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DEPRECIATION

AND

WASTING ASSETS

AND

THEIR TREATMENT IN COMPUTING ANNUAL PROFIT AND LOSS

BY

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"Leake's Register of Industrial Plant for the Measurement of Depreciation, with Introductory Notes";
"The Need of Present Accounting for Past Unexpired Capital Outlay";
"Can the Annual Assessment of Industrial Profit and Loss be Raised to an Exact Science?"; "The Use and Misuse of the Sinking Fund";
"Goodwill: Its Nature and How to Value It";
"Commercial Goodwill: Its History, Value, and Treatment in Accounts"; Balance Sheet Values; etc.

FIFTH EDITION

FIFTH EDITION 1948.

Made and printed in Great Britain by
GEE AND COMPANY (PUBLISHERS) LIMITED, LONDON AND ST. ALBANS

PREFACE TO FIFTH EDITION

THIS work now includes chapters dealing with the following subjects—

The "then value" of plant: a digest of the evidence concerning depreciation of Telephone plant submitted by the Author on behalf of the Postmaster-General in the case of *The National Telephone Company* v. *The Postmaster-General.*

Memorandum and criticism, prepared by the Author, on the financial proposals of the London County Council report on London electricity supply.

Mineral deposits: their base value and depletion by working—a revised digest of the Statement prepared and submitted by the Author to the Royal Commission on the Income Tax (1919) as the evidence in chief of the Institution of Mining and Metallurgy, acting through a joint committee representing the mining industry.

The economic and political importance of advancing the science of measuring the annual profits of every industry is becoming plainer to the many who are seeking answers to the questions: "What is the fair share of capital and what is the fair share of labour in the annual profits of industry?" It is obvious that before such questions can be satisfactorily answered, it must be possible to ascertain the annual profits of industry with such a degree of accuracy as shall exclude the irregular methods and wholesale

guesswork at present prevailing. It is only by means of the study and use of better methods in dealing in financial accounts with depreciation and wasting assets that the annual computation of industrial profit and loss can attain this necessary standard.

The science of accounting, and the proper treatment in accounts of depreciation and wasting assets should receive the attention of Scientific Institutions, Technical Colleges, and Universities. It should at the same time be recognised that present teaching facilities are not enough, because present knowledge is necessarily limited to past practice now rapidly becoming obsolete. There should therefore be constant effort to advance this important subject by means of systematic study and research. An interesting line of thought was suggested at one of the annual meetings of the Engineering Section of the British Association when discussing the question: "What is the workman's share in the present state of things?" The President pointed out that investigation shows the average capital expended in engineering works per individual employed was, before the war, about £200, and the dividends paid thereon averaged 4 per cent. per annum; while at that time the average wages for men and boys, skilled and unskilled, was about £70 per annum. These figures show that according to the then available statistical material the average annual earnings of a workman in the engineering industry were equal to the annual dividends of £1,750 of capital invested in that industry. Since then the earnings measured in currency values of both workmen and capital have, of course, greatly increased.

But the real earnings of capital in any year cannot be measured by the dividends actually paid—though this is often assumed to be so—because dividends sometimes amount to more and sometimes to less than the true annual profits. Neither are the true annual earnings of capital to be measured even by the balances of annual Profit and Loss accounts as at present drawn, because these often show results which are grossly inaccurate in consequence of errors—sometimes of omission and sometimes of commission—in regard to that factor of annual expense represented by expired capital outlay on wasting assets.

It is a self-evident proposition that the amount of the combined earnings of labour and capital in any year is automatically limited to an amount equal to the value of the product of the industry in that year, less all economic expenditure incurred in producing and selling other than salaries and wages. The expression "combined earnings" means, of course, salaries and wages (labour's earnings) on the one hand, and interest and profits (capital's earnings) on the other hand.

How far then are we able at present accurately to measure the amount of the combined earnings available in any year? The amount of the product is known, and the amount of salaries and wages (labour's earnings) is known, but owing to obsolete methods of accounting for capital outlay on wasting assets as it expires year by year, the amount of economic expenditure—other than salaries and wages—which must be deducted from the amount of the product is not known. The reason is that one important factor of economic expenditure—expired capital outlay,

commonly called depreciation—is merely guessed at without any attempt at measurement by means of systematic observation and record. It follows therefore that the true annual profits of industry which alone constitute the earnings of capital are not known, and thus there exists in the industrial world at the present time no accurate measure of the amount which defines and limits the combined earnings of labour and capital in any year.

When this unsatisfactory state of affairs is remedied —and it is capable of being remedied—an important new factor will become available to assist arbitration tribunals and industrial councils in arriving at clearly-reasoned decisions on all questions concerning the division of annual earnings between labour and capital because the true annual earnings will, for the first time, be known. Such questions generally involve either increase or decrease of wages, and the advance of the science of measuring annual profit and loss will materially assist in rendering possible true co-partnership between labour and capital. And above all it will make more visible the direct connection which must always exist between increased production and increased earnings for division between labour and capital.

The nature and deplorable results of the present failure to account currently for capital invested in the wasting assets of industry may best be explained by a simple illustration. An investment of capital in an ordinary annuity is sometimes likened to an investment of capital in industrial plant—a very important division of wasting assets—because the value of each is gradually wasted and comes to an end in the process

of giving, during a strictly limited life-period, an annual yield consisting in each case partly of capital and partly of income. The future life-period and annual composite yield consisting of capital and income of any class of annuity can be judged by a single forecast made at the time of purchase, and its unexpired value at any time can be calculated; and so the future life-period and annual composite yield of any class of industrial plant can be judged, and its unexpired value calculated not, perhaps, by a single forecast, but by forecasts based on the regular observation of its behaviour and of the changing conditions affecting it during its life-period.

What would be thought of a profit-seeking undertaking with a capital invested in thousands of terminable annuities of different classes, if its efforts at accounting for its capital outlay as it expired year by year went no further than entering the cost of all these annuities in one summary ledger account representing capital outlay on annuities, without any key to the whole contents? And at the end of each year either writing off a fixed percentage from the balance of the ledger account and charging the amount against the annuity revenue, or charging the cost of fresh annuities purchased during the year against the revenue, in the hope that the charge against revenue would be sufficient to answer the unknown amount of depreciation or expired capital outlay during the year on the old annuities? It is clear that such neglect would immediately produce financial confusion and chaos, which would become appalling as year followed year, even supposing that the sums so charged against annual revenue sometimes chanced to be sufficient.

What, then, is the difference from the practical point of view between such an undertaking and an undertaking with a capital invested in industrial plant ? The difference is only that one requires a little more accounting attention than the other. Each has the common duty to use accurate methods of accounting, and it is no exaggeration to say that, owing to want of systematic attention, the present state of confusion and chaos in the records of capital outlay on industrial plant in our industries is appalling. It is undoubtedly a common financial practice to enter the cost of thousands of units of perishable industrial plant, which cannot be debited to the revenue account of the year in which the payments are made, to some account representing capital outlay on plant, and there to leave it, unobserved and with details lost to mind, subject only to reduction by irregular allocations of sums out of revenue, to answer depreciation of quite unknown extent. The result is that the accounting records relating to capital outlay on industrial plant speedily become a confused mass of meaningless figures. No attempt is made to keep track of the cost of each class of plant and see that this cost, which was incurred solely on revenue account, is duly charged to revenue over the period which receives the benefit of the service, or usefulness, of each particular class of plant during its efficient life.

If this state of affairs is admitted the urgent need of a remedy will also be admitted, and as a first step towards a remedy it is suggested that every joint stock and municipal profit-seeking undertaking using industrial plant, should be required by law to keep a register of wasting assets. This register might

perhaps in the first instance apply compulsorily only to industrial plant and other wasting assets acquired after a certain date, and would contain records of the unexpired cost and year of purchase, and estimates of length of efficient life and remainder value relating to each class. All estimates would be in the absolute discretion of those in charge of the undertaking, but it would be necessary to keep the records of unexpired cost in agreement with the book values of the registered plant and other wasting assets shown on the annual Balance Sheet.

The obligation to keep such a register of new capital outlay on plant and other wasting assets would direct general attention to the subject ; and as the advantages of such records became apparent, the practice would gradually be voluntarily extended to include also the unexpired capital outlay on the earlier acquired plant, etc., which would thus all soon begin to receive continuous and systematic attention, and provision would be made for—

(1) The regular observation and record of the behaviour of, and the changing conditions affecting, each class of industrial plant representing capital outlay ;

(2) The use of suitable accounting equipment in the form of a register of wasting assets, capable of enabling the results of such observation and record to be currently reflected in the annual accounts :

(3) The adoption of a settled and continuous financial policy, under which each year's revenue account would be charged with a regularly measured sum, based on such current observation and record, to answer capital outlay expired during the year.

And the annual computation of industrial profit and loss would then, by comparison with the present irregular methods and wholesale guesswork, become an exact science. The problem is doubtless a difficult one, but its solution is of great economic and political importance, and it needs the co-operation of engineers and accountants, and a regular system of observing, recording, and averaging.

A grave question is raised on page 113 as to the present financial position of large undertakings, such as railways, which have for many years been accumulating capital outlay on plant. How much of this capital outlay, after deducting therefrom any available reserves, is represented by unexpired capital outlay on existing plant ?

Attention is called on page 130 to the advantages of issuing capital required for the purchase of wasting assets either not needing to be renewed, or not needing to be renewed for many years, in a form capable of being easily paid off by annual drawings to offset the gradual waste of the assets. In the present state of the law, this form of capital is practically restricted to debenture securities, but these may be issued at rates of interest appropriate to the risks involved, and when desirable may be issued linked together with any issue of share securities.

The dangers of the practice of accumulating sinking funds in outside investments, so commonly adopted by public authorities, for ultimate repayment of loans, are referred to in detail on page 178 and onwards in the course of a criticism on the London County Council report on London Electricity Supply; and on pages 132 and 181 a sound alternative method

of finance is suggested, which is equally applicable to profit-seeking undertakings having capital sunk in such wasting assets as collieries, mines, goodwill, patent rights, terminable concessions and the like, providing for the gradual repayment of such capital under what is called the " distributed " sinking fund method.

A review of the position of the science of accounting made at the time of the preparation of the fifth edition of this work showed, amongst other encouraging results, that considerable progress has been made in recent years with the measurement and regular provision of expired capital outlay (depreciation) on material wasting assets. Many industrial undertakings have adopted the equal annual instalment, or straight line method of measurement as recommended in this book, involving the keeping of a suitable register of material wasting assets containing recorded estimates, periodically revised to date, of the whole-life period in years of each class of industrial plant, with due regard to all known facts and future probabilities. This has enabled the balances of actual cost of plant, less estimated scrap values, to be easily distributed as a charge to revenue accounts in equal instalments over each year of the period of the useful life of each class of plant.

P. D. LEAKE.

LONDON.

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INTRODUCTION

BECAUSE it closely concerns Profit and Loss, the subject of Depreciation and Wasting Assets is of universal importance, and yet it has hitherto received little or no systematic attention. But it is evident that this neglect cannot continue indefinitely, in view of the present great and growing need for the use of reasonably accurate methods in computing annual profit and loss, for the following amongst other reasons :

The enormous and increasing development of joint stock and municipal trading enterprise, with the consequent passing of capital—which half a century ago was retained and managed by individual owners, or lent on specific mortgage—to the care and management of others, who are expected to uphold the value of the capital investment, and to ascertain and distribute the annual profits with due regard to the differential rights of holders of cumulative and non-cumulative preferred, ordinary, deferred, and other classes of shares.

The increasing adoption of schemes of profit-sharing co-partnership between capital and labour.

The increasing burden of income taxes assessable on annual profits arising.

The increasing burden of rates assessable on annual value

The increasing demands of labour for higher wages and other consideration, based on the declared annual profits earned by capital invested in industry and commerce.

The increasing demands for reduction in charges for the supply of municipal and other public services in the nature of monopolies, such as railways, tramways, electricity, gas, etc., based on the declared annual profits earned by the operation of such services.

No equitable adjustment is possible under any of these heads without the reasonably accurate computation of annual profit and loss, and this can never

be attained without systematic attention to the subject of Depreciation and Wasting Assets. In these circumstances, it is startling to find the general admission that the subject is in an altogether neglected and chaotic state, coupled with the further general admission that, unless a near approximation to the outlay on wasting assets which has expired within each year (depreciation) is made and fully provided for by being refunded out of the revenue receipts of the year, no correct statement of annual profit or loss can be obtained.

In the middle of the nineteenth century, when commerce was carried on by individuals, each on his own account, in a vast number of small undertakings, and there was no regular income tax, it was a matter of small moment to the individuals concerned to enquire whether in each case the surplus of cash receipts in or about each year, after payment of the actual cash outgoings, and allowing for difference in stock-in-trade, was wholly economic profit of the year or whether capital outlay, previously made for the purposes of the business, had been wasted or used up in the course of the year's operations, involving, therefore, another kind of expense and consequent reduction of the surplus of cash receipts by the amount of capital outlay so used up before arriving at annual profit. It was sufficient for their purpose that the surplus balance of cash receipts in each case, however large, should be available for use as and when needed.

Since that time the conditions under which commerce is carried on throughout the world have completely changed, and the great bulk of it is now controlled, not in small units each by an individual

owner, but in the form of great enterprises, under the guidance of a comparatively few highly-qualified directors and managers acting as agents for a vast number of owners who themselves know nothing about the business. In these circumstances, directors and managers are obviously expected to seek and use the best available means for computing with reasonable accuracy the profit or loss resulting from the operations of each year. It is strange, therefore, that the subject of Depreciation and Wasting Assets has hitherto received so little systematic attention, for it represents a large and regularly recurring part of economic cost, and it is impossible to determine the profit or loss resulting in a given period from any enterprise without first ascertaining the economic cost incurred during that period.

To call attention to the remarkable absence of any attempt to deal with depreciation in a systematic and regular manner is not to say that sufficient provision is not made in the long run, by hook or by crook, for this important part of economic cost by well-managed undertakings. But it is quite evident that, even if approximately correct long-period results are obtained, the present precarious and uncertain way in which depreciation is charged to annual revenue often causes the declared annual results to oscillate between one year and another, although the movement of the business during the period may have had a quite regular tendency. The reason is that the charges made to revenue under the head of depreciation in a given year have often little relation to the true benefit receivable by revenue during that year from the use of the wasting assets. The subject is thus of public

importance even as it affects enterprises administered in an able and honest manner, but it assumes far greater gravity in connection with that large class of undertakings which are habitually carried on under less sound and capable management.

It must also be noted that the regular treatment of Depreciation and Wasting Assets is necessary to determine with accuracy the actual cost (apart from questions of profit or loss) of producing commodities and of rendering public services, and it is thus of great importance to the internal management of industrial undertakings in all questions concerning competitive, comparative, or recurring cost, including—

Computing cost of production, for the purpose of fixing and grading competitive selling prices to customers.

Comparing cost of production by machine and hand processes respectively.

Comparing cost of out-turn of machines of different age or character.

Comparing cost of successive similar factory production orders.

A principal object of this work is to show that the present neglect to account systematically year by year for expiring capital outlay made in advance on revenue account is a matter of long-established custom rather than of inevitable necessity. Absolute accuracy cannot, of course, be attained, but a system giving results nearly approaching to accuracy by comparison with the present complete lack of method may be easily attained. The accounting for capital outlay, dedicated as such outlay always is to a certain purpose, constantly expiring, and which, rightly considered, is entirely unaffected by current market fluctuations in value, is as important as is the accounting for current cash

expenditure, which is now always minutely recorded and controlled in its thousandfold greater detail. Any class of wasting assets used in profit seeking is surely worth the making of a simple accounting record each year during the period of service within which the usable value must expire. All that is needed is the use of a suitable accounting equipment, supplementary to the ordinary financial ledgers, which shall record the estimates of the engineers or other technical advisers, and enable the accountants to give due financial effect to such estimates. Such an accounting equipment would form an invaluable key to the details of the capital investment in wasting assets as shown in total in the ordinary financial ledgers.

The vital importance of the whole subject has always been insisted upon by professional accountants, and its neglect continues in spite of, and not in consequence of, their attitude. When public and official opinion demands it, the present evil can be largely remedied without encountering any insurmountable difficulties, and at a cost infinitesimal compared to the value of the benefits obtained; but, until that time arrives, professional accountants are unable to give much effective aid.

The problem of Depreciation and Wasting Assets is so vast and complex, that it is apt to appal and discourage any sustained striving after the use of better methods. But it is clear that a great advance in the direction of improvement is easily attainable by taking thought, and some attempt is here made to set out the results of a general survey of the subject, on a basis wide enough to include every part, in the hope of assisting to influence opinion, and of attracting the

attention of those best able to develop the many and widely different branches of the problem. With this object in view, the Author will be greatly obliged to any interested in the subject who may be so kind as to submit suggestions and criticisms.

P. D. LEAKE.

DEPRECIATION AND WASTING ASSETS

CHAPTER I

DEPRECIATION

Definition of Depreciation

IN its true commercial sense, the word "Depreciation" means fall in going-concern or owner's cost value of wasting assets, computed on the basis of cost expired during the period of their use in seeking profits, increase of value, or other advantage. Depreciation is a part of the cost of seeking profits, equal in importance to other revenue expenditure.

Causes of fall in exchangeable value

The fall in exchangeable value of wasting assets during the period of their use in seeking profits may be due to any one or more of the following causes—

Expiration of time.
Natural decay.
Wear and tear.
Obsolescence.
Diminution of the mass or source of natural raw material.
Diminution of the principal sum involved in contracts such as purchased terminable annuities.

The term "profits, increase of value, or other advantage" ... "profits, increase of value, or other advantage"

The term "profits, increase of value, or other advantage" includes not only all kinds of industrial and commercial profits, but it also includes the accruing interest contained in contracts such as purchased terminable annuities, and all accruing benefits (having exchangeable value) which are received in any

form other than cash, such as the annual value of a house occupied by the owner, or of furniture, or horses and carriages used by the owner. As, however, private users do not generally have occasion to compute with accuracy the annual cost of their own establishments, this part of the subject is of little interest from a practical point of view.

Depreciation is unaffected by market fluctuations in value

It is important to observe that it is the fall in exchangeable value occurring during the whole period of use, and, further, that during that period wasting assets are not primarily intended for sale in their existing form. They are, in fact, out of the market, being all the time allocated to the specific purpose of seeking profits in the pursuit of which they will be destroyed, except as to any scrap or remainder value which may ultimately survive. Depreciation of wasting assets is, therefore, unaffected by market fluctuations in value due to the operation of the law of supply and demand during the currency of the period of their use.

Market fluctuations must be entirely disregarded

The failure to recognise this fact is responsible for that part of the difficulty surrounding the subject of depreciation which arises out of the common belief that regard must be had to fluctuations in value due to the temporary state of supply and demand. All such fluctuations must be entirely disregarded, except always in so far as they may safely be taken as useful indications in revising earlier estimates of the ultimate exchangeable value (if any) likely to survive at the end of the period.

Illustration of this

A profit-seeking undertaking using wasting assets is, and for accounting purposes must always be treated as, a going concern; and a going concern will apply

its wasting assets to the purposes for which they were acquired, and will not act as a dealer in the purchase and sale of such property for profit. Therefore, after the purchase of wasting assets at a certain cost, be it high or low, the accounting problem is confined to the proper distribution of that cost over the years of the efficient life of the wasting assets. Suppose a machine costs £1,100, with expected life ten years and scrap value £100, the proper provision for depreciation is £100 a year. It makes no difference at all that in five years the market price of such a machine may have advanced to £1,500. It is still only necessary within the ten years to refund the cost of the machine which was purchased for £1,100. When it becomes necessary to purchase another machine at the end of ten years, it may cost £1,500, which will need a capital outlay of £400 in excess of that needed for the purchase of the first machine; but this circumstance does not render inadequate the charge of £100 per annum for depreciation on the first machine, which cost only £1,100. It cannot be too clearly stated that depreciation extends only to the replacement of the cost of wasting assets already acquired and which are being wasted in the process of earning the revenue of an undertaking. The provision is not to cover the cost of future renewals, although it will be available to be applied to or towards that cost.

Stock Exchange securities and the like are not wasting assets

The word "depreciation" in its commercial sense can apply only to wasting assets, and it will be shown later that all wasting assets must inevitably waste and pass away while applied to the purpose of seeking profits, increase of value, or other advantage. Stock Exchange and other like securities are not wasting

assets; they are held, as a rule, for the purpose of obtaining the income receivable from them in the form of annual dividends, and although such securities may at any time either appreciate or depreciate in market value, this change in value will not arise out of the purpose for which they are held, and thus they are clearly distinguishable from wasting assets. This applies equally whether the securities are held as investments for the purpose of receiving the annual dividends, or by a dealer or speculator for the purpose of selling at a profit; for in neither case does any movement up or down in their exchangeable value arise directly out of the purpose for which they are held. Movements up or down in value of Stock Exchange or other securities are, of course, of every-day occurrence and arise from various causes, but the cost of the securities does not expire in pursuit of the object sought to be attained, as it always does expire in the case of wasting assets. Realised losses on the sale of investments in Stock Exchange and other securities may thus be clearly distinguished as "capital" losses by the application of this test. When such losses are incurred by a profit-seeking enterprise having part of its funds invested in outside securities, such realised losses should no doubt be refunded or made good out of profits retained in hand for that purpose, and the same applies to any fall in the value of investments when it is considered that the loss may be permanent, but this is quite distinct from commercial depreciation. All such refunds of "capital" losses are made out of true profits arising from the undertaking, except, of course, in the case of a financial enterprise specifically seeking profits

from the purchase and sale of investments, when the securities are, to the financial enterprise, much the same as the stock-in-trade is to the industrial undertaking.

The word "depreciation" is unsatisfactory as a definition of that which it is intended to imply, for it means much more than is intended; thus, a fall in the value of Stock Exchange securities held by bankers and others is no doubt correctly described as depreciation in the sense opposite to appreciation. Besides being commonly used to express fall in all exchangeable value, whether existing in the form of wasting assets or otherwise, the word is also used in the sense of lowering in estimation, thus—

The word "Depreciation" has too wide a meaning

"A method . . . which much depreciates the esteem and value of miracles." 1646. Sir T. Browne. Pseud. Ep. IV, X, 205.

"A great depreciation of the standard of morals among the people." 1829. J. Taylor. Enthus. IX, 225.

"Our architectural reputation, never high, is still more depreciated by the building at South Kensington." 1862. *Fraser's Magazine*, November, 631.

The term "expired capital outlay" is an exact definition of that which the word "depreciation" is intended to imply when used in its commercial sense, and the general adoption of this term would avoid the common mistakes arising from a natural belief that "depreciation" covers at least all that which is opposite to appreciation.

The term "Expired Capital Outlay" is an exact definition of "Depreciation" in its commercial sense

A clear understanding of the true meaning of "depreciation" as being expired capital outlay, enables questions which have been raised from time to time by legal writers to be easily answered; thus

Capital profits and losses which are non-inherent to profit-seeking

Buckley, L.J., in his work on the Companies Acts, in discussing depreciation, asks this question—

> Suppose I buy £100 Consols at 80, and at the expiration of a year they have fallen to 77½, is my income £2 10s. or nothing? If nothing, then if at the expiration of the year they had risen to 82½, my income would, by comparative reasoning, have been £5, not £2 10s. Is the result affected by the question whether at the end of the year I am or am not, about to sell my Consols?

The answer to the first question is, that the fall of £2 10s. in the value of the £100 Consols not being a loss resulting inevitably from the holding of the Consols for the purpose of receiving the £2 10s. dividend, is a capital loss. It is not commercial depreciation, and is not a charge against the income. Capital losses may perhaps be defined as the fall in exchangeable value of property not applied to the purpose of seeking profits in such a manner as to cause it inevitably to diminish or expire, and the capital invested in this £100 of Consols for the purpose of earning the £2 10s. dividend was not applied in such a way as to cause it inevitably to diminish in value. By the same process of reasoning, the answer to the second question is, that the rise in value of the Consols to 82½ results, if the Consols are sold, in a capital profit of £2 10s. which is of a different character to the dividend of £2 10s., and may be treated as income or not, at the option of the person concerned. The answers are unaffected by the question whether or not the Consols are about to be sold at the end of the year.

Another question in the same work is as follows—

> Suppose a tramway company lays its line when material and labour are both dear; both subsequently fall, and the

same line can be laid for half the money, and, as an asset (independent of depreciation from wear), is worth only half what it cost. Is the company to make this good to capital before it pays a further dividend? If so, then, if the cost of material and labour had risen after the line was laid, might not the company have divided as dividend this aggregation to capital? Upon such a principle, dividends would vary enormously, and sometimes inversely to the actual profit of the concern.

This question brings out clearly the importance of understanding the true meaning of depreciation in its commercial sense, which is nothing more or less than "expired capital outlay." The tramway company no doubt laid out its capital to the best advantage at the time of installing the tramway, and having made the bargain and bought the property, whether the price was high or low, the sole question for the company in preparing its annual revenue accounts is as to how the cost, which is expiring over a long period of years, is to be fairly allocated as a charge against the revenue account of each year for expired capital outlay. The company must, after the tramway has been laid and equipped, disregard all subsequent fluctuations in the value of material and labour for the reasons stated above, except in so far as these may safely be taken as useful indications in revising earlier estimates of the ultimate scrap values.

