ideal case above considered, the capital of the undertaking was made to follow the investment of the stockholders, and the full value of that investment was maintained by means of the reserves for renewals. In the case of a previously unregulated company this correlation of capital with cost is not likely to be found. The actual original cost is obtained by a valuation of existing property using former prices. It may be found that the present capital of the company differs materially from the actual original cost found by an appraisal. Again, in the case of a company ideally financed, the capital represents the investment of stockholders in useful property. In the case now under consideration the source of the money represented by the original cost is unknown.

This subject can be best presented by a discussion of various particular cases. In any investigation as to charges for service it is natural to have some criterion and this will be assumed to be, for the cases about to be discussed, the mean of charges for similar service elsewhere. Such a figure would correspond to the evidence of value cited in Smyth *v.* Ames as the probable earning capacity under a statutory rate. In this case, however, instead of the statutory rate the mean rate would be the basis of calculations of the probable earning capacity.

The difference between the actual operating expenses plus the reserves for renewals, and the gross income calculated on the mean of charges for similar service elsewhere, would give the net return. The net return capitalized at the fair rate of return would give a value which would be the fair present value, if, by its use, justice would be done both to the public and to the undertaking.

In order that these assumptions may be more fully defined, they are shown below in the form of equations:

(1) Gross earnings = mean charges for service × output of service of particular company.

(2) Operating expenses = actual costs of operation + reserves for renewals based on actual original cost (both of particular company).

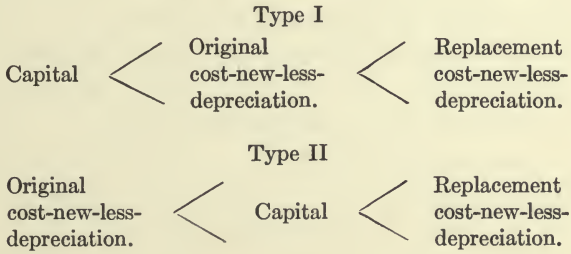
(3) Gross earnings − operating expenses = net return (based on mean charge for service).

(4) $\dfrac{\text{Net return}}{\text{Fair rate of return}}$ = capitalized net earnings.

It will be possible to discuss in detail only a few of the many types of cases that will be found in ascertaining the fair present value of all previously unregulated companies. Those that will be here presented are chosen to show the general methods of reasoning which must be

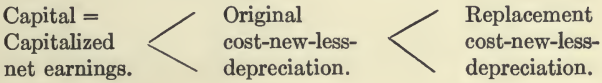
pursued in determining the fair basis for the fair return. It is easy to see that a large number of companies may fall into classes intermediate between those here considered and, consequently, that the Court was wise in ruling that the fair present value could not be found arbitrarily but only by sound and well-informed judgment.

Two general types of cases will be considered as coming under the head of successful undertakings. It will be assumed that the capital of the company, the actual original cost-new, the replacement-cost-new, and the depreciation, are known in definite figures in each particular case. The two types can be represented then by the two following expressions:



Type I. A series of cases coming under this heading may be formed depending upon the relation of the capitalized net earnings of the particular company under investigation to its capital, its original cost-new-less-depreciation, and its replacement cost-new-less-depreciation.

Type I. (*a*) The first case to be considered will be that of a company of which the net earnings capitalized, as above described, are equal to the par value of the securities of the company or



Such a condition would mean that the fair return estimated on the capital of the company when added to the operating expenses would require charges for service equal to those charged on the average elsewhere.

If the par value of the securities of the company was smaller than the replacement cost of all property less its depreciation and likewise smaller than the actual original cost-new-less-depreciation,[1] it might seem at first thought as if the fair present value should be ruled as equal to the capitalization of the company. The assignment of the capitalization as the fair present value under such conditions would not be fair to the company. The fair present value in this case should be the actual cost-new-less-depreciation.

The figures representing capitalized net earnings show that under average conditions the capitalization is normal but, on the other hand, the figures representative of the actual cost-new-less-depreciation show that the property had actually cost the company more than the par value of its securities. This difference can be explained in a number of ways, none of which will alter the conclusion that the present value based on actual cost is the present value fair both to the utility and to the public.

This difference between the face value of the securities and the cost-new-less-depreciation may be due to the fact that the company in the past had paid for many extensions of its plant with earnings which might have been paid legitimately to the stockholders. Instead of paying out such earnings as dividends, the company may have invested them in property useful to the public in accordance with what the management had believed to be a conservative business policy. As was

[1] Throughout this chapter the assumption is made that all reserves for renewals have been invested in the company's plant.

stated in the discussion of the ideal case in section 22, plant acquired with a portion of the return that might properly have been given to the stockholders represents quite as much the sacrifice of the stockholders as does money acquired through the sale of securities. Where this method of financing has been followed, the capitalization of the company is of little or no value as evidence, and the actual original cost must be accepted as evidence of greater importance.

But it may be argued that there can be no evidence which can now be offered to prove that this difference arose actually from a portion of the fair return to the stockholders which had been invested in the property. The stockholders may have obtained their full return and the difference between the capital cost and the cost-new-less-depreciation may have arisen from excessive charges for service in the past. It may be argued by the advocates of the public's interest that such excess earnings were derived from the users unjustly and that, although they have been retained by the company and made a portion of its property, still these excess earnings should be regarded as a surplus, upon which the users should not be obliged to pay a return. In support of this contention it may be argued further that this difference must be regarded as a surplus, as in this way only can equal justice be afforded both to the company and to the users; the company is enabled to show assets in excess of capitalization and, in consequence, is established in a sound financial position, whereas the public has the use of property purchased with the surplus earnings upon which it should not be obliged to pay a return.

The above line of argument is perfectly sound and reasonable when applied to an enterprise starting to-day, or to the future operations of a company which has been

investigated and for which the fair present value has been established. With such companies as have a known fair present value, earnings in excess of the fair return, if held as a portion of the property, must be regarded as a surplus upon which the users should not be required to pay a return. But the case under present consideration is that of an old company which is now being valued for the first time for the purpose of finding the fair present value of its property. By the assumptions of the present case it is not known whether the money used in building up the property was derived from the stockholders through the sale of stock or through a sacrifice of a portion of their legitimate return upon their investment. Justice demands under such a condition that the stockholders in the company should be given the benefit of the doubt. The valuation shows that the company has expended money for property now in use for the benefit of the users of a present value, based on actual cost, less than what it would cost to reproduce the same property at the present time. The present condition of the property as revealed by these figures shows that the management of the company has endeavored to work for the benefit of the service by conserving earnings and improving the property. In accordance with past accepted financial methods, all earnings might have been paid to stockholders without adverse criticism but were not, and there can now be no good reason for applying new methods of financial management to past operations provided that, by accepting past methods, charges for service would not be increased over what it would cost the users themselves to provide their own service, should they elect to do so.

The same reason would hold true even if it were known that the difference between the face value of the company's securities and the present value of the property

based on actual cost had arisen from excessive earnings in the past. In every case of this character, if the actual cost-new-less-depreciation is less than the replacement cost-less-depreciation, the actual cost-new-less-depreciation must be the fair present value.

Objection to this conclusion may be raised by the advocates of the public's interest on the ground that if the capitalized net earnings are less than the actual cost-new-less-depreciation and the latter figure is established as the fair present value, the charges for service would be higher than the mean charges for other similar communities producing substantially the same output.

There can be no doubt of the fact that, if the capitalized net earnings equal the capital of the company, if the cost-new-less-depreciation is greater than the capital of the company, and the cost-new-less-depreciation is made the fair present value, the fair return upon the fair value rather than the capital would necessitate higher charges for service. But there can be no argument based on this fact to warrant the use of capitalized net earnings or the par value of the capital as the fair present value. The costs of operation of the particular company may be higher than the average. If they could be proved to be too high, the capitalized net earnings would approach or exceed the cost-new-less-depreciation, but, in the present case, we are concerned simply with those companies where the capitalized net earnings are less than the actual original cost-less-depreciation. The only sound line of attack upon the actual cost-new-less-depreciation as fair present value and the higher charges for service that would result is as to the correctness of the figures showing actual cost-new and depreciation. But these figures have been obtained by a carefully made valuation and the figures representative of depreciation make full recognition of the obsolescence or

inadequacy which the property may have suffered. The actual cost-new-less-depreciation may be higher than the mean of other companies but, as that figure has been established by careful detailed work and is less than a similar figure based on the replacement cost, there can be little or no question of the fact that the actual conditions affecting the particular property have caused a higher initial cost.

It is true that the establishment of the cost-new-less-depreciation as the fair present value in cases of this kind will make a new capital value greater in amount than the actual face value of the securities of the company and that the return on the par value of the securities will be greater than the fair rate of return. In most cases this difference can be accounted for by a review of the earlier financial history of the company wherein capital expenditures were charged as operating costs. The time for a change in such past financial methods is that of the establishment of the fair present value of the property. If the amount of securities remains unchanged, the return may seem abnormally large to those ignorant of all of the conditions of the case, but the fair present value—the fair basis of future capital value—has been established by legislative authority; it represents the actual cost of the property less whatever loss in value it may have suffered on account of its years of service; there is included in it no unearned increment either of land or of other property; it is less than what it would cost to reproduce a similar property in similar condition at the time of valuation. When all of the facts are known and fully appreciated there can be no reasonable ground for objection to the actual cost-new-less-depreciation as the fair basis upon which the fair rate of return can be earned, at least so far as the users are concerned.

On the other hand, the stockholders, in companies which would come within the class under present consideration, would unquestionably claim that the replacement cost-less-depreciation, or even the replacement cost without deduction for its loss in value due to age, should be made the fair present value of their property.

There are two elements in this claim of the stockholders: (1) that the fair present value should include the unearned increment, and (2) that there is no loss in the value of their property arising from depreciation so long as it is producing service of a desired excellence.

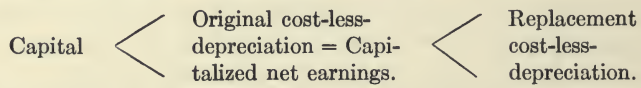
In the discussion of the value of the property of a new company it was held that the best interests of the company and the users were fostered by making that value conform with the actual investment of the stockholders rather than by making it follow the possible market value of the property; in other words, that the unearned increment should not be included, in such cases, as a portion of the value of a property upon which charges for service should be estimated. In the present case the same lines of reasoning hold good. The assignment of the actual cost-new-less-depreciation as the fair present value establishes a new capital value greater than the par value of the company's securities; the stockholders are consequently treated fairly. If the unearned increment ought not to be recognized in the case of a new company or of an older one after appraisal, there can be no possible reason in logic or in justice to the users for including it as a portion of the fair present value in such a case as that under present consideration. The stockholders cannot claim a profit from the operation of the enterprise greater than that included in a fair return.[1] This portion of the claim for replacement cost can be dismissed, therefore, as contrary to the funda-

[1] See sections 40–41.

mental principle of absolute justice to both users and stockholders.

Relative to the second portion of the claim — that there is no loss in the value of a property due to depreciation so long as it is producing good service — there are several conditions in actual practice which can be considered best in connection with a general discussion of depreciation.[1] In the present case, however, it is assumed that reserves for renewals have been made properly in the past and invested in property useful in the production of the service. Under these conditions there can be no doubt whatever that the fair present value cannot be the cost-new but must be the cost-new-less-depreciation. The cost-new in the assumed case includes property purchased not only with the stockholders' money but with the money contributed by users to pay for renewals required at some later time. Clearly it is unfair to users to oblige them to pay a return upon money contributed by them for a specific purpose.

Type I. (*b*). The second case of this type to be considered will be the ascertainment of the fair present value of a company of which the capitalized net earnings are equal to the original cost-new-less-depreciation. The conditions may be expressed thus:



This case is similar in many respects to that just discussed, and the same conclusion must be reached — that the fair present value must be the actual original cost-new-less-depreciation. There is less reason for objection to this conclusion in the present case than in the former, owing to the fact that the requirement that charges for service must be made such as will produce

[1] See section 106.

the fair return upon the original cost-new-less-depreciation calls for the same charges for service as are paid by users of a similar service in other communities.

Type I. (*c*) In this case it will be assumed that the capitalized net earnings equal the replacement cost-new-less-depreciation while other conditions remain similar to those of the two previous cases. This case is shown by the following expression:

Capital < Original cost-new-less-depreciation. < Replacement cost-less-depreciation = Capitalized net earnings.

The assumptions which were made in presenting this series of cases were that the actual original cost-less-depreciation exceeded the capital of the company and that the replacement cost-less-depreciation exceeded the actual original cost-less-depreciation. In the present case the net earnings equal the replacement cost-less-depreciation. In cases where this condition is found it can mean only that the undertaking has property of greater earning capacity than the average and, consequently, has greater intrinsic value than is represented by its actual cost.

Here again the actual original cost-new-less-depreciation must be made the fair present value of the property, despite its greater earning capacity and greater intrinsic value as measured by usual business standards.

The intrinsic value of the property may be due to its advantageous situation, to its excellence of design, or to the skill with which it is managed. All of these characteristics may be indicative of the foresight and exceptional ability of those who promoted and developed the enterprise. There seems to be good ground for the claim, which will be made unquestionably by the owners of such a property, that it has a value greater than the mean value of the properties of other similar companies,

many of which have been built and managed with no special skill. Further than this there is the fact that, as mean charges for service are and have been a measure of fair charges and as the company has been able, at rates equal to such mean charges, to pay larger dividends than other similar companies, the present stockholders may have acquired their holdings at a price greater than the par value of the stock, so that the present stockholders may suffer large losses if the fair present value is not now made to correspond with the intrinsic value of the property.

On the other hand, the rights of the public must be recognized. The public gave to the company its franchise — its right to locate within the community and exclusively to sell a special service. The public in giving these privileges to the company agreed to pay the cost of service plus a fair return. If a company has obtained property within a community so cheaply and has managed its business so efficiently that the costs of service are less than elsewhere, there can be no good reason for the company to demand more than the cost of service plus a fair return simply for the reason that the costs of producing service are less than elsewhere. If the company is successful in the community, its success must be shared with the users is some equitable way, otherwise the benefit would be derived wholly by the company. The fundamental principle of rate regulation is that charges for service must be fair not only to the company but to the users as well.

On the other hand, if the fair present value is always, for cases of the kind under present consideration, the actual cost-new-less-depreciation and the fair rate of return is the same for all companies of the same kind and similarly situated throughout the state, then all stimulus to special skill and effort in the operation and

design of a public utility property is lost. Excellence in the design of property, as well as skill and economy in its operation, can come only from the company's management, and the most efficient management can be obtained only when there is a possibility of a special reward. It is impossible to expect that a supervising body, such as a public service commission, can so scrutinize the operation and operating costs of each company within its jurisdiction that a maximum of economy will be obtained for each. A public service commission is not an executive but a supervisory body. The officers of the company are the executives and from them must come the initiative in adopting means whereby the service of the company can be improved and its cost decreased. This need of a special stimulus to increased economy in the production of a public service when under commission control is one of the most important recent problems involved in rate regulation; it has been recognized as such by all thoughtful students of this subject.

A few of the methods which have been tried or suggested for accomplishing this end will be described briefly in sections 30–33. It is not intended to suggest by this arrangement of the discussion that methods intended to stimulate efficiency in management and operation should be confined to cases of this type alone; a satisfactory method must be one which can be used advantageously by all companies. This subject is presented at this point for the reason that the need of some reward for the exceptionally well managed enterprise is conspicuously important in a case such as that just considered wherein the capitalization is low and the profits from the business on average charges for service are high.

30. Reward for efficient operation. (1) **Increase in fair present value.** — One method which has been suggested for recognizing exceptionally low costs of service

is to establish a fair present value greater than the actual cost-new-less-depreciation, the increase to be made by applying an arbitrary percentage based upon the judgment of the appraisers. If this increase made the fair present value a figure intermediate between the actual cost-new-less-depreciation and the replacement cost-less-depreciation, the public would obtain the service at a cost somewhat less than the mean cost of service elsewhere and the company would obtain a somewhat larger return than would be the case if the present value based on actual cost were established as the basis of the fair return. Such a method would provide the desired stimulus, would help those who had purchased the securities of the company at an advanced price, and, if the percentage increase could be fairly made, would make the users and stockholders share in an equitable manner in the successful operation of the company.

Such a method, while apparently accomplishing the desired result, would be objectionable for several reasons. This method would require a modification of the capital value of the company whenever there seemed to be a possibility of a readjustment of charges for service. The percentage to be added to the actual cost would depend upon the judgment possibly of different men each time that a change in charges for service could be made. There would be, consequently, a tendency for a company to retain existing charges rather than to incur the possibility of a change which would be less advantageous to the company's stockholders.

There seems to be good reason, theoretically and practically, for establishing the fair present value of a property once for all and for not changing that value except when plant is removed from service or when additions are purchased with the stockholders' money. Valuations should not be made at frequent intervals, for

the reason that large expense is involved as well as for the fact that the possibility of an arbitrary change in capital value must tend to destroy the stability of the investment.

The purpose of this method would be accomplished if the capital value of the company was maintained equal to the actual investment, and the rate of return that was permitted to be earned was made to vary in some way whereby the company's stockholders would derive larger dividends depending upon the saving obtained by the users through lower charges for service.

31. Reward for efficient operation. (2) **Sliding scale of return.** — The sliding scale method consists in establishing a "standard price" for a given unit of service as well as a "standard rate" of return per annum upon the capital—the fair present value of the property —of the company. If during any year the maximum net price per unit of service charged by the company has been less than the "standard price," the company may declare and pay as dividends to its stockholders a return exceeding the "standard rate" proportioned on some arbitrary basis to the reduction in the maximum net price below the standard price. Thus in the case of a gas company, if the "standard price" had been established at 90 cents per 1000 cubic feet and the "standard rate" at seven per cent per annum, a sliding scale would be established if the dividends were allowed to be increased over the standard rate of seven per cent by one-fifth of one per cent for every one cent reduction in the price of gas below 90 cents per 1000.

Such a plan as the above would seem, theoretically at least, to accomplish the end sought, as by its use the consumers and stockholders share in the success attending the operations of the company, a stimulus is given to the officers of the company to improve their organi-

zation and to adopt means whereby the cost of service will be reduced, and the stability of the investment in the property of the company will be maintained. A method of this character has been used extensively in England and was adopted in this country with the Boston Consolidated Gas Company in Boston, Massachusetts. The sliding scale method has been adopted principally by gas companies and only to a limited extent by electric companies in England.

This method illustrates well the end to be sought. It is a question whether it is one that can be applied practically to all classes of public utility service and whether there may not be inherent practical difficulties in applying it, even in the simplest cases, to companies in this country.[1]

32. Reward for efficient operation. (3) **Merit rating method.**[2] — This system can be best described by its author. "The merit rating method is one under which a commission will periodically rate the companies on a basis of comparative efficiency in serving the public and allow them to earn dividends varying with such efficiency. The aim will be to offer to capital and management a premium for such economy and efficiency of management as inures to the benefit of the consumer in better service or lower rates of charge. The companies will receive this merit rating periodically, say every five years, and the rating thus received will determine the maximum dividend that each will be allowed to pay out during the following period. This merit rating at each recurring period will be based on the progress made by the company since the last rating and on results at-

[1] For a full description of this method and discussion of its practical advantages and disadvantages, see Regulation of Public Service Companies in Great Britain, by Robert H. Whitten. (1914).

[2] This method is due to Mr. Robert H. Whitten. See Regulation of Public Service Companies in Great Britain. Chapter XIV.

tained by such company as compared with other companies similarly situated. The effect will be to make each company compete as to results with its own past record, and also with the results obtained by other companies. It will introduce a new form of competition or rivalry for the usual direct competition that is the incentive and life of ordinary trade. A plant in one place will be placed in open competition as to results and dividends with similar plants in all parts of the state and to a limited extent in all parts of the country. The manager of each plant will be given the data by which he can measure his results with the results obtained by other managers. The directors of each plant will have the data by which they will be able the better to judge the comparative merits and worth of their managing staff. They will, moreover, be forced to make these comparisons by the merit rating which their undertaking receives periodically from the rating commission and which determines within certain limits the amount of profits that may be distributed in dividends. The shareholders will be able to hold the directors to stricter account. If both directors and management go to sleep, a slight decline in the merit rating and consequent decline in dividends may serve to arouse the ordinarily complacent shareholders to demand a change in the management of the concern."

"If a company management could feel that generally and upon the whole special efficiency would count in higher dividends and inefficiency would be penalized by lower dividends, its success would be certain. It is believed a merit rating with this necessary degree of accuracy is entirely practical. On the practical side, the difficulties are certainly not greater than those accompanying present methods of rate regulation."

It is not necessary to enter into a discussion of the

actual method above outlined nor as to its feasibility from legal and practical points of view. Its description shows its author's full appreciation of the imperative necessity of a full and adequate reward to the well managed company and that such reward must come from a return larger than the average return obtained by similar enterprises and not from an inflation of the capital of the company.

33. Reward for efficient operation. (4) **Payment of excess earnings to state.**—This method cannot be regarded as a reward; on the contrary it is a penalty imposed upon a company for efficiency.

In some parts of this country a method of caring for earnings larger than the usual mean has been adopted, wherein the charges for service have been fixed as well as the rate of return that can be earned by the company on its capital; all earnings, in excess of those required to defray the costs of operation, reserves for renewals, and return to stockholders, must be paid to the state or to the community.

This method is objectionable in every way. It obliges those of the community who use the service to pay a tax to the community through higher rates for service than might otherwise be necessary. All classes of public service, such as water, gas, electricity, street cars, and telephone, should be extended to all members of the community and this can be done only by reducing the costs of service through the economies which will result from greater use or a greater number of users. This method tends to maintain a present cost of service and to tax the users, with the result that the users of water, gas, electricity or other similar service are obliged to contribute to the community for the benefit of the non-users. Furthermore, it is objectionable in that it tends to restrict the development of the service and to

foster extravagance in capital expenditures as well as in costs of operation. This method is fair neither to the users nor to the company.

34. Ascertainment of fair present value. Continued. — The cases to be considered under this subheading are those which would be represented by the following expression:

Type II. (*a*) Under this head will be considered companies of this type whose capitalized net earnings = cost-new = capital.

A full understanding of the discussion of this type of cases can be obtained best by a consideration of the general subject of depreciation given in Chapter VII and particularly of that portion treated in section 106.

The case defined by the above expression is the simplest of those wherein the question of loss of value of the investment in perishable property is involved. The expression shows that for a company coming within this class the capital of the company has been made to follow the actual original cost of the property, thereby showing that the requirements of the ideal case have been complied with; that the earnings at the time of the appraisal are possibly normal; but that the present value of the property based on its cost-new is less than its cost owing to the fact that the perishable property has grown old in the service and that reserves for renewals have not been accumulated to reimburse the company for such loss.

A doubt is introduced in this case as to whether the earnings are normal at the time of the appraisal. As the capital equals the cost-new there can be no doubt whatever that, if only the fair return had been paid to

stockholders in the past, the past earnings had not been sufficient, for the reason that reserves for renewals should have been made and this item of cost would have increased the total cost of service. On the other hand, it may have been the policy of the company not to make *reserves* for renewals but to pay for new plant items, which were required to replace those which had become unserviceable, from income, thus treating this expenditure as an operating cost. The inevitable result of such a policy is, in all cases, that the value of the investment in perishable property has been reduced through depreciation, although the efficiency of the plant may have been maintained. On the other hand, the effect of such a policy upon the current earnings will vary with different companies even though they all may have been many years in operation. If a company has perishable property consisting of many items of substantially the same life and cost, it is possible that the annual requirements of money with which to defray the cost of renewals will be practically the same each year and, consequently, approach or equal the amounts that should be set aside each year as a depreciation *reserve*, calculated in a proper manner. In such a case the earnings would be normal. But if a company possesses items of widely varying lives and costs, the requirements for renewals for one year will differ greatly from those for another year and, consequently, the net earnings for a given year may not be normal.

Notwithstanding this uncertainty as to whether or not earnings are normal, the figures describing this case show that reserves for renewals had not been made in the past in the manner that is now recognized as proper and necessary for maintaining the integrity of the investment of the stockholders in the property and for dividing the costs of renewals equitably among all past,

present, and future users of the service. This fact shows with a certainty that cannot be questioned that users of the past did not pay the full cost to the company of producing the service and, consequently, were benefited. If the actual cost-new-less-depreciation is now made the fair present value, the company will be penalized for the benefits which it had conferred upon past users. A company should not be now penalized for having followed a financial policy which had been regarded as sound in the past and had benefited the past users rather than burdened them. The company is in possession, at the time of the valuation, of a property which has a present value based on its replacement cost greater than the capital of the company; the company is not over-capitalized as the actual cost-new of the property equals the capitalization; and the fair return upon the capital of the company produces charges for service equal to the mean of charges in similarly situated communities. When all of these facts are taken into consideration it seems certain that justice to the company demands that the fair present value of the property should equal its actual original cost-new and not that cost-new-less-depreciation.

This conclusion while it establishes a value fair to the undertaking can be accepted only when it can be shown that it is also fair to the users. Its acceptance clearly is a departure from the theoretical principles laid down in the discussion of the ideal case wherein it was claimed that the fair present value of a property should follow the value of the investment made by the stockholders in the enterprise. The only way that the cost-new rather than the cost-new-less-depreciation can be justified in the present case is by admitting that the loss in value of the actual investment has been offset by the whole or a portion of the unearned increment shown as

properly attaching to the property by the figures representative of the replacement cost-new-less-depreciation. Such an admission would be contrary, apparently, to the contention made in section 19 relative to the unearned increment. The acceptance of the unearned increment as a portion of the fair value in the present case is based upon an entirely different line of reasoning from that used by those who favored its acceptance in a case such as was discussed in that section. In that case the company had been financed always in an ideal manner and users had paid in the past the full cost of service. The claim therein made was that the fair present value—in that case the capital of the company—should be enhanced as the selling price of some of its property advanced, even though that property remained a portion of the plant needed to produce the service. This claim, it was held, was unreasonable and unfair. In the former case it was assumed that the users had always paid the full costs of service, in which costs were included the reserves for renewals. In the present case the users have not paid the full reserves for renewals and, consequently, have not paid in the past the full costs of service; the inclusion of the unearned increment, under such circumstances, at the time of a valuation of a previously unregulated company, would be made not for the purpose of increasing the capital of the company but simply for the purpose of maintaining the capital value of the enterprise. Such a company, as is now being considered, has been financed properly in all respects, except as regards its reserves for renewals, and its capital has been made to follow the investment of its stockholders in property needed for the production of the service; it has erred only in the method which it had employed in caring for the costs of renewals. The method which it had employed was one that has been

generally accepted in the past as proper and just and is still so regarded by a large number of practical business men. The creation of proper *reserves* for renewals is unquestionably a safe plan and one fairer to the users than that employed in many cases in the past wherein the costs of renewals were paid as an operating expense and no *reserves* were created to equalize the yearly demands for the money to replace units of property which had become unserviceable. The time of a valuation is the proper time to change from an older and less satisfactory method to a newer and unquestionably better one. This change must be made in such a way as will work no injustice either to the company or to the public. This result can be attained by making the unearned increment offset the loss in value, which has arisen from a failure to make reserves for renewals, provided that there is that value still existing in the property when measured by the replacement cost-less-depreciation and the earning power on mean charges is that assumed for the present case.

When once the fair present value has been thus established, the company must make annual reserves for renewals in the future in such a manner that the costs of all future renewals will be shared equitably by all users of the service. In order to accomplish this result, reserves for renewals must be figured on the actual original cost-new of the items of perishable property; furthermore, the future reserves for renewals must be figured not on the assumption that the full cost of each item must be amortized during the years of remaining life but rather on the same yearly basis as would have been adopted if the company had made proper reserves for renewals from the start. To take as an example an item of property having a ten year life which had cost originally $100 and was five years old at the time of

valuation, the above rule would mean that the reserves for renewals for each of the remaining five years of the item's life could properly be made $10, even though there would be $50 only—one-half of the theoretical cost of its renewal—in the reserves at the time when the item had to be renewed. It would not be right to demand from future users the reserves which former users had been relieved from paying.

In all that has been said in this chapter, reserves for renewals have been assumed to have been invested in needed property of the company. Reserves for renewals, when received, are entered on the books of the company to the credit of the account headed "Reserves for Depreciation." When money is expended for the replacement of items of plant no longer serviceable, the amount expended is debited to the same account. The difference between the credit and debit sides of this account shows the balance of the money contributed by the users to defray a portion of the costs of future renewals. If these reserves have been made properly it shows likewise the loss in the value of the capital investment. When, therefore, the capital is made the fair present value in a case like the present one and the loss in value is offset by a portion or the whole of the unearned increment, the amount restored to the company is entered to the credit of the Reserves for Depreciation in exactly the same way and to the same amount as would have been the case if the users of the past had paid properly the *reserves* for renewals.

The above method of reconciling the absence of reserves for renewals by the substitution of a value, derived more or less theoretically from the value remaining in the unearned increment, will appear to many — and to railroad men in particular — as an unnecessary and academic treatment of the company's accounts.

They will argue that it would be simpler and easier to disregard *reserves* for renewals entirely and to adopt arbitrarily the cost-new of the property as its fair present value without any regard for its depreciated condition. Railroad men would be the most active opponents of the suggested method for the reason that the accounting methods used by the railroads quite generally in the past have not called for *reserves* for renewals but have charged the costs of renewals, when made, as an operating expense which has been cared for by current earnings. This contention on the part of railroad men is advanced with great earnestness at the present time owing to the appraisals which are now being made by the Interstate Commerce Commission of the properties of all railroads in the United States and the uncertainty which exists as to whether that Commission would recognize the depreciated condition of the investments in railroad property, should it undertake to find the fair present value of such properties as a basis for charges for transportation.

The advocates for the public's interests contend that the average or normal condition of a railroad is that its perishable property is half worn out; that no depreciation reserves have been set aside to meet future renewals and, consequently, that the fair value upon which the fair return should be estimated should be the so-called normal value of the property, i.e., its actual original cost-new-less-depreciation.

Such a line of argument is unfair to railroad companies. It is unfair to say that the property is half worn out owing to the false impression thereby created. The perishable property of a railroad — a portion only of its total property — may have served one-half of its useful life and, consequently, the investment in it will have lost one-half its value but its usefulness has re-

mained unchanged. Apart from the false impression given by such a statement, the argument is unfair to the railroads for the reason that a railroad company has undertaken to supply the public with a transportation service and to do so has expended a portion of its money in perishable property. The management of the railroad knows that most of its perishable property can be renewed in such a way that the cost of renewals will be substantially the same each year and, consequently, that no changes in the charges for service will be required by reason of the demand for money to defray the costs of renewal. The public has virtually agreed to pay the actual costs of transportation and to restore to the undertaking the original cost of each item of perishable property when it is no longer serviceable. If a railroad company, relying upon this implied obligation of the public, has not demanded from the users of its service all that the company was entitled to demand, it is not now right for the users to say that, as the capital of the company has been impaired, they not only will not now pay what they should have paid but that they will not hereafter pay a fair return upon the stockholders' legitimate investment.

On the other hand, present users are justified, to a certain extent, in objecting to pay now for reserves which should have been paid by past users. It must be admitted that a railroad, by adopting the plan of paying for renewals from income when renewals are required, has not distributed the burden of the costs of renewals equitably between all users of the service, past, present, and future; it is true that the users, after a valuation, will have to pay more for renewals than did the users of new items of plant in the past. This apparent injustice to present and future users, however, is wholly a question as between the past and

future users and not between the users and the company. The earliest users did not recognize that they were not paying the full cost of service, neither did the company. This fact is fully recognized to-day and this error of the past must be corrected for the future in a manner which will cause the least expense to future users. This can be accomplished most satisfactorily by adopting the method above advocated wherein the deficiency in past reserves is capitalized by the recognition of an equivalent value in the unearned increment. The effect of this method is to reduce the cost of service to future users to a minimum.

Again, advocates for the public may claim that, as charges for service have not increased during late years notwithstanding the fact that the costs of renewals have been made latterly a portion of the costs of operation, charges for service in the past, when the cost of renewals was less, must have been abnormally high: if the earlier charges for service were abnormally high, the company should have made the necessary reserves for renewals instead of paying possibly larger dividends to its stockholders. This line of argument is likewise unfair to the undertaking. Most railroads have never attempted to make *reserves* for renewals; they have made renewals when necessary but no reserves against future renewals. The public has been deceived in no way. Probably no railroad company has ever claimed reserves for renewals as a portion of its operating expenses and then paid out money thus obtained to its stockholders. In a very large number of cases undertakings of this class would have been unable to make reserves, had they wished to do so, owing to the net earnings being too small. In most cases it was probably a wiser financial policy to pay a return to the stockholders sufficient to attract new capital with which to extend the service and, con-

sequently, reduce its cost than it would have been to set aside reserves and pay smaller dividends or no dividends at all.

If railroad men and the officers of other public utility companies will accept the above method as suitable for caring for past neglect of adequate reserves for renewals, it is felt that most of the present opposition to the creation of proper reserves for renewals for the future will be removed. They will recognize that most of the plants operated by them are growing in size through new investments; that the value of these new investments will be constantly diminishing; and, in consequence, that if the unearned increment is not to be allowed by rate regulating authorities to be capitalized after once the fair present value of its property has been established, it will be necessary to make reserves for renewals, not only to safeguard the interests of their stockholders but to do justice to the users by an equitable distribution of the costs of a portion of the property consumed for their benefit.

It is possible that objection may be raised to the method above advocated of establishing the fair present value in a case of this kind on the ground that such a method means that the loss in value of the original investment is virtually capitalized and, consequently, that all future users must pay the full return upon a figure not representative of the actual original investment of the stockholders. It may be argued that if the full return is to be allowed upon such a figure the company should be required to amortize this loss in value by additional reserves set aside from earnings for succeeding years. Such a contention would be based only on a short sighted view of the problem. If the loss arising from a lack of reserves for renewals is to be amortized, it would require that the reserves for re-

newals should be brought up to the theoretically correct amount by imposing a considerable burden upon either the users or the stockholders. It would be unfair to future users to make them pay the reserves that should have been paid in the past in addition to the normal demands for such reserves in the future. It would be unfair to the stockholders as such a method would deprive them of the fair return upon their investment, and the fair return is that percentage of the capital cost which will stimulate investment in the property and thereby promote the sale of service.

The present method demands a fair return upon the stockholders' actual investment and imposes upon the users an increase in the cost of service which is so small as to be practically negligible.

Type II. (*b*) Under this head will be considered companies of the type

whose capitalized net earnings = replacement cost-new-less-depreciation and actual cost-new = capital.

In this case, as in case *a* of Type II, the capital should be made the fair present value. The case is that of a successful company and all that was said on that subject will apply equally here.

Type II. (*c*) In this case it will be assumed that the general conditions remain the same as in case *b* except that capitalized net earnings = original cost-new-less-depreciation. It would seem that in most cases the cost-new of the property, that is to say its capital, should be the fair present value even though it may require charges for service higher than the mean. The fact that the actual cost = the capital is *prima facie* evidence

that the company has been well managed in that the capital has followed the stockholders' investment.

35. Conclusions relative to successful enterprises. — The above cases are sufficient to indicate the lines of reasoning that might be followed in establishing the fair present value. It is seen that no hard and fast rules can be laid down, but one or two generalizations can be made, possibly without error.

One which seems to be most general in character is that the replacement cost-new cannot be made the fair present value of a property when reserves for renewals have been made and invested in perishable property.

A second generalization is that, if the capital has followed the actual cost of the property purchased with money obtained from stockholders, that figure can be made in most cases the fair present value.

It may appear as if there would be a certain amount of injustice done to a company, the capital of which was less than the original cost-new-less-depreciation, by making the fair present value equal to the original cost-new-less-depreciation; whereas for a company, the capital of which was greater than the original cost-new-less-depreciation, the original cost-new was made the fair present value. Such cases and many others will seem unfair and illogical if schedules of fair charges for service are not formed with a full recognition of the conditions under which the fair present value has been established and by a recognition of exceptional conditions in the assigned fair rate of return. Such recognition must be made in the fair rate of return for the ability of a company to furnish a high grade of service at a cost less to the public than is charged by other companies operating under similar conditions.

The most general conclusion that can be drawn from the above study is that the fair present value must be

measured, as far as is possible, by the actual investment made in good faith in property useful to the public. If the plant is well planned and exceptionally well managed, the fair present value should not be enhanced. The profit to the stockholders should be derived through the return and charges for service should be permitted to be made sufficiently high to yield an adequate return. The company having the lowest capitalization per unit of output would then be in the best position to obtain its profit through the return.

Non-competitive Unsuccessful Undertakings

36. Over-capitalized companies. — The most characteristic type of company coming within this class can be shown by the following expression:

Actual cost-new-less-depreciation < Replacement cost-new-less-depreciation < Capital

This expression illustrates the case of a company which has been over-capitalized and shows that the reason for its failure to make adequate returns may be due to the large capital upon which it is expected that returns should be made.

Over-capitalization may have been caused (1) by the construction of a property larger or more expensive than was required by the community to be served, or (2) by the financial methods which have been employed in the creation of the capital.

37. Over-built plant. — An over-built plant may be the cause both of over-capitalization and of abnormally high operating costs.

A decision as to whether a plant is over-built or not cannot be given until all of the facts relative to the initiation of the enterprise, the character of the community to be served, and the length of time that the

property has been in operation are known. A company undertaking to furnish a new character of service must erect a plant of sufficient size to meet the requirements of users for a number of years in the future, but it is impossible to expect the sale of a normal amount of service at the outset. It requires time and money to educate the public to the use of a new service. Moreover, time is required to enable future users to arrange their houses, stores or factories so that the service offered by the company can be utilized. Users' premises must be equipped with plumbing for the use of water, piped for gas, or wired for electric light. In many cases the cost to users of the equipment required by them is considerable and time may elapse before it can be shown that the benefits derived from the new service warrant the large first cost. During this early period of operation the company producing the service may not have been able to earn enough to set aside proper reserves for renewals, and consequently at the time of appraisal the capital will be found to exceed the replacement cost-new-less-depreciation. In such a case the fair present value must not be less than the amount invested in useful property even though the company may not be earning a fair return. Nor can the company be considered as unsuccessful, as there is inherent in the property the potentiality of bringing it to a paying basis.

A property, such as has just been considered, might seem to those unfamiliar with the conditions under which it has been operating as out of proportion to the number of users, but in very many cases of this kind the plant cannot be regarded as over-built.

"The determination of whether a plant has been over-built or not is a simple and common engineering problem. Every plant should be and usually is designed

to meet an expected growth in the number of users. It would be an extravagant and foolish policy to build a plant of such size as will meet only the present needs of the public, and to make repeated enlargements to care for an increasing number of users. . . . For all well-engineered plants, forecasts are made by those most competent to foretell the growth of the community and the probable percentage of the population that will be takers or users of the utility. With these forecasts before him, the engineer, on the basis of present worths and known costs of construction, can design the plant which will meet these present and future demands of the public with the least total expenditure. A plant thus designed and constructed would be a normal, not an over-built plant, although there would be at all times spare plant to meet emergencies and reasonable normal growth." [1]

On the other hand, when it can be definitely shown that the plant of the undertaking has been constructed of a size that can be proved to be more costly than would have been the case if it had been built smaller and enlarged from time to time, then neither the original cost nor the replacement cost can be used in any way as a criterion of its fair present value. The fair present value upon which the rate of return is to be figured in establishing a schedule of fair charges for service can be ascertained in such a case only by careful engineering studies designed to show the cost of a suitable plant of reasonable size.[2]

38. Over-capitalization. — The caution given above as to the necessity of a full knowledge of past and present conditions affecting a property holds equally true in the case of a company which is utilizing a well-designed

[1] Public Utilities: Their Cost New and Depreciation. Hayes, pp. 130–131.

[2] Long Branch Commission *v.* Tinturn Manor Water Co. 62 Atl. 474 (1905).

plant of suitable size and at the same time has a capital exceeding the present value of the property based on its reproduction cost. Thus a company may have been formed by the combination of two or more companies in the expectation that through the removal of duplicate plants and organizations better service could be obtained with smaller costs of operation. The excess of capitalization could be amortized in the course of time without imposing a burden upon the users greater than had been borne by them in the past. Clearly the public is benefited in many cases by such combinations. If, however, after such a combination has been made and duplicate portions of the plant removed from service, an investigation is made to ascertain the fair present value and only the usual rate of return is permitted, the public has obtained the advantage of the combination and the stockholders of the company have been penalized. In a case of this kind there may be over-capitalization but the company should not, in most cases, be considered as unsuccessful.

In cases, however, where expected earnings have been capitalized and the charges for service are not sufficient to pay the expected return upon the capital, then the capital ceases to be any criterion of value whatever. The decision as to fair present value must be formed, in cases where the mean charge for service will yield a return upon the probable actual investment, in much the manner described in the previous pages.

In cases, however, where the charges for service cannot be made high enough to pay the costs of producing the service and at the same time yield a return upon a fair and legitimate investment in useful property, the fair present value cannot be determined by the usual lines of reasoning. "It is apparent that in such cases rates must be fixed without much regard to cost of pro-

duction. Rates in such cases must be largely based on a fair judgment of the value of the service to the consumer. In such cases the existing property has little or nothing to do with the estimate. The entire problem is approached from the standpoint of what is fair to the consumer. It is recognized that a rate which would fairly compensate the company from the standpoint of its outlay is improper, as such rate would be higher than the consumer could justly be called upon to pay. Such cases are not, properly speaking, cases for valuation at all. They are cases in which the rates must be determined largely without regard to what is normally meant by value for rate purposes. It is true that no standard of rate-making can be adopted for such cases. The usual procedure is to determine actual cost, reproduction cost, accrued depreciation, capitalization, and perhaps other factors, and then to fix an amount as fair value which at the rate of return determined upon will permit of the rate which seems to correspond to the fair value of the service. The reasoning here is somewhat circular. The fair rate of charge must be first determined and then a fair value and fair rate of return that will seem to justify the rate of charge already determined upon. In considering a normal standard of fair value for rate purposes the abnormal case of the poorly located, unsuccessful, or partially obsolete enterprise should be excluded. Such abnormal enterprises must necessarily be put in a class by themselves in considering rate and valuation problems." [1]

Fair Value of Property of Competitive Undertakings

39. Fair value for railroad property. — The railroads of this country offer the best possible examples of

[1] R. H. Whitten, Harvard Law Review, Vol. XXVII, p. 435. (1914).

competitive public utility undertakings. The charges for the service furnished by an individual company cannot be raised and lowered to meet the costs of the service furnished by that company, as can be done in the case of non-competitive undertakings. On the contrary charges for service can be adjusted not on the basis of the individual company but on the costs of all companies coming within the range of competition. "The existing rate structure [of railroad companies] is the product of commercial, competitive forces, and as a whole is found, even by regulating bodies, to be about right. It needs constant adjustment to meet changing conditions and to insure reasonable equality. Following a world-wide change in wages and all costs, the entire rate structure may need to be increased horizontally — as is the case at the present time — but no road or system, even if legally permitted, could raise a rate by itself, because its traffic would immediately desert it and go to other lines. This is not true of local public utilities, because there is practically no other available supply of service for the public.

If all the railways were in one system and ownership, rates might possibly be predicated on value of investment, and changing costs be met by changing rates, so as to insure an average net earning. The strong lines would then support the weak; but, with diversified ownership and the demands of all parts of the country for adequate transportation facilities, nothing of the kind can be done, and speculation regarding it is useless and misleading."[1]

Where two or more companies are supplying the same service within a community, the problem of rate regulation is entirely different from that required in dealing

[1] Mr. Onward Bates' discussion "Valuation for Rate-Making Purposes." Proceedings Am. Soc. of Civil Engineers, Vol. XL, pp. 344–345.

with such non-competitive enterprises as have been considered in the preceding pages. A public service commission cannot ascertain the fair present value of the property of each competing company, determine the fair rate of return, and thereby establish the gross earnings to yield which the rates for each undertaking must be adjusted. Rate regulation by legislative authority is primarily designed to supply a supervision of charges for service where competition does not exist. Free competition is sufficient in itself to maintain charges for service on a basis fair to the public. Rate regulating authority may be required to prevent combinations on the part of competitors to maintain abnormal rates, to prevent discrimination, or to adjust inequitable charges for one class of service as compared with another, but this authority cannot be extended to the establishment of a schedule of charges for each competing company such that each company will obtain only a fair return upon its investment.

It is true that the public may claim that it is paying too much for a given service and that it should have relief. In such a case public service commissions can only ascertain the fair present value of the property of all competing companies as a whole and determine whether or not the charges for service as a whole produce more than a fair return upon the value of the total investment. Even under such conditions it is inevitable that the company which can produce a service more economically than a competitor will obtain a return greater than its rival and, possibly, greater than might be considered a fair return were that favored company operating under non-competitive conditions.

The above line of thought accentuates the burden imposed upon the public by competition in the case of many classes of public service undertakings. In a

single community one company may be well placed and well managed and another badly placed and less efficiently operated. Competition would be completely destroyed if each company had individual charges for service such as would produce an established rate of return upon the fair present value of its property. If an investigation of charges is made, the fair value of the two properties ascertained, and a schedule of charges established which would yield a fair return upon the two jointly, the charges for service would be inevitably higher than if the stronger company had no competitor and its charges were based upon its property alone.

CHAPTER III

FAIR RATE OF RETURN

40. Fair present value as related to fair rate of return. — The problem of valuation to ascertain fair charges for service can be expressed by the following equation:

> Fair present value × fair rate of return = (fair charges for service × units of service consumed) − operating costs.

In the preceding chapter the first term of this equation — the fair present value — was considered at length. It was there shown that, for a new company operated under ideal conditions and for all companies after the fair present value had been established, the fair present value — or that value increased by capital cost properly paid for with stockholders' money — became a *fixed* and arbitrary basis upon which the fair rate of return was to be figured. This means that, when once normal conditions for the future have been established, the basis upon which the fair return should be figured must be always equal to the actual investment and that no profit can be derived by the stockholders — so long as the property remains in service — through any enhancement of the capital of the company arising from the unearned increment or from the increased earning capacity

of the property due to growth of the community, to improved processes, or to exceptional skill of management.

There can be no question as to the tendency of all decisions to support the above principles. A study of the laws governing the duties of many, if not most, public service commissions shows that stocks, bonds, or notes of a company may be issued only when it can be shown to the satisfaction of the rate making tribunal that the money thus obtained is necessary for the purpose of acquiring property, for the construction, completion, extension or improvement of its facilities, or for the improvement or maintenance of its service, or for the discharge or lawful refunding of its obligations. This can mean only that capital can be increased hereafter only when new money has been invested in the property for the increase or improvement of the service. This is true for all new companies and for all older companies after regulation. These laws were evidently framed with the intent of preventing capitalization of the earning capacity of a property as well as the capitalization of the unearned increment which may arise in the market value of a company's property due particularly to the increasing value of its land.

For a new company, and for an older one after its value has been established, there is every reason for agreeing that the plan of making the fair basis for rates follow the investment—the stockholders' pecuniary sacrifice—in the production of useful property is sound. This subject has been sufficiently discussed in the preceding chapter and needs the support of no further arguments to show that by its adoption full justice will be done both to the public and to the company's stockholders.

In view of this conclusion it is necessary to accept the fair present value of a property as a quantity fixed by

its cost and, when once established, subject to no variation arising from any cause whatever provided that value is maintained by adequate reserves for renewals.

The first quantity in the above equation can be considered as sufficiently defined.

41. Fair rate of return.—The second quantity in the above equation—the fair rate of return—has been defined by the Courts as follows:

"In fixing the measure of return upon property devoted to public use, regard should be had to the character of the business, the locality and the risk, whether the return will be uniform and secure; whether the patronage is steady or fluctuating and quickly responsive to financial and commercial changes, interest rates legal and contractural and the rates customarily sought and required in like investments in the locality; if a railroad, the character of the traffic, whether largely of a kind dependent upon uncertain conditions or so diversified that causes affecting part will not greatly affect the whole. The return should be a fair, just, and reasonable one, and not so meager as to repel investment in the property or to embarrass the owner in operating it." [1]

One more quotation will be given to show a very general conception of what the fair rate of return should be made:

"A reasonable return is one which, under honest accounting and responsible management, will attract the amount of investors' money needed for the development of our railroad facilities. More than this is an unnecessary public burden. Less than this means a check to railroad construction and to the development of traffic. Where the investment is secure, a reasonable return is a rate which approximates the rate of interest which prevails in other lines of industry. Where the future is uncertain the investor demands, and is justified in demanding, a chance of added profit to compensate for his risk. We cannot secure the immense amount of capital needed unless we make profits and risks commensurate. If rates are going to be reduced whenever dividends exceed current rates

[1] Missouri, Kansas and Texas Ry. Co. *v.* Love, 177 Fed. 502 (1910).

of interest, investors will seek other fields where the hazard is less or the opportunity greater. In no event can we expect railroads to be developed merely to pay their owners such a return as they could have obtained by the purchase of investment securities which do not involve the hazards of construction or the risks of operation." [1]

This last quotation must be read with the conclusion reached in the previous section definitely in mind—that there can be no profit whatever derived through any speculative inflation of the company's capital—in order that its full significance may be appreciated. It can only mean that the profit—the difference between the permitted rate of return and current rates obtained on "investment securities which do not involve the hazards of construction or the risks of operation"—reasonably expected by those who invest their money in public service enterprises, must be found in the return.