CHAPTER II

WASTING ASSETS

Nature of capital outlay on Wasting Assets

THE majority of profit-seeking enterprises have to embark capital in wasting assets to enable them to earn their revenue, whether arising from the winning and sale of coal or minerals, as in the case of a colliery or mine, from traffic receipts, as in the case of a railway or tramway company, from the supply of electrical energy, gas, water, or other public service, or from the manufacture and sale of goods. It is, unfortunately, customary to record and describe capital laid out in wasting assets such as coal measures, mineral deposits, buildings, plant, machinery, and the like, as fixed or permanent, this custom having arisen out of a misapprehension of the facts. Consideration will show that all such outlay of capital, far from being represented by anything fixed or permanent, consists of nothing more enduring and substantial than expiring value acquired and paid for in advance on revenue account for the purpose of enabling the gross revenue to be earned, in which process the value of all these wasting assets will inevitably be destroyed. Wasting assets of all kinds, unlike trade stock, are not for sale as such, but are deliberately dedicated to be destroyed in carrying on the undertaking. All subsequent fluctuations in the market value of similar property are thus immaterial, and consequently should be deliberately excluded from the accounts, the sole question being how to apportion the cost of the wasting assets (a known amount be it observed) fairly over

each of the limited number of years which will benefit by the outlay. Undertakings using wasting assets (which are defined below) in earning their revenue incur each year expenditure under two distinct heads, one being that recurring expenditure for which cash has to be disbursed at the time, or in or about the year the benefit is received, as, for instance, wages, rent, and the like ; and the other being represented by that part of the previously incurred capital outlay which has expired within the year, and this latter head of expenditure is at present grievously neglected in accounting.

Definition of Wasting Assets

Wasting assets consist of all values of an exchangeable nature which inevitably diminish while applied to the purpose of seeking profits, or advantage otherwise than by purchase and sale, and they include the following—

(*a*) Industrial plant comprising all perishable material property other than that primarily intended for re-sale. Such plant includes all buildings, plant, machinery, fixtures, and furniture of manufacturers; all buildings, plant, machinery, fixtures, and furniture of mines; and all surface works (reservoirs, water service, railway sidings, roads, etc.); the way, bridges, works, stations, rolling stock, and all equipment of railway and tramway companies, other than site value of land in each case. Most of the capital of electric lighting and power companies; gas, water, and omnibus companies; cable, telegraph, and telephone companies; shipping and dock companies, as well as that of many other undertakings, is also invested in perishable industrial plant. The undertakings least affected are banking, insurance, investment, and finance companies.

(*b*) The mass or source of any natural raw material, including bodies of coal and all kinds of minerals; deposits of slate, stone, gravel, earths, oil, and nitrate; also timber and all kinds of growing plants yielding recurring crops.

(*c*) Main shafts, main adits, shafts which develop ore, and

other underground development undertaken to win natural raw material.

(*d*) Purchased terminable annuities.
(*e*) Purchased terminable concessions.
(*f*) Leaseholds.
(*g*) Copyrights.
(*h*) Patent rights.
(*i*) Goodwill and trade-marks

Materials held for manufacture and sale are not wasting assets, neither are Stock Exchange securities nor land

Purchased materials and stock held for the purpose of manufacture and sale are not wasting assets, neither are gotten minerals and the like, nor severed crops, for they are all held for the purpose of manufacture, or sale, and do not inevitably fall in exchangeable value during any period of use in seeking profits. Gotten minerals are easily distinguishable from the mass or source of the natural raw material, for the latter, when applied to the purpose of seeking profits, inevitably falls in exchangeable value during the period of its use in consequence of the gradual reduction of the mass, or source, as the product is won. It has been explained in the previous chapter that Stock Exchange securities and the like are not wasting assets. The site value of land is not a wasting asset; its value does not inevitably diminish while applied to the purpose of seeking profits otherwise than by purchase and sale of the land.

Inherently wasting assets

Wasting assets falling under the four heads (*a*) to (*d*) are inherently wasting assets, being represented by a corpus or fund (apart from the value of mere rights to future profits or increase) which wastes in the process of seeking profits. Wasting assets falling under the remaining five heads (*e*) to (*i*) are not represented by a corpus or fund apart from the value of terminable rights to future profits, increase of value,

or advantage. This distinction is of importance, especially when considering the assessment to income tax of annual profits arising.

Wasting assets always waste while applied to the purpose of seeking profits

All wasting assets, whether consisting of a corpus or fund which inherently wastes, heads (*a*) to (*d*), or of terminable rights to future profits, increase of value, or advantage, heads (*e*) to (*i*), have the common characteristic that they inevitably fall in exchangeable value while applied to the purpose of seeking profits; and unless an amount equal to this fall in exchangeable value is retained out of the revenue receipts of an undertaking by being charged to the revenue account as part of the cost, the cost will be understated to that extent and the profit overstated by a like amount. It is easy to ascertain the fall in exchangeable value which has taken place in a wasting asset at the end of the period of its efficient life; but at any time during the currency of that period this can only be a matter of estimate having regard to all known existing conditions and to probable future developments.

CHAPTER III

FIXED AND FLOATING CAPITAL

Distinction between amount of capital embarked, and state of capital investment

IT is necessary to distinguish clearly between the definite amount of capital embarked in a profit-seeking undertaking and the temporary states or forms of investment in which that capital afterwards exists from day to day, and to bear in mind that the turning of some of these forms of investment into other forms of investment, or into money again, is not in any sense a reduction of the capital of the undertaking. The capital of every profit-seeking undertaking is required for two well-defined purposes: first, to purchase the necessary wasting assets and sometimes land (this part of the capital being often called fixed capital); and, secondly, for use in the form of other necessary assets, such as sale stock, debts, temporary investments, and cash at bank, this part being called circulating or floating capital. The whole capital outlay, however, both fixed and floating, save that on land, is constantly circulating and passing from one form of investment to another, although at very different rates of speed.

Capital can exist only in exchangeable value

Capital can exist only in exchangeable value, and therefore capital can only be fixed by maintaining investments, in some form or other, at an exchangeable value equal to the fixed capital. As wasting assets in which capital resides become less in exchangeable value, some other form of exchangeable value arises which increases other assets, such as sale stock, debts, bank balances, or temporary investments.

This must happen automatically when an undertaking results in true economic profit, provided that no greater sum than the profit is withdrawn; but when the undertaking results in a loss, or a sum greater than the profit is withdrawn, the capital cannot be maintained except by introducing fresh value.

Capital outlay is only long-period revenue outlay

The theory that the capital and revenue outlay accounts of a profit-seeking undertaking are distinct, in the sense that the accounts relating to capital outlay can be partitioned off and treated as the capital account, is a fallacy. All capital outlay on wasting assets consists merely of payments made in advance on revenue account, all of which are constantly expiring in the service of the revenue account, and, therefore, the value of the capital investment cannot be upheld except by regular and adequate contributions, which must be retained out of revenue receipts by being charged to revenue account. These contributions need not remain lodged in the bank until the money is required to renew the wasting assets. The swelling balance at the bank should in the meantime be used, as it generally is used, if required, for the ordinary purposes of the business.

Constant interchange between fixed and floating capital

It increases for the time being the available floating or circulating capital, and, as the moneys representing the contributions are retained out of revenue receipts, the requirements of the business may simultaneously increase to an extent demanding the permanent use of these moneys as additional floating capital. Again, if not used to answer a growing need for further floating capital, the contributions may be gradually absorbed by the purchase of additional wasting assets, such as further plant, permanently required by the undertaking.

Capital released from wasting assets may be otherwise laid out

In either of these cases, when it becomes necessary to renew the original wasting assets, and bring them up to their value again, the money, although specifically contributed by revenue year by year in the past, will not be found at the bank available for use. The reason is that it has been already invested to answer the growing need of the business for new capital, and, therefore, directly the money is required for its originally intended purpose, it is legitimate and necessary to increase permanently the capital of the undertaking by issuing new capital, and to use the money provided by this increase of capital to renew the original wasting assets, because the undertaking now needs a permanently larger capital, fixed and/or floating. In the meantime, sums in lieu of this new capital have been borrowed year by year, as above stated, out of the proceeds of the gradual return of the money laid out in the wasting assets which formed part of the original " fixed " capital investment.

Reduction of wasting assets is not reduction of capital

The use of the new capital for the renewal of the original wasting assets will operate to pay back the temporary loan which was legitimately borrowed from the original " fixed " capital, at a time when the money would otherwise have remained unemployed in the business. Thus the operation of exchanging into other forms of value, and so gradually using up and reducing, what are called fixed assets (although really wasting assets) in the ordinary course of carrying on the business of a profit-seeking undertaking is not reducing the capital of the business, for the capital (or exchangeable value) will be found residing in some other asset received in exchange, which may be in the form of sale stock, debts, cash, plant or other value, provided

always that the revenue account has been in the meantime charged with adequate sums for expired capital outlay.

Illustration of interchange between fixed and floating capital

In order to demonstrate the continuous shifting of value taking place between the investments supposed to represent fixed capital and the investments supposed to represent floating capital, take the case of a profit-seeking undertaking with a capital of £70,000 invested at the beginning of a period " N," in the manner shown in the columns headed " Beginning " in the *pro formâ* balance sheet set out on p. 16. In this case, it must be assumed that the profits have been correctly computed during each part of the period, the revenue account having been charged with adequate sums for expired capital outlay. It must also be assumed, for simplicity, that the accrued profits have been distributed immediately prior to the termination of the middle and end parts of the period " N," except to the extent of £1,000, which was undistributed ; and, further, for the sake of simplicity, it must be assumed that the wasting assets had no remainder or scrap value. It is supposed that the total depreciation for the period " N," amounting to £50,000, had been correctly forecasted and regularly provided for, on a basis of equal distribution over each part of the period as approximating most nearly to the proportion in which the beneficial use of the wasting assets, having a strictly limited economic life, was obtainable for the service of revenue. The reasons for the adoption of this basis of distribution of expired capital outlay (depreciation), in dealing with industrial plant and certain other descriptions of wasting assets, are fully considered in later chapters.

BALANCE SHEET,

Showing position of Liabilities and Assets at three different dates in the period "N."

LIABILITIES.	Beginning.	Middle.	End.	ASSETS.	Beginning.	Middle.	End.
	£	£	£		£	£	£
CAPITAL—				Wasting assets, which will all expire by the end of period "N"—			
"Fixed" .	50,000	35,000	20,000				
"Floating" .	20,000	35,000	50,000				
	70,000	70,000	70,000	Lease of land	2,000	1,000	—
				Buildings .	10,000	5,000	—
Debts payable	5,000	5,000	5,000	Plant and Machinery .	38,000	19,000	—
Undistributed balance of profit . .	—	1,000	1,000		50,000	25,000	—
				Additional plant purchased later and which will not expire by the end of period "N" .	—	10,000	20,000
				Other assets—			
				Sale stock .	12,000	18,000	25,000
				Debts receivable . .	12,000	20,000	27,000
				Cash . . .	1,000	3,000	4,000
	£75,000	£76,000	£76,000		£75,000	£76,000	£76,000

At the beginning of the period, £50,000 of the capital was invested in wasting assets, and would be called fixed capital, and the remaining £20,000 was employed in the form of other assets, and would be called floating capital. By the middle of the period, it will be seen on reference to the columns headed "Middle," the unexpired value of the original wasting assets has been reduced to £25,000, and, in order to meet the requirements of a growing business during that time, additional plant (wasting assets) has been purchased, having then an unexpired value of £10,000; and, further, the amount of floating capital required

has risen from £20,000 to £35,000, consisting of floating assets, £41,000, less debts payable and undistributed profits, £6,000.

The money used to pay for the additional plant (wasting assets) purchased, and for the additional floating capital required, is together the £25,000 which has been gradually retained out of revenue to meet the expired capital outlay on the original wasting assets. The capital investment is thus upheld at £70,000, although altered in character, and now consisting of fixed capital £35,000, and floating capital £35,000. If during this time the revenue account had been charged with less than adequate sums for expired capital outlay, the capital account would have been robbed by revenue account to that extent, although this fact would not be apparent, because the value of the original wasting assets would stand overstated to that extent in the balance sheet, the balance of the floating capital assets being correspondingly reduced, or the debts payable increased, by the amount improperly paid away as dividend, assuming that this had been done, as would be natural, because the profits would have been overstated.

The position at the end of the period " N " is shown in the columns headed " End " in the above balance sheet. It is assumed that the business had by this time increased to an extent requiring the use of additional plant (wasting assets), having a then unexpired value of £20,000, and of additional floating capital of £30,000. Both these requirements have in the meantime been financed out of the sums taken out of the revenue receipts to answer the expired capital outlay on the original wasting assets, which, at the end of

the period, have fully expired in the sense of ceasing to have any value or useful existence. The fact that in actual practice this would not happen to all the wasting assets simultaneously does not in any way invalidate the principle which it is here sought to illustrate.

At the end of the period the capital investment is still fully upheld at £70,000, its original exchangeable value; but only £20,000 is at that time actually invested in the form of fixed capital, the balance of £50,000 being in the form of floating capital. It is assumed that up to the last day of the period "N" the manufactured out-turn of this increasing business required the full and efficient use of the whole plant and machinery, including that which originally cost £38,000 (part of the £50,000 wasting assets), as well as that represented by the additional plant purchased during the period. The whole range of plant and machinery, both original and additional, was thus rendering efficient service up to the end of the period (for otherwise it would have been scrapped at an earlier date); but immediately after the end of the period all the original plant was put out of service and scrapped, and it is assumed that the lease and efficient life of buildings also expired at the same moment of time and required renewal.

In order, therefore, to carry on undiminished the manufacturing and other operations of the business as before, it will be necessary to have immediately available new wasting assets (lease, buildings, and plant), and for the sake of demonstration it may be assumed that these again cost the original £50,000 to purchase. On looking at the final position at the end

of the period, as disclosed in the columns headed "End" in the above balance sheet, it may seem surprising to find that, although the expired capital outlay (depreciation) has been regularly contributed out of revenue receipts, there are no sufficient cash resources available to enable the original wasting assets to be renewed.

But, as has been shown in the case illustrated, the £50,000 required for this purpose will now properly be provided by an issue of new capital, which should be made at a time prior to the end of period "N" sufficient to allow of the renewal of the wasting assets to be ready for service when required. The total capital will then be £120,000, instead of £70,000, consisting of fixed capital £70,000 and floating capital £50,000. It is possible to observe, by reference to the above balance sheet, the ebb and flow which takes place between fixed and floating capital investments, although the sum of the two should never be less than the full amount of capital invested in the undertaking.

It has been assumed in the foregoing demonstration that the extent of the business *bonâ fide* increased during the period "N" from a figure represented by seven to a figure represented by twelve, and it has been shown that under these circumstances an increase in capital from £70,000 to £120,000 was necessary and proper, although the whole amount of such increase was needed to renew wasting assets purchased out of original capital. But the mere fact that the cash resources of a business are found to be insufficient to pay for the renewal of original plant or other wasting assets when needed, even though, in the meantime, without requiring the use of additional assets, the sales

or other receipts may have increased, by no means proves that it is sound finance to make a new issue of capital to provide the necessary money.

The shortage of cash resources may be due entirely to the fact that revenue has in the meantime been allowed to consume the capital invested in wasting assets, without refunding to capital, out of the revenue receipts, the value so consumed. The value consumed would, in that case, have been inadvertently regarded as part of the profits, and would probably have been paid away to shareholders as dividend, instead of being retained, and—additional plant not having been required—temporarily invested, to be available to renew the original wasting assets or ultimately to pay back the capital undiminished to shareholders.

Present neglect to account for capital invested in wasting assets

How, then, are shareholders, directors, and managers to judge of the true financial position of an undertaking from the balance sheet in each particular case? The state of such assets as sale stock, book debts, and the like is always recorded in the accounts with scrupulous care. Minute written particulars are available for inspection showing the original amount and all the subsequent transactions concerning each unit, both large and small. It is thus matter of common knowledge that the "floating" part of the capital investment, as existing from time to time, has been adequately accounted for and entered in each annual balance sheet at carefully settled values, based on the known current conditions. But no detailed records of the cost and present condition of investments, such as buildings, plant, and machinery, and other wasting assets, supposed to represent fixed capital, are, under the present common practice, available for inspection

and consideration, and, therefore, it is impossible to show a reasoned basis for, or to judge the sufficiency of, the annual refunds (if any) which have been made out of revenue receipts to capital to maintain the value of this part of the capital investment unimpaired.

And consequent impossibility of reasoned judgment on financial position of an undertaking

To enable any sound opinion to be formed as to the financial position of an undertaking, definite information, based on known facts and latest estimates, should be available concerning the assets supposed to represent fixed capital, just as it is now available concerning the assets supposed to represent floating capital. But as it is still customary to do without the aid of any properly developed records relating to that part of the capital investment represented by wasting assets, it must be admitted that it is at present impossible to form any reasoned judgment as to the true financial position of any undertaking employing wasting assets.

Co-operation needed between engineers and accountants

The cause of this unsatisfactory state of affairs is to be found for the most part in the neglected condition of that branch of annual accounting which calls for co-operation between engineers and accountants, and which has to do with transactions combining fact (known cost—save the case of an original owner working a mass or source of natural raw material, when the value must be estimated) and long-period probability (unknown life and scrap value). It is true that the amount of the provision for annual expired capital outlay (depreciation) is small compared with the enormous volume of other transactions involving current receipt and payment of money, which are accounted for with such scrupulous care and accuracy; but, nevertheless, this necessary provision often equals

or exceeds the amount of annual profit, and is therefore of vast importance.

Present haphazard methods should be superseded

It should be explained that all original, additional, and renewal capital outlay on wasting assets, such as buildings, plant, and machinery, is at present usually recorded in one or more capital outlay accounts in the financial books, and that when annual depreciation is charged to revenue it is arbitrarily computed, either as being equal to some fixed percentages calculated on the reducing balances of these capital outlay accounts, or as being equal to a lump sum which is allocated out of the surplus balance of the annual revenue account. An alternative method used is to charge revenue, haphazard, with the cost of renewing wasting assets as and when this is incurred, in lieu of charging properly measured annual depreciation. All these methods are unsatisfactory, precarious, and inadequate; and it is certainly true to say that no reasoned judgment can be formed as to the justification or otherwise for an issue of new capital required by an undertaking using wasting assets, and this is a very serious indictment of present accounting methods.

CHAPTER IV

ECONOMIC COST

Definition of Economic Cost

IT is impossible to determine the profit or loss arising in a given period out of the capital invested in any enterprise without first ascertaining the economic cost incurred during that period, exclusive only of interest on owner's capital, which interest forms part of any profit. This economic cost may be defined as " Applied exchangeable value *minus* interest on owner's capital." It is exchangeable value merged, converted, or used up in one form in seeking something of greater value in another form. In computing profit or loss for any period, the revenue account must, therefore, be charged with a sum equal to the exchangeable value merged, converted, or used up during that period.

Factors of Economic Cost

In the case of any enterprise using wasting assets, this used-up value will include sums representing the exhaustion, in whole or in part, of wasting assets previously acquired and paid for out of moneys provided as capital. It will also include the value of materials used up, and of work or services performed, during the currency of the period, and it may include sums representing the exhaustion, in whole or in part, of wasting assets acquired before, but not actually paid for until after, the expiration of the period.

Economic Cost is value consumed in producing value

The date of actual payment of cash is of no importance when computing economic cost to ascertain profit or loss, for cost incurred during a given period is not confined to the outlay for which money has then to be actually disbursed, but is the sum of exchangeable value which has passed away or been

merged in pursuit of the particular object. If the sum of exchangeable value produced during any period be greater, there is a profit ; if it be less, there is a loss. The words "cost," "expense," and "expenditure" are generally taken to mean something which involves an outlay of money at or about the present time, but in the economic sense they mean the amount of value consumed in securing the value produced.

Neglect of present accounting for past capital outlay unexpired

It is clear, therefore, that cost incurred during any period has no relation to the amount of value purchased or paid for, but is the amount of value consumed during that period. While it is true to say that cost is generally regarded as being practically confined to expenses involving present money outlay, and that that part of cost is commonly carefully recorded and adequately accounted for, it is equally true to say that the other part of cost, relating to past money outlay on wasting assets, the value of which is being daily consumed in the course of carrying on the business of an undertaking, has not hitherto been considered as outlay which can be systematically recorded and currently accounted for, and, therefore, it receives little or no accounting attention.

Depreciation is as much part of Economic Cost as are wages paid

It cannot by any means be denied that depreciation, or expired capital outlay, is as much a part of economic cost as is, for instance, the sum paid by the manufacturer for wages. The only difference between the two classes of expense is that in one the money is paid, or the exchangeable value outlaid in advance of its use, the objective consideration being received therefore at a later date ; and, in the other, the consideration (the man's work) is received first, and the money paid immediately afterwards.

Views of economists

The necessity for treating expired capital outlay as part of economic cost has always been insisted upon by economists; thus McCulloch, on Political Economy, says—

> If the produce derived from an undertaking, after defraying the necessary outlay, be insufficient to replace the capital exhausted, a loss has been incurred; . . . if it is merely sufficient . . . there is no annual profit.

The meaning of the words "capital exhausted" used here is evidently identical with the meaning of the words "expired capital outlay." Again McCulloch says—

> Profits must not be confounded with the produce of industry primarily received by the capitalist. They really consist of the produce, or its value . . . after all necessary payments have been deducted and after all the capital wasted and used in the undertaking has been replaced.

Illustration of Economic Cost

In order to demonstrate this fact, suppose a manufacturer purchased a lease of land, and built and equipped a factory upon it, and carried on a manufacturing business over a period "N," with the result shown below—

REVENUE ACCOUNT FOR THE PERIOD "N."

	Dr. £		*Cr.* £
Capital outlay of Money—		Current receipts of money, after receiving all debts receivable . . .	£1,060,000
Lease of Land . .	2,000		
Buildings . . .	10,000		
Plant & Machinery	38,000		
	50,000		
Current outlay of Money, including Materials, Labour, and other expenses, after paying all debts payable . .	950,000		
Economic Cost . .	1,000,000		
Profit	60,000		
	£1,060,000		£1,060,000

Suppose, at the end of the period "N," the lease had expired, and the buildings and plant and machinery were obsolete, and were taken over by the landlord to cover the cost of removal and restoring the site value of the land. In this case it is clear the manufacturer earned a profit over the period "N" of £60,000 at a cost of £1,000,000.

Difficulty in computing yearly economic cost

But the difficulty in computing economic cost arises largely from the fact that in practice it is necessary to divide the period "N" into parts known as years, and to estimate the profit which has accrued within each of such years. The outlay on the lease, buildings, plant, and machinery, amounting to £50,000, is paid in advance out of capital, and called capital outlay or capital expenditure, while the cost of materials, labour, and other current expenses, amounting to £950,000, is paid for out of current receipts spread over the whole period "N."

Neglect to refund expired capital outlay out of annual revenue receipts

Owing to the difficulty of estimating the proportion of the £50,000 capital outlay which has expired within each year of the period "N," it often happens, in estimating the annual profits of an undertaking, that no serious attempt is made to provide for that part of the cost which consists of expired capital outlay. It is sometimes ignored altogether until the value has been used up, and in other cases provision is made in a spasmodic and haphazard manner, without the use of any regular scheme for annual measurement based on properly recorded facts and latest estimates of useful life periods made in accordance with the current outlook. In the case stated, it might even happen that, by the end of the period "N," the annual profits have been computed as amounting to £110,000,

and have been assessed to income tax and distributed accordingly, entirely overlooking the fact that the original £50,000 invested by the manufacturer has in the meantime disappeared.

Over-statement of annual profits

If the profits for the period "N" have been computed at £110,000 instead of at £60,000, they will have been overstated by no less than 83·3 per cent. Assuming the period "N" to be twenty years, the so computed profits would be equal to a dividend of 11 per cent. per annum on a capital of £50,000—omitting for simplicity working capital, which is not always required—whereas the actual profits are equal to a dividend of 6 per cent. per annum on that sum.

Consequent shortage of actual capital

If the undertaking is owned by shareholders, and is to be continued after the end of the period "N," it is probable that during, or towards the end of, that time, sums would have been set aside by the Directors annually out of what would often be called "profits," and carried to the credit of an account called reserve for renewals, or reserve for depreciation, and shortly before the end of the period an invitation would have been issued to shareholders to take up further Preference or Ordinary Shares to provide capital which might be truly stated to be required to renew and enlarge the factory. Suppose, under these circumstances, a sum of, say, £20,000 is standing to the credit of the reserve account at the end of the period "N," being the total of the sums set aside for depreciation out of so-called "profits" during the period, this amount will be available to go towards the cost of rebuilding and equipping the new factory, provided the money has not already been absorbed in the purchase of additional fixed or floating capital assets,

as already described in the chapter on "Fixed and Floating Capital."

And inflation of share capital

And if the new equipment required for the undertaking is now on a somewhat larger scale and costs £60,000, instead of the original £50,000, to renew and enlarge, the shareholders will have to add a further £40,000, instead of £10,000, to their previous investment of £50,000; and the new factory equipment and other wasting assets will then stand in the books at £90,000, made up, as to £60,000, the actual cost, and as to £30,000, the balance of expired capital outlay (depreciation) on the old factory equipment and lease, which should have been charged to revenue during the period "N." There can be no doubt that this is the present condition of many industrial and railway companies.

Obscurity of financial position

In the particular case stated, the position of affairs would be clear enough to the directors and others having access to the books, but in actual practice the true financial position is always effectually obscured, owing to the fact that the useful life of each class and sub-division of wasting assets comes to an end at a different time; and as it becomes necessary to expend money on the renewal of each of the many different classes and sub-divisions as the end of the useful life of each approaches, the cost of replacement is charged to capital outlay as a matter of course, without any means of first ascertaining whether all the original cost has been duly charged to revenue. It is usual to charge the whole of such renewal expense to capital outlay in the case of those undertakings which make a charge to revenue purporting to answer the unknown cost of depreciation or expired capital outlay, although

the amount of this charge for depreciation is itself often made dependent upon the success or otherwise of each year's operations, and upon other considerations turning on the financial convenience of the moment.