The adoption of the actual investment as the fair present value of the property of a company and of that figure as the basis of rates, for all new companies and for older companies after the fair present values of their properties have been ascertained and established, removes the necessity for any further modification of this quantity and concentrates the supervisory actions of legislatures and commissions upon the fair rate of return. For the future, therefore, the fair rate of return will be the figure concerning which commissions will be called upon to exercise their judgment and the present discussions or controversies relative to fair present value will be transferred to that of fair rates of return.

The power of commissions to fix a fair rate of return—assuming the fair capital value established—will inevitably change entirely the methods of financial management which have prevailed in the past. It virtually

[1] Report Hadley Railroad Securities Commission, Nov. 1, 1911.

transfers from the officers of the company to the commissions the financial policy of the company. In the past, new companies have been promoted by the promise to investors of large profits derived both from capital stock and from the return. If possible profits from capital are denied, as it is held that they should be, the profits derived through the return must be proportionally increased in order that new capital may be attracted with which to maintain the standard of service and to provide enlargements and improvements for greater benefit to the public. Again, in the past, the charges for service, even for older companies, have been kept higher than were absolutely required for the payment of the fair return to the stockholders for any one year. This has been done by the management of companies not necessarily for the purpose of paying at some later time extra dividends to the stockholders but rather that experience might be gained, in the operation of the company, which could be relied upon to indicate a time when charges for service could be reduced without the possibility of the necessity of increasing them at some later day. Furthermore, in the case of many classes of utility companies, those in charge of the financial policy of the companies have recognized that, although there might be for a few years a diminution in the costs of service arising from the increased output obtained with the given initial organization and plant, the time might not be far distant when the original property would have to be modified by such expensive additions and improvements that present charges for service would be required in order to pay the increased costs of service and a fair normal rate of return to the stockholders.

Briefly stated, the officers of companies in the past have endeavored to make charges for service high enough

to pay operating costs and a return sufficient to attract the capital necessary for the development of the business and to maintain such charges until they could be assured that future conditions would be such that, if rates were lowered, such lower rates could be maintained without prejudice to the service.

If commissions exercise their powers by requiring rates to be made such that *only a fair return* over operating costs can be earned, an entirely new condition for the future will be established. Past principles of good management must be modified and, instead of charges for service being maintained until they can be permanently reduced, charges will have to be increased or lowered depending upon many conditions affecting the property at different times of its operation. In other words, in the case of a successfully managed enterprise the financial balance wheel of a surplus will be lost and its place must be supplied by intelligent decisions of fair minded commissions establishing from time to time fair charges for service; these charges for service must be such as will care not only for the changing conditions relative to the proper fair rate of return but will also reimburse the company for the money expended by it in the production of the service.

It is natural that those who have been responsible in the past for the finances of public utility properties should question the wisdom of transferring a most important part of their former duties to public service commissions. They very naturally feel that, as they are devoting their entire time and energies to the development and operation of their enterprises, they are in a better position to know the present and probable future conditions affecting their own properties. This objection would be well taken if the charges for service could only be lowered and never raised, as has been quite generally

the case in the past. It has required the greatest skill, foresight, and business judgment to maintain in the past a high standard of service with the probable requirement that charges could be lowered but never raised. No commission caring for the operations of all public service companies within a large area could be expected to exercise the same skillful supervision over each individual company as has the management of that company. The real difference between the older method and the newer lies in the fact that in the past charges for service were established with a view to future conditions as well as to present; under commission control future conditions are not considered, on the ground that justice to the public demands that the users of each year should pay the costs of producing the service of that year and of that year only, such costs of producing service being not only the actual costs of operation but a fair return to the stockholders based upon the money market conditions and the risks attending the operation of the property that year. The modern theory of supervision can be carried out successfully, therefore, only when charges for service are raised or lowered sufficiently to defray the costs of operation each year and likewise pay a proper return upon the invested capital.

The fear of commission control on the part of those who have invested their money in public utility properties arises from the tradition, which has grown up under former methods of management, that although charges for service can be reduced, they cannot be increased. They fear that this tradition has become so instilled in the minds of the public that decisions of commissions calling for increased charges for service will be so unpopular that increases will not be made even when absolutely demanded by the just requirements of the service. In other words, that the margin of safety,

which could be maintained and has been maintained in the past through charges for service somewhat higher than the actual immediate necessities of that period demanded, will be lost, and that the safety of their investment in the property will depend entirely upon the willingness or courage of public service commissions to raise rates when necessity requires.

If the financial supervision of public utility enterprises is not to be a menace and if disaster to the companies and the destruction of the service previously enjoyed by the public are to be avoided, charges for service must be raised or lowered freely at such frequent intervals as changes in conditions may demand. The users and the public at large must learn to recognize that charges must be raised as well as lowered, that they are paying simply the cost of service, and that the charges for service by this new method are following the cost. Whether or not the new method will be productive of the benefits to the public which are expected depends very largely upon the recognition of the users' obligations to pay costs of service even should such costs be increasing.

The full significance of the necessity of frequent changes in the charges for service can be appreciated possibly better by a transposition of the terms of the equation given in the opening lines of this chapter. That equation can be expressed as follows:

> (Fair present value $\times$ fair rate of return) + operating costs = fair charges for service $\times$ units of service consumed.

Operating costs will vary, fair present value will vary, and so will the fair rate of return, due to various causes or changed conditions which will be considered later. In consequence of the probable variability of the quantities in the left-hand member of this equation, the right-

hand member must of necessity vary if the equality expressed by this equation is to be preserved. Justice both to the company and to the users—the fundamental principle of rate regulation—demands that this equality be preserved.

The users of service must be taught to appreciate the fact that fair value, fair rate of return, and operating costs are and must be subject to the possibility of a variation which is beyond the powers of the management of the company or of commissions to control.

42. Possible causes of variation in fair present value.—In the preceding discussion of fair present value it was held that, when once established, the fair present value became fixed and could be changed only by the investment of new money, obtained from the stockholders, in property useful to the public or when the value of the property failed to be maintained by adequate reserves for renewals. It is not changes in the fair present value produced in either of these ways that are now to be considered; the fair present value will always remain fixed, subject to the above two conditions, but the fair present value per unit of plant or per unit of output may be subject to change.

The causes of these changes can be most easily understood by the substitution of actual figures in the above equation. If the operating expenses of a company are seventy cents, the fair rate of return six per cent, and the fair present value of a property five dollars, the equation becomes

$$(\$5 \times .06) + \$.70 = \$1.00$$

and shows that the charges for service under the assumed conditions must be such as will yield one dollar in gross income.

If the above equation was described in the ordinary manner it would be said that the operating costs were

70 per cent of the gross income and that, if money cost six per cent, five dollars could be invested in property which could be made to yield that income.

Looking at this equation, however, in accordance with the modern theory of rate regulation, the right-hand side of the equation is not and cannot be regarded as a fixed quantity, as has been usual in the past, and the equality obtained by variations in the left-hand members; on the contrary the right-hand member must be made to vary to meet the changes occurring in the left-hand quantities.

In accordance with these theories of rate regulation there are two reasons for a possible legitimate increase in the fair present value of a property.

Let it be assumed that the property is not growing, is not changing either in type or character; in other words, that renewals are made only to care for those items of perishable property which have become worn out and must be replaced in kind. If it is found that the costs of labor and material have increased since the units that must be replaced were originally installed, then the difference between the cost of the old unit and the cost of that which takes its place must be capitalized. The result of this is that the cost of a property of the same size, character, and operating efficiency will be gradually increasing; that is to say, its fair present value, while fixed at its first cost, will be increasing with its cost. If the property originally costing $5, in the above assumed case, has, through the increased cost of renewals, reached a fair present value of $5.50, clearly, as operating costs remain unchanged and the company is entitled to the fair rate of return upon the fair present value of its property, $5.50 instead of $5, the charges for service must be increased to do justice to the company.

A second cause of such a change in fair present value

arises from the fact that most public utility companies are growing or changing the character and quality of the service produced. There is hardly a single class of utility which has not so changed that the companies producing that service have not been obliged to face radical changes in the character of the property utilized in order to meet new and increasing demands of users or will be obliged to do so in the immediate future. Charges for service can remain unchanged only if it can be proved that every dollar invested in new or improved property can be made to earn the same return as did the money invested in the original property. It is usually found that the original property was placed at the center of maximum demand for service and that extensions made in the future will have to be carried into territory making smaller demands for service. This can result only in increasing the cost, the fair present value, of the property per unit of output. Again, the "cost of progress," so called, must be increased in providing a better quality or greater safety in the service rendered. If the case of railroads is considered, it is certain that the money to-day expended in steel cars, in the abolition of grade crossings, or in the construction of new terminal stations will not bring to the company the same return per dollar of investment as did the money originally invested in wooden cars, cheaper roadbed and smaller, less substantial, and less convenient stations. Or, if the case of a telephone company is considered, the return upon the investment in underground interurban construction will be far less for many years to come, if the same charges for the same service rendered are retained, than has been the case in the past with the smaller investment in overhead open wire construction. Further illustrations are not needed to show that if a company is to obtain the fair return upon its investment and costs

of operating remain unchanged, the charges for service must be changed owing to the change in the fair present value of the property.

43. Possible causes of variation in operating costs.—The causes of changes in operating costs are too apparent to require extended consideration. Changes in costs of labor and of material consumed in the production of the service, such as coal and oil, must produce changes in costs of operation depending upon market conditions. Changes in the taxes which must be paid by all companies will also affect the operating costs.

The questions of maintenance and depreciation and of the costs of production as affected by increasing output are, however, more difficult of solution. There is ever a question as to whether, if the fair present value of a property increases due to enlargements or improvements, the costs of operating may not be reduced to a like or even a greater extent owing to the smaller cost of maintenance and depreciation and the reduced cost per unit arising from a larger output of service to the public. Any question of this kind is irrelevant in a consideration of fair charges for service when a company is subject to rate regulation. It is very possible that the annual costs for maintenance and renewals may be less, as the result of changes in the property, than they had been in the past. It is also possible that some enlargements may have reduced the cost of unit service owing to the larger output. Whether the changes in the costs of operating balance the changes in the product of the fair return by the fair value so as to maintain the charges for service unchanged, does not affect the fact that the cost of operating is a variable as well as the fair present value and that when the fair present value has been fixed and the actual costs of operating for a given period of time accurately determined, the fair charges for

service may have to be raised or lowered to preserve the equality of our equation.

44. Possible causes of variation in the fair rate of return.—A comprehensive statement of the facts to be considered in the establishment of the fair rate of return was given in section 41. The practical interpretation of this ruling by public service commissions can be illustrated by the two following quotations which have been selected at random from the many that might be quoted:

"After a careful consideration of the legal and contract rates of interest in this State, the hazards of the business and other factors, the Commission finds that a net return of at least 7 per cent on the fair present value of the electric property of the Gas and Electric company as used and useful for the convenience of the public will yield a fair return in the present case. A fair and just rate of return must be determined from the facts of each case." [1]

"In at least five of the notable telephone cases brought before eastern Commissions in the past two years, 8 per cent has been designated as a reasonable rate of return on the value found by the Commissions, and these decisions are entitled to the respect of the entire country; so that if corporations of this kind in the East are allowed to earn 8 per cent, where money, as a rule, brings less interest than it does out West, and where capital is more easily secured at lower rates than in this section of the country, this Commission can hardly demand that the investing public shall be held to lower rates, or expected to serve the public with less compensation. . . .

"This Commission does not care at this time to bind itself to either 6, or 7, or 8 per cent, and promulgate any of them as a fixed rate of return, which will be fair in all cases. Nor for the purposes of this case is it necessary to reach a final decision that 8 per cent is necessary, or right. It does, however, feel that to calculate the rate of return at 7 per cent on the present depreciated value of the plant will not be unfair to the public." [2]

[1] Missouri Public Service Commission. Case No. 15. June 23, 1914.

[2] Nebraska State Railway Commission. *In re* Application of Lincoln Telephone and Telegraph Co. Application 1637. Decided June 26, 1913.

Many more decisions might be quoted to show that following substantially the same reasoning the fair rates of return have been established at 6, 7, 8, or higher percentages. In all such cases the fair present value of the property has been established, the proper operating costs at that particular time ascertained, and the charges for service have been made such as will yield the rate of return, established by the commission upon its own judgment as to what is fair considering all conditions affecting the property at that time. All of these figures are those which are considered by the commission as fair at that particular time—at the time of the investigation. Thenceforward the commission will see that new securities are issued only for money actually paid in and that the accounting methods conform to a prescribed standard. In accordance with past and present methods the active initiative work of the commission in most cases then ceases. The whole problem of the financial policy and operation of the company is thereafter under the control of the officers of the company.

It becomes thereafter the duty of the officers of the company to maintain the highest possible standard of service and to so alter its property and so supervise the operation of the plant that the company will earn as large a return as possible upon the established charges for service. The fair rate of return is, therefore, a figure of importance only for one day and is a portion of the scaffolding used in the construction of a schedule of fair charges. If, after the establishment of a schedule of fair charges, operating costs decrease for any reason, such as an increase in output or more skillful management, the earnings of the company will exceed the figure used as the fair rate of return in determining the rate schedule. On the other hand, if the costs of producing service increase, the company may not earn the estab-

lished fair rate of return and the efforts of the officers of the company must be directed toward finding some means of reducing costs or increasing output. This simply shows that the fair rate of return is an arbitrary figure used in the establishment of charges for service and dependent not directly upon the operation of the company but upon conditions surrounding its operation.

When it can be proved to the satisfaction of a commission that a previous rate schedule is productive of a net return which is too high or too low, then a new schedule of charges will be devised which will produce the same or a new fair rate of return. If the risk attending the operation of the company is increasing or is diminishing, then the fair rate of return may properly be raised or lowered. Likewise if "the interest rates legal and contractural and the rates customarily sought and required in like investments in the locality" are increasing, the fair rate of return may be increased or, if diminishing, the rate of return may be reduced. This is the most obvious and usual reason for a change in the fair rate of return. The possible frequency of such change will depend naturally upon the frequency with which revisions of charges for service may be required by a commission.

Another possible cause of changes in the fair rate of return may arise, should commissioners on their own initiative make frequent and regular revision of charges for service and modify the fair rate of return so that companies would be rewarded for special efficiency in the operation of their property in accordance with some method such as was suggested in section 31.

45. General conclusions as to fair rate of return. — In the above, an attempt has been made to outline as briefly as possible the problem of fair rate of return as it is presented to commissions and to public service com-

panies at the present time. It has been shown that the fair present value of a property per unit of output is changing constantly, that operating costs are changing, and that the output of a company is changing. It has been indicated that the fair rate of return is simply a figure used in establishing the fair charges for service at a particular time, and that when such a schedule of fair charges has been promulgated, a company may earn more or less than the fair rate of return depending in a large measure upon the charges established and upon the skill shown by the management in the operation of the enterprise.

The main feature of the above discussion which requires particular emphasis is that with all of the quantities in the equation expressing fair charges for service variables, fair charges for service must be likewise varied at each time of investigation and that it must be definitely understood that a schedule may be increased as well as decreased in order to accord the impartial justice demanded both by the public and by the companies.

CHAPTER IV

REPLACEMENT COST

46. Replacement cost. Definition.—Replacement cost or, as it is sometimes termed, "reproduction cost," has been defined already as that amount of money which would be required, at the time of an appraisal, to bring into existence a property identical with that of the undertaking under consideration.

47. Replacement cost of property.—The criterion of present capital cost must be what it would cost at the present time to produce a property capable of delivering a certain output of a present standard of excellence. Strictly speaking, the replacement cost, as above defined, of the present existing structures, of the land now

used, and of the system of operation employed in the production of service by the several existing companies, is not relevant. Theoretically, the criterion of present capital cost should be the cost of the most modern and efficient property suitable for the service in each community and of a size sufficient to produce the present required output and to care for a reasonable future increase in the public's demand for service.

The criterion of present capital cost is the money required to promote a new enterprise, similar to one now in existence, to make the necessary preliminary studies and plans, and to acquire the money that would be needed to develop the undertaking, both plant and business. This capital cost should include, likewise, the cost of building up the organization necessary for the production of the plant and business. It should include the cost of obtaining users and all other costs involved in bringing the property to such condition as would make it capable of producing the same amount of paid service as was furnished to the public by the existing undertaking at the time of the appraisal. This criterion of capital cost should include the cost of a physical plant capable of furnishing the same output as the existing plant but of higher grade or of cheaper cost in operation if possible. Thus the plant considered in such an estimate would not be identical with that under appraisal. The machinery might be entirely different in size and type; the land upon which the machinery was placed might be situated in some other locality, from which it might be figured that service could be delivered more economically. Moreover, this cost would have to be estimated for the production of plant and service at the present time and under existing conditions. Thus the cost of property placed in the streets would have to include the cost of taking up and

replacing pavements. It would have to include the cost of finding space at the present time for underground structures in streets already filled to a greater or less extent with structures belonging to other public service companies, or to the city or town. This figure would be the cost-new of both plant and business. It would be affected in no way by any consideration of the actual original cost of the existing property or by any consideration of the securities that had been issued to the existing owners.

Any such criterion of cost would be found to be largely theoretical, if an attempt were made to ascertain a figure of this kind for a practical case. There would be required, to obtain such a figure for a given property, the services of business men and engineers of the highest attainments to study the local conditions affecting each company and to design property which, they would feel, could be made to furnish service at the least expense. Work of this kind would require new and possibly alternative plans, as well as estimates of their probable costs in order that comparison might be made between the probable present cost of the existing property and that of some alternative arrangement suggested by the appraisers. Such a work would require exceptional skill and would have to be carried out by appraisers familiar not only with the engineering problems involved but informed as to the requirements of the public and as to the financial conditions under which each property would be operated. Again, as it would be known that no actual work would be done under the estimates made by the appraisers, the figures thus obtained would be of importance only as the expressions of the opinions of their authors.

On the other hand, the properties of most public utilities in this country have been expanding with con-

siderable rapidity. In practically all cases the apparatus required to care for such expansions of the service have been of the latest and most approved type, have been designed and installed by men familiar with local conditions and requirements and, consequently, represent the most modern and efficient property suitable for the service in that community. The result is that with such a large percentage of property of modern design, constructed by men most familiar not only with local conditions but with the state of the art, the cost of replacing the identical property is a more satisfactory criterion of present cost than could be obtained by studies made by appraisers of the cost of a substitute property which they personally might consider as more satisfactory. Unquestionably some of the older portions of the property may be somewhat obsolescent but the loss in their value thus arising from age can be cared for most satisfactorily as a portion of the loss in value due to depreciation.

In consequence of the doubt attaching to figures purporting to represent the cost of a more modern or efficient substitute property, it has become the custom to regard the replacement cost of a property, identical with that under appraisal, as the most reliable criterion of the present cost of a property. The present cost of a property, therefore, is what it would cost, at the time of an appraisal, to produce a property *identical* with that in existence.

48. Distinction between actual original cost and replacement cost.—A sharp distinction should be made in every valuation between the "actual original cost" and the "replacement cost." The actual original cost is what the existing property actually did cost the company originally. The replacement cost is what it would cost the company, if its present property were not in

existence and had to be reproduced at the time of an appraisal. The only thing in common between these two figures is that both are derived for the same aggregation of items constituting the useful property of the company. The prices used for original cost are the actual costs under conditions which existed when the present items were acquired. The prices used for replacement cost are estimates of what the same existing items would cost if it were necessary to reproduce them under conditions such as would be found at the time of an appraisal.

Neither actual original cost nor replacement cost is necessarily the fair present value. It is beyond the province of those engaged in the ascertainment of these costs to modify such figures so as to make the one or the other conform more nearly to their personal conception of the fair present value.

As will have been gathered from the discussions in previous chapters, the actual original cost is a figure of importance, in most cases, in the ascertainment of the value of the property upon which a public utility company is entitled to earn a fair return. Notwithstanding the fundamental importance of a correct figure showing the actual original cost, in most appraisals which have been made in the past, this figure has been neglected entirely and the replacement cost has been presented as the only evidence of value.

There are three reasons that can be given for the preference of appraisers for the replacement cost to the exclusion of the actual original cost. The first and probably the most important reason is that in the first valuations that were made by means of detail inventories by engineers acting for public authorities the replacement cost was found and not the original cost. The companies whose properties were appraised in these

early valuations were railroads and it was claimed that the books of these companies had not been kept in a manner which would make it possible to ascertain the original cost. The error, made at this early date, arose from a misunderstanding, already explained, of what the actual original cost means. It was no more difficult to ascertain the original cost of present items than to find the replacement cost of the same items. The costs of the original properties, doubtless, could not have been derived from the books of the companies and would have been of little aid to the appraisers, if such costs had been found.

The second reason arises, unquestionably, from the fact that the actual original cost is usually less than the replacement cost. Land forms a large percentage of the property of many public utilities. In most parts of this country land has appreciated in value and, consequently, the cost of acquiring the land used by the companies at the time of an appraisal would be far greater than its original cost to the companies. The same increase would be found in the costs of many other items of property. The desire of appraisers has been evidently to give the companies the full benefit of these increases in the value of their properties by accentuating the cost of replacement and by neglecting to show what it had actually cost to produce such properties.

The third reason may be found in the constitutional right of the owners of a property to a full compensation for its use. The Constitution of the United States says that individuals cannot be deprived of their property without compensation. The courts have held that a corporation, as far as the operation of this law is concerned, has the rights of an individual. If statutory charges for service are imposed upon a corporation which deprive it of a return upon the present value of its

property, the charges for service, imposed by rate regulating authorities, would be confiscatory and consequently illegal. It was evidently felt by appraisers that the replacement cost was more nearly the present value of a company's property than the original cost could be. Such a contention does not afford a satisfactory reason for the exclusion of the actual original cost as one of the evidences of the value of a property.

There has been an increasing tendency on the part of students of the subject of valuations to recognize that the replacement cost, if interpreted literally as meaning what it would cost to reproduce the present property under existing conditions, is a figure far greater than can be accepted as an indication of a value which will be fair to the public. The result has been that public utility commissions and appraisers have modified their methods of valuation so as to ascertain the actual original costs for certain portions of the property, whereas for other items or portions of the costs of items the replacement cost has been found. Such methods of valuation must be condemned. Figures derived in such a way are neither the original cost nor the replacement cost. It is the duty of appraisers to find both and not a hybrid of the two developed to show their individual belief of which costs of different portions of a property they think should be made a portion of the fair value. The replacement cost is what it would cost *under present existing conditions* to reproduce a property and not what at present prices it would cost to produce a property under past conditions. The actual cost reflects past conditions; the replacement cost reflects present conditions.

49. Property of undertaking. — The replacement cost is an estimate of the present cost under present existing conditions of producing a property identical with one in present use for the benefit of the public.

The replacement cost is found by the use of an inventory showing all items of property and by an appraisal in which the present costs of labor and material are used.

It is to be noted that the inventory and appraisal are made of the *property* of the company and not of the *plant* alone. When a definition of property is sought it will be found that, for the purpose of valuations, it can be considered best as "assets needed and used for the benefit of the public which have required capital to acquire or would require capital to reproduce." Thus, speaking very generally, experimental or abandoned machinery could not be included properly in an inventory and given a value upon which the fair rate of return could be computed. On the other hand, a new enterprise must incur expense in its promotion, and in procuring an organization capable of constructing a useful property and of producing a service satisfactory to all users. These latter costs cannot be avoided, are needed by the public, and are in use in providing service at the time of a valuation. They are, in consequence, a necessary portion of the property of the undertaking and must be included as a portion of the property in an inventory and assigned their true and proper cost.

50. Grouping items of property in appraisals. — When in an actual appraisal it is necessary to find what expenditures have been made in creating a property useful to the public or would have to be made if the entire property had to be reproduced, items of cost must be considered individually or brought together into groups.

The fact must be recognized that all such costs as are here considered were incurred or would be incurred in creating an operating physical property; in this sense they are all costs of the physical property used in furnishing service to the public at the time of the valuation.

Thus it cannot be said properly that payments made for the right to place structures in the streets are not a portion of the costs of the present operating plant, nor that the time and office expenses of those who have supervised the creating of the plant are not a portion of the cost of the plant. Or again, that the cost of the money used in paying for the property is not a portion of its cost. All expenditures made for property now useful to the public are inextricably a portion of the cost of the plant needed to produce the service.

On the other hand, in making an appraisal it is necessary to ascertain all of the expenditures which would be required to reproduce a property in the condition of that under appraisal. To do this the appraiser must consider the property item by item, analyze it, and find what its cost can be considered properly to be. For convenience and simply for clearness of presentation these several items may be grouped. The necessity for including an item of cost in one group rather than another depends not upon any claim that the property can be so divided but rather as indicating that the methods, which must be used by the appraiser in finding such costs, differ and that the costs in each group are obtained by the same method.

It has been found from experience in making appraisals that, if the costs of the property are brought together into three groups, the items, of which each group is composed, can be compared and weighed more readily than if considered separately or as a single group. These three groups will be called Cost of Promotion, Cost of Physical Property, and Going Value.

Cost of Promotion

51. Overhead charges. — The following list gives some of the items of expense which have been claimed,

more or less generally, as overhead charges and, consequently, made a portion of the cost of the physical plant: promotion, issuing and marketing of bonds, brokerage, taxes, company organization, general expenses, insurance, legal expenses, engineering and engineering supervision, contingencies, contractors' profit, and interest during construction.

52. Preliminary expenses. — It is beyond the scope of the present study to enter upon a discussion of these several items of cost. But if these overhead charges are considered with care it will be seen that, while all have relation to the plant, many of them were incurred and charged on the books of the company without any direct relation to the plant. Thus all preliminary expenses such as promotion, issuing and marketing bonds, brokerage, legal expenses in connection with the promotion of the enterprise, and preliminary engineering, were incurred before any construction work was undertaken.

In a carefully prepared valuation the cost that can be included under the above headings must be ascertained from estimates based not upon the cost of the physical plant alone but upon the conditions which would surround the promotion, construction and development, under present existing conditions, of a particular undertaking similar in all respects to that under appraisal. All of these expenses would be incurred in the promotion of any new enterprise and, consequently, are a portion of the property of the undertaking. Greater accuracy will be attained in a valuation, however, if all of these costs are treated not as overhead charges applied as percentages of plant cost but as a group which will be designated "cost of promotion."

53. Date of beginning of operation. — The result of this segregation of a portion of the overhead charges

is to establish a date between what may be termed preliminary work and actual operation. This date, the date of the beginning of actual operations, is not that when the plant was completed and turned over to the operating forces for the use of the public; it is, rather, that date when the money with which to build the plant had been obtained and actual work was to be started in the construction of the physical property and in bringing together men to form the organization for overseeing plant construction, producing, and selling service. The actual work of the undertaking begins on that day. Time will elapse from that date until the plant is ready for use or before there can be sufficient income to offset the expenses incurred.

It must be recognized clearly that this division of the period required in the acquisition of the present property of the undertaking is, possibly, a departure from past theories used in valuations, although such past theories have been defined so loosely as to make this uncertain. The method advocated in the present study is to have one date alone to mark the dividing line in the acquisition of the property. In past valuations, if any consideration has been given to this question at all, two dates have been established, one marking the division between preliminary or promotion expenses and the period of construction, and the other between the period of construction and the beginning of operation. It is felt that it is of great importance that these periods should be defined and, as will be shown later, a division into two periods is productive of greater accuracy in a determination of costs.

Physical Property

54. Cost of physical property. — Again, it will be noted that certain of the overhead charges above enu-

merated can be definitely assigned as a portion of the cost of the physical property. The men whose time and expenses would be covered by such charges were engaged wholly in the construction of the plant. Engineering and engineering supervision, contingencies, and contractors' profit are all expenses of this character and, in consequence, are overhead charges properly attributable to the plant cost and can be applied as percentages of such cost. These charges together with the actual cost of the plant should be grouped under the head "physical property."

Going Value

55. Expenses included under head of going value. — On the other hand, the expenses included under such headings as company organization, general expenses, legal expenses (except those that can be assigned definitely to legal work in connection with the construction of the plant), taxes, and interest during construction, are involved inextricably with expenses incurred in the operation of the property and in building up an organization to sell service. The time of some of the officers in charge of plant alone is consumed in the care and maintenance of the plant as well as in its construction. It is futile to attempt to find what portions of the time of the officers of the company are expended upon questions relating to the construction of the plant, upon its maintenance, and upon its operation. The same difficulty is found in dealing with the work of most subordinates, except the engineers and the actual construction forces. Yet this attempt has been made in one or more valuations where studies have been made to find, for a period of a week or a month, the time actually expended upon different classes of work by those, a portion of whose time might be occupied with questions relating to

the construction of the plant. Even the time of the office boy expended in mailing letters dealing with construction matters has been separated from that consumed in his other duties and its cost charged to cost of physical property. This attempt to obtain accurate figures is to be commended but the accuracy of such figures cannot be established owing to the impossibility of measuring the activities of the organization at any one time in different classes of work. All expenses of this character should be grouped together and designated as "going value."

56. Groups defined. — If all the preliminary costs, that can be regarded properly as property, are treated not as a portion of plant cost but as a necessary cost of the promotion of the enterprise, a certain amount of the present confusion will be eliminated. Again, if the only overhead charges that are added to plant cost are those clearly and definitely incurred in the construction of the plant, and those which cannot be definitely separated are considered in a class by themselves, then practically all of the present confusion will be removed.

Costs of promotion have been sufficiently defined and require no further discussion in the present study.

Going value is unquestionably a portion of the cost-new of a property whether the cost-new is ascertained as the replacement cost or as the actual original cost. This is particularly true in the case of valuations made in conformity with the groups of property above recommended. There has been in the past, however, much uncertainty as to the exact significance of "going value" and some authorities have held that no value could be assigned to it in appraisals to ascertain fair charges for service. The subject of "going value" is of such importance that it will be considered in a separate chapter apart from both the replacement cost and actual cost, with both of which it properly belongs.

The replacement cost of the physical property together with the overhead charges which can be properly associated with it will be considered in the following sections.

57. Ascertainment of replacement cost of physical property. — As already explained, the replacement cost of a property is what it would cost, under all of the conditions existing at the time of an appraisal, affecting the supply and cost of materials and of labor, the care and cost of transportation, the availability of the site of the plant, and the removal of the obstructions that might be found upon the land required for the production of the service. The existing property is assumed to have been obliterated; and the replacement cost is the cost of a new property, similar in all respects and similarly located, when constructed in an orderly and usual manner.

The costs to be included in the group, "cost of physical property", are, in addition to those obtained by multiplying the number of items of each kind by their unit costs, such overhead charges as cover the costs of engineering and engineering supervision, contractors' profits — if the work would be done by contractors, — and possibly a portion of the legal expenses — if such expenses can be found and attributed definitely as a portion of the cost of the plant.

It is beyond the scope of the present study to enter upon a description of the forms and methods to be used in making an inventory or of the derivation of unit costs. There are, however, a number of questions relative to the derivations of unit costs of replacement which have been the subject of much controversy. It is necessary that these questions should be carefully considered and a correct answer to them obtained.

58. Unit costs. Material. — It has become the custom of late to say that, in the ascertainment of the re-

placement cost of the plant of a company, the unit costs of material should not be the market prices prevailing at the exact date of the appraisal but rather prices averaged over a number of years in the past.

The reason, usually given for the use of the mean of the prices prevailing during a number of years immediately preceding the appraisal rather than the actual prices at the time of the appraisal, is that the market prices for the material are subject to fluctuation and that the prices at any definite time may be abnormally high or low. It is claimed that justice to the undertaking demands that the costs used in an appraisal should be normal or more nearly in accord with what the company would have had to pay if it had reconstructed its property in as reasonable a time as possible and had completed it at the date of the appraisal. Some authorities, therefore, have defined the time required to rebuild a plant as the "construction period" and have held that the costs of material which had prevailed during the construction period should be averaged and used as the unit costs. It is claimed that, if all of the material required to reconstruct a large property was ordered to be delivered on the day of the appraisal, prices would be advanced inevitably and, consequently, the replacement cost of the plant would be unduly enhanced. Others have gone still farther and have claimed that not only should the costs of material in the past be averaged to find a fair unit cost but such cost per unit for each year should be weighted by the number of units of each kind that had been purchased by the company that year. This claim is made on the ground that the greatest expansion of a property naturally occurs during times of greatest activity and, at such times, the costs of material are always high. Therefore, since the greatest expansion has been when costs were high, the use of a

mean cost would do serious injustice to the company as such figures would be liable to produce a lower replacement cost.

Before a decision of this question can be obtained, it must be recognized that the replacement cost has nothing whatever to do with what it has cost the company to produce the property. What it has cost the company to produce the property is the actual original cost — an entirely different figure. The actual original cost must be found by the use of entirely different unit costs from those used in ascertaining the replacement cost. The replacement cost is the cost of a hypothetical reproduction of the property at the time of the appraisal. It may aid the imagination to assume a period during which such a hypothetical replacement might be carried out, but the unit costs should be those existing at the day of appraisal for all items which are subject only to minor changes. The costs must be fair, however, and the judgment of the appraiser must be exercised as to whether the costs, at the date of appraisal, of certain materials, such as copper and possibly iron, if they form a large portion of the cost of the plant, are fair or are unduly affected at that particular time by a speculative market.

59. Unit costs. Labor.—The principal question in controversy, concerning the cost of labor to be used as a portion of the unit costs employed in finding the replacement cost of the plant of a company, is relative to whether those costs should be figured upon a "wholesale" or "piecemeal" reconstruction of the property. In an appraisal of the property of a public utility company it is not unusual to find that two groups of appraisers have been employed, each representing one of the two parties whose interests are involved. One group will present figures, purporting to show the replacement cost of the

plant, in which the costs of labor have been based on the reconstruction of the plant in the shortest possible time — in a wholesale manner. These figures are frequently obtained from contractors who may have done little or no work of the character involved, who may have never performed work in that particular locality and are consequently unfamiliar with the conditions under which the work must be performed, and who are submitting estimates for the cost of work which they know they will never be called upon to do. The other group — usually working for the interests of the company — will present figures intended to show what it would cost to reproduce the property no more rapidly than it was originally constructed — that is to say, in a piecemeal manner. The appraisers in this group will usually employ the same costs of labor as the company had paid in its actual work of construction.

Neither group of appraisers will show figures that can be accepted as correctly representing the theoretical replacement cost of the property. It is necessary, in order to establish what the correct cost of labor in a replacement of the plant should be, to realize definitely the real purpose of a figure representative of replacement cost. For the purpose of the immediate discussion it can be assumed that one object of finding the replacement cost is to ascertain what it would cost a new enterprise, if the existing property — organization, plant, and service — were obliterated, to enter the same field, obtain a new organization, construct a new and similar plant, and obtain the same number of users requiring the same amount of service. Clearly one condition, affecting the time of construction, will be different from that which affected the old company; the users will have been educated to the service and will have adapted their premises and their business to its use. But, even

granting this changed condition, much time must elapse between the initiation of the new enterprise and the time when it is producing and selling the same amount of service as is the older company; in other words, if the work is to be done in an orderly manner, as it would be done by a company performing the work as fast as its organization could properly supervise it, and avoiding all over-construction or waste of the stockholders' money, wholesale construction would never be done. As, in the case of most public utilities, wholesale work never has been done and never would be done, the figures purporting to represent the replacement cost presented by the first group of appraisers can be given little weight.

The figures of the second group are more reliable in that they are based upon actual costs of work performed in the locality where the property is to be situated. There is rarely a case where a company has not performed work upon a scale large enough to be commensurate, as far as costs of labor are concerned, with the work required in replacement. If the estimates are made on such figures, correct results can be obtained. The replacement would not be done in as piecemeal a manner as may have been the case when the original plant was constructed, but it would not be wholesale in the sense used by the first group of appraisers.

60. Replacement cost of construction in streets.— Many public utility companies have large portions of their capital invested in tracks, pipes, or conduits laid on or beneath the surface of the streets. In many places the conditions affecting construction of such a character have changed materially since the time that the original work was done. These changed conditions may be attributed to two different causes: (1) the amount of construction which has been placed on or beneath the street surface has become so great that much difficulty

would be experienced at the present time in finding the space required for a new system; and (2) much of the existing property may have been installed before a present higher grade of pavement had been laid by the public authorities. For both of these reasons it has been claimed that the replacement cost of such property would greatly exceed the actual original cost.

There can be no question whatever as to the fact that the unit cost of replacing construction in many streets of our large cities will be found to be much greater than the unit cost of the original construction. This difference in cost, however, arises simply from the increased difficulties which would be met in carrying out the underground work in close proximity to more sewers, manholes, or pipes belonging to other enterprises than were present at the time the original plant was installed. It would be necessary, in many cases, to excavate under or around such foreign structures; such work would be more expensive than that originally involved for the reason not only that the actual excavation would cost more but much expense would be involved in supporting the pipes or conduits of other companies and in the repairs that might be occasioned by injuries to them in the actual conduct of the work or the settling which might arise after the actual reconstruction work had been completed. It cannot be claimed properly that the increased cost of replacement arises from the present congestion in the streets and the consequent difficulty which might be found, at the present time, in obtaining the space required for the structures of the replacing system. The existing system has already the necessary space in the streets and the replacing system will occupy the same identical space. There can be, therefore, no difficulty or increased cost in finding the space, but there may be increased cost in getting the replacing

system into that space. The replacement cost is the cost of a plant of the same size and character as that in present existence and *situated in the same place.* If it were ruled that the replacement cost would be what it would cost to place a new plant in the streets wherever space could now be found for it, then the existing construction would prove an obstacle to the new and be itself a means of enhancing its own value. Such a line of reasoning would be manifestly absurd. Bearing directly upon this point is the following decision:

"The plant, in our opinion in arriving at its cost of reproduction new, should not be considered as an existing obstruction upon the streets which would have to be worked around in constructing a new plant of a similar kind." [1]

Likewise it cannot be questioned that the unit replacement cost of construction in streets which have been resurfaced with a higher grade of pavement will exceed the actual original unit cost. The replacement cost is what it would cost to-day under existing conditions to reproduce an identical property. If the street, where existing construction is to be replaced, is surfaced with a high grade of pavement, that pavement in a replacement would have to be torn up and relayed in kind and the unit replacement cost would properly include such costs. It is illogical to take any other view of this question.

Notwithstanding the logic of retaining the full significance of the definition of replacement cost in the case of construction in streets, there has been much misdirected controversy on this subject. It is a mistake to argue that, as the present congestion and the higher grade of street pavement has cost the company nothing, the replacement cost should be what such construction had

[1] Pioneer Tel. & Teleg. Co. *v.* E. H. Westenhaver *et al.* 118 Pac. 354 (1911).

actually cost the company for its existing plant. The actual original cost will show the company's actual expenditure; the replacement cost will show what it would cost to reproduce its plant. The real question involved has no bearing whatever upon either of these two figures but is rather whether this difference in cost should be made a portion of the fair present value upon which charges for service should be based.

As has been said already many times, the fair present value may be neither the replacement cost nor the actual original cost; the fair present value is determined after both of the above figures have been made known as well as other facts relating to the property in its actual operation in the past, present, and probable future. An indication of the general present opinion as to whether or not the replacement cost or the actual original cost of construction in streets should be included in fair present value is shown by a few decisions of public service commissions bearing on this matter.

"To include something in the valuation of the physical property for the cost of paving, is undoubtedly fair and just when such costs have actually been incurred. But when they have not been incurred, it is very difficult to find any just and reasonable ground upon which they can fairly be made a permanent charge against the consumers." [1]

"It is apparent that, if this basis for estimating replacement cost be adopted, every expenditure made by a municipality for more substantial paving will act automatically to enhance the basis on which the customers of a public utility would have to pay rates. They would first pay the taxes for the improved paving, only to find that they are expected thereafter to pay higher rates for service for structures under the paving. . . . We are therefore not justified in allowing any part of the sum of $142,500 which would now be required to assist in paying the replacement cost of paving over conduit." [2]

[1] Wis. R. Com. Reports, Vol. IV, p. 555 (1910).

[2] N. J. Board of Public Utility Comsrs. Gately & Hurley, *et al. v.* Delaware & Atlantic Telephone Co. (Jan. 7, 1913).

"We assume that the company is not entitled to collect from gas consumers a rate which will yield a fair return upon paving which the city has placed over its mains and services and for which the company has not expended directly or indirectly a single dollar. In other words, the company is not entitled to a larger return simply because the city authorities have improved the street paving." [1]

"If the cost of reproducing the plant new were the sole fact to be ascertained in determining the proper basis on which to fix rates, it might be logical to include the entire amount for tearing up and relaying pavement. . . . In view of the fact, however, that other elements, including original cost, must be considered, and that the amount actually expended by the Gas Company for this purpose was only $1198.24, it would seem more proper in determining the basis for fixing rates to follow the course pursued by Mr. Cory and not to include an amount for tearing up and relaying pavement in excess of the amount actually expended therefor." [2]

The above decisions have been quoted for the purpose of showing that the question of replacement cost *per se* was not involved but rather as to whether this portion of the replacement cost should be included in the fair present value. It will be noted that it is the opinion of the commissioners rendering these decisions that the actual original cost of construction in streets should be made a portion of the fair present cost-new of a property. These decisions accord, therefore, with the arguments relative to fair present value given in Chapter II of the present study.

But, in the arguments which have been presented as to fair present value, it was held that, in some instances, where this value was to be determined for a previously unregulated public utility, greater justice would be accorded the company if the fair present value was made somewhat greater than the actual original cost pro-

[1] N. Y. Pub. Service Com. First District. Rates of Brooklyn Borough Gas Co. (July 8, 1913).

[2] Calif. R. R. Com. Palo Alto *v.* Palo Alto Gas Co. (March 12, 1913).

vided there was greater value in the property arising from the unearned increment. A question is raised, therefore, as to whether the difference between the replacement cost and the actual original cost of construction in streets is an unearned increment of the same nature as the unearned increment in land or in the costs of construction material. There seems to be no good reason for making any distinction between the increased cost of work done in streets and that of work done elsewhere; consequently that portion of the increase in replacement costs, arising from the greater difficulty in replacing the plant to-day, should be treated as an unearned increment similar to that found in other items of property.

On the other hand, that portion of the replacement cost, which is due to the removal and reinstatement of a higher grade of pavement than was met in the original construction of the property, seems to be of a somewhat different character. The present higher grade pavement in the streets was paid for by the people of the community through the taxes. The company may have paid a portion of this cost through the taxes assessed upon it but the taxes are an operating expense which is restored to the company by the users through the charges for service. The public and the users of the service have paid the actual cost of the higher grade pavement and the company has paid nothing whatever. The company may argue that it did not require a better pavement but, on the contrary, would have preferred a lower grade pavement owing to the lesser cost which would be involved when extensions or repairs to their plants had to be made. Any such line of reasoning is faulty for the reason that the costs of extensions are capital charges upon which the company is entitled to earn a full return, and the cost of all repairs are a maintenance charge and, consequently,

a proper portion of the costs of operation, which costs it is encumbent upon the users to pay. Again, the streets do not belong to the company nor do the high grade pavements enhance the usefulness of the company's plant in any way whatever. On the other hand, the unearned increment in the case of land arises principally from the growth of the community and a consequent increase in the general demand for land. The land belongs to the company and its increase in value is similar to the increase enjoyed by other holders of land similarly situated. It is true that with the growth of the community, taxpayers may have expended large sums of money for street improvements which have tended to enhance the value of the real estate but such expenditure is indirect and favors all holders of adjacent land.

There seems good reason for holding that the enhancement in the replacement cost arising from the increased cost of pavement is not of the same character as the unearned increment in land and could be included rarely, if ever, as a portion of the fair present value upon which the cost of service should be calculated.

On the other hand, if the present plant was obliterated and the users themselves were obliged to create a new and similar one, the cost of replacement would be the full cost including the removal and reinstatement of the existing pavement. The cost-new of the property would be its replacement cost and that figure, less the depreciation, would be the value of the property of the company but not necessarily its fair present value upon which a full return could be earned with justice to the users. If the question was carried to the courts as to whether a statutory rate was confiscatory or not, the replacement cost—including the cost of high grade paving — less depreciation would be regarded unquestionably as the value upon which the return should be

figured — not the *fair* return but a return which was not confiscatory.

The following decision is frequently cited as authority for including the cost of high grade pavement, rather than what the pavement originally cost, in the fair present value upon which the full fair return should be earned:

"If it is 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." [1]

It should be noted that in the affirming case of Wilcox *v.* Consolidated Gas Company, 212 U. S. 19 (1909) this point was not specifically passed upon. Moreover, despite this decision, practically all commissions have refused to include costs of construction in streets other than costs incurred originally by the company.

61. Replacement cost of land. — The replacement cost of land is its fair market value at the time of a valuation. The fair market price can be found by obtaining "the present prices of neighboring land of similar character, augmented by the ratio ordinarily found to obtain in that region between land acquired by public service corporations, on the one hand, and by private parties on the other, and subject to the value of improvements upon the land obtaining at the time of purchase, said improvements being appraised at their present day prices.

Due consideration also should be given to the increased cost and value of public service property where it has been necessary to take a strip of land running through a large tract. In such a case the severance of the prop-

[1] The Consolidated Gas Co. *v.* City of New York, 157 Fed. 849 (1907).

erty into two parts decreases the value of the land not taken, and, therefore, augments the cost and value of the strip of land acquired.

In applying either of the above methods, care should be taken to use, as far as practicable, as a basis for valuation, land which has not been affected in value by the use to which the public service property is devoted."[1]

Some question may be raised as to the propriety of enhancing the price of land "by the ratio ordinarily found to obtain between land acquired by public service corporations and by private parties" owing to the decision of the Supreme Court in the Minnesota rate case.[2] In this case the Court said

"Assuming that the company is entitled to a reasonable share in the general prosperity of the communities which it serves, and thus to attribute to its property an increase in value, still the increase so allowed, apart from any improvements it may make, cannot properly extend beyond the fair average of the normal market of land in the vicinity having a similar character. Otherwise we enter the realm of mere conjecture."

Without question, public utilities are obliged to pay higher prices for land than the average market price for similarly located land. If this can be definitely proved to be the case, there can be no question whatever that the undertaking is entitled to such an increase. It seems reasonable to interpret this decision as meaning simply that the enhancement in value of land arising from the general prosperity of the community can be made a portion of the property of the company but that any further increase must not be predicated simply upon the fact that the property belonged to a public service company, nor must the value of land be enhanced by any multipliers which are wholly theoretical in character.

[1] Am. Soc. C. E. "Valuation for the Purpose of Rate Making," p. 52 (1914).

[2] Simpson *et al. v.* Shepard, 230 U. S. 352 (1913).

CHAPTER V

ACTUAL ORIGINAL COST

62. Actual original cost. Definition.[1] — The actual original cost is the sum of money which was expended by the undertaking for the property now in use for the benefit of the public. It is not what the original property cost but rather what the present property cost. The expression "original cost" is liable to convey a false impression. What is required in a valuation is the "actual cost" of the property now in use. The term "original cost" has been used so generally in decisions of courts and commissions, however, that it cannot be now eliminated. In order to emphazize the fact that the "original cost" is the actual cost of existing property, the expression "actual original cost" has been used throughout the present study.

The actual original cost should not be considered to be the cost of the first unit of plant used in a particular place or for a particular purpose. Items of perishable property, which are no longer in use or useful, cannot be considered as a portion of the property to be included

[1] Much of the present discussion of actual original cost was first published in an article by the writer in the Quarterly Journal of Economics, August, 1913.

See also "Fair Values for Rate Purposes," by R. H. Whitten, Harvard Law Review, Vol. XXVII, p. 419. (1914).

in a valuation for the purpose of determining the fair value for rates. Such items of property have passed out of existence and their cost should have been removed from the books of the company as a portion of the value of its assets. If the business of the undertaking had been conducted properly, reserves for renewals would have been made. These reserves are obtained from users as a portion of the charges paid for the service. Manifestly it is unfair to the users for the company to demand from them rates sufficiently high to create a fund for the replacement of obsolete items and then include the cost of such obsolete items in a new value upon which new rates should be based.