Need of regular accounting for capital outlay

Whether economic cost is at present in many cases largely understated, and if so to what extent this condition prevails, must be left to the determination of others ; but, however this may be, it is clear that the entire absence of organisation and method in recording and measuring expired capital outlay (depreciation) is an undesirable state of affairs. In unknowing or unscrupulous hands the financial evils arising out of this condition of chaos can scarcely be overstated, and the time has arrived for the general adoption and compulsory use of some suitable form of recording equipment providing a flexible scheme of measurement of annual expired capital outlay, based on recorded facts and latest estimates of useful life periods and scrap values, made from time to time and kept up to date in accordance with the current outlook. The compulsory use of a statutory register of plant would leave all estimates and rates of depreciation in the absolute discretion of those responsible for the undertaking, and they would not, under any circumstances, be penalised for errors of judgment.

The advantage of this compared with its cost

A study of the subject will show that this is quite practicable, and that the administrators of any kind of enterprise may, by taking thought, develop and adapt a suitable scheme, which may be regularly used year by year with great advantage, at a cost infinitesimal compared with its value. It is a problem affecting almost all industries and trades, which would well repay wide and organised scientific research ; and

it should have the special attention of scientific institutions, technical colleges, universities, and other bodies interested in the advancement of practical science.

Payment of company dividends is not always limited by law to amount of profits

It will be convenient here to call attention to the fact that the payment of dividends by joint stock companies is not in all cases limited by English law to the amount of economic profit earned. The legal position was clearly stated in *Buckley on the Companies Acts* (ninth edition), where, in discussing Article 97 of Table " A " of the Companies (Consolidation) Act, 1908, which provided that " no dividend shall be paid otherwise than out of profits," it is stated—

> The profits of the business are the excess of revenue receipts over expenses properly chargeable to revenue account. As to what expenses are properly chargeable to capital and what to revenue, it is necessarily impossible to lay down any general rule. For the purpose of ascertaining profit available for dividend, capital account and revenue account are to be treated as separate accounts.

The proviso is repeated in Article 91 of the Companies Act, 1929.

These principles, when rightly understood, are not antagonistic to the economic facts discussed in this chapter if the word " expenses " be read as meaning " cost." It has been already shown that the capital investment, in some form, must be maintained unimpaired, and so kept separate from revenue in the sense of being kept intact. But the portions of such assets as cash at bank, debts, or stock, which may for the time being represent part of the capital investment, cannot be earmarked and recorded in a separate account as capital.

Legal decision, *Lee* v. *Neuchatel*

The decisions in the following amongst other interesting cases are quoted in *Buckley on the Companies Acts* (ninth edition)—

In *Lee* v. *Neuchatel Company* (41 Ch. Div. 1) it was held that if the objects of the Company include the sinking of capital in the acquisition of wasting property, even depreciation by waste is not necessarily a revenue charge, but may by the regulations be thrown upon capital. . . . If the memorandum of association provides that the object of the Company shall be to sink its capital in a wasting property and acquire profit by working that property, then the gradual diminution of the property by waste is a gradual destruction of the Company's capital, which may be within its objects legitimate . . . it is for the shareholders to say whether or not they will put by a sinking fund to meet the waste, and the proper place to find this is in the Articles. They may if they like, but they are not bound so to provide.

Legal decision *Lambert* v *Neuchatel Asphalte Company*

In *Lambert* v. *Neuchatel Asphalte Company* [1882] W.M. 128; 30 W.R. 913, it was held that the Articles had given a general meeting power to declare what were net profits, and that the Court could not assume jurisdiction to determine it.

Legal dicta

Sir Henry Buckley states—

The fact is that the law is much more accurately expressed by saying that dividends cannot be paid out of capital than by saying that they can only be paid out of profits. The latter expression leads to the inference that the capital must always be kept up and be represented by assets, which if sold would produce it. This is more than the law requires. Fixed capital may be sunk and lost, and yet the excess of current receipts over current payments may be divided. But floating or circulating capital must be kept up, as otherwise it will enter into and form part of such excess (seeing that circulating capital, with the particulars of its purchase and sale, must appear in revenue account), in which case to divide such excess without deducting the capital which forms part of it will be contrary to law.
(Per Lindley, L.J.: *Verner* v. *Gen. Trust* [1894], 2 Ch. 266.)

Legal doctrine protects commercial practice

It may be said with equal truth that fixed capital should be kept up, as otherwise it will enter into and form part of the excess, for the particulars of its sale are equally included as part of the sales appearing in the revenue account, but the particulars of its cost—that is, the properly measured charge for expired

capital outlay (depreciation)—are often omitted altogether from the revenue account. The legal doctrine as to the difference in the treatment of the fixed and floating assets, when the declared object of the Company is to sink its capital in wasting assets (called fixed capital), is doubtless necessary in order to protect the present common commercial practice in the treatment of the accounts of collieries, mines, and other similar undertakings, where no serious attempt is made to ascertain and charge to the annual revenue account a proportionate part of the original cost of the diminishing mass of raw material. Thus the surplus balance of the annual revenue account, which is generally regarded as profit and distributed as dividend, includes, and may sometimes wholly consist of, exhausted capital outlay which has not been provided for out of revenue.

Directors are bound to make proper investigation

The law thus allows considerable latitude when the declared object of an undertaking is to sink its capital in wasting assets; yet directors are bound to make proper investigation before recommending the declaration of a dividend, and Sir Henry Buckley further states—

> But if a dividend be declared without proper investigation of the financial position of the Company . . . the burden is on the directors to show that the dividend was properly declared, and in default a director will be ordered to refund the dividend he has received (*Rance's case*, 6 Ch. 104); and if directors pay dividends out of capital, they may be liable for the whole amount so misapplied (*National Funds Company*, 10 Ch.D. 118; *Oxford Building Society*, 35 Ch.D. 502; *Leeds Estate Company* v. *Shepherd*, 36 Ch.D. 787).

CHAPTER V

THE INTEREST QUESTION

Interest question deserves careful attention

THE interest question in connection with depreciation and wasting assets deserves careful consideration, and some preliminary remarks on the nature of interest may be convenient.

Nature of interest

In theory, interest is always accruing on principal, the sum of which is always increasing by the accruing interest; but in commercial practice some definite period, or rest, is adopted, at the end of which period interest at the agreed rate is computed on the principal sum outstanding at the beginning of that period, and the amount of such interest is then either immediately paid off in cash or forthwith added to the principal sum upon which interest will next be computed, and so on. In commercial practice, therefore, interest remains unproductive until it is computed at the end of each period. It is thus really in the nature of a periodical rent, charged by a lender to a borrower, for the use of money.

Importance of interest periods or rests

The periods or rests may be of any length, but they usually cover three, six, or twelve calendar months. Commercial interest is commonly described as being at a stated rate per cent. per annum, but if the rests used cover periods either shorter or longer than one year, the expression is inaccurate unless qualified by the further words "payable quarterly" or "payable half-yearly." Thus, with half-yearly rests, interest is often described without qualification as being at a rate of, for instance, 5 per cent. per annum when it is,

in fact, a rate of 2½ per cent. per half-year, and greater than a rate of 5 per cent. per annum, and with rests extending over two years it is less than a rate of 5 per cent. per annum. The reason is, of course, that from the time interest is either paid to the lender or added to the principal sum, it acquires productive power itself, so that if the time recurs other than once a year it varies the consideration and thus the effective rate of interest passing to the lender. This fact may assume importance where, for instance, debenture or preference stockholders are entitled to a share of the profits of an undertaking limited simply to a stated rate per cent. per annum on the par value of their holdings.

Definitions of interest
Commercial compound interest

Interest has been variously defined as money paid for the use of money lent, or for forbearance of a debt according to a fixed ratio (rate per cent.), and it is also said that interest is the increase of an indebtedness by reason of the lapse of time, and that interest is possible only in case of the existence of a debt. Compound interest is interest upon interest, and in commercial practice it operates when an amount of interest, computed at the end of any period, is added to the principal sum, instead of being paid off in cash. Interest may be compounded in this way, either quarterly, half-yearly, yearly, or otherwise, according to the length of the period or rest used in each case, and it is then described, in commercial practice, as compound interest.

Proper use of interest

As a general rule, in computing the profit or loss of an undertaking, interest should only be employed in commercial accounts when it is actually payable or actually receivable as interest. The amount of the

profit or loss of an undertaking is itself the interest (increment) or discount (decrement) resulting from the capital employed. On the other hand, in computing the cost (as distinct from profit or loss) of producing commodities or other values, or of rendering public or private services, interest at a suitable rate on the capital employed is an important part of cost, and in computing annual cost must always be properly distributed as "Interest on Capital." Interest is, however, often used in commercial accounts in other ways, with results which are not always apparent, as will be seen from the illustrations set out below.

Annuity method of computing depreciation

There are certain theoretical methods of making provision for expired capital outlay (depreciation) which involve the use of interest: one known as the annuity method, in which revenue is charged, under the head of depreciation, with equal annual sums sufficient to provide at the expiration of the estimated life of, for instance, industrial plant, an amount equal to the original cost thereof, plus interest on the capital for the time being remaining invested therein. An amount equal to that part of these annual sums which represents interest is credited, in annually diminishing amounts, to the revenue account, so that, taking the difference between the constant amount debited for depreciation and the diminishing amount credited to revenue each year as interest, the result is really to throw increasing annual burdens upon the revenue account as the industrial plant gets nearer to the end of its life.

Illustration of annuity method

The effect of this method will be clearer by taking an imaginary case, in which industrial plant, having an estimated life of ten years, and no residual value,

has cost £6,000 and is to be written off within that period on the annuity system, charging interest at 3 per cent. per annum upon the diminishing balances. In this case, the constant annual sums chargeable to revenue for expired capital outlay would amount to a total, during the ten years, of £7,033 16s. 8d., and the diminishing sums which would be credited to revenue in respect of interest amount to a total of £1,033 16s. 8d.

The figures are shown below—

	Expired capital outlay charged to Revenue.	Interest credited to Revenue.	Actual burden on the year.
	£ s. d.	£ s. d.	£ s. d.
1st year . . .	703 7 8	180 0 0	523 7 8
2nd ,, . .	703 7 8	164 6 0	539 1 8
3rd ,, . .	703 7 8	148 2 7	555 5 1
4th ,, . .	703 7 8	131 9 5	571 18 3
5th ,, . .	703 7 8	114 6 3	589 1 5
6th ,, . .	703 7 8	96 12 9	606 14 11
7th ,, . .	703 7 8	78 8 8	624 19 0
8th ,, . .	703 7 8	59 13 9	643 13 11
9th ,, . .	703 7 8	40 7 6	663 0 2
10th ,, . .	703 7 8	20 9 9	682 17 11
TOTAL . .	£7,033 16 8	£1,033 16 8	£6,000 0 0

Thus the charging or debiting of interest to that part of the capital investment represented by industrial plant, and the crediting of this as interest to revenue, creates the necessity, as shown above, of debiting revenue with a correspondingly larger sum under the head of depreciation, and writing off this larger amount from the capital investment to offset the interest charged thereto, the operation resulting in an unfair annual distribution of the depreciation charge.

Another method of providing for depreciation involving the use of interest is that known as the sinking fund method; and to make the effect of this clearer a case may again be taken of a purchase of industrial plant which cost £6,000 and has a life of ten years, and no residual value, where the sinking fund method is to be applied, involving yearly instalments being taken out of the business and invested in outside securities, yielding, say, 3 per cent. Here the equal annual sums charged to the revenue amount to £523 7s. 8d., or a total for the ten years of £5,233 16s. 8d., and the total interest earned on the investments in securities outside the business amounts to £766 3s. 4d., being altogether £6,000.

Sinking fund method of computing depreciation

The figures are as follows—

Illustration of sinking fund method

	Expired capital outlay charged to Revenue.			Interest from Investments.			Actual burden on the year.		
	£	s.	d.	£	s.	d.	£	s.	d.
1st year . .	523	7	8		—		523	7	8
2nd ,, . .	523	7	8	15	14	0	539	1	8
3rd ,, . .	523	7	8	31	17	5	555	5	1
4th ,, . .	523	7	8	48	10	7	571	18	3
5th ,, . .	523	7	8	65	13	9	589	1	5
6th ,, . .	523	7	8	83	7	3	606	14	11
7th ,, . .	523	7	8	101	11	4	624	19	0
8th ,, . .	523	7	8	120	6	3	643	13	11
9th ,, . .	523	7	8	139	12	6	663	0	2
10th ,, . .	523	7	8	159	10	3	682	17	11
TOTAL . .	£5,233	16	8	£766	3	4	£6,000	0	0

By this method, £766 3s. 4d., the total of the annually increasing interest from the investment of the money gradually released from the original cost of the industrial plant, is diverted from the credit of the revenue account, where it ought to appear, and

is applied direct to the purpose of helping to accumulate, by the end of the economic life of the industrial plant, the sum of £6,000 (original cost), revenue account having in the meantime been charged with a less sum by £766 3s. 4d. than the actual provision which was made by the aid of this method; so that the true effect is an omission from both sides of the revenue account, under the heads of depreciation on the one side and of interest on the other side, of annually increasing sums amounting during the ten years to £766 3s. 4d.

If a record of these so omitted annually increasing sums is introduced to both sides of the revenue account, it will be found that the sinking fund method has exactly the same effect as the annuity method, for in both cases the actual burden upon revenue for the first year of the ten is £523 7s. 8d., and this increases until, for the last year of the ten, it is £682 17s. 11d. It must be remembered that in the sinking fund method the interest from investments is really received, whereas in the annuity method it is a mere fictitious entry, and, therefore, in order to get back to facts, must be cancelled by deducting it each year from the amount charged as depreciation on the debit side of the revenue account.

Comparison between annuity and sinking fund methods

If a comparison is made between the total sum of £7,033 16s. 8d. charged as depreciation during the ten years to the revenue account under the annuity method, and the total sum of £5,233 16s. 8d. charged in like manner during the same period under the sinking fund method, it will be found that the difference of £1,800 represents a sum equal to 3 per cent. for the whole period of ten years on the £6,000 originally paid for

the industrial plant; and thus the first-named method operates to add £1,033 16s. 8d. to the true amount of expired capital outlay (depreciation), and the last-named method operates to deduct £766 3s. 4d. from the true amount of this.

Effect of charging unexpired capital outlay with interest

In a going concern, having the use of a definite capital, the charging of imaginary interest on that part of the capital investment represented from time to time by the unexpired capital outlay on wasting assets is nothing more than a transfer of the amount of such interest from one nominal account to another, which has very little ultimate effect, although it varies the distribution of the annual profit over the series of years. It is really a manipulation of certain heads of capital outlay and certain heads of annual revenue, within the undertaking itself, which, as between one year and another, has important effects on the balances of the capital outlay and revenue accounts respectively, but does not vary the sum of the annual computations of profit or loss extending over the whole-life period, except to the extent of a small difference in the annual earning power of the money retained out of revenue receipts each year, caused by the difference in the rate of its annual accumulation. This will be made clear by an examination of the following illustration.

Illustration of this effect

Suppose a case in which a sum of £6,000 is invested in industrial plant having a life of ten years, and suppose the amounts of the sales and current expenses are constant in each of the ten years, the sales of the product of the industrial plant bringing in £13,000 per annum, and the current purchases of raw material, wages, and other expenses amounting to £12,000 per annum, leaving, therefore, £1,000 per annum to answer

expired capital outlay (depreciation) and profit. The following figures show the difference in the revenue results as between one year and another—(*a*) charging interest at 3 per cent. on the capital investment, known as the annuity method; and (*b*) omitting interest on the capital investment. In both cases, the results are equal over the whole-life period, and show a profit of £4,000—

	Charging interest at 3 per cent.				Omitting int.	
	Expired capital outlay charged to revenue.	Interest credited to revenue.	Resulting annual burden on revenue.	Resulting annual profit.	Expired capital outlay charged to revenue.	Resulting annual profit.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£	£
1st year	703 7 8	180 0 0	523 7 8	476 12 4	600	400
2nd ,,	703 7 8	164 6 0	539 1 8	460 18 4	600	400
3rd ,,	703 7 8	148 2 7	555 5 1	444 14 11	600	400
4th ,,	703 7 8	131 9 5	571 18 3	428 1 9	600	400
5th ,,	703 7 8	114 6 3	589 1 5	410 18 7	600	400
6th ,,	703 7 8	96 12 9	606 14 11	393 5 1	600	400
7th ,,	703 7 8	78 8 8	624 19 0	375 1 0	600	400
8th ,,	703 7 8	59 13 9	643 13 11	356 6 1	600	400
9th ,,	703 7 8	40 7 6	663 0 2	336 19 10	600	400
10th ,,	703 7 8	20 9 9	682 17 11	317 2 1	600	400
	£7,033 16 8	£1,033 16 8	£6,000 0 0	£4,000 0 0	£6,000	£4,000

In this case it is assumed that the industrial plant has done its work efficiently during the whole of its efficient life, and on the stated facts the true economic profit of the first year is £400 and not £476 12s. 4d., and of the last year it is again £400 and not £317 2s. 1d., because there is, in fact, no interest earned and it is not permissible to appropriate in advance in the name of interest sums on account of profit expected to be earned from the use of the plant in future years.

The accumulated portion of the £6,000 which has been released to the end of each year under each of these two methods varies, and is shown below; and

a column is added in each case showing simple interest at 3 per cent. per annum on the accumulated amount so released, as being the minimum earning power of this money to the undertaking for use in other ways. This table is inserted expressly to show approximately the extent of the difference in the annual earning power of the varying amounts of money retained out of revenue receipts each year under each of the two methods—

	Charging interest at 3 per cent.		Difference in annual earning power of accumulated portion released.	Omitting interest.	
	Accumulated portion of £6,000 released (*see* Note below).	Earning power at 3 per cent. per annum.		Accumulated portion of £6,000 released (*see* Note below).	Earning power at 3 per cent. per annum.
	£ s. d.	£ s. d.	£ s. d.	£	£
1st year	261 13 10	7 17 0	1 3 0	300	9
2nd ,,	792 18 6	23 15 9	3 4 3	900	27
3rd ,,	1,340 1 10	40 4 0	4 16 0	1,500	45
4th ,,	1,903 13 6	57 2 2	5 17 10	2,100	63
5th ,,	2,484 3 4	74 10 6	6 9 6	2,700	81
6th ,,	3,082 1 6	92 9 3	6 10 9	3,300	99
7th ,,	3,697 18 6	110 18 6	6 1 6	3,900	117
8th ,,	4,332 4 11	129 19 4	5 0 8	4,500	135
9th ,,	4,985 12 0	149 11 4	3 8 8	5,100	153
10th ,,	5,658 11 0	169 15 1	1 4 11	5,700	171
		£856 2 11	£43 17 1		£900

NOTE.—The amounts appearing in the columns headed "Accumulated portion of £6,000 released" allow for the fact that each periodical contribution accrued continuously over each period and not in one sum at the end of each period.

In commercial accounting, interest should not be charged on capital locked up in wasting assets

In the case of a going concern using a definite capital, the moneys retained out of revenue to answer expired capital outlay on wasting assets (depreciation) are, as a rule, immediately requisitioned either to purchase other wasting assets, thereby maintaining the volume of the "fixed" capital investment, or for use in some other form as part of the "floating" capital investment, as explained in the chapter on "Fixed and Floating Capital." If, however, the

moneys are not required for either of these purposes, they will, doubtless, be temporarily invested in income-yielding securities, so that in any case they remain productive of income to the undertaking. Nothing is gained by debiting the wasting assets account and crediting revenue with imaginary interest on the moneys remaining locked up in these wasting assets, which cannot earn interest. There is no good reason for charging this part of the capital investment with interest and exonerating the other part. If interest is charged on the moneys locked up in investments such as wasting assets, supposed to represent fixed capital, it should surely also be charged on the moneys locked up in investments such as sale stock and debts, supposed to represent floating capital.

But interest is an important factor in computing cost of production

The fallacy of incorporating in commercial accounts, prepared with the object of ascertaining annual profit or loss, interest on the money locked up in wasting assets may have originated in questions of the comparative cost of different methods of producing commodities and rendering public services. Thus, in comparing the relative advantage of a method of production necessitating the use of expensive machinery, with a method of production by hand labour, it is necessary to have regard to all the factors of cost, including, in the case of the method involving the use of machinery, both expired capital outlay (depreciation) and interest on the capital outlay. In all questions concerning the determination of cost for competitive or for comparative purposes, therefore, interest on the amount of capital outlay must always be included as part of the cost; and, as more fully explained later, in computing annual cost for this

purpose, in the case of an undertaking to be treated as terminating at the end of the life of certain long-lived wasting assets which are not to be renewed, care should be taken that the sum of the whole-life period interest is evenly distributed over each year on the principle of average, as otherwise the annual cost, for the purpose of comparison with outside contractors' charges, will be overstated in the earlier years and understated in the later years of the period.

Diminution in capital locked up in industrial plant does not diminish the extent or efficiency of the plant

Another cause which may have led to the practice of charging, and incorporating in commercial accounts, interest on the money remaining locked up in wasting assets—such as an electric power station, for instance, which cost when new £100,000, and has an average life of twenty-five years—may be the mistaken impression that the annual instalments of the original cost, taken back out of each year's gross revenue, which diminish the amount of capital locked up, also in some way diminish the extent of the industrial plant offered for the use of the undertaking in the later years of the life period; and that, therefore, these later years should be charged with a gradually diminishing sum. But this is not so, for until the industrial plant becomes worn out or obsolete, which cannot be during its efficient life, each unit most do its work well, and be able to give an output not seriously diverging from the highest of which it is capable in a state of complete efficiency; and during the whole life of the industrial plant forming the equipment of this electric power station the quantity of plant remains the same as it was at the beginning of the period, for the short-lived classes will be duly renewed from time to time. Doubtless there is some falling-off in the efficiency of

individual units as they approach the ends of their life periods but the effect of this is equalised by the operation of the law of average, and obviously each unit must render not less than efficient service during the whole of its efficient life.

Use of annuity and sinking fund methods by municipalities

Government departments and municipalities often undertake the manufacture and supply of commodities, such as gas, water, electrical energy, and the like, and also the provision of public services, such as transport, telephones, etc., involving a large initial outlay of capital, which may be subscribed by individual members of the public or provided out of public moneys. The nature of the arrangements made for financing these undertakings varies considerably; but annuity or sinking fund methods, involving the use of interest, are often adopted, the annual instalments being sometimes brought into revenue account in lieu of properly measured charges for depreciation in a way which may cause the balances of the annual revenue accounts to vary considerably from the true annual profit or loss of the undertaking. It is thus most important that the effect of these financial arrangements on the annual accounts should be clearly understood, to ensure that the accounts are correctly treated, and any necessary further provisions made, as it will be found that instalments of principal and interest are dangerous sums to handle as alternatives to properly measured charges for depreciation when it is desired to ascertain either true annual cost or true annual profit or loss of an undertaking.

Computation of annual cost in a terminating undertaking

In view of the fact that it is sometimes necessary to compute the annual cost, apart from profit or loss, of carrying on an undertaking terminating at the end

of the life of certain long-lived wasting assets which are not to be renewed, it will be worth while to consider how, for the purpose of ascertaining annual cost, that part of the cost represented by interest on the capital employed should be distributed over each year. When the long-lived industrial plant needed for an undertaking of this kind is new, the amount of capital locked up therein is greater than it is in the later years of the period, and in ascertaining the annual cost, therefore, for the purpose of comparison with outside contractors' charges (assuming that contractors' undertakings are permanent and need an average capital outlay), it will be misleading for this purpose to charge the earlier years with the interest on the larger amounts of capital then locked up in the industrial plant as part of the cost of those earlier years, and to charge the later years of the period with interest on the then comparatively small amounts of capital remaining invested at that time.

Interest should in such cases be charged on average capital

The object is, of course, to compare the cost of production of commodities or supply of services by a public authority with the average cost at which similar work might be performed by outside contractors under ordinary outside conditions, and, therefore, it is necessary to bear in mind in this connection that the industrial plant of outside contractors is "aged," that is to say, has reached, and is presumably maintained in, a state of average efficiency such as would be needed for the purposes of a continuously going concern. Thus the outside contractors' cost is burdened only with interest on the average capital employed, and therefore for comparative purposes the annual cost of operating a

terminating undertaking should be charged with annual interest on the same average basis.

Illustration of method of arriving at average capital

In order to illustrate the method of arriving at the average capital employed in carrying on an undertaking which is to be treated as terminating at the end of the life of long-lived wasting assets, it will be convenient to assume, for the purpose of demonstration, a period of ten years instead of a longer period, and to consider the case of an electric power station involving an initial outlay of capital of, say, £75,000, made up as under—

Land		£25,000	Life period	permanent
Plant	A	£10,000	,,	1 year
,,	B	£10,000	,,	2 years
,,	C	£10,000	,,	4 ,,
,,	D	£10,000	,,	5 ,,
,,	E	£10,000	,,	10 ,,
		£75,000		

For the sake of simplicity, scrap value of the plant is omitted.

It is required to ascertain the average amount of capital remaining invested in this undertaking over the whole period of ten years. The capital locked up in the land, £25,000, will remain the same throughout the period, for it does not waste ; and, as already explained in the earlier chapters, any fluctuations in its market value during the period must be disregarded. In order to follow in detail the ebb and flow of the volume of capital locked up during the assumed life period (ten years) in the several classes of plant, with different efficient life periods, reference may be made to the tabular statement set out below, which contains a column for each class of plant, showing the

fluctuating amount of capital invested therein at the beginning of each of the ten years—

STATEMENT

Showing Amount of Capital locked up in each class of Plant at the beginning of each of the ten years.

Beginning of year.	A Life 1 year.	B Life 2 years.	C Life 4 years.	D Life 5 years.	E Life 10 years.
	£	£	£	£	£
1	10,000 ÷ 1	10,000	10,000	10,000	10,000
2	10,000 ÷ 1	5,000	7,500	8,000	9,000
		15,000 ÷ 2			
3	10,000 ÷ 1	10,000	5,000	6,000	8,000
4	10,000 ÷ 1	5,000	2,500	4,000	7,000
		15,000 ÷ 2	25,000 ÷ 4		
5	10,000 ÷ 1	10,000	10,000	2,000	6,000
				30,000 ÷ 5	
6	10,000 ÷ 1	5,000	7,500	10,000	5,000
		15,000 ÷ 2			
7	10,000 ÷ 1	10,000	5,000	8,000	4,000
8	10,000 ÷ 1	5,000	2,500	6,000	3,000
		15,000 ÷ 2	25,000 ÷ 4		
9	10,000 ÷ 1	10,000	10,000	4,000	2,000
10	10,000 ÷ 1	5,000	7,500	2,000	1,000
		15,000 ÷ 2		30,000 ÷ 5	55,000 ÷ 10

Uncorrected average capital locked up during the period—

£	£	£	£	£
10,000 ÷ 1 = 10,000	15,000 ÷ 2 = 7,500	25,000 ÷ 4 = 6,250	30,000 ÷ 5 = 6,000	55,000 ÷ 10 = 5,500

In the above computations of average capital remaining invested in each of the different classes of plant, it will be observed that the annual contribution has been deducted at the end of each year; whereas, in order to obtain the true average, due allowance must be made for the fact that each annual contribution accrues continuously during each year, and not in one sum at the end of each year; and therefore, the average capital employed in the undertaking is (subject to the reservation set out in the next paragraph) ascertained in the following manner—

	Uncorrected Average.		Corrected Average.
	£		£
Land . .	25,000	. . . . .	25,000
Plant A .	10,000	minus half of £10,000, being one year's contribution	5,000
„ B. .	7,500	„ „ £5,000, „	5,000
„ C. .	6,250	„ „ £2,500, „	5,000
„ D. .	6,000	„ „ £2,000, „	5,000
„ E. .	5,500	„ „ £1,000, „	5,000
		Average capital . .	£50,000

Short method of arriving at average capital

In the case illustrated above, however, it will be noticed that the efficient life periods of the several classes of plant do not all terminate at the end of the assumed period of ten years, being the period covered by the useful existence of the longest-lived class of plant. The case has been stated and set out in this form in order to call special attention to the fact that in dealing with an undertaking to be treated as terminating at the end of a certain period it is desirable that the efficient life periods of all the several classes of industrial plant shall be so planned as to

end as nearly as possible at the same time, to avoid a loss on forced realisation of any unexpired capital outlay, which in the case illustrated would be £5,000, the computed value of two years' unexhausted working capacity remaining in Plant C at the end of the ten years. Assuming the efficient life periods of the different classes of plant will all terminate about the same time, the short method of ascertaining the average capital employed in a terminating undertaking is to divide by two the amount of the original capital invested in wasting assets, and add thereto the amount of capital invested in land, which remains permanent throughout the whole period.

Use of interest in dealing with cost of leasehold premises

Although as a general rule interest should only be employed in commercial accounting when it is actually payable or actually receivable as interest, there may be exceptional cases in which its use is desirable, as, for instance, in dealing with the cost of leasehold premises, when it is sought to charge the revenue account with a sum to represent the annual value of premises occupied for trade as a basis for comparison with other similar undertakings paying an annual rental. In such a case, the use of the annuity method in writing off the annual instalments of the cost of leasehold premises may be convenient. Supposing a short lease to have cost £6,000, and to cover a period of ten years, it will be seen by reference to page 36 that, with interest at 3 per cent. per annum, the annuity method will involve an annual charge to revenue of £703 7s. 8d., which is, no doubt, nearer to the true annual value of the premises than the £600 to be charged if the plan of writing off one-tenth of the cost each year were adopted. Under this

annuity method, interest is credited in annually diminishing amounts to the revenue account, and represents the gradually diminishing alternative profit which would have been earned by the money invested in the leasehold premises if it had been otherwise employed for the purposes of the business, and the premises had been held on an annual, instead of on a leasehold, tenancy.

Summary of conclusions

To sum up the interest question, it is submitted that—

(*a*) The amount of the profit or loss of an undertaking is itself the interest (increment) or discount (decrement) resulting from the capital employed.

(*b*) In computing the annual profit or loss of an undertaking, therefore, interest should only be employed in commercial accounts when it is actually payable or actually receivable as interest.

(*c*) Annuity and sinking fund methods involving the use of interest should never be used in measuring annual expired capital outlay (depreciation) on wasting assets, unless some special reason exists.

(*d*) In computing cost of production, as distinct from profit or loss, interest on the capital employed must be included as part of the cost.

(*e*) In computing annual cost of production for comparative purposes in the case of an undertaking to be treated as terminating at the end of the life of long-lived wasting assets which are not to be renewed, the interest should be evenly distributed over the period on the principle of average.

Further arguments against the use of interest or discount in commercial accounting unless actually payable or actually receivable

Further arguments against the use of annual interest, or annual discount, in commercial accounting, unless actually payable or actually receivable by the owners of an undertaking, may be stated thus—

The argument that the capital locked up in such assets as industrial plant, leasehold property, or purchased terminable concessions must be charged, in the accounts of a commercial undertaking, with interest, because it might otherwise have been invested to produce interest, has no force. It might as well be applied to the capital locked up in the other assets of a business over long and varying periods of time, such as goodwill, patent rights, stock-in-trade, and book debts; but

it is never suggested that assets of this kind should be subjected to interest or discount in commercial accounting.

The capital of an undertaking is provided expressly to be locked up in carrying out all and any of the legitimate transactions of the business. All transactions involve the use of more or less capital for some period of time; and, if the cost of some transactions is to be increased by adding to it imaginary annual interest on the capital locked up, then surely interest should be added to the cost of all transactions, whether extending to more or less than a year, which, obviously, would be absurd. In commercial accounting, no attempt should be made by manipulating interest to reduce the results of certain selected long-period transactions to the basis of annual transactions.

Any long-period transaction which is essentially in the nature of a loan, calculated with annual interest, as in the case of a purchased terminable annuity, should be treated as such in the accounts of a commercial undertaking; thus, each equal annual payment of an annuity contains both interest and capital, but in each annual payment after the first the proportion of interest becomes less, and the proportion of capital becomes correspondingly greater.

As shown in the illustrations of the effect of the annuity and sinking fund methods already given in this chapter, the use of the annuity method for providing annual depreciation operates to add to the true depreciation a fictitious sum (interest), this fictitious sum being, on the other hand, credited to the revenue accounts as interest (though it is not received) in annually decreasing amounts, the net result of these entries being to place an increasing burden of depreciation on the annual revenue accounts.

And the use of the sinking fund method for providing annual depreciation operates to deduct from the true depreciation a sum equal to the dividends which will be received from outside securities in which the annual sinking fund instalments will be invested. These dividends, being actually received, are true revenue of the undertaking, and should appear to the credit of the revenue accounts as received in annually increasing sums, involving, on the other hand, a similar annually increasing further charge to the revenue accounts under the head of depreciation, the net result being again to place an increasing burden of depreciation on the annual revenue accounts.

In the case of a long-period transaction entered into by a private individual, as, for instance, the purchase of a lease, it may be convenient to charge the transaction with annual interest on the capital remaining from time to time invested

therein, by the use of the annuity method of writing off the cost. The transaction does not form part of a business having a definite amount of capital subscribed for the purpose of seeking profits by carrying out a number of transactions, of which the purchase of a lease may be one.

Thus the indiscriminate use of internal annual interest, or discount, in commercial accounting, and especially in connection with depreciation and wasting assets, is often misleading, and should be discouraged.

CHAPTER VI

INDUSTRIAL PLANT—
MEASUREMENT OF DEPRECIATION

Industrial plant the largest division of wasting assets

INDUSTRIAL plant represents the largest and most important division of wasting assets, and is the most difficult to deal with systematically. Industrial plant comprises all perishable material property of a profit-seeking undertaking, other than that primarily intended for re-sale, and it includes, therefore, all buildings, plant, machinery, fixtures, and furniture of manufacturers; all buildings, plant, machinery, fixtures, and furniture of mines; the way, bridges, works, stations, rolling stock, and all equipment of railway and tramway companies, other than site value of land in each case. Most of the capital of electric lighting and power companies; gas, water, and omnibus companies; cable, telegraph, and telephone companies; shipping and dock companies, as well as that of many other undertakings, is also invested in perishable industrial plant. The undertakings least affected are banking, insurance, investment, and finance companies.

Extent of capital outlay on industrial plant

In order to give some idea of the enormous annual capital outlay on industrial plant, the following figures taken from a supplement to *The Economist*, may be useful. The figures given show the amount of fresh capital applied for by prospectus in the English market during each of two normal pre-war years, connected with undertakings proposing to lay out the capital chiefly in the purchase of industrial plant.

	£	£
British Railways	400,000	3,715,000
Indian and Colonial Railways	11,244,500	10,096,000
Foreign Railways	30,766,700	49,974,700
Breweries and Distilleries	—	675,000
Manufacturing	4,335,900	5,086,300
Iron, Coal, Steel, and Engineering	2,560,100	5,409,300
Electric Lighting, Power, & Telegraphs, &c	7,194,500	6,160,000
Tramways and Omnibus	10,510,400	4,701,000
Motor Traction and Manufacturing	1,511,300	368,500
Gas and Water	976,800	131,700
Docks, Harbours, and Shipping	1,709,500	4,600,000
Total	£71,209,700	£90,917,500

The above figures do not include the probably equally large sums of money invested during these two years in State and municipal trading enterprises, including railways, tramways, harbours, electricity, gas, water, telegraphs, and telephones; neither do they include capital invested in connection with all the many forms of private enterprise, which amounts to a very large sum, especially in England and other developed countries, but of which it is impossible to obtain any record.

Investment therein is nothing more than payments in advance on revenue account

All capital invested in industrial plant is invested in nothing more substantial than in payments made in advance on revenue account, and the whole of such outlay, less scrap value, must ultimately be recovered out of revenue receipts. About this there is no room for doubt; but difference of opinion still exists as to the proportion of the outlay which should be refunded each year out of annual revenue receipts during the period of the useful life of the plant.

Outlay on industrial plant compared with other advance payments

Money invested in industrial plant, being nothing more than a payment made on revenue account in advance, may be compared with a premium paid in

advance to cover, say, seven years' fire insurance. Such a payment is, in fact, sometimes made in order to secure better terms than would be obtained by paying an annual premium; and there is in such case no doubt that one-seventh of the sum paid would be properly charged to revenue account each year, until, at the end of the seventh year, the last instalment of one-seventh of the original payment would come back out of revenue receipts.

Agreement between capital outlay account in financial books and register of industrial plant

In the system here proposed, it is intended that all capital outlay on industrial plant shall be recorded as usual in the financial books in one account or group of accounts which will also be charged each year with all further outlay (outside mere maintenance), whether for renewals, additions, or betterments of the plant. All such capital outlay will be periodically analysed into classes and distributed to the class records filed in a loose-leaf register of industrial plant, as fully described in the next chapter. The capital outlay account in the financial books will be credited annually, in one total, with a sum equal to the measured amount of depreciation as ascertained by means of, and deducted in detail in, the register, the profit and loss account being at the same time debited. The capital outlay account will also be credited each year with the total of the estimated scrap value of all that industrial plant which has gone out of service during each year, as shown by the register of plant, a scrap account being opened in the financial books and debited. The balance of capital outlay on industrial plant, as brought forward in the financial books at the beginning of each year, will thus equal the totals, in the register, of the class

summaries appearing in columns headed "Balance of unexpired capital outlay," so that the balance of the capital outlay account in the financial books can be exactly agreed with a list of the amounts abstracted from the class summaries in the register of plant. The scrap account in the financial books will be credited with the proceeds, or value, of scrap sold or otherwise utilised, the balance being adjusted from time to time in respect of the differences between the estimated value of the scrap charged to the scrap account, and the actual proceeds of the sale of this. If, however, this cannot be adjusted in detail, the value of the scrap on hand at the end of each year should be estimated, and the balance of the scrap account adjusted accordingly.

Expiration of *time* is the proper basis for measuring depreciation

In selecting the proper basis for an annual charge to revenue for depreciation of industrial plant, the evidence is irresistible that expiration of time is the dominating factor. The following considerations have an important bearing on the question—

(*a*) The efficient life period of all industrial plant is strictly limited, although difficult to forecast It may be compared to the period of animal life, which is not more surely limited.

(*b*) The extreme efficient life period of any class of industrial plant may, in a few cases, exceed one hundred years, but rarely exceeds fifty years, the most common life period being, perhaps, between ten and thirty years.

(*c*) Industrial plant has a strong tendency to fall in present value to a going concern directly in proportion to that part of its limited efficient life which has expired, because the process of natural decay; and the advance of obsolescence, due to new inventions and other change, always progress, whether the plant is in actual use or not. Use, therefore, or the amount of work done by the plant, is not generally the dominating depreciation factor.

(*d*) The only exception to this rule is when the plant is of

such a nature that the amount of actual wear caused by work done will obviously be the dominating depreciation factor, as with steel rails, which, if used enough, will wear out before they rust out. In cases of this kind, the efficient life period should be estimated according to the expected amount of work to be done, provided that the resulting rate of depreciation never falls below the rate necessary to cover the process of natural decay and the advance of obsolescence.

These considerations suggest that the mere existence of industrial plant offers, to the undertaking owning it, a continuous opportunity of advantage which must be charged for in the revenue account, because it expires, whether it is used or not, just as the annual rent of premises must be provided because a year has expired, whether the premises have been actually used or not. It is astonishing how rarely the rate of destruction of value, due to actual use, overtakes the rate of destruction due to constant and inevitable decay and liability to obsolescence.

Cost, less scrap value, should be distributed to revenue equally over each year of the whole-life period

In measuring annual depreciation, therefore, by far the nearest approach to accuracy will be obtained by estimating the whole-life period, in years, of each class of industrial plant, with due regard to all known facts, as well as to future probabilities, and distributing the cost, less estimated scrap value, to future revenue accounts, in equal instalments over each year of that estimated whole-life period.

This secures a regular annual charge coinciding roughly with value consumed each year

It will be found that this only means the provision, out of revenue receipts, of a fairly regular annual sum, amounting over a series of years to no more than is now taken out of the revenue receipts of any soundly managed undertaking, at irregular intervals, to pay for renewals of industrial plant at or about the time the cost of these is actually incurred. This latter is a

haphazard method, frequently causing the declared net profits to oscillate between one year and another, although the movement of the business during the period may have had a quite regular tendency; and this is a serious defect, especially when the annual profits are meagre and happen to be distributable in priorities between holders of cumulative and non-cumulative preferred, ordinary, deferred, management, and other classes of shares.

Employment of money set aside

Against this plan, in the case of some undertakings it has been urged that constantly to set aside sums out of the revenue receipts each year available to meet expenditure on renewals, which may not be needed for perhaps a number of years, would be most inconvenient, and would embarrass the undertaking with surplus money, which would not be properly employed, and which shareholders would be clamouring for as dividend. The answer is that in the case of most undertakings, considerable sums of money are constantly required for actual renewals of other and different classes of plant; or, again, in the case of an increasing undertaking requiring additional plant, the money so retained out of revenue would be very usefully employed in the purchase of this additional plant; but otherwise it would be necessary to invest the surplus moneys in safe securities, and in the meantime to be content with the interest earned thereon.

Increase in cost of repairs in later years

Objection is also sometimes taken to the principle of writing off the cost less scrap value of industrial plant in equal annual instalments on the ground that the cost of repairs, to each particular unit of plant, becomes heavier as the age of each unit increases

year by year, and therefore it is said that the provision for depreciation of plant should be greater in the earlier years and less in the later years. In an "aged" plant, however, the cost of repairs will be found to average year by year in a remarkable way, as there are always units of plant in all stages of the useful life period; and, apart from the cost of important renewals of parts, such as the boilers of a steamship, for instance, which should be treated as capital outlay and recorded in the register of plant as a separate class, the outlay on repairs and maintenance, although it may be large in the aggregate, consists of a vast number of comparatively small items, which naturally tend to average. It must also be borne in mind that a new plant—that is, a plant which is not "aged"—rarely gives its full output, and generally requires special attention and adjustment, the cost of which is a set-off against the cost of repairs required at a later period. Thus, the argument based on the increased cost of repairs in later years has little or no weight, although it is often used by those who still uphold the method of measuring depreciation on the reducing balance of cost basis. It is thought that an examination of the effect of this method, as hereafter illustrated in this chapter, will show its utter unsuitability and how little way such an argument goes to justify its retention.

The use of existing industrial plant cannot be deferred with impunity

On the other hand, an exactly opposite argument is often used to the effect that if industrial plant has been well maintained out of revenue and is working, perhaps, even more smoothly at the end than at the beginning of the first year of its life, no specific charge for depreciation need be made to the revenue account

of that first year; but this view is unsound. And, further, the use of existing industrial plant cannot even be deferred with impunity, because, as already stated, the process of natural decay, and the advance of obsolescence, always progress, and for this reason expired capital outlay on existing industrial plant must be charged every year, whether the plant is used or not.

Treatment should be similar, whether life be one or more years

If the efficient life of any class of industrial plant began and ended within a period of one year, instead of extending over a longer period, no one would suggest that the cost of the industrial plant was not a necessary charge to the revenue account of that year; and the fact that this outlay on revenue account does not all expire within an exact accounting period of one year is no reason for neglecting to refund out of the year's revenue receipts the year's expired portion of the outlay. A year is nothing but an arbitrary division of time, at the end of which it is usual to compute trading results.

Depreciation provision is not for future renewals, but for past capital outlay expired

It is still a common custom to describe the annual provision for depreciation of industrial plant as a provision for future renewals, as though it has reference to the future; but this is a misconception. The annual provision for depreciation has nothing to do with the future, but relates solely to the past. It is a replacement of capital in respect of past capital outlay expired in the process of carrying on a profit-seeking undertaking, and is not less an expense than other expenditure of a current character, such as operative wages. It is an expenditure of exchangeable value incurred daily, and must be provided for with other working charges, although the exchangeable

value so expended has been acquired and paid for at an earlier date out of moneys provided as capital.

Depreciation is fall in exchangeable value over whole period of use, and is unaffected by fluctuations in market prices

It has been shown that depreciation of industrial plant is the fall in exchangeable value computed on the basis of cost expired during the period of its use in seeking profits ; and that this fall is due to natural decay, wear and tear, and obsolescence, and to all or any of these causes. It has also been shown that it is the fall in exchangeable value occurring during the whole period of use, this being equal to the difference between the original capital outlay and the ultimately realised scrap or remainder value. Depreciation of industrial plant is, therefore, accurately defined by the term " expired capital outlay," being wholly unaffected by fluctuations in the market price of similar property during the period of its use.

Principal difficulty arises from need of making provision year by year during period of use

The principal difficulty in dealing with the question of depreciation arises from the fact that it must be measured year by year during the period of the use of the industrial plant, while the length of the period is unknown. To ensure absolute accuracy, it would be necessary to know with certainty not only the amount of the original cost, but also the length of the useful life period, and the amount of the ultimate scrap or remainder value. But the first only of these three factors is known with certainty during the currency of the life period, and therefore the other two factors must be estimated, and the estimates revised from time to time if necessary.

And suitable accounting equipment is required for this

Thus, in order to enable this to be done and the capital outlay on industrial plant to be currently accounted for as it expires year by year, it is necessary to provide, as part of the regular accounting equipment

of an undertaking using industrial plant, some suitable means of recording details of the industrial plant, including the cost—which is the known factor—and estimates of the useful life period, and of the ultimate scrap value—which are the two unknown factors. If these records be in suitable form, it will be a simple matter for the accountant to distribute equitably over each year the proper proportion of the whole-period depreciation, always making the distribution of the remaining balance of cost with due regard to the latest estimates affecting the two unknown factors, which must be revised whenever current knowledge and experience show that revision is needed. Such revision can be easily made, as is shown in the next chapter, but it will not generally be needed except at long intervals.

Annuity and sinking fund methods are unsuitable

It has already been shown in the chapter on "The Interest Question" that annuity and sinking fund methods, involving the use of interest or discount, should not be used in measuring annual depreciation. It is there demonstrated that such methods result in an unfair annual distribution over the period, for the reason that the depreciation charges fall upon each year in an increasing ratio, and do not coincide, even approximately, with the proportion of consideration obtainable from the industrial plant during each year of its efficient life, which in the case of each individual unit tends downwards.

Original cost basis is most suitable

The following tabular statement is intended to demonstrate that the "original cost basis" of distributing annual depreciation charges is the most suitable for common use, because the distribution will coincide approximately with the value of the services

rendered each year by the industrial plant. For comparative purposes a column has been added showing the annual distribution on the "reducing balance of cost basis," and this shows in graphic form the widely different results of the two methods. The cost of the industrial plant is assumed to be £100, the life ten years, and the scrap value £5.

	Estimated proportion in which the total output is receivable each year.	Original cost basis.	Divergence from output.	Reducing balance of cost basis.	Divergence from output.
	Units	£		£	
1st year. .	10	9·5	− ·5	25·0	+ 15·0
2nd ,, . .	11	9·5	− 1·5	18·8	+ 7·8
3rd ,, . .	11	9·5	− 1·5	14·2	+ 3·2
4th ,, . .	11	9·5	− 1·5	10·6	− ·4
5th ,, . .	10	9·5	− ·5	7·9	− 2·1
6th ,, . .	10	9·5	− ·5	5·9	− 4·1
7th ,, . .	9	9·5	+ ·5	4·6	− 4·4
8th ,, . .	8	9·5	+ 1·5	3·4	− 4·6
9th ,, . .	8	9·5	+ 1·5	2·6	− 5·4
10th ,, . .	7	9·5	+ 2·5	2·0	− 5·0
	Total output in units 95	Usable value 95 Scrap value 5 £100	12	Usable value 95 Scrap value 5 £100	52

Industrial plant must be capable of efficient work during efficient life

Industrial plant is, of course, expected to do its work well, and to give an output not seriously diverging from the highest of which it is capable in a state of complete efficiency; and when, as in the case shown above, the annual output falls from a quantity represented by the figure 11, to anything like a quantity represented by the figure 7—being a decrease of upwards of 36 per cent. from the highest—it is likely the industrial plant will be scrapped and sold for a sum not exceeding 5 per cent. of its cost.

Proportion in which whole output is receivable period by period

It is probable that the first column in the above tabular statement shows approximately the widest variations in which the whole-life output, or usefulness, of industrial plant is likely to be receivable, period by period, during its efficient life. It is generally admitted that the whole-period depreciation of any class of industrial plant should be distributed to annual revenue in proportions which will coincide, as nearly as possible, with the proportionate benefit obtainable from the plant during each year of its limited efficient life, and it is, therefore, of the utmost importance to determine what this proportionate benefit is. It is probable that the figures in the first column show a width of variation between the beneficial output of one period and another never likely to be exceeded in ordinary cases. The suggested equal annual distribution of depreciation charges is based upon this assumption, that the difference in the yearly output obtainable from any kind of industrial plant is never greater than the curve represented by the variation in the figures shown in the first column above. This curve will be less abrupt whenever the whole-life period is twenty, thirty, fifty, or any other number of years above ten; and it will be observed that even the curve shown does not at any point vary very widely from the straight line which coincides with an equal annual output.[1]

Reducing balance of cost basis is unsuitable and misleading

The above tabular statement shows that the reducing balance of cost basis is unsuitable for measuring the annual charge for depreciation. It will be seen that on this basis the sum of the errors in annual distribution over the whole-life period is as

much as fifty-two in ninety-five, whereas, on the original cost basis, it is only twelve in ninety-five; and, further, on the reducing balance of cost basis, the charge for the first year is 150 per cent. more than the year's receivable proportion of the total output, and for the last year it is 65 per cent. less than this, against 5 per cent. less for the first year, and 35 per cent. more for the last year, on the original cost basis.

Reducing balance of cost basis takes excessive time at ordinary rates

It is sometimes roughly assumed that, in writing off depreciation on the reducing balance of cost basis, a rate of 5 per cent. is sufficient if the whole-life period of the plant is twenty years, or a rate of 10 per cent. if the whole-life period is ten years, and so on; but this is not so.

The table appearing opposite to page 224 shows the proportion of the whole-life output of Industrial Plant receivable annually, in comparison with the proportion of the cost charged annually to Revenue under various methods of distribution in common use.

Rates needed to operate within the limits of ordinary life periods

The actual rates needed to write off the cost of plant having a scrap value of about 5 per cent., if calculated on the reducing balance of cost, are, as shown by the table at the head of page 66.