63. Past neglect of actual original cost.—The actual original cost has been presented as a figure representative of the value of a property in relatively few appraisals, whereas to-day the replacement cost is almost always ascertained. There are several reasons for this neglect of actual original cost. Probably the most controlling reason is that, through a misunderstanding of the true meaning of "original cost," such a figure can rarely be obtained. This misunderstanding of original cost is due to the efforts of the advocates of the theory of value based on cost to define the original cost as the stockholders' investment in existing useful property. Such an interpretation of original cost requires an analysis of the company's books, an identification of each unit of the existing plant with the book entries showing its original cost, and a determination of the source of the funds used to pay for each item. It will be apparent to all who are familiar with the construction, maintenance, and renewal of large public utility properties that such a figure can be obtained but rarely — usually in the cases only of enterprises which have been constructed but recently. In most instances, items of plant

cannot be identified by the book entries, nor is it possible to trace the sources of all funds used in constructing the plant. Time and again attempts have been made in valuations to derive a figure representative of original cost in accordance with such a definition, and without success. The replacement cost has become, therefore, the only figure which rests on definite knowledge of the existing property, and a figure representative of actual original cost has not been presented to the rate making tribunal.

64. Importance of actual original cost.—The original cost has been called for by the courts as one of the figures representative of value which must be ascertained to assist the rate making tribunal in forming its judgment as to the fair present value of a property. It is a figure, consequently, of quite the same importance as that representing the replacement cost. The responsibility is upon the engineer, therefore, to find some way whereby the demand of the courts can be complied with and an accurate determination of original cost be made.

65. Method of ascertaining actual original cost.—The actual original cost, if the above interpretation of its meaning is accepted, can be ascertained in a manner almost identical with that used in determining the replacement cost. The inventory, describing all useful property now in service, is identical for the two purposes. The unit cost will be different, however. The unit costs used in ascertaining replacement costs are, theoretically, the prices for labor and material prevailing at the date of valuation. Practically, it is usual not to take actual present prices, since such figures may have been affected by abnormal market conditions, but a figure for each unit of plant representative of a probable present cost had market conditions been normal. The unit costs used in ascertaining actual original costs will

be the actual prices for labor and material paid by the company in each year in the past in which plant units had been purchased and installed. Thus, instead of a single unit cost for each unit, as is the case with replacement costs, there will be as many unit costs for each unit as there are years in which existing units have been purchased.

This method of ascertaining actual original cost is not so difficult or laborious as at first thought it may appear. The age of each unit of perishable property must be ascertained in every valuation for the purpose of determining the loss in value of the unit due to depreciation. The present value of the items of perishable property, whether that value is based on original cost or replacement cost, is the cost-new-less-depreciation. The present value of the property as a whole is the value of the perishable property in its present condition plus the value of the non-perishable property. With the ages of all units known, it is only necessary to group together units of the same kind and age. The age indicates directly the year in which the units were purchased. The prices paid for each unit in each year in the past can be obtained readily from the books of the company or, if such records are not available, it rarely would be difficult to obtain reliable figures from outside sources. The product of the unit costs for each year, obtained in this manner, multiplied by the number of units found by a knowledge of their age to have been installed in that year, gives the costs for each year of the perishable property. The sum of the costs of all units for all years gives the total actual original cost of all perishable property. To this sum must be added the actual cost of the non-perishable physical property. Frequently the non-perishable property consists principally of land. There is usually but little difficulty

in identifying the sums paid for land as shown in the company's records. To the actual original cost of the physical property must be added the usual overhead charges, derived in the manner described in the previous chapter.

66. Accuracy of this method of ascertaining actual original cost. — Actual original cost, derived in the above manner, presents no difficulties to the appraiser, is founded on a carefully made inventory, and uses unit costs freed from any assumptions. It would seem to be a figure possibly even more reliable than that derived to show the replacement cost. These unit costs are actual costs, whereas the unit costs used in a determination of the replacement cost are based theoretically upon the assumption that all material and labor must be figured at the prices prevailing on a particular day, and that such prices should be not the actual prices but what they would be if the market were normal. Original cost, being actual cost, avoids the contentious question usually incident to replacement cost — whether such a figure should show the cost of plant replaced in a wholesale or in a piecemeal manner. There are many other similar points favoring the reliability of a figure representative of actual original cost, derived as described above, which are of interest to the expert on valuations but need not be considered here. Every consideration tends to show that the actual cost of an existing plant is a more acceptable figure, as far as the accuracy of its determination is concerned, than a figure based upon the supposititious replacement of a plant. All doubt as to the reliability of the books of the company is removed, as the inventory establishes the present useful items of property and their ages. The books of the company can be trusted to show what was paid for labor and material and, even if this is doubted, market rates for

labor and material for the years in question can be obtained from other sources.

67. Actual original costs supplement replacement costs. — It must be distinctly understood that the above arguments in favor of actual original cost are not intended to advocate the use of that figure to the exclusion of the replacement cost. On the contrary, figures to show the replacement cost have been demanded by the courts and must be prepared and presented to the rate making tribunal for its information. The point which it is wished here to emphasize is simply that the actual original cost is likewise a figure of importance and is one which has been greatly neglected in the past. The actual original cost is capable of determination with quite as great a degree of accuracy as the replacement cost and can be accepted in many cases with less controversy.

68. Actual original cost of land. — The actual original cost of land will be found in many cases to have been not the cost of land similarly situated but land encumbered by buildings which had to be destroyed to make the premises serviceable for the purposes of the utility company. The actual original cost, as shown by the books of the company, can be obtained in a very large percentage of cases, and such figures will be more useful than those based upon any present estimates which necessarily must be based on assumptions as to possible former conditions.

The importance of obtaining the actual original cost of land is well shown in an illustration taken from actual experience. The case cited was that of a large reservoir.

"In constructing this reservoir it was necessary to acquire land upon which were many buildings and mills with their water power. Included in the reservoir site, also, were many highways and two railroads. As a

substitute for the highways obliterated, others had to be built around the margins of the reservoir, and some were raised above the water level. One of the railroads was relocated for many miles at one side of the reservoir and another was raised. To make the reservoir a better receptacle for water, the surface soil was stripped from its whole area. One main dam and two subsidiary dams were necessary for holding the water. Incidentally, under special laws, damages had to be paid for real estate which was not acquired but which was said to be indirectly damaged by the construction of the reservoir.

"At present there are in the reservoir no buildings, mills, water powers, highways or railroads except the highways and railroads which were raised. The title to the highways and the new railroad outside the reservoir vests in the adjacent municipalities and in the railroad company, so that they would not appear in a schedule of reservoir property."[1]

Clearly in such a case, which is more or less characteristic of the conditions affecting the land acquired by many utilities, the actual original cost must include, so far as may be possible, all expenditures necessarily incurred in making the land suitable for the purposes of the utility. In but few cases would it be impossible to find records of the work which had been done in the past and to review the cost of such work in order to be assured that it had been efficiently and economically carried out.

The actual original cost derived with a full recognition of all past conditions is a figure of greatest importance as evidence of the fair present value of property in a valuation for rates. It must be recognized that, provided the replacement cost is found with the same

[1] Am. Soc. Civil Engineers. Report Special Com., Dec. 1, 1913.

complete knowledge of previous conditions as is required in checking the actual original cost, a figure possibly larger might be obtained. Such a figure would be less reliable, however, as most of the costs which would be attached to such a work would be assumptions based upon more or less hypothetical estimates of the claims for damages which might be made to-day under conditions entirely different from those which existed at the time when the land was originally acquired. Such changed conditions would have been produced in many instances, particularly in the case of land of railroads, by the facilities and community growth occasioned largely by the facilities provided by the utilities themselves. Unquestionably cases of this kind were in the mind of the Court when it ruled, as it did in the Minnesota Rate Case, that in ascertaining the value of land use should not be made of "multipliers" to cover hypothetical outlays.

CHAPTER VI

GOING VALUE

69. Confusion of going value with good will. — A careful study of the valuations that have been made in the past, wherein a claim has been made for going value as a portion of the property of a public utility, as well as the decisions and reports of courts and commissions bearing upon this subject, show that there has been great confusion as to the precise meaning of this term. This confusion has arisen, in a large measure, from a careless use of the overhead charges, usually

claimed as a portion of the cost of physical property, and from a demand for the recognition of an indefinite asset, which has been called going value, arising from the fact that the undertaking was in active operation and earning a return. This confusion has been increased further by confounding going value with "good will" and "franchise values," neither of which can be given values in an appraisal for rates other than those represented by actual costs to the undertaking. It is felt that proper recognition cannot be obtained for going value as a definite asset of a public utility until the present confusion has been eliminated.

70. Definition of "going value" and "value as a going concern." — The "value of a property as a going concern" is its value based on its earning capacity. When this term is used in its broadest sense the cost of the property, either original cost or reproduction cost, does not enter. If put into the form of a mathematical equation it can be defined thus:

$$\left.\begin{matrix}\text{Value of a property as} \\ \text{a going concern}\end{matrix}\right\} = \frac{\text{Net earnings}}{\text{Desired rate of return}}$$

A business man knows the rate of return which he or the investing public expects to receive on money invested in enterprises subject to the hazard of that under investigation. The gross return, the operating expenses and, consequently, the net income of the undertaking, are known. The net earnings, capitalized at the desired or expected rate, give the value of the property as a going concern. Thus, taking as an example, an enterprise which obtains a net income of $8000 a year, if the rate of return expected for investments in undertakings of the character of that under consideration is 6.76 per cent per annum, then by the above equation

$$\text{Value of property as a going concern} = \frac{\$8000}{.0676} = \$118{,}343.$$

The "going value" of an undertaking is the difference between its value as a going concern and its cost as shown by the capital account, or

Going value = value as going concern − capital cost. Thus, if in the above numerical example the cost of the property as shown by the books of the company was $100,000, its

$$\text{Going value} = \$118{,}343 - \$100{,}000 = \$18{,}343.$$

For private and unregulated undertakings it has been usual to say that an undertaking had property of two kinds, tangible and intangible. In the above example its tangible property was worth $100,000 and its intangible property $18,343.

71. Going value a portion of property of public utility. — It has become the custom of late to say that such definitions of "value as a going concern" and of "going value" as given above cannot be accepted when they are applied to the property of a regulated public utility. In fact it has been denied in some cases that there can be a going value as a portion of the property of a utility whose charges for the service rendered to the public are subject to regulation. It will be shown that the above definitions are general and apply equally to regulated and to unregulated properties.

Looking at the right-hand side of the above equation for "value as a going concern," it will be seen that there are two quantities — "desired rate of return" and "net earnings." In the case of a regulated enterprise the rate making authorities have the right to say what each of these figures should be. In other words, the "desired rate of return" is the "fair rate of return" and the "net earnings" are those obtained through fair charges for service when the company is properly and economically operated. For a regulated as for an un-

regulated undertaking the value of the property as a going concern is the net income capitalized at the desired rate of return, but for the regulated undertaking the equation can be defined more closely by saying that the

$$\left.\begin{matrix}\text{Value of the property as} \\ \text{a going concern}\end{matrix}\right\} = \frac{\text{The fair net earnings.}}{\text{The fair rate of return.}}$$

72. Fair rate of return. — Relative to the "fair rate of return," it can be said that the rate assigned by a banker or by a business man most familiar with the rate of return demanded by the investing public should be that adopted by the rate making authorities. A rate of return can be "fair" only when it is such that new capital will be attracted at all times to the undertaking, and the enterprise thus be enabled to finance needed extensions and improvements of the property. The proper figure to represent the fair rate of return must be established at the outset of a valuation and is necessarily of fundamental importance. A proper figure for the denominator of the above fraction will be assumed as fixed and need not be considered further in the present discussion.

73. Fair net earnings. — If the fair value of a property as a going concern can be determined in some way through the money which has been expended to create it, then the fair net earnings become x, the unknown quanity in the investigation. It is to obtain this fair value of the property in order to find x that appraisals and valuations are made.

74. Capital cost. — For the purposes of the present discussion it will be assumed that two figures must be derived to be used as evidence of the fair present value of a property, one based upon what it has cost to produce the present property and the other what it would cost to reproduce it at the present time.

"Going value" has been defined by the equation

Going value = value as a going concern – capital cost,

but "value as a going concern" can be assigned only by well informed judgment after cost figures have been found. "Going value" must be regarded simply as a term — unfortunate in that the word *value* must be retained — to designate certain classes of costs. For an appraisal, therefore, the equation can be expressed more accurately,

Going value = cost as a going concern – capital cost.

It is seen from this that, if the capital cost equals the cost as a going concern, there is no going value, and the contention so often made that there is no going value in a regulated public utility holds good. But this contention holds equally true for an unregulated concern. There is need, therefore, of a careful consideration of what is meant by capital cost.

It will be necessary to review briefly what has been said already in sections 51, 52, 54, and 55 relative to the property of a company and to the use, that has been made in past appraisals, of overhead charges.

It has been usual, in past appraisals, to add, in the form of percentages of the cost of the physical property, certain costs which had been incurred in the production of a property or which would be incurred should it be reproduced. As has been already stated, many of such costs bear little or no relation to the cost of the plant, and a more orderly and accurate method of treating such costs would be to bring them together into three groups, in each of which the costs are more nearly of the same nature or can be found by an appraiser in more nearly the same manner.

The overhead charges used in former appraisals, when

brought together in the manner recommended, would be grouped as follows:

Cost of Promotion or Preliminary Expenses:

Actual promotion costs.
Issuing and marketing bonds.
Brokerage.
Certain legal expenses.
Costs of charter, of franchise, of permits and consents.
Preliminary engineering costs.

Costs of Physical Property:

Actual cost of physical property.
Engineering and engineering supervision.
Contingencies.
Contractors' profit.

Going Value:

Company organization.
General expenses.
Legal expenses.
Taxes.
Interest during construction.

All of the above costs are unquestionably portions of the capital cost of a property and, if all have been included in figures purporting to show the actual original cost and the replacement cost, the capital cost equals the cost as a going concern. Consequently "going value," so called, is already included in the capital cost. When the items of cost given in the group "going value" have been omitted from an appraisal in which the costs of the other two groups have been included, then, and then only, can it be said that there is a difference in cost between figures showing the cost as a going concern and the capital cost.

All that has been said above is elementary and would be unnecessary were it not for the fact that in practice the capital cost, as shown by the books of a company,

does not include, usually, some of the items of property cost given in the group headed "going value." Moreover, in most appraisals some of these costs have been found in a manner which does not create a desired accuracy.

75. Necessity of distinguishing between going value and certain overhead charges. — Therefore in an appraisal to find the cost of a property as a going concern there is no necessity for introducing another factor such as capital cost. Expenses of the character of those above described, which form a portion of the total cost of the property as a going concern, may be grouped together and, to follow the accepted understanding of the term, may be called the "going value." Going value, in a valuation to ascertain the cost as a going concern, would be, therefore, simply costs necessary to the production of the property which have not been included as a portion of capital otherwise expended. Going value thus becomes simply a term to designate certain classes of expenses incurred in the production of the property. If all such expenses have been included as a portion of another element of property, as might be the case if all were included as overhead charges and made a portion of the cost of the physical plant, there could be presented no figure properly representative of going value. In other words, such expenses have been capitalized already and the capital cost equals the cost of the going concern.

76. Items of cost in going value group a portion of the property of a company. — The difference between the income, obtained by the company from funds in its hands or from the sale of service, and all proper operating expenses is to be included under this head as a portion of the property of the undertaking as a going concern. These figures are to be calculated from the

day of the initiation of actual work of building the plant and bringing together the organization up to the time when a fair return is obtained upon the property. The difference between the actual net return and the fair return gives, for any one year, the cost of this group of property for that year to those who have invested in the enterprise.

In speaking of the overhead charges applicable to plant, only such expenses as would be directly assigned as plant costs were used. There are other costs which are clearly a portion of the cost of building the physical property, such as the time and office expenses of the head officers in the direction of subordinates devoting their entire time to plant construction, certain legal expenses which relate to rights of way or damages incurred in construction work, taxes, and interest upon money invested in the plant during the construction period. But the time and expenses of many officials of the company are devoted to the operation and maintenance of the property as well as to its construction.

Except possibly the item of interest during construction, usually all of the above expenses have been charged, in the past, upon the books of the company as operating expenses. They show the money expended in supervising the construction of the plant, in its maintenance, in the development of an organization to get in touch with the public, to solicit business by advertising and canvassing, to gain a knowledge of present and probable future requirements and to so coördinate the organization and plant that good service may be produced with the least cost. If the method of segregation above outlined is carried out, none of these expenses is charged as a portion of the figures presented in an appraisal to show the cost of the structural property nor as a portion of the cost of promotion. If the expenses included in

the group of "going value" are found from the day when operations begin up to the day when a fair return is earned, there is obtained a definite measure of the cost of developing the plant and business and there is no reason whatever for attempting to ascertain what portions of such expenses might be attributed properly to the construction of the plant as distinguished from the creation of the property as a whole.

77. Good will and franchise not items of property. — It is not necessary to enter into a review of the many decisions of courts and commissions bearing on "good will" and "franchise value." It is sufficient to say that much confusion is manifested in them, owing to a lack of proper definition of the meaning of "good will" as distinguished from "going value." It is admitted generally to-day that, for a public utility, there can be no such asset as good will, an asset that can be included properly, in some cases, as a portion of the property of private enterprises. All that this item can mean, therefore, when used in connection with the property of a public utility, is that the company is supplying service to users.

It must be recognized, at the outset of a discussion of this subject, that good will and franchise values form no part whatever of the going value, so called, that may be found as an intangible asset of a public utility undertaking. A public utility is considered by the courts as a monopoly with rights given to it by the public. The courts have ruled that such rights cannot be given a value upon which the public must pay necessarily higher rates.[1] On the other hand, good will and franchise are attributes or assets of the utility in that they confer upon the physical property the activity produced by

[1] As opposed to this, see decision, "Passaic Gas Case," New Jersey Court of Errors and Appeals, December 9, 1914.

users and the legal right to furnish the public with a desired service. The physical plant of a public utility would have no value, except as scrap, if it had no users and no right to furnish service to the public. It is the fact that it has customers, the so called good will of the users, and the right to operate — franchise rights — that transforms the physical plant from a dead plant, worth only its scrap value, to a live plant wherein the value of the physical plant is measured by the money that has been expended or would be expended to produce it. Looking at this question practically it is clear that, if the physical plant is appraised at its present value based on its fair cost, there should be no recognition of any added value arising from the factors of good will or franchise rights. On the other hand, if it is argued that without good will and franchise rights the plant has scrap value only, the fact that justice demands that the fair cost of the plant should be recognized as an asset of the company necessitates the recognition of good will and franchise rights as creating that difference. But even in this case there is no special value attached to these two factors *per se*. They both operate to create or maintain the proper value of the physical property.

78. Going value a definite asset of company. — It has been contended that there is no such thing as going value divorced from physical value; that the fact that the physical plant was valued at its fair cost rather than scrap value created its going value. Such a contention arises very largely from the methods which have been used in the past in making appraisals. If the definition of going value is accepted as the difference between the cost as a going concern and the capital cost, and if all the expenses, that have been described above as properly segregated into a group called "going

value," have been added already in the form of overhead charges to the capital cost of the physical property, clearly these same costs cannot be added again to the property account. Where valuations in the past have made use of overhead charges for practically all costs incurred in developing the property, doubt has arisen very naturally whether "going value," so called, can be claimed as an additional asset. If, however, the method above advocated is followed, there can be no question of the admission of the items of cost which, when grouped together, show a figure representative of the true going value of the property of the enterprise.

The claim which has been made, that going value can be considered in a case of sale but must be rejected as property in a rate case, arises partly from the indefiniteness of the sources of the figures presented to show the cost incurred in making the company a going concern and partly from the fact that in cases of sale the net earnings are usually accepted and not treated as an unknown quantity, as must be done necessarily in a rate case. Going value, consisting of costs made up as outlined in the present study, is as much a portion of the property of a company in a rate case as in a case of sale.

79. Interest during construction a portion of going value. — Interest during construction has been included in practically all appraisals as a portion of the cost of the plant. It has been usual to assume that current rates of interest applied to the cost of the plant during one-half of the period of construction indicated the loss of interest during that period.

In the grouping of costs advocated in the present study, interest during construction is included under the head of going value and treated with other expenses usually entered on the books of a company as operating

costs. Taxes would be included, similarly, as a portion of the expenses considered under the heading of going value. This suggestion, as to the grouping of expenses, should not effect any change in the total cost of the property from that which would be produced by making interest during construction a portion of the plant cost, provided all estimates of cost were accurately determined.

The present practice of making interest during construction and taxes during construction a portion of the plant cost arises from the artificial assumption of the date of the completion of the plant as the date of the beginning of the operation of the company. It is unquestionably true that sales of service do not begin until at least a portion of the plant is completed, but the active work of the enterprise begins on the day promotion ceases and construction work is started. Not only, as has been explained above, is the staff of the company supervising construction work but the organization must be perfected for operating the plant and selling the service. Plant is brought into operation gradually and the date of beginning of operations, in very many cases, is most indefinite. All expenses, of the kind above discussed, are a portion of the cost of developing the property and must be made a portion of the figures presented as evidence of its going value. Again, there will be some income during this period; at first, possibly, only from funds held ready for the payment of the costs of the property but later from payments made for some service rendered to the public. If all income and all legitimate operating expenses from the date of starting actual work are brought together, the net losses or income each year can be treated more accurately than is possible in any other manner.

80. Stockholders entitled to a full return upon investment from the start.—The fair return to invest-

ors in a public utility may be regarded as formed of two parts, a fair rate of interest and a reasonable profit. Thus, if the fair rate of return established for the undertaking under investigation is 6.76 per cent and the current rate of interest is 5 per cent, the profit may be regarded as 1.76 per cent. This 1.76 per cent upon the investment represents the added payment to the investor for the use of his money in an enterprise involving a special hazard.

Interest during construction, as it has been calculated in the past, has been figured only on a portion of the investment in property and at a rate constituting only a portion of the fair return, the return established by the rate regulating authority as due the stockholders. There seems to be every reason for contending that those who placed their money in the enterprise are entitled not to interest alone during the construction period but to a full return, interest and profit, not only during the period required to develop the business but also during the time the plant was under construction.

This contention introduces two features: (1) that the full fair return and not interest alone is due the investor during the period of construction of the physical plant; and, (2) that foregone profits are due the investor during the time required to build up the business.

81. Stockholders entitled to interest and profit. — Relative to the first of these contentions it must be recognized that it is unquestionably true that an undertaking can capitalize the interest lost on the money invested in physical property during the time that the plant is under construction and, likewise, that a return, interest and profit, cannot be paid to the stockholders until such return is earned from the operations of the property. But those who invest their money in a new enterprise expect to obtain, later, a return sufficiently

large to repay them for the loss of income which must occur necessarily between the time of their investment and the time when the property is earning a full return. The return, therefore, which is due to those who have invested in the enterprise, should be larger in the early years of the operation of a property than might be assigned later as the fair rate of return. But, in an appraisal, the fair rate of return is defined — and in very many cases this rate is established many years after the initiation of the enterprise — and, if this fair rate is made to run from the date of the beginning of operation rather than from that of the beginning of the construction of the physical property, the stockholders are forced to lose not only interest and profit on promotion costs but profit on construction costs during the construction period. Nor can such losses be recovered, as all calculations are made on the basis of a single figure — the fair *present* rate of return.

When this distinction is clearly made between what can be done in the actual operation of an undertaking and what should be done in the case of a valuation to show the real sacrifice of the stockholders in constructing a property, there can be no question of the justice of admitting the first contention and allowing, as a portion of the cost of the property as a going concern, losses of a full return each year from the date of the beginning of the construction of the plant. If this is done, "interest during construction" ceases to be an independent overhead charge as it is made a portion of the foregone fair return. This method of treatment illustrates further the advantages that are obtained by dating the beginning of operations at the time of initiation of plant construction.

82. Stockholders entitled to fair return during development period. — Before the second contention

can be discussed it is necessary to examine more closely the method of valuation advocated in the present study. It will be noted that all of the items of cost, which have been grouped as a portion of going value, are such as would be treated ordinarily as operating expenses. Also it will be remembered that there are retained in these operating expenses items, which have been taken out in past valuations in some more or less unsatisfactory way, and included with the group designated as physical property. With the cost of promotion, the amount invested in physical property, the rate of return, the income, and the operating expenses known, the increment to going value each year can be computed readily. Such increment will be the fair return upon the investment in the property for that year plus the operating expenses less income. The figures representing this increment will be added to the cost of the property each year until the income equals the fair return plus operating expenses. Thus it is seen that all of the items of cost are brought into the property directly and without recourse to the arbitrary assumptions required when they are treated as overhead charges and applied as percentages of plant cost.