Life in years.	Rate per cent. required on reducing balance of cost basis.	Life in years.	Rate per cent. required on reducing balance of cost basis.
100	3	30	9½
84	3½	28	10
72	4	27	10½
65	4½	26	11
58	5	25	11½
53	5½	23	12
48	6	22	12½
44	6½	18	15
41	7	13	20
38	7½	10	25
36	8	8	30
34	8½	7	33⅓
32	9		

Effect of employing reducing balance of cost basis at ordinary rates

To understand the true effect of computing depreciation on the reducing balance of cost at rates ordinarily used, suppose that from its commencement a gas company buys one hundred new meters each year at a cost of £1 each, being an annual capital outlay of £100 on new meters, and suppose the meters have an efficient life of ten years, the unexpired capital outlay on meters never, in fact, rises above £450, as is seen in the following table—

Year.	Capital outlay during year.	Annual Depreciation.		Balance of unexpired capital outlay at end of year.
	£	£	£	£
1909	100	10 per cent. on	100 = 10	90
1910	100	,, ,,	200 = 20	170
1911	100	,, ,,	300 = 30	240
1912	100	,, ,,	400 = 40	300
1913	100	,, ,,	500 = 50	350
1914	100	,, ,,	600 = 60	390
1915	100	,, ,,	700 = 70	420
1916	100	,, ,,	800 = 80	440
1917	100	,, ,,	900 = 90	450
1918	100	,, ,,	1,000 = 100	450
1919	100	,, ,,	1,000 = 100	450
1920	100	,, ,,	1,000 = 100	450

But, by computing depreciation at 10 per cent. on the reducing balance of cost, the annual amount of depreciation will not rise, as it ought, to the sum of £100 by the end of the tenth year, or until the end of a period of about forty years, by which time the balance of the capital outlay account will have accumulated to nearly £1,000, being more than double the true unexpired capital outlay. This is clearly seen in the following table—

Illustration of reducing balance of cost basis

DEPRECIATION ON THE REDUCING BALANCE OF COST. *The figures with the + prefix represent the annual capital outlay on new meters; and the figures with the − prefix represent the annual depreciation, calculated at 10 per cent., on the reducing balance of cost.*

	100		687		892		963
1909 .	− 10	1919 .	− 69	1929 .	− 89	1939 .	− 96
	90		618		803		867
	+ 100		+ 100		+ 100		+ 100
	190		718		903		967
1910 .	− 19	1920 .	− 71	1930 .	− 90	1940 .	− 97
	171		647		813		870
	+ 100		+ 100		+ 100		+ 100
	271		747		913		970
1911 .	− 27	1921 .	− 75	1931 .	− 91	1941 .	− 97
	244		672		822		873
	+ 100		+ 100		+ 100		+ 100
	344		772		922		973
1912 .	− 34	1922 .	− 77	1932 .	− 92	1942 .	− 97
	310		695		830		876
	+ 100		+ 100		+ 100		+ 100
	410		795		930		976
1913 .	− 41	1923 .	− 79	1933 .	− 93	1943 .	− 98
	369		716		837		878
	+ 100		+ 100		+ 100		+ 100
	469		816		937		978

DEPRECIATION ON THE REDUCING BALANCE OF COST—*contd.*

	469		816		937		978
1914 .	− 47	1924 .	− 82	1934 .	− 94	1944 .	− 98
	422		734		843		880
	+ 100		+ 100		+ 100		+ 100
	522		834		943		980
1915 .	− 52	1925 .	− 83	1935 .	− 94	1945 .	− 98
	470		751		849		882
	+ 100		+ 100		+ 100		+ 100
	570		851		949		982
1916 .	− 57	1926 .	− 85	1936 .	− 95	1946 .	− 98
	513		766		854		884
	+ 100		+ 100		+ 100		+ 100
	613		866		954		984
1917 .	− 61	1927 .	− 86	1937 .	− 95	1947 .	− 98
	552		780		859		886
	+ 100		+ 100		+ 100		+ 100
	652		880		959		986
1918 .	− 65	1928 .	− 88	1938 .	− 96	1948 .	− 99
	587		792		863		887
	+ 100		+ 100		+ 100		+ 100
	687		892		963		987

Disadvantages of reducing balance of cost basis

The disadvantages, then, of writing off depreciation on the reducing balance of cost basis include the following—

When a rate sufficiently high to extinguish the cost at the end of the estimated whole-life period is employed, it throws an abnormally heavy burden on the earlier years and an altogether inadequate charge on the later years of the period.

When, as usually happens, the rate employed is too low to extinguish the cost at the end of the estimated whole-life period, the annual depreciation is systematically understated, and the amount so understated each year remains to the debit of the capital outlay account in the books of the undertaking, which will thus be systematically overstated, and will gradually accumulate to an amount which, in combination with the rate employed, provides an annual sum equal to the true annual depreciation.

In the case of the gas company's meters, referred to above, the capital outlay account would continue to accumulate until it reached £1,000, although the unexpired capital outlay on the meters never, in fact, rises above £450.

Simple *versus* complicated methods of measuring depreciation

The simple method of measuring depreciation by keeping suitable accounting records and regularly distributing the cost, less scrap value, equally over each year of the estimated whole-life period of each class of industrial plant, is in striking contrast to the complicated methods which are sometimes recommended; thus, it has been gravely suggested in a well-known scientific journal that the conditions controlling the rate of depreciation of industrial plant are all represented by various well-known curves, including—

The vertical parabola,
The logarithmic curve,
The ellipse,
The horizontal parabola,
The cubic parabola,

and on this assumption it is seriously argued that, as possibly no single curve represents the manner in which depreciation actually occurs, the problem should be solved by the adoption of several curves. It is obvious that such methods, even if practicable, would give no useful results; whereas approximately accurate results can easily be obtained by simple means with the aid of a properly developed system of accounting record, requiring comparatively little labour, and no more skill to maintain than that which has always been ungrudgingly devoted to the classification and record of the thousandfold greater detail connected

with all the many forms of commercial cash and credit transactions.

Financial evils encouraged by present neglect of the subject

The following extract from a letter, addressed to the author some years ago, by an experienced railway manager abroad, gives an entertaining account of the possibilities of unchecked financial enterprise—

> In this country, scarcely any of our railway companies have reached such a stage as to be able to give consideration to the matter of depreciation in any form. Such a thing as writing off from any account is practically unknown. The process is about as follows: A railway that should properly cost, say, £2,000,000, is built at a cost of, say, not to exceed £500,000. Of course, it is not built; in fact, it is not completed in any particular. The right-of-way is only partially secured and generally too narrow; the road-bed is always built too narrow; ballasting is lost sight of entirely, except with such material as may be along the side of the road-bed. The sleepers are small and generally of inferior material, rails are light, fences poor, and the railway carriages and wagons are of the cheapest kind, but made to look well on the outside.
>
> Buildings are generally of wood, except, perhaps, the offices of the company which are made quite up to date of brick or stone and elaborately furnished. In consequence of the above state of affairs, almost immediately that operation is begun additional right-of-way must be purchased, road-bed, ties, and rails strengthened, new machinery purchased, etc., all of which must necessarily be charged to capital account; and in this way the operation is kept down below what it really should be.
>
> In most cases, but not always, the entire cost of new work is charged to capital account, although it may take the place of repairs. Hence it is that usually more money must be found, and the road is burdened with fixed charges which it cannot pay. Mortgages are foreclosed, and the property is sold for much less than it cost, and a reorganisation takes place, the bondholders being the losers, although they may have purchased the bonds at a considerable discount, and have had a donation of capital stock thrown in. This reorganisation comes about three or four times before the

road is completed, and even in such cases very few managers know anything about charging off for depreciation.

It seems to me that your plan for handling the accounts, and letting each particular kind of property stand its own depreciation, is most excellent; but it would be useless at the present time to undertake to inaugurate any accounting of this kind in this country.

The fact of the matter is that directors would not tolerate it, as it would show up the truth, namely, that somebody, generally foreigners, had been buncoed into buying securities that were really not worth more than 40 to 50 per cent. of what they paid for them. While it is a fact that such a plan might tend to prevent inequities occurring, as between different classes of shareholders, at the same time let me tell you that in this country shareholders know very little, and care much less, about what is going on, simply because they are not, in fact, shareholders as a rule, but only the holders of certificates of little or no value.

I believe that your plan would work excellently where there was honest intention.

Suggested statutory register of plant for the measurement of depreciation

The method of keeping the accounts, relating to capital outlay, by means of regular records in a register of plant, is discussed in the next chapter, entitled "Industrial Plant: Record of Depreciation"; and, in view of the comparative ease with which this can be done, and having regard to the enormous interests and responsibilities involved, it is here again seriously suggested that every joint stock and municipal trading undertaking should be required by statute to keep a register of plant, in which the year of purchase and the cost of each of the various classes of industrial plant in which capital is invested should be recorded under proper heads. There would be no difficulty in this from the clerical point of view, even where there are scores of classes of industrial plant owned by one undertaking. It only requires the provision of proper equipment.

Check upon doubtful methods

Such a register would be a valuable check upon doubtful financial methods, where doubtful methods exist, although each undertaking would merely have to record the fact that it had provided in its revenue account each year a sum to replace expired capital outlay amounting to not less than that necessary according to its own estimate of the length of efficient life of each class of plant appearing in the statutory register of plant. There would be no statutory control of estimates of life periods, which would be in the absolute discretion of those responsible for the undertaking.

Responsibility for declaration of economic life period

A company or municipality might declare the economic life of each of its various classes of plant as being any period it pleased, from two years to one hundred years ; but if a motor-omnibus company, for instance, declared the life of the chassis of its motor-omnibuses to be fifty years, and so had to provide out of its annual revenue, for expired capital outlay, a sum equal to only 2 per cent. of the original outlay on these, it would obviously stand self-condemned, and certainly no engineer or other official of the company responsible for declaring the efficient economic life period would be willing to certify such a statement in the register of plant. With a system of this kind in general use, a rough standard, falling within reasonable limits, would speedily be established ; and it would no longer be possible for profits to be computed, and dealt with, without making any provision whatever for expired capital outlay (depreciation) on industrial plant.

Register does not involve liability upon directors

It is not suggested that any liability should attach to directors or others in connection with the proposed

statutory register of plant, except that a company or municipal body making default in keeping the statutory records would be subject to a sufficient penalty during the continuance of the default. Such a statutory register of plant would do no more than make compulsory the keeping of suitable records in a common form, but it would nevertheless compel attention to this important subject; and the result would be a great and growing improvement in financial methods, and in the science of computing annual profits. Such a register would supply a much-needed guide and source of information: it would insure the adoption of a regular and consistent policy, and would prove of great use in the many questions arising between the various parties interested, who ought to be able to obtain some information as to the treatment of this important matter. More information would be available for both directors and shareholders than at present, and this alone would tend to relieve directors of much anxious responsibility.

Register might be compulsory on new undertakings only

Such a register of plant might, in the first instance, be made obligatory on all new joint stock and municipal trading undertakings; and when understood, it would not be objectionable to the great body of able and honest directors, who would even welcome it as a help to them, and it would certainly be of assistance to those who are now unaware of the importance of this matter. In the case of existing undertakings, the use of a register of plant might be left as a voluntary question, as there would be some preliminary difficulty in obtaining a basis to start upon, besides other objections which may exist in the case of old undertakings.

Present methods may be improved

It is certain that, by taking thought, much may be done to improve present methods, consisting as they often do partly of spasmodic allocations of revenue account balances to reserve accounts to meet requirements of really unknown extent, and partly of the rough-and-ready apportionment between capital and revenue accounts of large outlays on combined renewals and extensions which must be allotted in some way, partly to revenue as representing maintenance, and partly to capital expenditure as being for betterments, involving an anxious responsibility being placed upon the shoulders of officials who have no very definite rules to guide them; whereas, if a settled and methodical policy be laid down, it will be found that, although the length of efficient life of any class of industrial plant is a matter upon which opinions differ widely, yet there is an outside limit in all cases beyond which no one would be found to go; and even if this outside limit were admitted and provided for out of revenue, a great improvement over the present condition of affairs would ensue.

French company law makes compulsory some annual provision

It is interesting to note the recognition, found in the French Joint Stock Company law, of the need of making compulsory the regular setting aside of a portion of the surplus balance of revenue receipts each year to make good expired capital outlay. Every joint stock company in France in which the public were invited to participate was bound to place each year 5 per cent. of the surplus balance of revenue receipts to reserve. This amount might be increased, but it might not be less than 5 per cent. of such surplus balance. As this reserve accumulated, it was devoted to paying off the capital of the company by annual

drawings, the holders whose shares were drawn in the ballot receiving back the par value of their shares, or the amount which had been actually paid up upon them. These holders then received certificates, called *actions de jouissance*, which gave them the right to participate in any dividends which might be paid over a certain minimum amount according to the regulations of the company, as well as the right to participate in the surplus proceeds of the realisation of the company's assets in the event of the company being liquidated; while, in the event of liquidation, such holders were not liable to refund the moneys received for these shares when they were redeemed.

Proposed statutory register is a great advance on present methods

This provision of the French Company law worked in a rough-and-ready fashion, for the amount to be set aside was a percentage calculated on the surplus balance of revenue receipts instead of on the wasting capital outlay; but it was important because it made compulsory some regular annual provision to answer expired capital outlay. There is urgent need, however, for the common employment of some practical method of systematically measuring and recording each year's expired capital outlay, and the compulsory use, by joint stock companies and municipal trading undertakings, of a statutory register of plant, in some such form as that suggested in the next chapter, would enable this desirable object to be attained with ease, and with considerable precision.

CHAPTER VII

INDUSTRIAL PLANT—RECORD OF DEPRECIATION

Annual revenue account should not be charged with cost of new plant or renewals, but should be charged with measured depreciation

ALL outlays on original, renewal, and additional industrial plant, except the cost of current repairs, are payments made on revenue account to secure benefits extending to a date beyond the year of purchase, and as such are unsuitable to be charged direct to the revenue account of the year of purchase, or of any other one year. They should, therefore, always be charged in the books of an undertaking to capital outlay account, except only the outlays for loose tools and utensils, which are treated separately, for reasons explained later. This is clearly so, whether the outlays are for additional industrial plant, sometimes involving improvements known as betterments, which increase the quantity and/or capacity of the industrial plant in use, or for mere renewals of industrial plant which has become either worn out or unsuitable for use. It is important to observe that no distinction must be attempted between the outlays on additions and the outlays on renewals. All such outlays made within each year, and charged to capital outlay on plant, should be abstracted at the end of each year, and distributed into a register of plant, by means of which the amount of depreciation will be measured and charged, in total, to each annual revenue account, the amount of depreciation being at the same time written off the capital outlay account in the financial books. This system will avoid the present dangerous lack of principle in determining what outlays are to be treated as outlays on additions and charged

to capital, and what outlays are to be treated as outlays on renewals and charged to revenue. The answers to such questions are always beset with insurmountable difficulties, and constantly necessitate the making of arbitrary allocations of large sums between capital and revenue without any adequate rule or guide, and open, therefore, to be influenced by unsuspected individual caprice, and by considerations of the financial convenience of the moment.

Difficulty of distinguishing between additions and renewals

As an illustration of the difficulty arising in allocating capital outlay between additions or betterments on the one hand, and renewals on the other, take the case of a railway company rebuilding a bridge at a cost of £12,000, to replace a bridge which, twenty years before, had cost £10,000. With the present lack of method in the treatment of capital outlay, the new outlay of £12,000 may be either wholly or partly charged direct to the year's revenue by one railway company, while another railway company may charge an exactly similar outlay wholly to capital, and the advisers of a third company may consider that the bridge is better than the original structure, and, therefore, that a portion of the cost, amounting to £2,000 or £3,000, should be charged to capital and the balance charged to the revenue account of the year as part of the cost of maintenance.

Proposed register of plant obviates this difficulty

Under the system of record suggested in this chapter, the register of industrial plant would show at once how much of the original cost of the bridge, amounting to £10,000, had been charged off to the annual revenue accounts by the end of the twenty years, and thus the facts would be known. If the life of the bridge had been originally estimated as, or

subsequently adjusted to, a period of twenty years, the whole of the original cost would, at the end of that time, have been refunded out of revenue receipts. Under this system there is much less guesswork. The annual revenue accounts will be charged with the maintenance of industrial plant under two distinct heads, one being repairs, which includes all current outlay on plant—except the cost of additions, betterments, and renewals charged to capital outlay and duly distributed at the end of each year into the register of plant—and the other being depreciation, or expired capital outlay, the amount of which will be measured at the end of each year by means of the register of plant.

Use of official schedule of capital outlay to avoid danger of charging cost of small renewals and repairs to capital outlay

To avoid the danger of outlays on small and partial renewals of industrial plant, in the nature of repairs, being charged in the accounts to capital outlay, instead of direct to annual revenue as repairs, each undertaking should prepare, and adopt the use of, an official schedule containing descriptive particulars of all outlay which is to be charged to capital; and this schedule may be added to, under proper authority, as fresh questions arise from time to time. All outlay not clearly defined in the schedule as being capital outlay must be charged under the head of repairs to the annual revenue account of the year in which it is incurred. This official schedule of capital outlay should be settled and kept up to date under the joint control of the engineers' and accountants' departments and it would soon become more or less standardized for each class of industry.

On the scrapping or abandonment of any industrial plant, it will be necessary to ascertain, by reference

Treatment of scrapped or abandoned industrial plant

to the register of plant, if any part of the original cost of the plant, so scrapped or abandoned, in excess of the estimated scrap value, still remains in the capital outlay account, and, if so, either this remaining balance of cost must be written off by being included in the measured amount of depreciation to be computed at the end of that year, or some duly authorised arrangement must be made, and noted in the register of plant, by which the amount still remaining will be automatically written off, over the next three, five, or other number of years, by being included in the measured amount of depreciation for each of those years.

Loose tools and utensils

Loose tools and utensils form part of the industrial plant of an undertaking, but the outlay on these should be recorded separately in a loose tools and utensils account in the financial books, apart altogether from the capital outlay accounts, the contents of which are abstracted at the end of each year and recorded in the register of plant, because the existing value at any time of these loose tools and utensils can best be ascertained by an annual count and inventory, on the same lines as the annual stocktaking of goods which are intended for re-sale. All outlay, for both renewal and repair of loose tools and utensils, should, therefore, be charged, through this account, to the revenue account of the year in which it is incurred, after adjusting the balance of the account to agree with the value of the stock on hand at the end of each year.

Convenient form of register of plant

A convenient form of register of plant [1] is a loose-leaf

[1] *Leake's Register of Industrial Plant for the Measurement of Depreciation* is published by Messrs. Gee & Co. (Publishers) Ltd., 27-28 Basinghall Street, London, E.C.2.

book, of suitable size, having a page, which can be followed by others when required, known as "Class Record," allotted to each class of industrial plant, each page ruled with twelve separate decimal cash columns, one column for each year. Each page should be headed with a description of a particular class of the industrial plant, its declared length of life in years, and its scrap value; and there should be a space for the signatures of the officials responsible for making, and, when necessary, revising these estimates, which all appertain to the engineering, and not to the accounting, side of the subject. All capital outlay recorded in the financial books should be analysed and distributed according to its nature, to the appropriate columns for each year in these class record sheets, the outlay being stated in two sums—one above the other. One would represent the estimated scrap value and the other the usable value, which latter will thereafter be subjected once a year—in the process of measuring the annual depreciation—to an equal annual deduction based on the estimated number of years over which the particular class of plant will be useful, the first deduction being perhaps one-half of the full year's charge as probably nearest to the proper charge for the year in which the plant is purchased. It will be found that adjustable records kept in this form, used in combination with the summaries mentioned below, are capable of easily enabling prompt effect to be given, in measuring annual expired capital outlay (depreciation), to all altered estimates of life periods, scrap values, or other change of outlook, which will be noted in the register from time to time by the engineers.

There will be filed in the register, after each class record sheet or sheets, a suitably ruled sheet known as "Class Summary," containing three decimal cash columns headed respectively "capital outlay," "depreciation," and "balance of unexpired capital outlay." At the end of each year, after the class records have been written up from the capital outlay accounts in the financial books, the capital outlay, if any, appearing on each class record for the year, including both scrap and usable values, will be abstracted from the column for the year in the class record to the capital outlay column in the "Class Summary," and at the same time the year's depreciation on that class will be measured by adding across the depreciation deductions made for the year from the columns in the class record, the total being transferred to the depreciation column in the "Class Summary." Then, by deducting the lesser amount from the greater, the plus or minus balance of unexpired capital outlay for the year in connection with that class is ascertained and filled into the third column. It should be observed that a list of the balances of unexpired capital outlay at the end of any year, abstracted from the third column of the class summaries, will agree with the balance of the capital outlay account in the financial books, after the measured depreciation for the year has been written off.

There will be filed at the end of the Register of Plant, a sheet called "Annual General Summary," containing three decimal cash columns, headed in the same way as the three columns in the "Class Summary." This annual general summary will be written up once a year by abstracting from each "Class

Summary " the figures relating to that particular year only, so that the Annual General Summary will, when added, show the total capital outlay, depreciation, and increase or decrease in unexpired capital outlay for each complete year. The total of the depreciation column for the year is the sum to be written off the balance of capital outlay in the financial books and charged to profit and loss account, this being a part of the year's expenditure equal in importance to other revenue expenditure.

Register will show many years' history of scores of classes of industrial plant

Many years' history of scores of different classes of industrial plant can be recorded in a register of this kind without any confusion ; and when, during the life of any class of industrial plant, it is found in the light of subsequently acquired knowledge that the original estimate was either over or under the mark, this can easily be adjusted, and effect given to it so as to provide for the then unexpired balance appearing in the register being written off over any altered remaining period. Thus, an effective review or survey of the state of the whole of the industrial plant of an undertaking keeping a systematic record of this kind, will be carried out periodically with considerable precision, and effect given to any altered conditions of some of the classes of industrial plant by suitably modifying the efficient life period in the register of plant to meet the new circumstances ; and, further, there will be a permanent record of this always available, and a direct connection between the plant and the going-concern value of that plant as shown in the financial books and in the balance sheet of the undertaking.

When it is desired to measure the depreciation

Measurement of depreciation each month if desired

monthly, each column in the register may be used for one month instead of for one year ; but, for ordinary purposes, sufficient accuracy of result can probably be obtained by taking one-twelfth of the whole depreciation of the previous year, and adjusting the difference in the last month of the financial year.

Division of industrial plant into classes

In determining the classes into which industrial plant is to be divided for the purpose of record in the register of plant, questions will arise as to the most convenient units to be adopted. The answers to such questions must, in every case, depend on the nature of the particular undertaking ; thus, the original cost of construction of a railway station buildings would be one unit of plant, but any number of roughly similar units would be grouped as one class, according to the more or less permanent nature and situation of the station buildings and their consequent probable duration of efficient life : therefore the station buildings of a railway company may fall under several classes for the purpose of record in the register of plant. In the case of a steamship, the efficient life periods of the engines, boilers, and hull will all vary, so that for the purpose of record in the register of plant such property must be divided into at least three heads or classes. In dealing with a fleet of steamships, the hulls, of varying size, but having a common estimated length of economic life, may all be grouped under one class. In the case of the motor omnibus, if the chassis has a shorter economic life than the coach-body, it will be an easy matter to record the cost in the register of plant under two heads instead of one.

Identification of plant by distinctive numbers

Movable units of industrial plant, such as, say, gas meters, should bear identification numbers, and fixed units, such as buildings, should be so described in the register of plant as to enable them to be always easily identified.

Working illustration of register of industrial plant

It is now proposed to show in some detail a simple illustration of the working of the register of industrial plant. For the sake of brevity in this first illustration, scrap values have been omitted, the method of recording these scrap values being shown in a second, but more condensed, illustration of the register of plant which follows, and is intended more particularly to show the manner of arranging and linking up the loose leaves in the register in such a way as to constitute a perpetual record. In the first illustration, the figures are stated in British currency; but, in practice, it will be found more convenient for purposes of calculation to state the figures in pounds sterling and decimals thereof.

Electric tramway undertaking

The following particulars have been prepared of a portion of the capital outlay on the plant of an electric tramway undertaking covering a period of twelve years, and in the illustration of the register of plant the details of some of this outlay are recorded.

It will be seen that the annual capital outlay on plant is shown in total in the first column. The figures in the three other columns are obtainable only from the register of plant with its annual general summary, the working of which is shown hereunder in sufficient detail to enable this to be understood.

Annual outlay compared with annual depreciation

The particulars, which are explained by the illustrations hereunder, show that the undertaking was started in the year 1895, by the end of which year the

PARTICULARS OF OUTLAY ON PLANT.

	Capital outlay.	Annual depreciation provision.	Year's increase in balance of unexpired capital outlay.	Year's decrease in balance of unexpired capital outlay.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1895	88,000 0 0	3,097 1 11	84,902 18 1	
1896	34,500 0 0	7,705 10 8	26,794 9 4	
1897	19,500 0 0	9,891 13 10	9,608 6 2	
			121,305 13 7	
1898	8,500 0 0	10,928 4 1		2,428 4 1
1899	7,375 0 0	11,564 4 5		4,189 4 5
1900	1,850 0 0	11,913 18 2		10,063 18 2
1901	7,350 0 0	12,297 8 3		4,947 8 3
1902	3,450 0 0	12,743 9 3		9,293 9 3
1903	2,690 0 0	10,930 17 7		8,240 17 7
1904	7,650 0 0	9,732 3 9		2,082 3 9
				41,245 5 6
1905	29,500 0 0	10,918 8 11	18,581 11 1	
1906	14,040 6 0	12,682 5 2	1,358 0 10	
	£224,405 6 0	124,405 6 0		
Balance of unexpired capital outlay				100,000 0 0
			£141,245 5 6	141,245 5 6

capital outlay on industrial plant amounts to £88,000, and the depreciation provision amounts to £3,097, this being one-half of a full year's allowance. For the next two years there was a further capital outlay on industrial plant, and at the end of the year 1897 the balance of unexpired capital outlay on industrial plant amounted to £121,305 13s. 7d. For the next seven years, to the end of 1904, the yearly capital outlay on renewals of industrial plant amounts to considerably less than the depreciation provision; so that upwards of £40,000 of the original capital outlay, for which a capital of about £120,000 was

required, becomes gradually liquidated, and would have accumulated in hand in the form of cash or securities. In the year 1905, however, £29,500 was spent on renewals, consisting principally of £21,000 for renewal of track (see illustrations hereunder), and in the year 1906 £14,040 6s. was spent, consisting again, principally of £13,000 for renewal of track; so that by the end of 1906 the balance of unexpired capital outlay on industrial plant had increased from about £80,000, at which it would have stood at the end of 1904, to £100,000.

Reason for difference in annual depreciation in illustration

It will be noticed, on examining the depreciation column in the above particulars, that the annual depreciation for the years 1903, 1904, and 1905 has fallen somewhat, and this is caused by the fact that the track work, the life of which was estimated as being only 7·7 years (see illustrations hereunder), turned out to have a life of ten years, for it was not until the year 1905 that it had to be renewed. In practice, this might have been easily adjusted as soon as it was seen by the engineers that the track was likely to be efficient for more than 7·7 years. The rates of depreciation employed are the highest rates of depreciation shown in the following table of allowances for depreciation which was compiled by a

	Per cent.
Boilers	8 to 10
Turbines	7 to 9
Transformers	5 to 6
Cars	4 to 6
Track Work	7 to 13
Buildings	1 to 2
Overhead System	3 to 8

CLASS RECORD.

Description of Industrial Plant: Track Work. Class No.

Length of Efficient Life: 7.7 years (equal to 12·987 per cent.). Sheet No.

Date of Declaration Declared by Certified by

Year of capital outlay and subsequent annual depreciation deducted.

Depreciation year.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	20,000 0 0											
1895	1,298 14 0											
	18,701 6 0	11,000 0 0										
1896	2,597 8 0	714 5 8										
	16,103 18 0	10,285 14 4	3,000 0 0									
1897	2,597 8 0	1,428 11 5	194 16 1									
	13,506 10 0	8,857 2 11	2,805 3 11	200 0 0								
1898	2,597 8 0	1,428 11 5	389 12 2	12 19 9								
	10,909 2 0	7,428 11 6	2,415 11 9	187 0 3	500 0 0							
1899	2,597 8 0	1,428 11 5	389 12 2	25 19 6	32 9 4							
	8,311 14 0	6,000 0 1	2,025 19 7	161 0 9	467 10 8	350 0 0						
1900	2,597 8 0	1,428 11 5	389 12 2	25 19 6	64 18 8	22 14 6						
	5,714 6 0	4,571 8 8	1,636 7 5	135 1 3	402 12 0	327 5 6	400 0 0					
1901	2,597 8 0	1,428 11 5	389 12 2	25 19 6	64 18 8	45 9 1	25 19 6					
	3,116 18 0	3,142 17 3	1,246 15 3	109 1 9	337 13 4	281 16 5	374 0 6	600 0 0				
1902	2,597 8 0	1,428 11 5	389 12 2	25 19 6	64 18 8	45 9 1	51 18 0	38 19 3				
	519 10 0	1,714 5 10	857 3 1	83 2 3	272 14 8	236 7 4	322 2 6	561 0 9	440 0 0			
1903	519 10 0	1,428 11 5	389 12 2	25 19 6	64 18 8	45 9 1	51 18 0	77 18 6	28 11 5			
		285 14 5	467 10 11	57 2 9	207 16 0	190 18 3	270 4 6	483 2 3	411 8 7	900 0 0		
1904		285 14 5	389 12 2	25 19 6	64 18 8	45 9 1	51 18 0	77 18 6	57 2 10	58 8 10		
			77 18 9	31 3 3	142 17 4	145 9 2	218 6 6	405 3 9	354 5 9	841 11 2	21,000 0 0	
1905			77 18 9	25 19 6	64 18 8	45 9 1	51 18 0	77 18 6	57 2 10	117 17 8	1,363 12 9	
				5 3 9	77 18 8	100 0 1	166 8 6	327 5 3	297 2 11	723 13 6	19,636 7 3	13,000 0 0
1906				5 3 9	64 18 8	45 9 1	51 18 0	77 18 6	57 2 10	117 17 8	2,727 5 6	844 3 1
					13 0 0	54 11 0	114 10 6	249 6 9	240 0 1	605 15 10	16,909 1 9	12,155 16 1

competent authority, as the result of an extended study of street railway conditions in America.

Class record in register of industrial plant

The history of each separate class of industrial plant will be recorded in the proposed register of plant on a class record, as illustrated by the outlay on track work shown on page 87.

The annual total of depreciation of each class of plant is ascertained by adding across the amounts deducted from the yearly columns, as shown above. The totals so obtained will equal the amount of depreciation of track work for each year, and each total is entered in the column headed "depreciation" in the class summary set out below. Thus the depreciation of track work for the year 1902 is arrived at as follows—

	£	s.	d.
On outlay in 1895	2,597	8	0
,, ,, 1896	1,428	11	5
,, ,, 1897	389	12	2
,, ,, 1898	25	19	6
,, ,, 1899	64	18	8
,, ,, 1900	45	9	1
,, ,, 1901	51	18	0
,, ,, 1902	38	19	3
	£4,642	16	1

Class summary in register of industrial plant

The loose leaf, or leaves, containing the history of each class of industrial plant, called the "Class Record," as shown on page 87, will, in the proposed register of plant, be immediately followed by a record for each class, called "Class Summary," as shown on page 89.

In the register, the plus quantities are recorded in the class summaries in black ink, and the minus quantities in red ink.

CLASS SUMMARY

Description of Industrial Plant: Track Work.
Length of Efficient Life: 7·7 years (equal to 12·987 per cent.).
Class No. Sheet No.

	Capital outlay.			Depreciation.			Balance of unexpired capital outlay.		
	£	s.	d.	£	s.	d.	£	s.	d.
1895 . . .	20,000	0	0	1,298	14	0	+ 18,701	6	0
	20,000	0	0	1,298	14	0	18,701	6	0
1896 . . .	11,000	0	0	3,311	13	8	+ 7,688	6	4
	31,000	0	0	4,610	7	8	26,389	12	4
1897 . . .	3,000	0	0	4,220	15	6	- 1,220	15	6
	34,000	0	0	8,831	3	2	25,168	16	10
1898 . . .	200	0	0	4,428	11	4	- 4,228	11	4
	34,200	0	0	13,259	14	6	20,940	5	6
1899 . . .	500	0	0	4,474	0	5	- 3,974	0	5
	34,700	0	0	17,733	14	11	16,966	5	1
1900 . . .	350	0	0	4,529	4	3	- 4,179	4	3
	35,050	0	0	22,262	19	2	12,787	0	10
1901 . . .	400	0	0	4,577	18	4	- 4,177	18	4
	35,450	0	0	26,840	17	6	8,609	2	6
1902 . . .	600	0	0	4,642	16	1	- 4,042	16	1
	36,050	0	0	31,483	13	7	4,566	6	5
1903 . . .	440	0	0	2,632	8	9	- 2,192	8	9
	36,490	0	0	34,116	2	4	2,373	17	8
1904 . . .	900	0	0	1,057	2	0	- 157	2	0
	37,390	0	0	35,173	4	4	2,216	15	8
1905 . . .	21,000	0	0	1,882	15	9	+ 19,117	4	3
	58,390	0	0	37,056	0	1	21,333	19	11
1906 . . .	13,000	0	0	3,991	17	1	+ 9,008	2	11
£	71,390	0	0	41,047	17	2	30,342	2	10

Annual general summary in register of industrial plant

At the end of the proposed register of plant suitably ruled loose leaves will be inserted, headed "Annual General Summary," as illustrated below; and the

total of the depreciation column of this annual general summary for each year will show the amount necessary to be provided out of the revenue receipts of the year for depreciation before the profit or loss can be ascertained. This amount must, therefore, be charged to the annual revenue account and written off the capital outlay account in the books of the undertaking. The annual general summary of the various class summaries is shown below for each of the twelve years, and the figures appearing thereon will be found to agree with the particulars of outlay on plant of the undertaking set out on page 85. The class record and class summary of the track work only have been shown in detail above, but it will be understood that in the register of industrial plant a similar class record and class summary for each of the other six classes of industrial plant will be required.

In the register, the plus quantities are recorded in the annual general summaries in black ink, and the minus quantities in red ink.

ANNUAL GENERAL SUMMARY.

Sheet No.

	Capital outlay.			Depreciation.			+ or − Balance of unexpired capital outlay.		
1895.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Boilers	5,000	0	0	250	0	0	+ 4,750	0	0
Turbines . . .	3,000	0	0	135	2	8	+ 2,864	17	4
Transformers . .	2,000	0	0	60	4	10	+ 1,939	15	2
Cars	25,000	0	0	753	0	5	+ 24,246	19	7
Track Work . .	20,000	0	0	1,298	14	0	+ 18,701	6	0
Buildings . . .	24,000	0	0	240	0	0	+ 23,760	0	0
Overhead System .	9,000	0	0	360	0	0	+ 8,640	0	0
£	88,000	0	0	3,097	1	11	+ 84,902	18	1

ANNUAL GENERAL SUMMARY (*continued*)—

	Capital outlay.	Depreciation.	+ or − Balance of unexpired capital outlay.
1896.	£ s. d.	£ s. d.	£ s. d.
Boilers. . . .	2,500 0 0	625 0 0	+ 1,875 0 0
Turbines . . .	nil	270 5 5	− 270 5 5
Transformers . .	1,000 0 0	150 12 1	+ 849 7 11
Cars	16,000 0 0	1,987 19 6	+ 14,012 0 6
Track Work . .	11,000 0 0	3,311 13 8	+ 7,688 6 4
Buildings . . .	nil	480 0 0	− 480 0 0
Overhead System	4,000 0 0	880 0 0	+ 3,120 0 0
£	34,500 0 0	7,705 10 8	+ 26,794 9 4
1897.			
Boilers. . . .	250 0 0	762 10 0	− 512 10 0
Turbines . . .	1,250 0 0	326 11 6	+ 923 8 6
Transformers . .	nil	180 14 6	− 180 14 6
Cars	10,000 0 0	2,771 2 4	+ 7,228 17 8
Track Work . .	3,000 0 0	4,220 15 6	− 1,220 15 6
Buildings . . .	3,000 0 0	510 0 0	+ 2,490 0 0
Overhead System	2,000 0 0	1,120 0 0	+ 880 0 0
£	19,500 0 0	9,891 13 10	+ 9,608 6 2
1898.			
Boilers. . . .	1,250 0 0	837 10 0	+ 412 10 0
Turbines . . .	4,750 0 0	596 16 11	+ 4,153 3 1
Transformers . .	2,000 0 0	240 19 4	+ 1,759 0 8
Cars	nil	3,072 6 6	− 3,072 6 6
Track Work . .	200 0 0	4,428 11 4	− 4,228 11 4
Buildings . . .	nil	540 0 0	− 540 0 0
Overhead System	300 0 0	1,212 0 0	− 912 0 0
£	8,500 0 0	10,928 4 1	− 2,428 4 1
1899.			
Boilers. . . .	1,625 0 0	981 5 0	+ 643 15 0
Turbines . . .	nil	810 16 3	− 810 16 3
Transformers . .	nil	301 4 2	− 301 4 2
Cars	5,000 0 0	3,222 18 7	+ 1,777 1 5
Track Work . .	500 0 0	44,74 0 5	− 3,974 0 5
Buildings . . .	nil	540 0 0	− 540 0 0
Overhead System	250 0 0	1,234 0 0	− 984 0 0
£	7,375 0 0	11,564 4 5	− 4,189 4 5
1900.			
Boilers. . . .	nil	1,062 10 0	− 1,062 10 0
Turbines . . .	500 0 0	833 6 8	− 333 6 8
Transformers . .	nil	301 4 2	− 301 4 2
Cars	1,000 0 0	3,403 13 1	− 2,403 13 1
Track Work . .	350 0 0	4,529 4 3	− 4,179 4 3
Buildings . . .	nil	540 0 0	− 540 0 0
Overhead System	nil	1,244 0 0	− 1,244 0 0
£	1,850 0 0	11,913 18 2	− 10,063 18 2

ANNUAL GENERAL SUMMARY (*continued*)—

	Capital outlay.			Depreciation.			+ or − Balance of unexpired capital outlay.		
1901.	£	s.	d.	£	s.	d.	£	s.	d.
Boilers. . . .	500	0	0	1,087	10	0	− 587	10	0
Turbines . . .	3,750	0	0	1,024	15	5	+ 2,725	4	7
Transformers . .	nil			301	4	2	− 301	4	2
Cars	2,000	0	0	3,494	0	4	− 1,494	0	4
Track Work . .	400	0	0	4,577	18	4	− 4,177	18	4
Buildings . . .	nil			540	0	0	− 540	0	0
Overhead System	700	0	0	1,272	0	0	− 572	0	0
£	7,350	0	0	12,297	8	3	− 4,947	8	3
1902.									
Boilers. . . .	1,500	0	0	1,187	10	0	+ 312	10	0
Turbines . . .	nil			1,193	13	10	− 1,193	13	10
Transformers . .	nil			301	4	2	− 301	4	2
Cars	nil			3,554	5	2	− 3,554	5	2
Track Work . .	600	0	0	4,642	16	1	− 4,042	16	1
Buildings . . .	1,000	0	0	550	0	0	+ 450	0	0
Overhead System	350	0	0	1,314	0	0	− 964	0	0
£	3,450	0	0	12,743	9	3	− 9,293	9	3
1903.									
Boilers. . . .	500	0	0	1,287	10	0	− 787	10	0
Turbines . . .	750	0	0	1,227	9	6	− 477	9	6
Transformers . .	nil			301	4	2	− 301	4	2
Cars	nil			3,554	5	2	− 3,554	5	2
Track Work . .	440	0	0	2,632	8	9	− 2,192	8	9
Buildings . . .	nil			560	0	0	− 560	0	0
Overhead System	1,000	0	0	1,368	0	0	− 368	0	0
£	2,690	0	0	10,930	17	7	− 8,240	17	7
1904.									
Boilers. . . .	3,750	0	0	1,500	0	0	+ 2,250	0	0
Turbines . . .	nil			1,261	5	2	− 1,261	5	2
Transformers . .	nil			301	4	2	− 301	4	2
Cars	3,000	0	0	3,644	12	5	− 644	12	5
Track Work . .	900	0	0	1,057	2	0	− 157	2	0
Buildings . . .	nil			560	0	0	− 560	0	0
Overhead System	nil			1,408	0	0	− 1,408	0	0
£	7,650	0	0	9,732	3	9	− 2,082	3	9
1905.									
Boilers. . . .	1,750	0	0	1,520	0	0	+ 230	0	0
Turbines . . .	5,000	0	0	1,486	9	4	+ 3,513	10	8
Transformers . .	nil			301	4	2	− 301	4	2
Cars	nil			3,734	19	8	− 3,734	19	8
Track Work . .	21,000	0	0	1,882	15	9	+ 19,117	4	3
Buildings. . .	1,500	0	0	575	0	0	+ 925	0	0
Overhead System	250	0	0	1,418	0	0	− 1,168	0	0
£	29,500	0	0	10,918	8	11	+ 18,581	11	1

ANNUAL GENERAL SUMMARY (*continued*)—

	Capital outlay.	Depreciation.	+ or − Balance of unexpired capital outlay.
1906.	£ s. d.	£ s. d.	£ s. d.
Boilers. . . .	250 0 0	1,250 0 0	− 1,000 0 0
Turbines . . .	nil	1,378 7 1	− 1,378 7 1
Transformers . .	nil	301 4 2	− 301 4 2
Cars	nil	3,734 19 8	− 3,734 19 8
Track Work . .	13,000 0 0	3,991 17 1	+ 9,008 2 11
Buildings . . .	790 6 0	597 17 2	+ 192 8 10
Overhead System	nil	1,428 0 0	− 1,428 0 0
£	14,040 6 0	12,682 5 2	+ 1,358 0 10

Further illustration of register of industrial plant

The following further illustration of the working of the proposed register of industrial plant is intended particularly to show the manner of arranging and linking up the loose leaves in the register in such a way as to constitute a perpetual and uninterrupted record of the history of each class of plant over any number of years. Owing to considerations of space only three annual columns are shown on each class record sheet in this illustration, in place of the twelve columns which should be provided in the register of industrial plant. For the particular purpose of this illustration, the contraction has the advantage of calling for the use of a fresh class record sheet at the end of each period of three years, instead of twelve years, thus enabling the simple method of indefinitely expanding the records to be shown in a small space.

Particulars of illustration

The illustration shows the case of a new undertaking, which commenced operations on the 1st January, 1909, being at that time unequipped with industrial plant. The industrial plant subsequently acquired is assumed to consist of four classes, viz., boilers, turbines, cars, and buildings. In this illustration only the class

record sheets for boilers are shown, and these are set out in detail for a period covering two sets of sheets, with an illustration in skeleton form showing the arrangement of the third set of sheets required to follow on. The class summary is also for boilers, and extends only to the end of the year 1913. The annual general summary is for the year 1911 only, and includes in this case the assumed figures relating to each of the four classes of industrial plant. The boilers—the class selected for detailed illustration—have an estimated efficient life of ten years. One or more new boilers are purchased each year, except in the year 1913, when there is no capital outlay on new boilers. The scrap value of the boilers is estimated at about 1 per cent. of the cost. For the purpose of entering in the register, the original cost is divided into two parts—scrap value and usable value. The outlay on the purchase of new boilers, which, of course, includes the scrap value, is as under—

1909. . .	£2,020	1912. . .	£ 505
1910. . .	1,010	1913. . .	nil
1911. . .	1,515	1914. . .	1,010

By reference to the class summary for boilers, shown on page 97, the effect of the transactions in this class of plant each year can be followed to the end of the year 1913. It will be noted that in 1913 the existing unexpired capital outlay on boilers is reduced for the first time, the transactions in the former years having in every case resulted in an increase in unexpired capital outlay on boilers, after deducting the depreciation of the year. The class record sheets and class summary sheets for turbines, cars, and buildings are not shown, but they would be written up in the same

way as for boilers. The illustration of the annual general summary, shown on page 97, covers the year 1911 only, but an annual general summary will, of course, be prepared for each year on the same lines. This annual general summary shows that during the year 1911 the total capital outlay on industrial plant amounted to £4,015, and the total depreciation accruing during the year to £2,775, which amount must be charged to the revenue account for the year under the head of depreciation, thus providing out of revenue receipts £2,775 towards the £4,015 outlay during the year, the balance of £1,240 having to be found elsewhere.

Class Record

The one sheet below will, in the register, have twelve columns, and will cover not less than the period between the first and the twelfth year inclusive. Class record

Filed 1st in Class 1.

Boilers. Life 10 years.			Class 1. Sheet 1a.		
		1909.	1910.	1911.	
O		£	£	£	
Scrap value		20			Capital Outlay £2,020, having an estimated scrap value of £20.
Usable value		2,000			
Depreciation	1909	100			Half of one year's depreciation on the usable value, £2,000, is deducted.
			10		
		1,920	1,000		
	1910	200	50		
				15	Capital Outlay on Boilers is £1,515 in 1911.
O		1,720	960	1,500	
	1911	200	100	75	The total of the items in this line is £375, being the Depreciation of Boilers in 1911.
	£	1,520	860	1,440	

See Class Summary and Annual General Summary page 97.

The two sheets below will, in the register, have twelve columns on each sheet, and will cover not

less than the period between the thirteenth and the twenty-fourth year inclusive.

FILED 2ND IN CLASS 1.

BOILERS. Life 10 years.		Class 1. Sheet 2A.		
		1909.	1910.	1911.
O		£	£	£
		1,520	860	1,440
	1912	200	100	150
		1,320	760	1,290
	1913	200	100	150
		1,120	660	1,140
O	1914	200	100	150
	£	920	560	990

FILED 3RD IN CLASS 1.

BOILERS. Life 10 years.		Class 1. Sheet 2B.		
		1912.	1913.	1914.
O		£ 5	£	£
		500		
	1912	25		
		480	—	
	1913	50	—	
		430		10
O	1914	50	—	1,000 50
	£	380	—	960

The reducing totals of unexpired capital outlay always include estimated scrap value ; thus, the above £920 includes £20 scrap value ; the £560, £10 ; the £990, £15 ; the £380, £5 ; and so on. It is not necessary in a class record to set apart a column for any year unless capital outlay has been incurred during that year.

The three sheets below will, in the register, have twelve columns on each sheet, and will cover not less than the period between the twenty-fifth and the thirty-sixth year inclusive, and to set them out in detail would be needlessly cumbersome.

FILED 4TH IN CLASS 1.

Class 1. Sheet 3A.				

FILED 5TH IN CLASS 1.

Class 1. Sheet 3B.				

FILED 6TH IN CLASS 1.

Class 1. Sheet 3c.				

The class record sheets may thus be multiplied to any extent required. The system of numbering the class record sheets should be carefully noted. The loose leaves or sheets used in building up the Register of Industrial Plant will be in use for many years and, therefore, they should be made of the best and most durable material.

Class summary and annual general summary

CLASS SUMMARY

FILED AT END OF CLASS 1.

BOILERS.

		Capital outlay	Depreciation.	+ or − Balance.
O	1909. .	2,020	100	+ 1,920
		2,020	100	1,920
	1910. .	1,010	250	+ 760
		3,030	350	2,680
	1911. .	1,515	375	+ 1,140
		4,545	725	3,820
	1912 ..	505	475	+ 30
O		5,050	1,200	3,850
	1913. .	—	500	− 500
	£	5,050	1,700	3,350

ANNUAL GENERAL SUMMARY

FILED AT END OF REGISTER

		Capital outlay.	Depreciation.	+ or − Balance
O	1911.	£	£	£
	Boilers .	1,515	375	+ 1,140
	Turbines	200	700	− 500
	Cars . .	1,300	1,400	− 100
	Buildings	1,000	300	+ 700
	£	4,015	2,775	+ 1,240
O	1912.	etc.	etc.	etc.

In the register, the plus quantities are recorded in the summaries in black ink and the minus quantities in red ink.

In the case of an established undertaking

To bring the register into use in the case of an established undertaking, an analysis must first be made of the balances standing in the ordinary financial ledgers representing the existing book value of capital outlay on industrial plant, and dividing this existing value into suitable classes for record in the register,

showing each type of plant separately, and when required sub-dividing each type into groups, each group having a common useful life period. Where a single unit, such as a steamship, comprises several distinct parts having different lengths of useful life, which are renewable separately, as engines or boilers, or, in a motor-omnibus, coach-body and chassis, the outlay may, in the register of industrial plant, conveniently be sub-divided into separate classes for engines, boilers, and so on. If a rough-and-ready computation of depreciation only is required, a division into a few well-defined classes will be sufficient, or in some cases, the whole capital outlay may even be dealt with as one class, the use of the register enabling depreciation to be easily computed on original cost year by year, instead of on the diminishing ledger balances of cost, as is still a common practice.

Method of registering outlay and measuring depreciation

The contents of the analysis will be distributed to separate class record sheets, to be opened in the register for each class as shown above. The unexpired usable value, with remainder or scrap value shown separately, will be entered on the first line of the first or left-hand cash column, and the total of the amounts so distributed will agree with the balances in the ordinary financial ledgers representing the existing book value of capital outlay. Full instructions as to the manner in which the unexpired capital outlay on each class, at the date the register is brought into use, is to be charged to the revenue accounts of future years should be entered on each class record sheet, and an estimate of the whole useful life period of the class, and of the remainder or scrap value, with any special information as to this, should also be noted

at the head of each sheet. At the end of each subsequent year all capital outlay on industrial plant during the year, as recorded in the ordinary financial ledgers, will be analysed and distributed to the next available column in each class record sheet under the head of that year. The year's depreciation will be computed on the original outlay, less scrap value, at a rate according to the instructions in each case, and deducted on the class records from the unexpired outlay appearing in each year's column; and the class summaries will then be written up for the year, together with the annual general summary, the depreciation column of which latter will show the amount to be charged under the head of depreciation to the revenue account for the year.

Initial difficulty in the case of an established undertaking

In the case of an established undertaking starting the use of a register, some difficulty will be experienced in determining the proportion in which the then unexpired capital outlay on each class of industrial plant is to be charged to the revenue accounts of future years. This outlay will generally fall under one of two characteristics. One will represent outlay such as that on the construction of a building with a whole useful life period of, say, fifty years, twenty years of which may have expired at the date the register is brought into use. Here the matter is simple, it being merely necessary, in future, to write off one-thirtieth of the unexpired capital outlay in each of the remaining thirty years of the estimated future life. The other characteristic is represented by any class consisting of separate units, some of which are renewed from year to year, or occasionally, such as, for instance, the meters of a gas company. In such a case it will be found that the

unexpired capital outlay cannot properly be equally distributed over future years to represent depreciation, as the depreciation will, in fact, be a diminishing quantity each year. It will be necessary, therefore, to abstract the outlay on the purchase of units for each former year over a considerable period, in order to ascertain the present unexpired value of each year's purchases; and this can most easily be done by writing up class record sheets for the necessary back period.

Class record for meters of a gas company

To make this clear, it is necessary, as an example, to set out as on page 101 a class record relating to the meters of a gas company which buys, say, one hundred new meters each year at a cost of £1 each, the meters having an efficient life of ten years.

Need of back years' records

If the gas company, not having previously kept a register of industrial plant, proposed to commence the use of such a register as from, say, the 1st January, 1911, the ledger balance of the capital outlay accounts standing in the ordinary financial ledgers must be split up and roughly allocated between the various classes of industrial plant for record in the register. One of these classes will be gas meters, and, assuming that the ledger balances truly represent the unexpired capital outlay and can be correctly allocated to the different classes of industrial plant, the amount allocated to gas meters will be £450, in addition to £100, the cost of new meters prepared for use as from the 1st January, 1911. It might be hastily assumed that, as the meters have a life of ten years, this £450 should be written off to future annual revenue accounts in equal instalments of one-tenth over the next ten years; but this is not so, because, although the year 1911 will

it will be helpful to abstract roughly the past annual outlay on the purchase of plant, such as meters, for instance, for each of the nine years, 1902 to 1910, inclusive, being one year short of the whole-life period, and to write up a class record sheet covering this period, for otherwise it will be difficult equitably to distribute the unexpired capital outlay as depreciation to the revenue accounts of subsequent years.