The increments to going value, thus added to property each year, up to that time when there are no losses of this character, are the foregone return and these increments capitalized with promotion costs and the costs of the physical property give the cost of the property as a going concern. In other words, the aggregate of these costs is the figure to obtain which the valuation was made.

83. Illustration of determination of going value as portion of replacement cost. — The conditions usually presented in a practical determination of going value can be illustrated best by an example. Let the case

be that of a public utility having as property, promotion costs and physical plant which, it has been determined, would cost $5000 and $95,000 respectively to reproduce. In these figures are included only the costs described above as proper portions of promotion costs and of the costs of physical property. Let it be assumed that the rate making tribunal has ruled that for a utility, situated as is that under consideration, 6.76 per cent of the fair value of the property in use would be the fair rate of return. In order to find the cost of reproducing the business, i.e., the costs included in the group designated as "going value," experts in the operation of utilities of the character of that under investigation would be asked first how long it would take to reproduce the plant and business. This question differs somewhat from that which has been asked and answered in all appraisals made in the past as to the period of construction. The answer to this question will require two estimates: (1) of the time it would take to construct sufficient property to enable some service to be supplied to users, and (2) of the time it would take to build a plant and perfect an organization capable of supplying the same units of service as are furnished by the existing property at the present time. Let the answer to this question be, that it would take one year to build sufficient property to begin to furnish service and that it would take four years to acquire sufficient property to make the production of service of the new property equal that of the company under appraisal. It is estimated further, on these assumptions, that $50,000 would be expended during the first year for physical property and that the increasing demands for service would require new plant costing $15,000 during each of the three succeeding years.

The next question would be, what would the net

deficit or income be for each of the four years required to reproduce the property. Before this question can be answered, it is necessary to emphasize the fact that the method under consideration is based not on what it had cost the company to acquire its present income but rather on what it would cost under good management and fair rates to acquire, under existing conditions, the present business of the enterprise. There are, therefore, three factors to be considered before this question can be considered fully: (1) what number of units of service would be sold during each year of the reproduction period; (2) what would be a fair cost for operating expenses, reserves for renewals, and taxes per unit sold for each year of this period; (3) what would be the gross return each year based on fair charges for the units of service sold.

The answer to the first of these questions must be based on the judgment of those best qualified to speak. It is not a difficult question to answer and would be subject, in most cases, to little or no controversy. For the specific example under present consideration, let the answer be that no service could be sold during the first year but that during the second, third, and fourth years there would be sold 10 per cent, 25 per cent, and 75 per cent, respectively, of the service sold by the existing undertaking at the time of the valuation. That is to say, the service sold during the fifth year would equal that at the time of the appraisal.

Relative to the second question, it is manifest that the operating expenses during this period of assumed reproduction must be estimates made by men experienced in the operation of utilities of a similar character. These estimates of expenses must be such as will conform reasonably with the conditions under which the plant is operating and would be free from abnormal

cost of service arising from the poor management which may have existed in the operation of the existing enterprise. Attention should be directed to one feature of this calculation. The object of making an estimate of operating expenses is to guide the judgment of the appraiser in obtaining a figure representative of the relative net earnings each year during the reproduction period. Net earnings are the gross return less operating expenses, taxes, and reserves for renewals. Until these charges have been paid, no return can be made to the stockholders.

The last question to be answered is that relative to revenue. The units of service sold each year are supposed to have been estimated. Likewise figures have been brought together to show what the cost of operating, taxes, and needed reserves for renewals would probably amount to during each of the years required for the reproduction of the property. With this data in hand it would be a simple matter to calculate the net revenue each year, provided it were known what the fair charges for service and, consequently, the gross revenue should be. This, however, is the unknown quantity, to determine which the entire investigation is being made. The solution of this problem is simple, however, if a single assumption will be accepted. This assumption is the relation of the income each year to the income, at fair rates, from the service sold at the time of the appraisal. If the fair present net income at fair charges for service is x, the assumption that must be made is as to what proportion of x the net income each year would be with known relative output and known operating expenses. Let the answer to this question be, for the example used as an illustration of this method, that the net expenses for the first year would be $2000, that for the second year the income would offset expenses, that for the third year

the net income would be $.25x$, and that for the fourth year $.75x$. Thereafter the net income would be x.

When the assumptions have been put into this form, the determination of the cost of the property as a going concern is simple. In order to reproduce the property under consideration $102,000 would be required from the stockholders, — $5000 for promotion costs, $95,000 for purchase and construction of physical property and a cash expenditure of $2000 to defray the expenses during the first year of operation. This $2000 is a known portion of the costs included in the group "going value." The other costs to be included in this group will be found from the following calculation. In order to make the discussion of this calculation as simple as possible, it will be assumed that the money required to pay the necessary cost of property can be obtained as required.

CALCULATION OF COST OF PROPERTY AS GOING CONCERN

YEAR			
End of 0	Paid for promotion costs	$ 5,000	
During 1st,	Paid for plant	50,000	
End of "	Return on $5000, 1 year @ 6.76 %	338	
" " "	" " $50,000 ½ year @ 6.76 %	1,690	
" " "	Operating expenses	2,000	
" " "	Amount invested in property	$59,028	
During 2nd,	Paid for plant	15,000	
End of "	Return on $59,028, 1 year @ 6.76 %	3,990	
" " "	" " $15,000, ½ year @ 6.76 %	507	
" " "	Operating expenses or income	0	
" " "	Amount invested in property	$78,525	
During 3rd,	Paid for plant	15,000	
End of "	Return on $78,525, 1 year @ 6.76 %	5,308	
" " "	" " $15,000, ½ year @ 6.76 %	507	
" " "	Income $.25x$		$-.25x$
" " "	Amount invested in property	$99,340	$-.25x$
During 4th,	Paid for plant	15,000	
End of "	Return on $99,340 - .25x$, 1 yr. @ 6.76 %	$(99,340 - .25x)$ $.0676$	
" " "	" " $15,000, ½ yr. @ 6.76 %	507	
" " "	Income $.75x$		$-.75x$
" " "	Amount invested in property	$114,847	$-.25x + (99,340 - .25x) .0676 - .75x$

From these figures an equation can be formed, for (the replacement cost of the property as a going concern) multiplied by fair rate of return (6.76%) = fair return, (x) and, consequently (the replacement cost of the property as a going concern) =

$$\frac{\text{the fair return,}}{\text{the fair rate of return}} = \frac{x}{.0676}$$

From the above calculation (the replacement cost of the property as a going concern) = $\$114{,}847 - .25x + (\$99{,}340 - .25x)\ .0676 - .75x = \$121{,}562 - 1.0169x$
Consequently,

$$\$121{,}562 - 1.0169x = \frac{x}{.0676}, \text{ and}$$

$$x = \$7689, \text{ and}$$

(the replacement cost of the property as a going concern) =

$$\frac{x}{.0676} = \frac{7689}{.0676} = \$113{,}743$$

The above calculation shows that the cost of the property as a going concern is $113,743. As the promotion cost plus the cost of physical property was $100,000, the going value is $13,743 based on a rate of return which has been ruled as fair to both the public and the stockholders of the undertaking. It further shows that if the operating expenses were normal the charges for service should be made such as in the aggregate would produce a net income payable to the stockholders of $7689 a year.

The above method is a hypothetical replacement of the business of an undertaking at fair present charges for service. It is exactly analogous to the replacement cost of the physical property based on fair present costs of labor and material.

84. Going value determined by reproduction method less favorable to company. — Clearly the above method must be based upon assumptions and estimates as to the time required to reproduce both the plant and business as well as the rapidity with which each can be acquired in each year of the reproduction period. Moreover, the relation between operating expenses and return each year can be predicated only from a general knowledge of the production and operation of similar utilities under like conditions.

Any method requiring assumptions of this kind is open to attack on many grounds, the most convincing of which is the possible injustice which such figures, if accepted as final, would do to the owners of the property. Practically every assumption is unfair to the undertaking. The enterprise may have been initiated many years ago when the community served was smaller and before the public had become educated or was ready to use the service. Again, calculations of the character of that shown above are based upon a present fair rate of return, a rate of return which may be fair only under existing conditions wherein the risk attending the investment in property may be much less than that which prevailed in the early years of the operation of the property. Furthermore, the assumed cost of operation per unit of service sold or during the construction of the plant would be, in any reproduction method, unquestionably less than were the actual costs in the operation of the company in the early days of its existence. These and many similar objections may be raised against the acceptance of figures derived by a method involving the reproduction of a property as an indication of the correct amounts to be attributed to such items of cost as are included in the group of "going value." Such objections, for the most part, would be well taken.

Attempts may be made to modify the assumptions, necessary in a calculation of this kind, so as to bring them more nearly into accord with the actual original conditions. Such attempts would be misdirected. If the cost as a going concern, derived by a reproduction method, is accepted simply for what it actually is, i.e., an estimate of what it would cost to reproduce the property under present existing conditions, there should be little or no controversy as to its accuracy. The actual cost under original conditions must be ascertained and can be found from the books of the company with greater accuracy, in most cases, than is possible with the assumptions required in a reproduction method. The cost as a going concern, calculated by a reproduction method, is probably not the *fair* value of the property, but it is a useful figure which must be presented as a portion of the evidence upon which the fair value can be predicated. In most cases the going value thus derived will be less than one which does full justice to the undertaking, but it clearly defines the minimum cost that should be assigned to the items of that group.

85. Present worths method of calculating replacement cost of a going concern. — The above method is a modification of one which has been employed frequently in the past, particularly in the valuation of waterworks. This latter method has been called the "present worths" method of calculating going value. The present worths method will not be discussed in the present study, as it is felt that the method above described will be found simpler and will be free from some objectionable assumptions necessarily inherent in the present worths method of calculating cost as a going concern.

The present worths method in its fundamental conception may seem, however, to be founded on a some-

what more logical and careful mode of reasoning. An appraisal is made to find the value of a property on a given day. The unit costs are based, theoretically at least, upon the costs of labor and material on that day and, as a consequence, the replacement cost of the plant is its cost at the date of the appraisal. An appraiser, applying the present worths method to the above example, would reason that the hypothetical plant would be built and its business developed during the four years succeeding the appraisal. The present value, at the date of appraisal, of the income or outgo would be what such sums were worth at that time, — that is to say, their present worths. If the method described in this study is adopted, it is necessary for the appraiser to use the cost of the property as of the date of the appraisal and to say either that the hypothetical replacing period began four years ago and that, with everything else remaining as at the present time, the capitalized net losses during these past four years would be a certain sum of money at the day of appraisal or that, with all other assumptions as of to-day, the foregone losses at the end of the period of replacement, four years in the future, would be the same sum.

As far as figures are concerned, the method described above and the present worths method give the same results provided the assumptions in the two cases are kept the same.

86. Determination of going value as a portion of original cost. — The above method gives figures which may be accepted as an indication of what it might cost, at the present time and under existing conditions, to reproduce a property as a going concern. Such figures, in the case of most undertakings, are less than those which would show what it had cost the undertaking originally to bring the organization and plant up to its

present efficiency. It is of the greatest importance, therefore, that the actual original cost of producing the property should be ascertained and presented as evidence of its value.

The original cost of producing the business must be derived from the books of the company and the method of calculating the cost of the property as a going concern will be substantially the same as that used in figuring the reproduction cost of the property. The original cost, however, will be largely free from assumptions. Actual expenses, as well as excess or deficiency of earnings over the earnings that should have been received at a fair rate of return, will be definitely known. In other words, the unknown quantity, x, of the previous calculations disappears, as well as the assumptions as to the relative earnings at fair charges for service during the development period. There are, however, several features of the calculation of the original cost of producing a property which require careful consideration.

The first feature of this calculation which should be considered is the fair rate of return that should be assigned for a period involving the development of a utility furnishing a new and possibly untried service. In the reproduction method of ascertaining the cost of a property as a going concern, the rate of return during the development period was the fair present rate under present existing conditions. Such a rate was justified on the ground that the prime object of such a calculation was to ascertain what might be expected to be the cost of reproducing the property at the present time. The conditions surrounding the existing undertaking in the past were entirely different from those affecting the property at the present time and, consequently, it is probable that, in many cases, justice to the undertaking demands that the foregone losses should be calculated

by the use of a higher rate of return, a rate fairer under past conditions than a fair present rate. In all cases, wherein doubt may arise relative to this feature of the calculation, it will be best to calculate the original losses of income at two rates of return, one the present fair rate of return, and the other a rate which may seem to do greater justice to the undertaking in that the hazards of the past are recognized adequately. These two figures should be presented, with others, for consideration as to the fair present value of the business of the undertaking.

The second feature of this calculation to which attention should be directed is that relative to operating expenses, taxes, and reserves for renewals. Special care must be exercised in reviewing past operating expenses to see that costs of construction, costs of renewals, costs of engineering, or similar items which should have been included in the appraisal to ascertain original costs as a portion either of the group entitled "cost of promotion" or of "cost of physical property," have not been entered as operating expenses on the books of the company. It is for the purpose of reducing to a minimum the possibility of a duplication of this kind that the method of caring for what have been considered in the past as overhead charges has been advocated in the present study of this subject.

87. Acceptance of going value as a portion of the actual or replacement cost of a property. — It is not unusual to hear the argument made that "going value" cannot be made a portion of the property of a company when the fair present value is sought in a rate case. It is argued that the inclusion of "going value" derived in any such ways as have been described above would lead to absurd values. It is argued that this would be the case for the reason that the "going value,"

as measured by the foregone profits, of a property which had been well designed, favorably situated, or needed by users, would be small owing to the relatively short time that would elapse between the initiation of the enterprise and the time when it had become self-supporting; whereas another plant, furnishing the same character of service, which had been built or operated unwisely or had been started before it was needed, would have a large "going value" owing to the fact that it had been for many years a losing venture. In other words, if the foregone profits are made the measure of the "going value" of a concern, the "going value" of the successful company would be small and of the unsuccessful company abnormally large. It is argued that nothing can be more absurd than to say that the business of a well planned, well designed, and well operated enterprise has little value, as compared with one which has been badly engineered and badly operated, simply because the cost of the former was less than that of the latter.

These arguments are entirely wrong for the reason that "going value," in the sense that the term is used in an appraisal, is the name applied to a certain class of *costs*. An appraisal is made for the purpose of ascertaining the costs of a property — its actual original cost and its replacement cost. The items of costs, included in the class termed "going value," represent money expended in the production of the property, or which would be expended if it should be reproduced, quite as much as do those included under heads of physical property or of promotion costs, items which always have been accepted without question as portions of the property of an undertaking The costs included under "going value" represent the sacrifice of the stockholders' money. The stockholders used their money

to create the property, and a portion of that money was the return to which they were entitled but did not receive. If the foregone profits were not large, their sacrifice was small and the cost of developing the business was not large. On the other hand, if a company undertook to provide a community with a needed service, built a suitable plant, operated it wisely, and was obliged to pay a portion of the costs of operation for a number of years before the stockholders could obtain a fair return upon their investment, clearly the sacrifice was greater and the cost of the business was larger.

The arguments against the inclusion of "going value" are based on false premises arising from the unfortunate use of the word "*value*" in the term "going value" applied to actual *costs*. There can be no question of the propriety of making the costs included under the head of "going value" a portion both of the actual cost and of the replacement cost. If the cost of producing the property of the successful company is smaller than that of the unsuccessful company owing to the smaller "going value" of the former than of the latter, it does not mean necessarily that the *value* of the property of the successful company is less than that of the unsuccessful. The fair *value* and the fair return are determined by a consideration of both the actual cost and the replacement cost "with other things" affecting the property and operation of the company. The ascertainment of the fair present value has been considered at length in Chapter II.

Notwithstanding the fact that "going value," as the term is here used, is cost not value, there are two important questions that arise when these methods of ascertaining "going value" are applied to a particular practical case: (1) In the case of a successful enterprise, can the losses of the past which have been capitalized

be extinguished by later profits so that the "going value" at the time of a valuation may approach zero or even be negative? And (2) in the case of an unsuccessful enterprise, shall all of the foregone profits of the past be capitalized and made a portion of the cost of the property under the head of "going value"?

It is to be noted that probably neither of these questions will arise where foregone profits are ascertained by a hypothetical reproduction of the property, owing to the fact that the time assumed for creating the property is relatively short. When the "going value" is derived as a portion of the actual original cost, however, these questions become important for the reason that the time required to bring the property to its present condition may have extended, in many cases, over many years.

There can be but one answer to these two questions so long as the fair present value of the property of a public service corporation is to be determined by judgment based upon an accurate knowledge of all figures relating to the property under valuation. This answer must be that the actual cost and the replacement cost must be found without regard to the effect that such costs may have upon the figure to be ultimately established as the fair present value of the property. These two cost figures are simply two out of a number of evidences as to what the fair present value may be.

CHAPTER VII

DEPRECIATION

88. Definition of depreciation. — Depreciation may be defined as "the loss, arising from years of service, in the value of the investment in perishable property." "Depreciation is a measure of the loss in value of the *investment in perishable property* arising from the time that such property has been in service as related to the total number of years of serviceability."

In estimating the depreciation of any unit of perish-

able property, therefore, there are but three figures required: (1) the investment, i.e., its cost (less salvage value, if there is any); (2) its age; and (3) its life. Depreciation is simply an accounting problem after these three figures have been ascertained. The cost and age of each individual unit of perishable property are definite figures which can be ascertained by engineers usually with reasonable accuracy. The life of a unit is its age plus the number of years that the unit can be retained in service. The years of remaining life must be estimated not by engineers alone but with the assistance of officers of the company most competent to forecast the future requirements of the business.

Many writers have complicated the subject of depreciation by dividing it into two classes which they have termed "physical depreciation" and "functional depreciation." Physical depreciation, they say, arises from the "wear and tear" of service upon the item of perishable property. Functional depreciation arises from the changes in the art which produce obsolescence or from the growth of the business which causes the item to become inadequate to meet the demands of the service. Such a distinction is unnecessary and confusing. Depreciation is measured by the years of service as related to the years of serviceability; that is to say, by the years of service as related to the life. The important factor is the *life*, the number of years a unit of perishable property can be used. The life of a unit may be limited by the "wear and tear" upon it, by its "obsolescence" or by its "inadequacy"; the limit in life may be produced in rare cases by all three of these factors. A unit may wear out and become obsolete and inadequate at the same time, but the usual limit is imposed by one of these three considerations. There is but one kind of depreciation. Depreciation can be only the loss in value

arising from the limited life of an item, regardless of the agency producing such limitation.

Depreciation, when once the cost, life, and age of a unit have been ascertained, has no relation whatever to its efficiency of operation or to the nature and quality of the service produced by its use. All of these considerations enter in establishing the life. If it can be proved that cheaper or better service can be obtained by the use of a new unit, the life of the unit under consideration must be shortened. The fact that a unit is retained in service presupposes that it is furnishing the requisite standard of service. If it were not giving such service it would have been the duty of the company to have replaced it. It has reached the limit of its usefulness and has no value.

The value of the *investment* in a unit depreciates because of the fact that it is a wasting investment and the remaining years of usefulness are diminishing. So long as it is useful, however, its operating efficiency should not have been impaired. //

89. Distinction between investment in item and investment in property. — The property of an undertaking consists of many items of perishable property as well as of other assets, possibly of large value, which are not perishable. Depreciation is concerned with the loss in value of that portion of the investment which has been made in items of property of limited life. Again, although a property may consist of many items of perishable property and the value of the investment in them may be constantly diminishing, as the limits of their lives approach, still the total value of the original investment may be maintained by additions to the property. Much misconception of depreciation may be avoided if the fact is recognized that it is the investment in the *item* of perishable property that loses in

value or depreciates. If additions to the property are not made to offset the losses in the values of the items, the value of the property as a whole will diminish.

90. Reserves for renewals. — In order to offset the losses in the values of the items of perishable property, it is usual to set aside, each year, a portion of their cost so that, when an item has reached the end of its life and must be removed, there has been reserved an amount equal to its original cost. The amounts thus set aside are known as "reserves for renewals." These reserves are called, quite commonly, "reserves for depreciation," for the reason that they are supposed to equal each year the loss in value of the investment in each perishable item.

The reserves for renewals thus set aside are increments to the property so long as they are held by the undertaking and are not paid out to the stockholders or otherwise deflected from the uses of the company.

91. Obligation of users relative to renewals. — An understanding of the full significance of reserves for renewals can be obtained best by a recognition of the mutual obligations existing between the utility company and the users. The utility undertakes to provide the capital necessary to build and operate the property and to furnish the desired service to the users. The users agree to pay, for the service obtained, the cost of the service, including a fair return upon the necessary capital, and to reimburse the utility for the capital invested in perishable property. This conception of the mutual obligations of utilities and users cannot be questioned.

The users are bound, in return for the service furnished, to repay to the company the cost of the plant which is destroyed in the service. If the users agree to this — and there is no question whatever of

their obligation — and guarantee to pay to the company the full actual original cost of each item when it is no longer serviceable and must be renewed, then the investment in each item of perishable property may be losing its value, but associated with each item is the promise of the public to pay its full first cost when the time comes to replace the existing item by a new one. The value of the item plus this promise maintains the full original value of the investment and there is, in consequence, no depreciation of the property.

Under such an assumption as the above, the users would pay nothing as a reserve on items still serviceable but would pay the full original cost of all items that had to be renewed that year, in addition to a fair return upon the cost-new of all property used for the benefit of the public.

92. Justice to both users and company demands annual reserves for renewals. — The case assumed in the above section has been given to illustrate the obligation of users to pay to the company the costs of items of property which perish in furnishing service. The plan of requiring users to pay for renewals when they become necessary rather than to divide such costs over a term of years fails in doing justice both to the users and to the undertaking. It is, consequently, a method which cannot be used in practice.

The reserves for renewals must be made each year in such amounts that a portion of the original cost of each item will have been paid to the company by the users each year of the life of the item and in such amounts that the total original cost will be available to the company with which to defray the cost of renewal when needed, for the reason that by any other plan the users of different years are not treated alike. It is true that, if the users were the same individuals, were equal in

number, and always used the same amount of service during the life of each item of perishable property, the plan of paying the cost of renewals rather than annual reserves for renewals might do no injustice to users, but such a condition never has existed in practice and never will exist. Users of service are changing in person, in numbers, and in quantity of consumption. Should the plan of users paying for renewals but nothing as reserves for renewals be adopted, the entire burden of paying the cost of a new item, which replaces an old one, would be imposed upon those using the service during the last year of the life of the item, whereas those who had used the item during the earlier years would have paid nothing toward the cost of its ultimate and necessary renewal. Justice as between users demands that all users should share in the cost of renewals and as nearly as may be possible in proportion to their consumption of service.

It is of interest to note that the above argument favoring annual reserves for renewals is based wholly upon the necessity of doing justice to the users. The utility is in no way affected and either plan is acceptable to it, provided the utility can be assured that the users can and will pay the cost of all necessary future renewals. The utility may be considered, as far as this feature of the problem is concerned, as demanding annual reserves not for its own benefit but for the benefit of the users.

On the other hand there is need of annual reserves for renewals in order to do justice to the undertaking. In discussing the users' obligation to pay for renewals, it was said that if the users guaranteed to pay to the company the full original cost of each item when it was no longer serviceable, then annual reserves need not be paid and the undertaking would earn the fair return on the full cost-new. This is unquestionably true, if the

users can give such a guarantee, but they cannot. Users of service in early years of the life of an item cannot say that they will not pay any portion of the wasting value of that item but that some future users will pay its entire cost. When the time comes for the renewal of an expensive item of plant, the users of that day can say that they are obliged in no way to pay for the cost of renewing an item which has served its useful life for the benefit of others, and that they are bound in no way to carry out a promise made by others who have shifted the entire burden from their own shoulders to the later users of the service. An undertaking for its own protection cannot accept such a guarantee but must require each user throughout the time of his use of each perishable item to contribute his just share of the cost of ultimate renewal.