Apparent difficulty in the case of some established undertakings

An apparent difficulty in the way of measurement of annual depreciation by the use of a register of industrial plant, in the case of some established undertakings, may arise from its being found that the amount of the ledger balance of capital outlay on industrial plant, which also appears year by year on the assets side of the balance sheet as the value of this asset, is much greater than can fairly be allocated to the various existing classes of industrial plant, if these are valued at anything like a reasonable sum. This state of affairs has probably arisen from the fact that in former years the amounts charged against revenue receipts to answer annual depreciation have been inadequate, with the result that the balance of capital outlay on industrial plant has gradually accumulated to an altogether excessive amount. In such cases, the difference between the estimated actual value of the existing industrial plant and the balance of the capital outlay on industrial plant appearing in the financial books should be transferred in the books to a goodwill, establishment, or suspense account, which may be gradually reduced in future years by being written down out of profits. It may not in all cases be necessary to disclose these book entries on the face of the published balance sheet, this being a

question of policy to be considered in the circumstances of each particular case. In any event, it is evident that such a condition of affairs is no bar to the adoption at any time of a plan for the systematic measurement and provision of depreciation on any industrial plant.

Method of revising estimates of life periods and scrap values

It has been pointed out in the previous chapter that the written estimates of the two unknown factors relating to the depreciation of each class of industrial plant must be revised whenever current knowledge and experience show that revision is needed, and an illustration of the manner of doing this is given below with the aid of a specimen "class record." In this illustration, both the length of the period of useful life and the scrap value have been revised after a lapse of five years from the start.

Illustration of this method

For the purposes of the illustration (*see* class record on page 107), the sums spent on new boilers each year are assumed to be as under—

	Outlay.	Estimated usable value.	Estimated scrap value.
	£	£	£
1909 . .	2,020	2,000	20, afterwards adjusted.
1910 . .	1,010	1,000	10 ,, ,,
1911 . .	1,515	1,500	15 ,, ,,
1912 . .	505	500	5 ,, ,,
1913 . .	nil	nil	
	Estimates are revised as from the end of five years from the 1st January, 1909.		
1914 . .	1,000	900	100
1915 . .	500	450	50
1916 . .	800	720	80

The life of the boilers was originally estimated at ten years, and the scrap value at about 1 per cent. of the cost, and the measurement of depreciation

proceeded on this basis up to and including the year 1913. It is assumed that in the course of the year 1914 the engineers found that it would pay to scrap the boilers of this class after they had been in use for eight years, instead of ten as originally estimated, and that they could then be disposed of at a sum equal to about 10 per cent. of their original cost. The engineers in charge of this plant accordingly caused to be altered in the class record the written estimates of the life period and of the scrap value under date the 21st December, 1914. It will be seen on reference to the class record on page 107 that when, after the close of the year 1914, the accountants proceed to measure the depreciation for that year, due effect is given to the altered estimates by drawing a line under the columns containing the records computed on the old estimates to the end of 1913, and proceeding, then, to compute and note the fraction of the surviving usable value which, according to the new estimate, must in future years be written off each of the annual columns containing unexpired capital outlay. They then re-state in each column the scrap value appertaining to each former year's outlay, according to the new estimate, and also the usable value, and proceed to deduct the depreciation for 1914, measured on the new basis.

The fractions of the surviving usable value to be written off in future years, shown in the illustration, are arrived at as follows: By the end of the year 1913, four and a half years' depreciation had been written off the boilers which were brought into use in the course of 1909, and, therefore, when the estimates were altered in the year 1914, there would

remain three and a half years of the new estimate of eight years' life within which to write off the balance of the then surviving usable value. By deducting £202, the new estimate of the scrap value of the 1909 outlay, from £1,120, the balance of the 1909 column at the end of the previous year, the surviving usable value is found to be £918. It will, therefore, be necessary in future years to write off two-sevenths of this usable value in order to reduce the balance of the 1909 column to an amount equal to the estimated scrap value at the end of three and a half years. The other fractions—two-ninths, two-elevenths, and so on—are determined by the same process of reasoning. It will be seen that, after the new computations have once been made and noted on the class record, it is merely a question in future years of repeating the deductions from each column. The final deduction for depreciation in each column represents one half year's depreciation only for the reason that for the year in which the plant was constructed the first deduction was in each case for half a year only. The remainder, shown at the foot of each column, represents, roughly, the scrap value according to the amended estimate. An amount equal to the scrap value of any exhausted plant will, in the financial books each year, be transferred from the debit of capital outlay account to the debit of scrap account, the exhausted column being at the same time ruled off each year in each class record in the register of industrial plant.

Simplicity of method

To the casual observer it may appear that the treatment of this class record is too complicated to be practicable, but a little study of the matter will show

BOILERS *Life period*, 10 *years*, *altered to* 8 *years* 21 12 14 *Scrap value*, 1 *per cent*, *altered to* 10 *per cent.* 21 12 14 £4.

	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.
	£	£	£	£		£	£	£	£	£	£
Scrap value	20										
Usable value	2,000										
1909	100										
		10									
1910	1,920	1,000									
	200	50									
			15								
1911	1,720	960	1,500								
	200	100	75								
				5							
1912	1,520	860	1,440	500							
	200	100	150	25							
	1,320	760	1,290	480	—						
1913	200	100	150	50	—						
	1,120	660	1,140	430	—						
Write off usable value	2/7ths	2/9ths	2/11ths	2/13ths	2/15ths	1/8th					
Scrap value	202	101	151	51	—	100					
Usable value	918	559	989	379	—	900					
1914	262	124	180	58	—	56	= £680, being depreciation on boilers for 1914				
							50	on amended estimates.			
	858	536	960	372	—	944	450				
1915	262	124	180	58	—	112	28				
								80			
	596	412	780	314	—	832	472	720			
1916	262	124	180	58	—	112	56	45			
	334	288	600	256	—	720	416	755			
1917	131	124	180	58	—	112	56	90	etc.		
	203	164	420	198	—	608	360	665			
1918		62	180	58	—	112	56	90			
		102	240	140	—	496	304	575			
1919			90	58	—	112	56	90			
			150	82	—	384	248	485			
1920				29	—	112	56	90		etc.	
				53	—	272	192	395			
1921					—	112	56	90			
						160	136	305			
1922						56	56	90			
						104	80	215			

that it is really exceedingly simple, and merely requires the most ordinary clerical attention. It should be remembered that the class record set out above is an important and necessary statement of account relating to capital outlay on boilers, amounting to upwards of £7,000, incurred in the course of eight years, and covering a period of working of no less than fourteen years, so that the detail cannot be considered excessive.

Use of remainders in building new plant

It often happens, in the case of railway and other undertakings, that at the end of the useful life of some class of plant, such as railway passenger coaches, for instance, certain parts are detached and used in the construction of new plant: thus the old wheels may be re-tyred and used in building a new class of horse-boxes, and so on. In all such cases, directly the probability of this is foreseen, the intention should be noted in the register of plant as affecting the remainder, or scrap value, of the particular class; and when the transfer of the parts takes place, the transfer value must be deducted in the register from the outlay on the old class and added to the outlay on the new class, for which a fresh class record sheet will be opened.

Accidental destruction of plant

In case of destruction of industrial plant by fire or other accident, the unexpired book value of the plant destroyed must be deducted from the particular class record in the register of plant, and entries made in the ordinary financial ledgers in such a way as to relieve the capital outlay accounts by charging the value so destroyed to a suitable heading of expense.

Outlay on plant at intervals during life period

It is sometimes known in advance that further substantial outlay will be incurred, as a matter of course, on certain classes of industrial plant at

intervals, in order to keep the plant efficient during the useful life period. In such cases, the total amount of this further outlay may be estimated and recorded in the register under the year the plant is originally acquired, in order to provide a fair and regular depreciation charge against each year's revenue in return for efficient service. Any such entries in the register of plant must be also recorded in the ordinary financial ledgers, by debiting the capital outlay accounts and crediting a reserve for future capital outlay. As and when the outlays actually take place, the reserve account in the financial books will be debited with the cost, instead of the capital outlay accounts being debited with it, and any difference between the reserve and the actual outlays must be afterwards adjusted.

Treatment of proceeds of sales of scrap

The proceeds of sales of remainder and scrap should be credited in the ordinary financial ledgers to a remainder and scrap account, and the scrap values as originally estimated and recorded in the register of plant should, as the plant goes out of use, be debited to this account and credited to the capital outlay accounts. The amounts at the same time are eliminated by ruling off the columns in the register of plant, so that the amount remaining in the register of plant will always agree with the balance of the capital outlay accounts in the ordinary financial ledgers.

Adaptable nature of register

To illustrate the adaptable nature of the register, suppose the cost of a railway station buildings to have been originally £5,000, and to be recorded in the register with others of a group of stations having an estimated efficient life of fifty years. At the end of thirty years the station is partially pulled down and a new one built, the new expenditure being double

the cost of the original station, or £10,000. It will be possible to say, definitely, that £3,000 has been taken out of revenue receipts during the thirty years for expired outlay on the original station, the life of which was estimated at fifty years. It may then be determined either to write off the remaining £2,000, in whole or in part, over the next few years, or to add it to the £10,000 new expenditure, and immediately thereafter revenue account will begin to contribute annually to the reduction of the new total of £12,000. Again, if a railway company decides to reconstruct and greatly enlarge a terminal station, and the total reconstruction and enlargement costs £200,000, it may be determined that, taking all known facts and probabilities into consideration, the efficient life of the station shall be estimated at one hundred years. This will involve, in addition to dealing with any balance of cost of the original station, the charging to revenue account of an annual sum of £2,000; or, if it is determined that the efficient life shall be declared at fifty years, then £4,000 per annum will be charged to revenue account, and will become part of the operative expense of maintenance under the head of depreciation, the operative expense also including the cost of all structural and other repairs, which will be charged to maintenance under the head of repairs in the years they are incurred. In the case of extensive repairs, such as the repainting of the ironwork, the cost may, if desired, be treated as capital outlay and recorded in the register of plant and spread over the ten or twelve years, or other period, over which the benefit is expected to extend. The charging of £2,000 or £4,000 per annum to revenue

is, of course, not intended to represent the annual value of the station, but only to provide for the inevitable decay of the structure, which forms part of the operative expense of the undertaking, whether so recorded or not.

Sectional registers of plant for large undertakings

Railway companies and other undertakings with large amounts of capital invested in industrial plant would do well to install and use a system of registers of plant. In the case of a railway company, for instance, it would probably be desirable to divide the area served by the company into suitable sections, and a separate register of plant would be kept at a convenient point within each section. At the end of each year, when the sectional registers were completely written up, a summary of each would be sent to the chief accountant, who would have the figures tabulated and thus obtain the total amount of depreciation to be charged against the year. The tabulation would show whether the volume of unexpired capital outlay at the end of the year was greater or less than at the beginning of the year. The whole of the figures would be based on recorded estimates of lengths of lives contained in the registers of plant, all these estimates being kept revised up to date by those who are in actual contact with the plant, and who, therefore, possess the best obtainable expert knowledge of its condition and outlook.

Schedule of expenditures to be charged as capital outlay

The particular office within each section for keeping the sectional register of plant would be that at which the expenditure on materials and wages within the area of the section is recorded and dealt with; and to avoid the danger of outlays on small and partial renewals in the nature of repairs being treated as

capital outlay instead of being charged under the head of repairs, an official schedule should be prepared containing descriptive particulars of all expenditures which are to be charged as capital outlay, which schedule will be added to and varied, but only under proper authority, as fresh questions arise from time to time. All expenditures not clearly defined in this official schedule as being capital outlay would be charged under the head of repairs to the annual revenue account of the year in which they are incurred. This official schedule of particulars of capital outlay would, of course, be identical for each section, and would be settled and kept up to date under the joint control of the Engineers' and Accountants' Departments.

Gigantic capital outlay on plant

For the purpose of starting the sectional registers of plant, it would be necessary to split up and allocate, under suitable headings for each section, the total amount of capital outlay appearing in the accounts as the unexpired value of plant, etc. That this preliminary work would in some cases be a gigantic undertaking is well illustrated by reference to a balance sheet of one of our British railway companies, showing unexpired capital outlay on plant as set out on the next page. All this outlay, except only the cost of the land, is represented by nothing but wasting assets.

Deducting from this outlay of one hundred and fourteen million pounds the accumulated depreciation and reserve funds about three and a quarter million pounds and the balance of premiums received on issues of shares about ten million pounds, there remains upwards of one hundred million pounds. It is almost

	£	£
Lines open for traffic		86,069,825
,, not open for traffic		424,435
,, leased		6,042
,, jointly owned		6,517,822
,, ,, leased		196,983
Rolling Stock		13,183,202
Manufacturing and Repairing Works and Plant—		
Land and Buildings	1,782,995	
Plant and Machinery	1,705,042	3,488,037
Steam Boats		876,038
,, Boat Repairing Works and Plant		126,242
Canals		892,215
Docks, Harbours, and Wharves		1,480,540
Hotels		497,279
Electric Power Stations		769,390
		£114,528,050

as difficult for the mind used to the ordinary standards of expenditure to grasp the meaning of one hundred million pounds as it is for the mind used to the ordinary standards of distance to grasp the meaning of distances in space. It would, however, be interesting to endeavour to ascertain whether the original cost of the land, plus the unexpired capital outlay (going-concern value) of the now existing plant and leaseholds, would amount to anything like one hundred million pounds.

Gradual development of registers of plant

The splitting up and allocation under suitable heads of the old capital outlay on plant in the case of an established undertaking must, of course, be approximate; but such an analysis, even if incomplete, would be of the utmost value as compared with the alternative of total absence of information. The first allocations may be rough, but, however approximate these may be, it will be found that the registers can be gradually developed, extended, and improved in a remarkable manner; and the result will be to place

the future finance of the undertaking on a sound basis by enabling the annual cost of working and the annual profits to be correctly computed, and the balance of unexpired capital outlay shown on the annual balance sheet kept in proper agreement with the then going-concern value of the plant according to the present opinions of those responsible and best able to judge. Having once allocated the total unexpired capital outlay to the several heads in the various sectional registers, all further capital outlay each year would be recorded and dealt with in the registers of plant without any difficulty in accordance with the official schedules showing the various descriptions of outlay to be treated as capital outlay. A record of this kind is a necessity, however great the preliminary difficulties may be, because it is of as much importance to charge, on a regular plan, the year's expired capital outlay as it is to charge other working expenses, such as wages, against the revenue of the year. Unless capital outlay is accounted for year by year as it expires, it is impossible to ascertain the cost of carrying on an undertaking, or the profit or loss resulting therefrom.

Explanations and illustrations are incomplete

The explanations and illustrations set out in this chapter of the method of using the register of industrial plant, although detailed, are altogether incomplete ; but the principles laid down are most important. All capital outlay on industrial plant should be currently accounted for, as it expires year by year, on a recorded basis, coinciding as closely as possible with the actual course of current events. For this purpose, a subsidiary accounting equipment, in the form of the proposed register of industrial plant, is needed, and will be found capable of endless adaptation to every

conceivable condition which can arise; and, if the general nature of the proposals have been here sufficiently set forth, engineers and accountants will themselves best be able to adapt and develop them for practical use.

CHAPTER VIII

NATURAL RAW MATERIAL AND RECURRING CROPS

Description of wasting assets under this head

ANOTHER important division of wasting assets includes the mass, or source, of any natural raw material, such as bodies of coal and all kinds of minerals, deposits of slate, stone, gravel, earths, oil, and nitrate; also timber, and all growing plants yielding recurring crops, such as tea and rubber. All capital outlay on main shafts, main adits, shafts which develop ore, and other underground developments, also falls conveniently under this head of wasting assets, as also does the capital outlay on clearing, planting, developing, and weeding estates yielding recurring crops.

Extent of capital outlay on natural raw material and recurring crops

A large amount of capital is invested each year in undertakings owning wasting assets of the kind dealt with in this chapter. A supplement to *The Economist*, issued each year, shows the amount of fresh capital applied for by prospectus in the English market connected with such undertakings, which in two pre-war years was as under—

	£	£
Mines.	8,122,100	7,392,600
Oil	1,918,200	9,466,400
Rubber	5,924,200	19,143,800
Estate and Land . .	3,589,400	5,169,900
	£19,553,900	£41,172,700

The greater part of all this capital will be laid out in the purchase of natural raw material, or in the cost of planting and developing estates to yield

recurring crops, and the lives of all such classes of property are finite.

All are payments made in advance on revenue account

The payments made for the purchase of all this property are, without exception, payments made in advance on revenue account. The property is in each case wholly dedicated to the purpose of earning profits or increase. It is not intended for re-sale in its existing form, and, therefore, as has been already pointed out in the chapter on "Depreciation," subsequent market fluctuations, due to the operation of the law of supply and demand, cannot affect the question of the annual amount of depreciation necessary to be provided out of the revenue receipts of each year to replace the expired outlay or cost of this perishable property.

Depreciation and natural raw material

In measuring the annual depreciation of the mass or source of natural raw material and land intended for sale, the chief factor to be taken into consideration is the proportion which the volume exhausted by being won, and thereafter assuming the same character as stock in hand for sale—or, in the case of land, exhausted by being actually sold—in each year, bears to the whole volume according to the latest estimates. It should be noted that the factors of expiration of time, natural decay, wear and tear, and obsolescence, which are so prominent in considering the question of depreciation of industrial plant, are absent here; for, in the case of the mass or source of natural raw material and of land intended for sale, the only question for consideration is the proportion which the annual depletion of the mass bears to the whole mass (known or estimated) which originally represented the capital outlay.

Depreciation and recurring crops

In determining the annual amount of expired capital outlay (depreciation) to be taken back out of each year's revenue receipts, in the case of recurring crops, such as tea and rubber plantations, many questions of difficulty will arise. It is, however, clear that the benefit of all outlay incurred in securing planted and developed estates, except only the cost of the land, is temporary and finite; and, therefore, before profit can be claimed, each year's revenue account which receives any part of that finite benefit must be made to contribute something towards the cost of producing every unit of quantity, either weight or measurement, the proceeds or value of which is brought to credit of the revenue account. This annual contribution must be charged against revenue receipts quite independently of the results of each year's trading, which may be either good or bad; and the regularity of the provision should be secured by the use of a carefully prepared scheme, drawn up to suit the circumstances of each case, and capable of future adjustment to any altered conditions which may develop in the future. The important point is to secure the regular provision of an annual sum out of revenue receipts upon a settled basis. If the amount is at first wrongly estimated, the rates can be easily adjusted at a later date.

Depreciation factors to be considered

In preparing such a scheme, it should be borne in mind that the outlay on planting and developing estates of all kinds falls under several heads, each having, perhaps, a varying degree of permanence. The original cost of clearing jungle land, and draining and road making, for instance, may in some cases be considered of so permanent a nature as to entitle

it to be placed in the same category as the site value of the land, so that, therefore, no provision for expired capital outlay need be taken back out of the revenue receipts of each year; but this is at best a doubtful policy. The cost of planting, and of weeding, and of tending the young plants until they reach maturity, including a proper proportion of supervision and administration expenses, is of a less permanent nature, and should generally be dealt with separately. The provision should, in each case, be made by fixing a sum to be charged against the revenue receipts in respect of each unit of quantity, the value of which is brought to the credit of each annual revenue account. Unless this is done, the economic cost of producing the product will be understated in the revenue account. The policy of charging against annual revenue the cost of up-keep and replanting, only when it is incurred, does not overcome the difficulty that the economic cost of the product will be understated in the earlier years, and probably also in many subsequent years during the currency of the undertakings. The most convenient method of accounting for capital outlay of this kind is to divide it into classes, and record it in a register in the same form as the register of industrial plant explained in the previous chapter. The register would be called " Register of Wasting Assets."

Depreciation and collieries, mines, etc.

It is obviously impossible to determine with accuracy the proportion which the annual waste taking place in the property of collieries, mines, etc., bears to the total cost of such property. It is, however, always possible to obtain sufficient data to fix the value of such property for selling purposes: and this is generally

done by means of estimates of the total number of tons of ore contained in the mines, the assay value per ton, and the cost per ton of raising, smelting, and marketing, from which data a capital value is fixed, which is considered by the purchasers safe and sound enough to justify them in risking their capital in the venture. This subject is fully discussed in Chapter XV.

Wasting assets dealt with in this chapter all come to an end in yielding their product

It should be possible, therefore, in the case of every undertaking with capital invested in property falling under the heads dealt with in this chapter, to lay down a definite policy on some settled basis to enable a regular charge to be made to the annual revenue accounts to answer that part of the cost of obtaining the annual revenue which is represented by the depreciation (expired capital outlay) of the property. The property in every case will come to an end in yielding its product, and, therefore, each annual revenue account, containing revenue produced by the sale of that product, must be charged with a proportion of the cost of the property before there can be any profit for the year.

Inconvenience of repaying capital in the form of ordinary dividends

Doubtless undertakings with capital invested in wasting assets of this description have hitherto been looked upon as being on a different footing from other kinds of commercial enterprise, and shareholders in such companies, as a rule, prefer to take their proportion of the surplus receipts in the form of dividends, and make their own allowance for depreciation; but this is a dangerous state of affairs which science should be able to remedy. The practice of including, without distinction, capital and income in the annual dividends paid to shareholders is becoming increasingly inconvenient, and the custom is probably largely

responsible for the long-continued failure of the Income Tax Authorities, when assessing income tax on such undertakings, to allow deduction from the annual revenue receipts of the necessary provision for wasted capital, with the result that income tax is paid by this class of undertaking on capital as well as on profits.

A remedy for concealed reduction of capital, and an example

A remedy for the present unsatisfactory state of affairs would be to issue redeemable preference shares under Section 46 of the Companies Act, 1929, to enable the undertaking gradually to repay capital to the shareholders by annual instalments, which might be paid together with the annual dividends representing profit, and shareholders would thus receive the same distribution as at present, but accompanied by a statement showing how much of the distribution was attributable to capital and how much to income. Otherwise the English law does not recognise the right of any joint stock company to reduce its share capital without, on each occasion, going through a number of formalities, and then obtaining the formal sanction of the Court to this. But in undertakings of this kind the capital outlay representing the share capital is, in fact, reduced every year, because each annual dividend paid to shareholders consists in part, and sometimes wholly consists, of capital outlay refunded, although it purports to be profit. The result is that a company owning a mine orginally costing, say, £200,000, which in due course has been completely worked out, having in the meantime returned, say, £300,000 to shareholders in dividends, will still show in its accounts a share capital of £200,000, although the value of the capital outlay is, in fact, *nil*, having wholly expired.

Illustration of proposed remedy

A great improvement would be effected over the present unsatisfactory method of treating the accounts of mining and kindred companies if the annual published accounts were so drawn as to show, in each case, how much of each year's surplus of receipts over working expenses—which it is proposed to pay away as dividend—is estimated to be capital, and how much is income, and the details might be stated under the following heads—

Cost of ore raised and sold.

NOTE.—If the mine had been purchased on an estimated capacity of 1,000,000 tons, and the vendor was paid £200,000, or 4s. a ton, as purchase consideration, then, if 100,000 tons had been raised during the year, £20,000 might be treated as a return of capital to answer expired capital outlay.

Depreciation of shafts, adits, and underground developments.

Balance, being profit.

At present, the amount paid away as dividend includes not only the balance of profit, but also the other two items, except to the extent of any annual provision which may have been made for development redemption.

Present "case" law allows concealed reduction of capital

The apparent illegality of this concealed reduction of capital has been remedied by the unsatisfactory decisions in the cases referred to at the end of the chapter on "Economic Cost." In these cases, it has been held that what is known as "fixed capital" may be legally sunk and lost, and yet the excess of current receipts over current payments may be divided, and this is what usually happens in a case such as the one given in the preceding paragraph.

Depreciation and mine development

Main shafts, main adits, shafts which develop ore, and other underground developments, fall strictly

under the head of "Industrial Plant"; but for the purpose of measuring annual depreciation thereon, this kind of property should be treated separately, because the outlay should be gradually refunded out of revenue receipts in the proportion which the quantity of the product won each year bears to the estimated total quantity to which access is expected to be gained by such works.

Accounting equipment for recording depreciation

The accounting for capital outlay of the character dealt with in this chapter is comparatively simple; but it is important in each case to keep constant watch upon the development of all property of this nature, and to alter the original estimates of volume or capacity whenever this is needed, owing either to fresh discoveries or to other cause. Additional capital outlay will, doubtless, be incurred from year to year on many of these wasting assets, such as recurring crops, and works undertaken to develop ore; and, therefore, it will probably be found convenient to measure the annual depreciation by means of a subsidiary accounting equipment similar in design to the register of industrial plant, the working of which has been fully explained in the preceding chapter. Such a register can be adapted to all possible conditions, and has the advantage of showing clearly, at any time, the proportion of outlay incurred, in any year, under any head, which has, up to then, been refunded out of revenue receipts. This is practically impossible if the whole of the records are kept in ledger accounts in the ordinary financial books. The register is subsidiary to the capital outlay accounts as recorded in the financial books, and the figures therein should be periodically agreed with the balances of these accounts.

CHAPTER IX

PURCHASED TERMINABLE ANNUITIES

Nature of purchased terminable annuities

PURCHASED terminable annuities form a division of wasting assets. They usually run either for a life or for a fixed number of years. Life annuities are the most common form, but annuities extending over a fixed number of years are occasionally purchased, generally in connection with the carrying out of some financial arrangement. A fixed term exceeding twenty years is rare. Before the war the rate of interest usually allowed was 3 per cent. to $3\frac{1}{2}$ per cent. per annum.

Loans repayable with interest in equal annual payments

The purchaser of an annuity of either kind enters into a transaction, the effect of which is that he lends money at interest to the grantor of the annuity on the terms that the principal sum is to be repaid to him, together with interest thereon, in equal annual payments. Each annual payment contains both principal and interest, and, therefore, the unexpired capital outlay representing the present value of the annuity diminishes as each annual payment is received.