Objection will be raised unquestionably to the above lines of argument on the ground that they are theoretical and that, although they may be applicable to certain classes of properties, particularly such as contain items of long life and large cost, they are not applicable to properties consisting of many items of relatively short life and small cost. It will be contended that the renewals of each year will be substantially uniform and, if the users pay for the renewals as they must be made, no injustice is done either to the users or to the public. Such arguments are specious in that sight is lost of the fact that users of to-day are unquestionably paying some of the costs which should have been shared by past users. They who are active in supporting this contention are those who have assumed that the public of the past could guarantee that the public of the future would pay the cost of renewals in which the public of the past had failed to pay its own just share. Those who accepted such a guarantee theoretically now claim

that the present public should pay the cost of all renewals as they come due and that, as they have that guarantee, the value of the property has not depreciated and the utility, which they represent, is entitled to earn on its full cost-new. If the present public refuses to recognize any such obligation, such a theoretical guarantee has no value, the investment in perishable items has depreciated, and the undertaking can earn a fair return only upon the fair present value, that is to say, the cost-new-less-depreciation.

If justice can be done to such utilities, as have accepted such a guarantee on the part of past users and now find that the guarantee is valueless, in accordance with some such adjustment of fair present value as was considered in Chapter II, then for the future there can be no question whatever that reserves for renewals must be made each year. The choice of method to be pursued in apportioning the cost of renewals fairly among all users is not an engineering problem but one of accountancy.

93. Sinking fund method of making annual reserves for renewals. — The problem before the accountant is to devise some means whereby the cost of renewing each item of property, which becomes unserviceable, will be apportioned most equitably among all users of the item during its useful life.

Theoretically there can be but one solution of this problem. This solution is found in the use of what is known as the sinking fund method of creating reserves for renewals. The annual reserves for renewals are held by this method as a special fund, safely invested in readily convertible outside securities. When thus invested the funds obtain interest and these interest accretions are added to the amounts contributed by the users. As at the end of the life of each item of perishable prop-

erty, its original-cost-new will have been accumulated (neglecting for the present discussion any question of its salvage value), and, as the fund receives increments both from the users and from the compounding interest, the users will not be obliged to pay each year a sum of money equal to the cost-new divided by the life of the item but rather an annuity, based upon the life of the item and upon the rate of interest which this fund receives. If this method is used in practice, the undertaking includes the annuity in the rates, and, acting as the trustee of the fund, adds to it the annuities and interest accretions of later years. The undertaking draws upon the fund thus created only when an item has completed its serviceable life and the cost of renewal must be paid.

The operation of the sinking fund method may be shown by the following illustration. Let the original investment of the undertaking in an item of perishable property be $100, and let the life of the item be estimated as ten years. The users must pay to the undertaking in addition to operating costs a full return upon the original investment of $100 each year of the ten years in which the item is in service and, at the end of ten years, $100 with which to pay for the similar new item required to prolong the service. If the fair rate of return is 8 per cent, the annual return to the stockholders of the company is $8. It was explained above that justice to both the users and the company demanded that all users of the item throughout the ten years should contribute their fair share of the cost of renewals — in the present illustration $100 — and to do this the users of each year must pay to the reserves for renewals such a sum as would amount with compound interest to $100 at the end of ten years. Let the interest which such a fund can receive be assumed to be 4 per

cent, then the amount to be paid to this fund as an annuity is $8.33.

The operation of such a fund for a single unit is shown in the following table.

TABLE I

SINKING FUND METHOD — SINGLE UNIT

Age in years	Value at end of year	Payment to reserves	Return on remaining value	Combined depreciation and return	Cost per unit of service
(1)	(2)	(3)	(4)	(5)	(6)
0	$100	$8.33	$8	$16.33	$0.1633
1	100	8.33	8	16.33	.1633
2	100	8.33	8	16.33	.1633
3	100	8.33	8	16.33	.1633
4	100	8.33	8	16.33	.1633
5	100	8.33	8	16.33	.1633
6	100	8.33	8	16.33	.1633
7	100	8.33	8	16.33	.1633
8	100	8.33	8	16.33	.1633
9	100	8.33	8	16.33	.1633
10	100	8.33	8	16.33	.1633
11	100	8.33	8	16.33	.1633
12	etc.	etc.	etc.	etc.	etc.

A study of the above table shows that the sinking fund method operates to do justice both to the users and to the undertaking. The users of each year contribute a like amount; the company obtains a full return on its investment of $100 throughout the life of the item. The value of the property, the item and sinking fund, does not depreciate. The value of the item diminishes but the size of the fund increases. At the end of ten years the item has no value but the fund equals the original cost of the item. Again, if it is assumed that the amount of service furnished to users is proportional to the plant cost, the cost of unit service remains constant. This is shown in column 6.

For most public utility enterprises in this country,

however, the sinking fund method, while satisfactory theoretically, is not one to be used practically for the reason that it produces a cost of service to the users greater than is wise or necessary. This increased cost of service arises from the fact that the rate of return which can be obtained upon safely invested readily convertible funds, such as would be acquired by the trustees of the sinking fund, would be less usually than the fair rate of return which the users are obliged to pay upon the capital invested in the undertaking producing the service. Most utilities in this country are growing and there is a constant need of new money with which to pay for useful extensions of their plants. So long as the sinking fund method of caring for reserves for renewals is employed, stockholders must advance the money required for extensions, and users must pay the full return — in the illustration 8 per cent — upon the stockholders' investment; whereas the money which the users have paid to the trust fund to create the reserve for renewal is obtaining a much lower rate of interest — in the above illustration 4 per cent. If the company, acting still as trustee of the reserves for renewals, invests the annual payments for renewals in new plant of the company, instead of obtaining new money from the stockholders for that purpose, then the users obtain a certain reduction in the cost of service. It will be of interest to examine this feature of the treatment of reserves for renewals later after other methods of caring for renewals have been presented.

94. Straight line method of making annual reserves for renewals. — If the method of reasoning used above is continued, the reserves for renewals may be considered virtually as contributions of users to be held by the company in trust until the reserves have amounted to the cost of an item and that item must be renewed.

If the company, as trustee, invests these reserves in property to be used by the company, the users' money is invested in the property. The money thus invested increases the size or efficiency of the property and thus increases the gross income. This is unquestionably true, but sight must not be lost of the fact that, when the users' money is thus invested, the users must pay not only the annuity but the interest as well. In other words, the users must pay the entire cost-new, not the annuity alone, as was the case in the sinking fund method, wherein the reserves for renewals were invested in outside securities. If the users pay both annuity and interest, as is the case when the reserves for renewals are invested in the property producing the service, all questions of the rate of interest and, consequently, of the size of the annuity disappear. The users must pay the entire original cost-new of each item in yearly sums of such amount as will be fairest to all users.

In a discussion of cases wherein the reserves for renewals are invested in extensions of the property of a utility, it is no longer possible to consider the investment in a single item of perishable property, as was done in the explanation of the sinking fund method. This is true for the reason that when the sinking fund method is employed, no new items of perishable property are created; the plant, representing the original investment in perishable property, remains unchanged. On the other hand, when reserves are invested in the property, the number of items in the property is increased. When the sinking fund method is used, the value of the investment in the item decreases with its age but the sinking fund increases to maintain the value of the original investment. When the reserves for renewals are invested in the property, new items of property are created, the value of which together with the re-

maining value in the original item remains equal to the original investment of the stockholders.

In every practical case the property of a public utility company will consist of items having various ages, lives, and costs, but to simplify the presentation of this subject and to take first a theoretical condition, let it be assumed that the life of each item is ten years, and that the cost of each item is one dollar; further, let it be assumed that the property at the outset of the investigation consists of ten items absolutely new, ten items one year old, ten items two years old, and similarly ten items for the other years of the life of the one hundred items of which the plant is composed. Accepting for such a case the sinking fund method as correct but recognizing the fact that when reserves for renewals are invested in the property of an undertaking both the annuity and interest must be paid by the users of the service, then the sums to be paid as annuity and interest would be for each and every year as follows:

TABLE II

YEARLY SINKING FUND PAYMENTS

Annuity and Interest (8%)

10 items	1 year old	$ .690
10 "	2 years "	.745
10 "	3 " "	.805
10 "	4 " "	.869
10 "	5 " "	.939
10 "	6 " "	1.014
10 "	7 " "	1.095
10 "	8 " "	1.183
10 "	9 " "	1.280
10 "	10 " "	1.380
		$10.00

It will be seen from the above figures that there would have to be paid, in such a case as is at present being considered, toward the fund for renewals $10, or one-

tenth of the first cost of the property each year so long as such a relation as that shown above existed between the ages, lives, and costs of the items of which the plant was composed. In other words, the payment to the renewal fund each year is uniform and equal to the total cost-new of the property divided by the life.

Clearly it would be unnecessary, in such a case as the above, to resort to the calculation of annuity and interest for each item or group of items and it would be far simpler to abandon such calculations and to ascertain the amount of the annual increment to the reserves for renewals by dividing the cost-new of the property by its years of life.

Such a method of calculating reserves for renewals, wherein the annual reserves are the original cost-new divided by the life of each item or the cost-new of the entire perishable property of the company by the mean life of the items of which it is composed, is known as the straight line method. It is extremely simple and easy of application in all practical cases where the cost-new and life of all plant units have been ascertained.

95. Distinction between sinking fund method and straight line method. — The above method of introducing the discussion of the straight line method explains correctly the operation of creating reserves for renewals but is faulty in that it appears to regard the annuities and the interest accretions upon them, when such annuities and interest are invested in plant, as a "sinking fund." When reserves are invested in useful plant they can be regarded no longer as a sinking fund. If the reserves are invested in plant and are of such an amount as is required by the straight line method, the value of the stockholders' investment is maintained and the utility and the users are fairly treated, except possibly in one respect, which will be discussed later in detail;

but it is contrary to a proper understanding of the principle of annuities and interest accretions to regard the investment in extensions of the plant as a sinking fund. The reserves invested in additional property increase the original cost of the property. When so invested there is no *fund* for renewals. The money contributed by the users is carried on the books of the company and accounted for as "Reserves for Depreciation" — the term usually employed having the same significance as "Reserves for Renewals" used throughout the present study. The original cost of the plant is the cost of the plant purchased with the stockholders' money plus that purchased with the reserves for renewals. Consequently, if reserves have been made properly by the straight line method and all have been invested in the property, the present value of the property must be equal always to the stockholders' investment or to the original cost of the property less the "Reserves for Depreciation."

There is a fund for renewals only when the sinking fund method is employed, and the reserves for renewals are segregated from the other property of the company not simply as a book entry, as in the straight line method, but as an actual independent investment.

Objection may be raised to the investment of reserves for renewals in property of the undertaking on the ground that, when reserves are required, there will be no money available with which to pay their cost. Whether or not such an objection is well taken depends entirely upon the financial conditions surrounding the enterprise and in no way whatever upon any general principles involved. If a company is able to sell its service at a price which covers all costs, operating expenses, reserves for renewals, and a proper return to the stockholders, and there is need of more plant to provide more service to users, then there can be no question whatever that new

money can be obtained from the stockholders with which to pay for the renewals. The company is furnishing, at the time of renewals, service far greater in amount than could be provided with a plant purchased with the funds originally derived from the stockholders; there is full value of the original investment in the present property; there is no question whatever of the earning capacity of the property, as the earning capacity will remain substantially unchanged. Under such conditions there can be no question of the ability of the stockholders to acquire new money, and the investment of reserves in plant extensions is fully justified.

On the other hand, if a plant is not growing or is not particularly successful, it is for the best interests of the undertaking and of the users to hold the reserves for renewals as a sinking fund from which fund the money required for renewals can be obtained when renewals must be made.

96. Illustration of the operation of the straight line method. — The operation of the straight line method when applied to the illustration given above is shown in Table III on the opposite page.

The table shows, for each of the thirty years that a property may have been in existence, the amount invested in useful property, the plant value of such property at the end of each year, the payments properly made on the straight line method to the reserves for renewals, the return for each year on the fair present value, and the cost per unit of service for each year. It assumes that the stockholders made an original investment of $100 and that, at the end of each year of service, the reserves for renewals were immediately invested in needed extensions to the property.

Column 2 in the above table shows for each year the cost-new of the perishable property of the company.

TABLE III

STRAIGHT LINE METHOD — ALL PROPERTY

Age in years	Amount invested in plant	Value at end of year	Payment to reserves	Return on remaining value	Combined reserves and return	Cost per unit of service
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	$100	$100				
1	110	100	$10	$8	$18	$.1800
2	121	100	11	8	19	.1727
3	133	100	12	8	20	.1661
4	146	100	13	8	21	.1601
5	161	100	15	8	23	.1546
6	177	100	16	8	24	.1497
7	195	100	18	8	26	.1451
8	214	100	19	8	27	.1410
9	236	100	21	8	29	.1373
10	259	200	24	8	32	.1339
11	285	210	26	16	42	.1617
12	314	221	29	17	46	.1589
13	345	233	31	18	49	.1563
14	380	246	35	18	53	.1540
15	418	261	38	20	58	.1519
16	459	277	42	21	63	.1500
17	505	295	46	22	68	.1482
18	556	314	51	23	74	.1466
19	611	336	56	25	81	.1452
20	673	459	61	27	88	.1439
21	740	495	67	37	104	.1546
22	814	535	74	40	114	.1535
23	895	578	81	43	124	.1525
24	985	626	90	46	136	.1517
25	1083	679	99	50	149	.1509
26	1192	737	108	54	162	.1501
27	1311	800	119	59	178	.1494
28	1442	870	131	64	195	.1488
29	1586	947	144	70	214	.1483
30	1745	1132	159	75	234	.1477
31			174	91	265	.1519

The stockholders' original investment was $100. At the end of the first year the reserve for renewals, $10, was used to purchase new property. Similarly at the end of each year the entire reserve for that year, and no more or less, was invested in useful plant extensions.

Column 3 shows the value of the perishable property at the end of each year. These figures likewise show the money which has been invested by the shareholders in the enterprise. It is upon these amounts that the return to the stockholders must be estimated. It will be seen from this table that the shareholders obtain a fair return upon the money invested by them in the perishable property so long as the property represented by that investment remains serviceable. The company also receives from the users, during the life of each perishable item, such a portion of its cost that by the end of its life the entire first cost will have been returned. In the present case the users pay $10 a year on the original investment of $100 for the first ten years so that at the end of ten years the company has had returned to it the original capital investment. As each year the increment to the reserves for renewals has been invested in perishable property, that property also must be maintained through a reserve for renewals. As all reserves for renewals have been invested in plant, it becomes necessary, when a portion of the property has to be renewed, for the stockholders to contribute new money with which to buy the items needed to maintain the efficiency of the property. The new money, paid to the undertaking at such times, is simply a repayment by the stockholders of the reserves for renewals which had been paid by the users and invested by the company in serviceable items of plant. When this new money has been invested, the value of the property in service remains equal to the stockholders' investment and, as a consequence, the stockholders can continue to obtain a full return not only on their original investment but upon the original investment plus the money thus contributed to the enterprise. The stockholders, however, are not entitled to a full return based upon the cost-new

of the property, i.e., the total amount of money which has been invested in existing useful property, for the reason that, at all times, a portion of the property in use was acquired not with the stockholders' money alone but with the reserves for renewals entrusted by the users to the enterprise for the one purpose of repaying to the stockholders the investment originally made by the stockholders in perishable property.

Column 4 shows the amount obtained from the users each year as a contribution to the reserves for renewals. Following the theory of the straight line method, these reserves are equal to the cost-new of the property in use during the year for which the reserves are made divided by the mean life of the perishable items in service.

Column 5 shows the return to be paid by the users each year. These returns were figured upon the cost-new-less-depreciation, i.e., the present value of the property or, what amounts to the same thing in this case and in all cases where reserves have been made properly and systematically, upon the investment made with the stockholders' money in useful perishable property.

Column 7 requires special attention. In preparing Table III it was assumed that the quantity of service sold was proportional to the plant cost-new. Therefore column 6, the annual charge upon the users for reserves for renewals and return upon stockholders' investment, divided by column 2, the cost-new of the property, gives column 7, the cost each year of a unit of service — apart from the other costs of operation. An examination of column 7 will show that the costs of service are constantly changing, being highest the first year and gradually diminishing until at the eleventh year they increase again. This cycle is repeated each ten years. It is to be noted, however, that in the illus-

tration given in Table III the range of costs of service in each cycle is gradually diminishing; in the first cycle the range is $.1800 to $.1339, a difference of $.0461; in the second cycle from $.1617 to $.1439, a difference of $.0178; in the third, $.1546 to $.1477, a difference of $.0069. Moreover, if the calculations were carried further, it would be found that the costs of unit service would become more nearly the same for each year. The mean cost of service for each cycle is, however, the same.

97. Equal annual payments method. — It can be contended that the straight line method, as shown by the above example, does not produce the equitable distribution of charges for service that should be obtained in a method purporting to distribute the costs of renewals fairly among the users of all of the years of operation of a property. The sinking fund method, wherein the sinking fund is segregated, accomplishes such a distribution equitably. As has been shown in section 94, the straight line method likewise accomplishes the same result, provided the number and costs of units to be replaced each year remain the same. It is for the reason that the increments each year to plant tend to become more nearly uniform in succeeding cycles that the range in costs of service diminishes as has been just shown in Table III. If, however, the money required to replace property in any one year is not proportional to that required in succeeding years, a variation in the costs of service, such as has been shown in column 7 of Table III, must result.

It is seen, therefore, that if the costs, lives, and ages of plant items differ materially from the uniformity given in section 94, absolute uniformity in the yearly cost of unit service cannot be maintained. To attain this desired uniformity when reserves are invested in the

property of an undertaking, recourse must be had to still another scheme for calculating the yearly amounts to be contributed by the users as reserves for renewals. This scheme has been called the equal annual payments method.

In order to explain this method, reference will be made to Table II given in section 94. It was there shown that, when reserves were invested in the plant of the undertaking furnishing the service, the users of that service were obliged to pay not only the annuity that would have been paid if the sinking fund method were employed, but also the interest that would have been earned each year upon the amounts already in the sinking fund. Thus, as was shown by Table II, the annuity only would be paid on all items which were one year old; on all items which were two years old, the annuity plus the interest on the annuity contributed the previous year would have to be paid by the users; on all items three years old, there would have to be paid, in addition to the annuity, an amount equal to the interest for one year on the two previous annuities plus the interest which had been obtained the previous year; and similarly annual payments of annuity and compounding interest for the items of greater age.

Equal annual payments for the unit costs of service for the different years of operation can be obtained by using annuities based on the same rate of interest as the fair rate of return paid to the stockholders, by finding for each age of items of each life the percentage that the annuity and interest for each age bears to the cost-new, and by applying the percentage applicable to its age and life to the cost-new of each item of perishable property. The sum of the amounts, thus formed as the proper reserves for renewal for each item of perishable property, gives the total reserves for the property for that year.

The operation of the equal annual payments method can be shown by the use of the figures for annuity and interest given in Table II and by applying them to the case that was assumed in the calculations of Table III. The figures derived by the use of this method are given in Table IV.

TABLE IV

EQUAL ANNUAL PAYMENTS METHOD — ALL PROPERTY

Age in years	Amount invested in plant	Value at end of year	Payment to reserves	Return on remaining value	Combined reserves and return	Cost per unit of service
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	$100	$100				
1	107	100	$ 6.90	$8.00	$14.90	$.149
2	115	100	7.93	8.00	15.93	.149
3	124	100	9.11	8.00	17.11	.149
4	134	100	10.47	8.00	18.47	.149
5	146	100	12.03	8.00	20.03	.149
6	160	100	13.83	8.00	21.83	.149
7	176	100	15.89	8.00	23.89	.149
8	194	100	18.25	8.00	26.25	.149
9	215	100	20.97	8.00	28.97	.149
10	239	200	24.10	8.00	32.10	.149
11	259	207	19.69	16.00	35.69	.149
12	281	215	22.07	16.55	38.62	.149
13	306	224	24.73	17.19	41.92	.149
14	334	234	27.69	17.91	45.60	.149
15	365	246	30.97	18.75	49.72	.149
16	399	260	34.63	19.71	54.34	.149
17	438	276	38.68	20.82	59.50	.149
18	481	294	43.17	22.09	65.26	.149
19	529	315	48.15	23.55	71.70	.149
20	583	439	53.65	25.23	78.88	.149
21	635	466	51.71	35.16	86.87	.149
22	692	496	57.29	37.29	94.58	.149
23	755	530	63.43	39.69	103.12	.149
24	825	568	70.18	42.39	112.57	.149
25	903	611	77.58	45.45	123.03	.149
26	989	659	85.70	48.89	134.59	.149
27	1083	714	94.60	52.76	147.36	.149
28	1188	775	104.33	57.13	161.46	.149
29	1303	845	114.97	62.04	177.01	.149
30	1429	1022	126.57	67.57	194.14	.149

The above table is similar to Table III in that the original investment of the stockholders is $100 and the reserves for renewals are invested in needed extensions of perishable property.. The reserves in Table IV, however, are not, as in Table III, the cost-new of the property divided by the life but have been calculated upon each item by the use of the percentages applicable to the age of each item given in Table II. The detailed calculations of a few of the figures given in column 4 are shown in Table V given below:

TABLE V

EQUAL ANNUAL PAYMENTS METHOD

Detailed Calculation of Yearly Reserves

Reserves on Individual Items Purchased at end of

Age in years	0 yr. Cost $100	1st yr. Cost $6.90	2nd yr. Cost $7.93	3rd yr. Cost $9.11	4th yr. Cost $10.47	5th yr. Cost $12.05	Total Payment to Reserves
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
0	—						
1	$6.90	—					$6.90
2	7.45	.48	—				7.93
3	8.05	.51	.55	—			9.11
4	8.69	.56	.59	.63	—		10.47
5	9.39	.60	.64	.68	.72	—	12.03

A characteristic of the equal annual payments method is that the reserves for renewals for any item are less during the early years of the life of the unit than the mean of all years and greatly exceed the mean during the later years. The result of this is that, although the total amount paid as a reserve for an item of the same cost is the cost-new in both the equal annual payments method and in the straight line method, the amount of property in service is less, when the equal annual payments method is employed and the property expands only in

proportion to the reserves, than when the straight line method is used. There is a smaller investment in perishable property during the early years and, consequently, a demand for smaller reserves each year. A comparison of columns 2 in Tables III and IV shows this to be true. This fact does not mean that there is a lighter burden upon the users when the equal annual payments method is employed; on the contrary, if there was need of plant costing as much as is shown in column 2 of Table III, the straight line method would be more favorable to the users as the difference in cost of plant would have to be supplied by new money obtained from the stockholders.

Column 7 in Table IV is obtained by dividing the cost of reserves and return, column 6, by the cost-new of the property employed each year in producing the service, column 2, on the assumption that the amount of service sold is proportional to the cost of the property. It is seen that, on this assumption, the cost of unit of service is the same each year of the operation of the property and does not vary as do similar figures given in column 7 of Table III. This column thus shows that the equal annual payments, demanded by this method, have been obtained.

98. Characteristics of equal annual payments method.—It must be recognized definitely that the equal annual payments obtained by this method depend upon the use of an assumed annuity based on a rate of interest equal to the rate of return paid to the stockholders. Annuity and interest based on any other figure would produce varying costs of unit service.

This can be illustrated by the following table, wherein the annual increments to the reserves for renewals have been figured on an annuity and interest at the rate of 4 per cent.

TABLE VI

ILLUSTRATION OF EFFECT OF CHANGE IN PAYMENTS TO RESERVES USING PRINCIPLE OF EQUAL ANNUAL PAYMENTS METHOD

Age in years	Amount invested in plant	Value at end of year	Payment to reserves	Return on remaining value	Combined reserves and return	Cost per unit of service
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	$100	$100	—	—	—	—
1	108	100	$ 8.33	$ 8.00	$16.33	$.1633
2	118	100	9.35	8.00	17.35	.1602
3	128	100	10.51	8.00	18.51	.1573
4	140	100	11.80	8.00	19.80	.1545
5	153	100	13.26	8.00	21.26	.1518
6	168	100	14.89	8.00	22.89	.1494
7	184	100	16.73	8.00	24.73	.1471
8	204	100	18.79	8.00	26.79	.1449
9	225	100	21.11	8.00	29.11	.1429
10	248	200	23.71	8.00	31.71	.1411
11	271	208	22.64	16.00	38.64	.1555
12	296	226	25.10	16.64	41.76	.1540
13	324	254	27.82	18.08	45.23	.1527

It is seen from this table that the variations in the cost of unit service are similar in character to the variations which were found when the straight line method was employed.

One of the advantages claimed for the equal annual payments method over the straight line method is that by its use costs of service are maintained uniform throughout the life of the property. This claim is undoubtedly well founded provided that from the beginning to the end of the life of the undertaking a uniform rate of return can be predicted. Should there be any change, however, in the financial ability of the undertaking to pay its return, either increasing or decreasing the percentage paid to the stockholders, the same irregularity in costs of service would be found as is characteristic of the straight line method.

99. Relative costs of service in different methods of creating reserves for renewals. — In closing the description of the sinking fund method in section 93 it was said, "If the company invests the annual payments for renewals in new plant of the company, instead of obtaining new money from the stockholders for that purpose, then the users obtain a certain reduction in the cost of service." The correctness of this statement will now be apparent, if the costs of unit service in the three methods of creating reserves for renewals are compared. The costs of unit service were shown to be $.1633 for the sinking fund method, assuming a 4 per cent interest return upon such funds. The straight line method showed a mean cost of service of $.15019 per unit. The equal annual payments method showed a uniform cost of service of $.149. If the rate of interest obtainable on the trust funds of the sinking fund method had been 8 per cent, the cost of service would have been the same as in the equal annual payments method. Eight per cent interest can be obtained rarely on trust funds properly invested, consequently for most cases the cost of service, when the sinking fund method is employed, is greater than when the reserves are invested in the property of a successful enterprise. The lower the interest obtained on the sinking fund the greater is the cost of service.

The cost of service when the reserves are invested in property is substantially the same whichever method is employed. The difference is insignificant when the total costs of service are considered.

There seems to be every reason, therefore, as far as the burden upon the users is concerned, for investing the reserves for renewals in needed useful property.

100. Consideration of relative merits of different methods of creating reserves for renewals. — The

above descriptions of these methods of creating reserves for renewals have been presented as the accountants' recommendation as to means whereby the cost of renewals can be distributed in an equitable manner between all users of each item of perishable property and, at the same time, full justice can be done to the stockholders of an enterprise. The descriptions of these methods necessarily have been theoretical. The creation of reserves for renewals is, however, a very practical business problem, and a decision, as to which method should be used in actual practice, requires thoughtful consideration.

101. Criticism of sinking fund method. — The sinking fund method demands that reserves for renewals should be segregated from the property of the company employed in the actual production of the service, and should be invested safely in such a manner that such funds would have the benefit of all interest accretions. The practical use of this method would be that each undertaking would have an investment in enterprises foreign to its own management equal, on the average, probably, to one-half of the investment in its own perishable property. Thus, if a company had perishable property which had cost $10,000,000, the sinking fund method would require that possibly as much as $5,000,000 should be held, at times, in a reserve fund invested in outside securities.

It requires no imagination to see the practical difficulties which such a method of financing would impose. Pressure would be exerted upon the management of the company, having reserve funds thus invested, from all sides. The stockholders of the company would feel that the money so invested belonged to them and would demand that it be divided among them. The public would object to the payment of proper charges for service and would claim that such charges should be reduced

for the reason that the company had property, equal in value to a large percentage of its proper capitalization, upon which the company was receiving a return far less than the return which the public was obliged to pay to the company. The users would argue further that a public utility had obtained its rights to furnish a particular class of service to those within the community who desired that service and, consequently, that the utility had no right to invest money in other enterprises which were foreign to its own particular field of operation. It might be claimed, in some cases, that a company's investments in outside securities were for the purpose of obtaining control of competing companies; or for the purpose of aiding some enterprise in which the officers of the company owning the reserve funds had some personal interest. Likewise the investment of such funds in a bank or trust company might give rise to a contention, on the part of the public, that the users were unfairly treated in that the return obtained was abnormally low and that those obtaining the fund derived a benefit which should belong to the users and not to the bankers.

The only conclusion that can be drawn from the lines of reasoning suggested above is that, when reserves for renewals are invested otherwise than in property useful in producing the service which the company was organized to provide, a greater cost of service is imposed upon the users, that such funds are liable to be deflected improperly from their legitimate purpose, and that the management of the company may be subjected to such unfavorable criticism that difficulty may arise in obtaining from users even the actual costs of producing the service. For these reasons, and for others which they suggest, there seems good reason for holding that, as a practical means of caring for reserves for renewals, the sinking fund method cannot be recommended.

102. Criticism of equal annual payments method. — The equal annual payments method will be assumed to be free from some of the objections suggested as attaching to the sinking fund method in that the reserves for renewals thus obtained are invested in needed extensions of the company's property. No criticism whatever can be made as to the equity of the equal annual payments method provided that it is possible to utilize it practically in the exact manner which its theory demands. On the contrary it must be admitted that the equal annual payments method is the only method which, for all cases, meets the requirements of absolute justice to all users as well as to the utility.

A serious objection to this method is that it is difficult, if not almost impossible, to use it in practice when the reserves for a large property, containing many items of perishable property, must be ascertained. The equal annual payments method requires that the reserves for renewals for each year be ascertained for each *individual item.* The mean life even of items of the same kind cannot be employed; the life and age of each item must be known each year. The practical difficulty of obtaining the requisite data and of making the calculations necessary to find the reserves for a certain year is very great. In order to make the calculations required by the equal annual payments method, a carefully prepared inventory of all items of perishable property is needed. Such an inventory is at hand at the time of valuation, and, consequently, the labor involved in finding the reserves for renewals for that year would not be inordinately great. Few public utility companies, however, could afford to prepare a complete inventory of their property each year. The expense thus involved would be out of all proportion to the advantages attaching to the method.

The above objection applies to the use of the equal annual payments method for the properties of most large public utilities. Unquestionably there are some enterprises which possess single plant items of very large cost and long life. Such items are so conspicuous that they can be readily identified, their history made known, and the proper reserves for their renewals calculated without abnormal difficulty or expense. The dam of a hydro-electric or water company is an illustration of a plant item which may represent a very large portion of the total investment of the company owning it. On the other hand, the many items of relatively small cost and short life possessed by railroads, electric light companies and telephone companies, could not be identified usually through book entries and, consequently, each item would have to be recorded in an annual inventory and its loss in value individually calculated.

This method is likewise subject to the objection already noted, that the rate of interest, upon which the annual reserves for each item must be estimated, must be the same as the return which it is expected that the company can pay to its stockholders throughout the life of the plant. This objection in itself reveals the theoretical nature of this method.

It must be appreciated that the annual reserves for renewals are not capable of being calculated in practice with the absolute accuracy that is naturally attributed to the figures shown in a theoretical discussion of the subject. The amount of the reserves for each item of perishable property for any one year is dependent upon the life of an item in each method which has been discussed or in any method that can be suggested. The life of the item is dependent upon future conditions and, although the life may be forecast with all the skill and knowledge possessed by the engineers and by the manage-

ment of the company, still it is only an estimate based on personal judgment. The percentage of error may be considerable in the case of some items, but, so long as there is the possibility of such an error, it is unnecessary to resort to complicated and expensive methods of calculation in order to avoid another more or less theoretical error which is usually of smaller magnitude than that which is involved in estimating life.

The only conclusion that can be drawn from a careful consideration of the equal annual payments method is that it is theoretically accurate and fair but that it is not a method which can be used to advantage practically, except in comparatively few instances.

103. Criticism of straight line method. — The use of the straight line method is confined to cases where the reserves for renewals are invested in the useful property of a company.

The only objection that can be raised to the straight line method is that it tends to make the cost of service greater in some years than in others; in other words, that it does not treat the users of all years alike.

This objection is founded on a theoretical view of the subject, at least as far as most public utility undertakings are concerned. A false impression of the magnitude of the variations in cost of service is given by such figures as were shown in Table III. The costs of service therein shown were only the reserves for renewals and the return upon the investment in perishable property; these two items of cost are but a portion of the total cost of service. In addition to such costs are all of the operating expenses as well as the return upon the investment of the company in non-perishable property. Had column 7 in the above tables shown the total costs of service, the percentage variations in cost produced by the use of the straight line method would have been much smaller. The

figures given in Table III tend to exaggerate the variations in the costs of service for another reason; Table III was calculated upon an initial investment in items of property of the same life and age. This condition changed somewhat in succeeding years, as new items of plant were purchased with the reserves for renewals. The reserves made during early years were relatively small and, consequently, the investments in items of different ages were very unequal. In the usual actual case the perishable property of a company would consist of many items of widely different ages and lives so that, except in such a case as was considered above where a large percentage of the total investment of a company attached to a single item, there would be a tendency for the sums of money required for renewals each year to become equal in amount. This is shown clearly by a comparison of each decade in the illustration given in Table III.

Thus it is seen that, although there is unquestionably a theoretical variation in the costs of service produced by the use of the straight line method, the variation will be so small in most cases as to be negligible in comparison with the other variations necessarily inherent in the cost of producing a service. This is conspicuously true when the practical conditions which have affected the operations of public utilities in the past are considered. Companies furnishing a public service have found it extremely difficult if not impossible to raise rates; rates could be lowered but, when once lowered, they could not in most instances be increased. The result of this condition has been, therefore, that the cost of service to the users could not be made to conform each year absolutely with the actual cost of producing the service. The costs of producing service are by no means uniformly the same each year but are constantly changing

on account of some special condition, or simply from the changes in the costs of materials and supplies used in the production of the service, or from the difference in the amount of service sold. Public service companies have been obliged to establish charges for service which would conform as closely as was possible to the costs of producing service, when measured by the experience of a number of years. Rates could be lowered only when the experience of a number of years had shown that there was a distinct tendency downward in the costs of producing service. There is good reason to feel that for most companies this variation in the cost of furnishing service would far outweigh the variation produced by the straight line method of calculating reserves for renewals.

It would seem, therefore, that the objection to the straight line method on account of the variation in the costs of service which it has a tendency to produce is derived largely from theoretical rather than practical considerations — at least as far as such enterprises as railroads, electric light or power companies, and telephone companies are concerned.

The practical advantages of the straight line method are very great. The annual reserve for each item is its cost divided by its life and is, consequently, the same each year. More than this, however, is the fact that it is possible by a very simple calculation to ascertain the weighted mean life of an entire property, so that, instead of being obliged to ascertain the proper reserves for each year for each item, the total reserves required for the entire property can be ascertained by dividing the cost of all perishable items by their weighted mean life. The straight line method is, in consequence, simple, easy of application, does not require an annual inventory and, consequently, can be used without the

great cost which would be found were the equal annual payments method employed.

While it seems unnecessary to enter upon a description of the method to be used in figuring mean life,[1] it is important to correct a very common misunderstanding of the term "mean life." Mean life is the quotient obtained by dividing the cost-new of all perishable property by the sum of the reserves which should be made properly by the straight line method for all items of which the plant is composed. It does not mean that all of the items must be retained in service, for the mean life of the whole plant. The mean life is simply a means of ascertaining, when the straight line method of creating reserves for renewals is employed, by what figure the cost-new of the property should be divided in order to obtain the proper reserve for the whole plant for that one year.

104. Conclusions as to the choice of method of creating reserves for renewals. — The conclusion to be drawn from the above discussion is that, as far as distributing the cost of renewals in a substantially equal manner among all users is concerned, all methods are satisfactory in most practical cases. Likewise all these methods are fair to the stockholders of the enterprise. With the single exception to be noted, a choice of method to be used in a particular case depends upon special conditions affecting the particular enterprise under appraisal.

The sinking fund method can be selected in such rare cases as where a company is able to earn a return less than the interest that can be obtained on trust funds or there is no need of new money with which to create extensions to the property. It will be seen from this

[1] See Public Utilities: Their Cost-New and Depreciation. Hayes, p. 186.

that the use of the sinking fund method would be confined to relatively few undertakings and practically to only those which are expected to be of doubtful earning capacity. The sinking fund method, therefore, can be regarded as not the method to be selected as the best for the creation of reserves for renewals for most cases of public utilities in this country.

The equal annual payments method can be selected in a few special cases wherein the property of the company under appraisal contains one or more units of predominating cost as compared with its other items of perishable property. Even in cases where this condition is found, it is a question whether more satisfactory results in practice would not be obtained by confining the use of this method to the items of large cost and age and using the straight line method in calculating the reserves for the renewal of other items.

The straight line method should be used in all cases, except those special cases just described where either of the other methods is to be preferred.

105. Choice of method of calculating loss of value in a property at the time of an appraisal.—At the time of an investigation into the charges for service made by a public utility, two figures showing the cost of replacement and the actual original cost are presented as evidences of the fair cost-new of the property used for the benefit of the public. The fair rate of return is to be figured upon the fair present value of that property at the time of the appraisal. Clearly the value of the investment in perishable property which has been some years in service is less than would be represented by its cost-new. The loss in value of the investment in perishable property must be found, consequently, and made another figure to be used by those whose duty it is to ascertain the fair present value of the property as a

whole. How this figure representing loss of value shall be used will be discussed in the following pages.

This loss in value of the investment in perishable property is the depreciation and, as has been explained, this loss in value can be offset by the reserves for renewals when properly made and retained as assets of the undertaking. If the depreciation is compensated by the reserves for renewals, clearly the depreciation at any time must be equal to the reserves for renewals which are in hand either as a special fund or invested in plant useful in the production of the service. At the time of an appraisal, therefore, the loss in value of the investment in perishable property—the depreciation—can be ascertained from the known age and estimated life of each item by calculating what the proper reserves for renewals should be under such conditions.

The above relation between depreciation and reserves for renewals is unquestionably sound and accurate; nevertheless, the statement is frequently made that reserves for renewals have no relation whatever to the loss in value of a property. This statement can be attributed to those who, relying upon their faith in the ability and willingness of the users to pay the costs of renewals when renewals must be made, hold that even the investment in perishable property retains its full value to the end of its life. In those cases where this doctrine is carried out, the users pay the costs only of such renewals as may be made each year and no reserves whatever are made to provide funds with which to defray any abnormal costs of renewals that may arise in later years. Clearly in such cases reserves for renewals can bear no relation whatever to the loss in value of the investment. As has been explained in section 92, justice to the users demands that annual reserves be so made that the costs of renewals may be distributed equitably.

The laws require that this should be done and, in consequence, there can be no question of the depreciation being equal to the amount that should have been set aside at the time of an appraisal as reserves for renewals.

As depreciation is measured, therefore, by the amount of reserves for renewals which should have been set aside to maintain the full value of the investment in perishable property, the choice of the method to be employed in figuring what the reserves for renewals should be at the time of an appraisal is of great importance. This is true for the reason that the amount which should have been set aside will be different, depending upon what method has been employed in calculating the annual reserves for this purpose. Justice demands, therefore, that the method employed at the time of appraisal should be the same as that which had been employed by the corporation in the past in creating the reserves for renewals.

106. Is a figure showing depreciation required in a valuation?—It has been held throughout the present study as a fundamental principle that, as far as it is possible to do so with equal justice to the undertaking and to the users, the fair return due the stockholders must be estimated upon the investment made by them in the enterprise, provided that there is a value in the existing useful property of the enterprise equal to the stockholders' investment. When, therefore, a question arises as to whether the return should be calculated upon the cost-new or upon the cost-new-less-depreciation in such cases as reserves for renewals have been invested in the property of the company, there can be but one answer which will conform with this principle. The return must be calculated upon the cost-new-less-depreciation. The cost-new is the sum of the costs defrayed by the stockholders' money and those defrayed by the

reserves for renewals; reserves for renewals equal the depreciation; cost-new-less-depreciation, therefore, must equal the stockholders' investment and upon this the return must be calculated.

Many will be found who will be unwilling either to accept this principle or agree to its justice. The argument, which may be made by those favoring the cost-new as the fair basis upon which the fair return should be calculated, would be somewhat as follows:

In the above discussion of the several suggested alternative methods of making reserves for depreciation, the sinking fund method was said to be fair to both the users and the undertaking. That method, therefore, can be accepted as the one to be adopted. It will be argued that when that method is employed, the fair present value of the perishable property is its cost-new throughout its useful life. The reserves for renewals and the compounding interest upon the sinking fund can be invested in any safe securities which will pay a fair interest rate upon the money thus invested. Let it be assumed for the purpose of the present discussion that 5 per cent is a usual and proper interest rate. The users each year, therefore, will pay an annuity which at 5 per cent will, by compounding, become equal to the stockholders' investment in each item of plant at the end of its life. It cannot matter to the users in any way where the money contributed as reserves for renewals is invested provided it is safeguarded and obtains 5 per cent in interest accretions. This being in exact accordance with the theory of the sinking fund, full justice is done to both parties interested. Where the sinking fund method is employed, needed extensions to the plant must be made with new money; but as it can make no difference to the users where the reserve funds are invested, the officers of the company are free to invest these funds in

the new plant of the company and thereby relieve the stockholders from contributing the necessary funds. As the cost-new is the basis of the fair return when the sinking fund method is employed, the users must pay the full return upon the cost-new of the property purchased with the money originally contributed by the stockholders plus that obtained from the users as reserves for renewals. The officers of the company can argue that the rate of return, let us say 8 per cent, is fair as they assume the risk attending the investment in an operating property. Thus it is contended that the full 8 per cent return should be earned on the full cost-new of the perishable property.

This contention is presented at considerable length as it illustrates well the error which is inherent in any method which does not do full justice to the users. This argument is specious but fundamentally faulty. The premise that, when the sinking fund method is employed, the cost-new of the perishable property is the basis of the fair return is wrong and the entire argument falls in consequence. The fair return should be figured upon the fair value of the property, plant plus reserves; the present value of *the two together* equals the cost-new of the original investment. If the reserves are invested in needed plant, the fair basis upon which the fair return is to be figured is not the cost-new of the property purchased with both the stockholders' money and the reserves but rather the sum of the present value of each, which should be—if reserves had been made properly—the cost-new of the original investment. The whole contention fails in consequence of this false premise. It is unnecessary to do more than indicate the injustice of the remainder of the contention. The assumed rate of return on money in the sinking fund was 5 per cent, and on this percentage the annuity to be paid by the

users was computed. The contention was that, if invested in its property, the company was entitled to 8 per sent. Had the annuity been figured on this latter rate of return, the amount to be paid yearly by the users would have been much smaller, but the officers of the company by their contention demand the larger return as they contend that they assume the greater risk involved in an investment of such a kind. Trustees of property who said that the normal rate of interest on trust funds was 5 per cent and then invested such funds in property producing 8 per cent would betray their trust if they kept the profit of 3 per cent for their own benefit, notwithstanding the fact that they might claim that they were assuming whatever responsibility might be incurred on account of an increased hazard. A utility undertaking is virtually a trustee of the reserves for renewals and its responsibility for such funds is similar in every respect to that of a private individual.

There are other objectors to this principle—that return must be based on the stockholders' investment—who go still farther. They deny that public utility companies are under any obligation to the users relative to the reserves for renewals which the users have advanced. Reserves for renewals, they argue, are an operating cost of the same character as coal or other supplies that are consumed in the production of the service. Reserves for renewals when paid by the users become the property of the company to be utilized as the management of the company may deem best. The company assumes the cost of renewals; as it assumes that burden it also assumes the risk involved; and, as a consequence, the company and its stockholders are entitled to a full return upon the entire investment in useful property, in other words, upon the cost-new and not upon the cost-new-less-depreciation.

Here again the reason for the contention will be found in a failure, on the part of those advocating the cost-new as the basis of calculating return, to understand the full significance of *reserves* for renewals. A part of the reserves for renewals is money paid in advance of actual requirements for renewals; a portion of the yearly payments for renewals is reserved or held until a renewal must be made. If the users pay the cost of renewals when renewals must be made and nothing more, then there are no *reserves* for renewals and, consequently, although the money paid by users of a service is expended in the property, the size of the property is not increased nor has its cost-new been enhanced in any way. The case here is different from that previously discussed in that as there have been no reserves for renewals — no advanced payments toward future costs — the cost-new of the property represents only the stockholders' original investment. In such a case as this, the contention that the money received from the users to repay the company for property *already* completely consumed in the service belongs to the company and to the stockholders with which to do as they like, is unquestionably sound, but as the property represented by this money has gone out of existence the capital upon which the return can be earned is reduced by a similar amount.

The error which is inherent in this contention consists in regarding the investment in a property, which has been built with the stockholders' money only and has served already a considerable portion of its useful life, as of a value equal to the original investment. No business man would ever make or accept such a contention, and the only way that it can be given a semblance of reasonableness is by claiming that a company's perishable property consists of two items: (1) the physical plant, and (2) the expectation that users will make up

the loss in value of the plant arising from depreciation. On this assumption, therefore, it must be argued that when the plant is new its value equals its cost and no value can be attached to (2), the expectation of payment of the cost of renewals by the users; but as the plant approaches the limit of its life the value of this expectation increases. Any such line of reasoning is too fantastic for serious consideration in a practical case. A figure showing the depreciation that a property has suffered is absolutely necessary in an appraisal.

The above line of reasoning is confirmed by the two principal decisions of the United States Courts bearing upon this subject, shown by the following quotations: —

"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. This course would lead to a constantly increasing variance between present value and bond and stock capitalization — a tendency which would inevitably lead to disaster either to the stockholders or to the public, or both. 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 in management which have been committed in the past." [1]

"It was obligatory upon the complainant to show that no part of the money raised to pay for depreciation was added to capital, upon which a return was to be made to stockholders in the way of dividends for the future. It cannot be left to conjecture, but the burden rests with the complainant to show it. It certainly was not proper for the complainant to take the money, or any portion of it, which it received as a result of the rates under which it was operating, and so to use it, or any part of it, as to permit the company to add to its capital account, upon which it was paying dividends to shareholders. If that were allowable, it would be collecting money to pay for depreciation of the property, and, having collected it, to use it in another way, upon which the complainant would obtain a return and distribute it to its stockholders. That it was right to raise more money to pay for depreciation than was actually disbursed for the particular year there can be no doubt, for a reserve is necessary in any business of this kind, and so it might accumulate, but to raise more than money enough for the purpose and place the balance to the credit of capital upon which to pay dividends cannot be proper treatment." [2]

107. Depreciation at time of valuation.—From what has been said in the preceding pages it is seen that an undertaking may have elected, for some reason connected with the character of the property which it is operating, to employ one of a number of methods of creating its reserves for renewals. One company may have invested all of its reserves for renewals in plant useful to the public; another may have held all of the reserves as a trust fund separately invested; and a third may have invested a portion of its reserves in

[1] Knoxville *v.* Knoxville Water Co. 212 U. S. p. 13 (1909).

[2] Louisiana R. R. Com. *v.* Cumberland Tel. & Teleg. Co. 212 U. S. 424 (1909).

plant extensions and have retained in the treasury a portion of these reserves either invested or subject to check. In the case of a valuation it is necessary to know by how much the investment represented by the cost-new may have depreciated owing to the limited number of years of remaining usefulness.

If reserves for renewals have been made by a company in the past in accordance with the sinking fund method, there would be found, as a portion of the property of the company under investigation, specially invested property distinct in every way from the perishable property used in the production of the service. If the sinking fund method of figuring the loss in value of a property has been employed by a company and the amounts thus received from the users are invested in plant extensions, the method ceases to be a sinking fund method and will become, for most cases, practically the straight line method. The loss in value of a property should be found by the sinking fund method, therefore, only in the rare cases where the reserves have been retained as a special fund. For most practical cases, therefore, the depreciation which a plant has suffered must be ascertained in some other way than by the use of the sinking fund method.

The equal annual payments method is theoretical and simply a suggestion as to a means which might be adopted in the future for creating reserves. The fundamental principle of valuation which has been reiterated throughout the present study is that the fair value must follow the stockholders' investment. This principle can lead only to the conclusion that, in figuring the amount that should have been reserved to care for renewals at the time of a present appraisal, a method cannot be adopted which it is known has practically never been employed by operating companies. Should the equal annual

payments method be adopted by a company and the reserves for renewals be figured in the future in that way, the fact would be known owing to the attention which the use of such a method would necessitate.

The straight line method can be employed, therefore, for most cases with the certainty that by its use the required justice will be accorded both to the users and to the company.

In cases where no *reserves* for depreciation have been made in the past although the required renewals have been carried out and charged as a portion of the cost of operation, the loss in value arising from years of service must be figured even though the present value may be less than that represented by the money actually invested in good faith by the stockholders of the company. Such a figure may not be the fair present value, particularly in the case of a previously unregulated company or of a new company which has not as yet reached a paying basis. In the former case the *fair* value may be made higher than the present value for the reasons suggested in section 34. In the latter case the *fair* value will be greater than the present value of the physical property taken alone, owing to the increasing cost represented by the going value derived as suggested in section 86.

INDEX