Illustration of meaning of present value of an annuity

This will be made clearer by a simple illustration. Taking the value of money at 4 per cent. per annum, the present value of an annuity of £100 for three years is £277·51. This present value is built up by adding together a number of units, each of which units represents the present value of one future year's instalment as on next page.

The sum of the present value, amounting to £277·51, plus the sum of the interest from the present date.

	Instalments of Annuity. 1st year.	2nd year.	3rd year.	Int.	*Total*
Present value of £100 instalments	96·15	92·46	88·90	=	277·51
One year's interest at 4 per cent. for 1st year	3·85	3·69	3·56	= 11·10	
	£100	96·15	92·46		
One year's interest at 4 per cent. for 2nd year	—	3·85	3·69	= 7·54	
		£100	96·15		
One year's interest at 4 per cent. for 3rd year	—	—	3·85	= 3·85	
					22·49
			£100		£300

with yearly rests, to the date when each instalment of £100 becomes due, amounting to £22·49, equals £300, being the sum of the annual instalments.

Illustration of annuity certain

The following table shows the amount of interest and repayment of principal contained in each

TABLE SHOWING REPAYMENT

of £100,000, with 3 per cent. interest, in ten years, by equal instalments of principal and interest combined : Annual instalment = £11,723.

Year.	3 per cent. interest.	Repayment of principal.	Principal outstanding.
	£	£	£
1	3,000	8,723	91,277
2	2,738	8,985	82,292
3	2,469	9,254	73,038
4	2,191	9,532	63,506
5	1,905	9,818	53,688
6	1,611	10,112	43,567
7	1,307	10,416	33,160
8	995	10,728	22,432
9	673	11,050	11,382
10	341	11,382	—
	£17,230	£100,000	

payment of an annuity certain for ten years, interest being at the rate of 3 per cent. per annum. The purchase consideration is £100,000, and the annual instalment received in the form of an annuity is £11,723.

Illustration of life annuity

The following table shows the amount of interest and repayment of principal contained in each payment of a life annuity, calculated by the Om 3 per cent. table. In the table below it is necessary to introduce an additional column showing the gain in the event of survival, this gain being equivalent to the loss sustained in those cases where death occurs during the year. In the case assumed, the purchase consideration for the annuity of £26,021 on a healthy life aged 80 is £100,000.

TABLE SHOWING REPAYMENT

of £100,000 invested in an annuity on a healthy life aged 80.

Amount of annuity (by O^{M} 3 per cent. table) = £26,021.

Year.	3 per cent. interest.	Repayment of principal.	Balance of principal.	[1] Gain in the event of survival.	Value immediately after payment of annuity.
	£	£	£	£	£
1	3,000	23,021	76,979	16,567	93,546
2	2,806	23,215	70,331	16,995	87,326
3	2,620	23,401	63,925	17,442	81,367
4	2,441	23,580	57,787	17,856	75,643
5	2,269	23,752	51,891	18,288	70,179
6	2,105	23,916	46,263	18,738	65,001
7	1,950	24,071	40,930	19,100	60,030
8	1,801	24,220	35,810	19,537	55,347
9	1,660	24,361	30,986	19,911	50,897
10	1,527	24,494	26,403	20,279	46,682

[1] In a group of such cases, this gain, in the event of survival, would (if the mortality actually experienced agreed with the O^{M} table) be exactly counterbalanced by the corresponding loss in those cases where death occurred during the year.

Factors in annuity can be easily separated

From the above illustrations it will be seen that the sums received annually from purchased terminable annuities are not income, but that each payment consists partly of capital and partly of income, and that whenever it becomes necessary, for any purpose, the two factors can be easily separated. The circumstance that a person in receipt of an annuity may, and perhaps usually does, elect to expend the whole of the amount of the annuity does not affect its character in any way, or alter the economic fact that the annuitant is expending both his capital and his income together.

Interest factor diminishes annually

It will be noticed that the interest factor contained in each annual payment, whether from an annuity certain or from a life annuity, is not a constant annual sum, but diminishes year by year. This is, of course, owing to the nature of the annuity contract, which is a specific agreement under which a certain sum of money is advanced in consideration of its being repaid in instalments within an agreed time, either fixed or ascertainable by average, together with interest on the diminishing amount of principal remaining from time to time outstanding.

CHAPTER X

PURCHASED TERMINABLE CONCESSIONS LEASEHOLDS

Inherently wasting assets and other wasting assets

IT has already been pointed out, in the chapter on "Wasting Assets," that wasting assets falling under the first four heads (*a*) to (*d*) there set out may be described as inherently wasting assets, being represented by a corpus, or fund (apart from the value of mere terminable rights to future pure profits or increase), which wastes in the process of seeking profits; and, on the other hand, that wasting assets falling under the remaining five heads (*e*) to (*i*) (which will be considered in this and the following chapters) are not represented by a corpus, or fund, apart from the value of terminable rights to future profits, increase of value, or advantage, and are, therefore, not inherently wasting assets. This economic difference should be borne in mind, as it is important, especially in connection with an income tax assessable upon annual income arising annually. An exception to the rule in the case of certain kinds of leasehold property is referred to later in this chapter.

Value of concessions and leaseholds consists of rights to future pure profits

Purchased terminable concessions and leaseholds are like wasting assets, and they are akin to each other to the extent that, subject to the already mentioned exception in the case of certain kinds of leasehold property, their values, based on unexpired cost, will be found to consist exclusively of rights to receive and enjoy profits, increase of value, or advantage expected to arise in future years. The consideration

Note.—The subject-matter of this and the next chapter is fully dealt with in the Author's work entitled *Commercial Goodwill: Its History, Value, and Treatment in Accounts*, by the same publishers.

paid for purchased terminable concessions, and also for ordinary leaseholds, therefore, may be accurately defined as payments to the grantor or lessor in advance, under discount, of future pure profits, increase of value or advantage expected to arise.

Purchased terminable concessions

A common case of purchased terminable concessions is that of a public authority owning the right to carry on some description of public trading enterprise in the nature of a monopoly, such as electricity supply, which is expected to yield annual profits, on the amount of capital required, larger than the profits usually sufficient to attract capital to an enterprise of that description. In such a case the public authority may either itself raise the capital and endeavour to secure the benefit of the large super-profit which should remain after paying the comparatively low rate of interest at which such public authorities should be able to borrow, applying any surplus to the relief of the rates, or it may sell the valuable monopoly for a term of years to men of business, who will form a company to construct and work the undertaking.

Consideration is future pure profit, paid in advance of its arising

The consideration payable for such a concession is sometimes a very large sum, and it is important to notice that, whatever form the consideration takes, its present value really represents a payment made in advance on account of pure annual profits expected to arise out of the undertaking in the future. It represents, in fact, that part of the whole expected profit which is super-profit, in the sense that it still leaves sufficient expected profit remaining to attract the co-operation of men of business and capitalists to the enterprise.

Illustration of purchased terminable concession

To illustrate the nature of a purchased terminable concession, the case may be taken of a concession, granted by a municipality to a company, to construct and work an electricity supply undertaking for a term of thirty years, at the end of which time the undertaking comprising all the plant is to be handed over, free of cost, to the municipality in good working order. Such terms introduce an undesirable element of speculation, but suppose the estimated value of the undertaking in good working order at the end of the time is likely to be £100,000, being the estimated value of the "aged" plant in an average efficient working condition.

Annual provision for expired capital outlay

If the company, having obtained such a concession, is soundly financed, it must provide out of its annual revenue receipts during the thirty years a sum which will amount to £100,000, being the estimated value of the consideration payable at the end of thirty years, in addition to making full annual provision out of revenue receipts for depreciation of plant, before any balance of annual profit will be properly available for distribution as dividend on its shares. In this case the company has entered into an arrangement the effect of which is that it divides the future profit with the municipality to the extent of consideration having a value at the end of thirty years estimated to amount to £100,000.

Capital should be raised in suitable form

Prior to the inception of such an undertaking and of every undertaking with a fixed capital to be invested in wasting assets, the question should be carefully considered as to how much of the capital employed should be raised in a form which can be gradually repaid by annual drawings or otherwise. When the

wasting assets to be acquired include mines, for instance, or when they include anything in the nature of goodwill, it is clear that the amount of the future annual provision, which should be retained out of revenue to answer expired capital outlay, ought not to be required for re-investment in the undertaking, and, therefore, should be used for repaying the capital. Yet these considerations are too often disregarded, and no attempt is made to fit the form in which the capital is raised to the future requirements of the undertaking in the interests of sound finance. This subject is one which offers an attractive and almost unexplored field for systematic investigation.

Suppose in the case of this electricity supply undertaking that the capital required is £150,000, of which sum £100,000 will be sunk in the cost of the plant and the balance of £50,000 used for working capital. Now, the question is, in what form can this £150,000 of capital be most suitably raised in order to provide convenient facilities for the sound financing of this concern, which has agreed to hand over all the plant estimated to be worth £100,000, free of cost, to the municipality, in good working order, at the end of thirty years?

The first point to bear in mind is that, after the transfer of the consideration at the end of thirty years, the value of the original capital investment of £150,000 will, as far as the company is concerned, have been reduced to £50,000 only, representing the working capital, because the remainder was invested in the cost of the plant which is to be handed over free to the municipality. Therefore

provision must be made in the meantime either to accumulate a sum of £100,000 in cash or securities by the end of the period, in order to enable the capital to be paid off in full at that time, or else gradually to repay, by a scheme of annual drawings, that part of the capital which is represented by the sum of £100,000 invested in plant.

Debentures bearing high rate of interest

It is evidently desirable in this case that not less than £100,000 of the capital should be issued in a form which provides easy facilities for repayment by annual drawings, and this can be done either as redeemable preference shares of by the issue of debentures. Suppose, then, that the capital is raised in the form of £100,000 10 per cent. cumulative debentures to be paid off at par by annual drawings during the thirty years, and £50,000 in the form of shares of £1 each. If considered desirable, it might be provided that the allottee of each £1 share should be entitled to subscribe for and be allotted £2 in 10 per cent. debentures. Suppose, then, for the sake of illustration, that the annual surplus of revenue receipts in future years is on an average £20,000, this should be applied as follows—

	£
Depreciation (say).	4,000
Provision for repayment of debentures on the distributed sinking fund system	608
Interest at 10% on £100,000 cumulative debentures.	10,000
Profit available for dividend on share capital . .	5,392
	£20,000

The undertaking of electricity supply is a risky one, and there is nothing to prevent the issue of debentures bearing a high rate of interest.

By setting aside out of revenue the annual sum

of £608 (shown above as the provision for repayment of debentures), and investing this in outside securities, the sum of £100,000 would be accumulated in a sinking fund at the end of thirty years, if suitable securities yielding 10 per cent. per annum were available; but they are not. If, however, instead of investing in outside securities and accumulating the annual instalments in a sinking fund to be retained in the hands of the company, a like amount of money is used to repay the debentures by annual drawings, the result will be to secure an absolutely safe investment yielding 10 per cent. per annum, under a method which may be described as the "distributed" sinking fund method. The amount available each year for the reduction of the debentures by drawings would be the minimum sum of £608, plus an amount equal to the year's interest on the proportion of the debentures already repaid; and thus, together with the sum of the annual interest paid, an equal annual charge to revenue of £10,608 results, in respect of that part of the capital, amounting to £100,000, which is invested in plant, over the period of the concession, because as the interest paid each year on the balance of the outstanding debentures decreases, so does the amount equal to the annual interest on the proportion of the debentures repaid increase, and this latter sum is added to the amount of £608 representing the ordinary sinking fund instalment.

"Distributed" sinking fund method

It is important to notice that, assuming equally capable management and other equal economic conditions, the annual surplus of revenue receipts of the undertaking would be £20,000, whether it be carried on by the municipality or by a company acquiring

and working the concession. Of this £20,000, £16,000 is pure annual profit; and by a sound system of finance the whole of the annual profits, save the sum of £608 for the annual sinking fund instalment, goes to the holders of debentures and shares, while at the same time the capital value is fully maintained.

Legal facilities needed to enable surplus share capital to be repaid to shareholders

It often happens in carrying on an undertaking, and especially a terminating undertaking, as in the case set out above, that a large amount of the capital originally required and invested for the purposes of the business becomes gradually released during the period of carrying on the business, and is not likely to be required again. In such cases, some regular means should be provided by law to enable a company gradually to repay capital sums to the shareholders by annual drawings or otherwise. As the English law stands at present, the only means of gradually repaying capital which is not needed appears to be for the shareholders to exchange their share holdings in the company for holdings represented by debentures, which may legally be repaid; but this is a clumsy method, and one which is rarely resorted to. This matter has been already referred to in the chapter on "Natural Raw Material," when discussing the financial treatment of mines and other terminating enterprises. There can be no doubt that the absence, until recent years, of legal facilities for repaying surplus capital strongly encouraged the payment to shareholders of the annual surplus revenue receipts as dividend, though in reality they consist not only of profit, but also of the proceeds of capital investments which are being gradually liquidated.

Leaseholds

The consideration paid for leasehold property is the

rent of future years paid in a lump sum in advance under discount by the lessee to the lessor; and, as time expires, therefore, the surviving exchangeable value of leasehold property, based on its unexpired cost, which is the only factor entering into commercial accounting, becomes less.

Repairs and maintenance at cost of lessee

When leasehold property is held under a grant in the common form, the consideration paid usually entitles the lessee to the use of the land and buildings for a fixed term of years, subject to his undertaking to repair and maintain the property at his cost during that term. The exchangeable value of such leasehold property at any time based on its unexpired cost is, therefore, represented wholly by rights to pure profit, increase of value, or advantage expected to arise in future years, and it is thus a wasting asset of a nature similar in this respect to that represented by purchased terminable concessions.

Repairs and maintenance at cost of lessor

Leasehold property is also held under a less common form of grant, which entitles the lessee to the free use for a fixed term of years of land and buildings, etc., which are, during the term, to be maintained and upheld by, and at the cost of, the lessor, in which case the consideration paid will include not only the net annual value of the property during the years of the term, but also a sum covering the estimated cost of repairs and maintenance during that term. In this case, therefore, the exchangeable value of the leasehold property, based on its unexpired cost, includes not only the right to the use and enjoyment of the premises during the term, but also the right to call for the performance, free of charge, of the necessary repairs and maintenance.

Importance of distinction between the two kinds of wasting assets

To the extent, therefore, that the value of such leasehold property, based on its unexpired cost, consists of rights to call for the free performance of such services, it represents an inherently wasting asset, and, in view of the importance of the distinction between the two kinds of wasting assets in the scheme under which British income tax is assessed on annual value, as it arises annually, at its source, it is worth noticing that this particular class of leasehold property appears to be the only kind of wasting asset which cannot be classified with precision, as belonging either to the class of inherently wasting assets (*see* chapter on " Wasting Assets ") or to that other class of wasting assets the value of which is represented wholly by rights to pure profit, increase of value, or advantage expected to arise in future years.

CHAPTER XI

COPYRIGHTS, PATENT RIGHTS, GOODWILL, TRADE-MARKS

Characteristics common to these wasting assets

ALL forms of exchangeable value represented by unexpired capital outlay on the purchase of copyrights, patent rights, goodwill, and trade-marks are wasting assets, and they have the common characteristics that their value arises out of work done in seeking profit, increase of value, or advantage which has not yet been fully realised. All capital outlay on property of this description is subject to depreciation due to expiration of time and obsolescence. Wasting assets of this nature are not inherently wasting assets, being represented only by mere rights to future profit, increase of value, or advantage expected to arise in future years.

Nature of their exchangeable value

Whenever monetary or other consideration passes from one party to another for the transfer of the ownership of this kind of property, the payment is in effect the carrying out of an agreement under which the purchaser pays in advance to the seller a share of a portion of the profits expected to arise in future years. These expected profits may or may not arise, but of this the purchaser takes the risk. It is important to observe that, except where property of this kind has been transferred from one person to another for valuable consideration, there is no capital outlay; and, therefore, there can be no expired capital outlay to be refunded out of future profits, except, perhaps, the actual cost of obtaining patent

Note.—The subject matter of this and the last preceding chapters is fully dealt with in the Author's work entitled *Commercial Goodwill; Its History, Value, and Treatment in Accounts*, by the same publishers.

rights or developing goodwill, which may have been charged in the accounts as capital outlay.

Expected future super-profits

The portion of the expected future profits which has exchangeable value is only that which may conveniently be called super-profits, that is, the amount by which the future profits is likely to exceed the sum needed to attract ability and capital to the enterprise. If the whole expected future profits is not more than sufficient to reward adequately the ability and capital needed to earn those profits, then no present exchangeable value can exist.

Provision for expired capital outlay

The obligation to make regular provision out of annual profits for expired capital outlay on property of this description is, if rightly considered, quite unaffected by the circumstance that, either at the time of purchase or at any subsequent date, the property may be worth more than the price paid for it. The question is not the present exchangeable value of the property, but the proportion of the capital outlay on the purchase of the wasting assets which has expired. If the wasting assets represented by the capital outlay are not permanent, then any enjoyment of the limited opportunity for their use in revenue earning must be paid for, because the wasting assets, be their value great or small, are concurrently becoming exhausted, and so are nearer their end, and the capital outlay thereon has by so much expired. In other words, the whole usable capacity (apart from monetary value) of wasting assets is represented by the capital outlay thereon, and the capital outlay expires simultaneously with the usable capacity, which must always be a decreasing quantity.

Copyrights

The author may elect to retain the copyright of his

works in his own hands, being content to receive the yearly income as it arises, instead of compromising the matter by parting with his rights to future profits in exchange for a present payment in cash or other consideration. The exchangeable value of a copyright (if any) exists equally, though it may never have passed from one to another by sale and purchase. But the financial position of the author-owner of a copyright is different from the financial position of the purchaser-owner to the extent that whereas the former may take and enjoy the whole of the annual profits arising from his work, the latter must first refund out of those annual profits the share which he has already paid in advance to the author, in the form of purchase consideration, for the copyright.

Patent rights

The inventor may elect himself to manufacture and sell the subject-matter to which his protected inventions apply; and in that case he may safely take and spend the whole annual profits arising, without reference to the facts that the limited term of the patent rights is expiring, and that competition, obsolescence, and other change, must inevitably destroy the demand at some future time. But the purchaser of patent rights, on the other hand, must have due regard to these facts, and must set aside out of his annual profits the estimated share which he has already paid in advance to the inventor. Subsequent fluctuations in the market value of an invention do not affect the obligation to refund, out of every hundred pounds of profits earned, the proportion which has already been paid in advance to the inventor. The proportion may be either large

or small, but the principle which necessitates some provision is clear.

Goodwill Trade-marks

It is said that the term "goodwill" has two meanings, which may be conveniently distinguished as personal and local goodwill. Personal goodwill is that interest which is sold along with a profession, and is transferable from one person to another by the recommendation of the seller, and his agreement not to compete with the buyer, as when a doctor or a dentist sells his practice. Local goodwill is the exchangeable value attaching to a particular business, at a particular place; or, as Lord Eldon defined it, "the chance that the old customers will resort to the old place" without the further advantage of personal stipulations with the seller, as in the sale of such a business as "The Railway Hotel" or "The Market Shop." Local goodwill of this description, however, forms part of the annual value of the premises, for though it may have been created by the personal ability and industry of the owner of the business, yet it vests in the person entitled to the occupation of the premises. Capital outlay on this kind of property is for this reason generally described as "leaseholds and goodwill." There is also another kind of goodwill, the value of which resides in the right to the use of well-known trade names, such as "Bass," "Guinness," "Dunlop"; and of trade-marks, such as the registered design of a hand or a plough. The value attaching to trade names and trade-marks is often very great.

Goodwill must be written off

The argument is sometimes used that goodwill can only be written off when its value undoubtedly exists; that is to say, when the profits of the particular

undertaking are so large that there is a balance over and above the amount needed for the ordinary reward of the ability and capital devoted to the business. But this is surely a misapprehension, unless, indeed, it can be shown clearly that the particular future super-profits, which have been already advanced to the seller in the price paid for the goodwill, were actually expected to arise, not at present, but at a later date from the work of the seller. The bargain has been made, and the expired capital outlay must be duly refunded out of future profits with the same certainty that the money paid for current expenses must be refunded out of revenue receipts if a correct statement of the owner's economic profit and loss is required.

Substituted exchangeable value is not a sound alternative

It cannot be too clearly stated that the obligation to refund, out of future profits, the expired capital outlay on goodwill is neither excused nor lessened by the fact that there may be fresh goodwill arising out of the exceptional ability and skill of the present management, or out of any unexpected later developments of the business, of an exchangeable value as great as, or greater than, the amount originally paid. In other words, exchangeable value arising from unexpected developments taking place subsequently, and which was, therefore, not included in the original capital outlay, cannot properly be substituted for that which has expired. Otherwise, by parity of reasoning, any undertaking would be entitled to add to revenue, and charge to capital outlay, sums purporting to represent the exchangeable value of self-created goodwill.

It is sometimes argued that an increase in the value

Increase in value of goodwill is not part of annual profit

of the goodwill of an undertaking is part of the annual profit, on the ground that it is an increase in the present exchangeable value of the concern. Such an increase in exchangeable value is clearly distinguishable from the annual profit which actually arises, year by year, out of the business of an undertaking. Any increase in the value of the goodwill is merely the present value of the right to receive, if and when realised, at a future time, certain super-profits expected then to arise out of the business.

Illustration of accounting for capital outlay on goodwill

Suppose the owner of a well-established business, in which £10,000 capital is invested, and which earns a regular profit of £3,000 per annum, sells the whole undertaking to a company for £25,000. The capital of the company will be £25,000, represented by assets in the following form—

	£
Goodwill	15,000
Other assets, *less* liabilities	10,000
	£25,000

The question, How is the £15,000 to be refunded out of the profits of future years ? is not easy to answer, but there is no doubt that it should be so refunded. The sum paid for goodwill must have some relation to the amount of the estimated future profits, and the value of the goodwill in a case such as that set out above is sometimes fixed by the rough-and-ready process of multiplying the past average annual profits by three, five, or more, this being known as the three, five, or other years' purchase basis.

The least that can be done is regularly to appropriate some proportion of the future profits, which have been purchased in the price paid for the goodwill, to write

down the cost. The benefit of the estimated value existing at the time the goodwill was purchased may possibly extend to fifty years, or even more in some cases; but, in view of competition and change, the period is more likely to be between ten and thirty years. If the basis of some percentage of future profits be adopted, it will be necessary to estimate the period over which the benefit arising out of the goodwill purchased will extend, and also to estimate the total profit likely to be earned during that period. This should not be impossible, because, in fixing the selling value of the goodwill, some attention must already have been given to these aspects of the matter.

In the case of the well-established business mentioned above, if the benefit period was estimated to extend to twenty-five years, and the total profit to be earned during that period was estimated at £75,000 (£3,000 × 25), then 20 per cent. of the annual profits must be appropriated each year to answer the expired capital outlay on the goodwill, this being the percentage which £15,000 bears to £75,000. Assuming then, for the sake of illustration, that the annual earnings of the business remain constant after its transfer and are exactly as before, they would be applicable as under—

	£
Written off goodwill, 20 per cent. on £3,000 . .	600
Profit available for dividend on the share capital of £25,000, being at the rate of £9 12s. per cent. per annum	2,400
	£3,000

A better plan might be to issue part of the capital in the form of £15,000 Debentures, bearing 10 per cent. interest, to be redeemed by annual drawings under

the distributed sinking fund method mentioned in Chapter X.

It is undoubtedly sound financial policy to appropriate the largest possible sums out of super-profits to write down the book value of goodwill, and it is as certainly unsound policy to wait for super-profits to become available, for it is clear that at least some percentage of all profits earned should be regularly appropriated for this purpose.

CHAPTER XII

WASTING ASSETS AND AN INCOME TAX ON ANNUAL INCOME

Need of reasonably accurate methods of computing annual profit and loss

IN order that an annual income tax may be equitably levied on annual income arising, it is obviously necessary that reasonably accurate methods of computing annual profit and loss shall be in common use, as otherwise considerable difficulty is sure to arise in making the annual assessments on the sums upon which the tax is to be levied, leading to mischievous friction between the taxing authorities and the taxpayers.

Danger of levying income tax on that which is not income

An income tax on annual income arising should doubtless be levied on the nearest possible approximation to true annual economic profit, and on nothing else. This is important, not only because it tends to prevent excessive friction and difficulty arising in the collection of the tax, but also because the alternative, frequently involving the taxing, as income, of sums which consist partly of capital, gives an apparent official sanction for treating such sums as being economic profit, and, therefore, as being wholly distributable as dividend, although a large part may be nothing but capital which was originally invested in wasting assets, and has, subsequently, in the ordinary course of the business, passed again into the form of cash. This subject is dealt with in the chapter on "Fixed and Floating Capital."

Opportunity to encourage proper accounting

The assessment of an annual income tax must always present great difficulties, owing in a large measure to failure on the part of those liable to be

assessed to an income tax to keep proper and adequate accounts. When laying down rules for assessing an annual income tax, it seems well worth while for the executive of any State, obtaining part of its revenue from this source, to grant special consideration to persons who give proper attention to accounting for wasting assets. Subject to necessary and obvious adjustments, the amount of the annual profits shown by such regular and properly prepared accounts might be accepted as the amount upon which income tax is to be assessed. Thus the wasting assets representing part of the capital of all such persons—being systematically accounted for—would properly escape taxation as income in passing from some form of fixed capital outlay into some liquid form of capital such as cash.

Surplus of annual receipts *versus* economic profit

Owing largely to the absence of systematic accounting, an income tax is of necessity at present generally assessed upon an amount representing the surplus balance of annual revenue receipts over revenue payments, made in or about the period covered by the accounts, rather than upon the true economic profit ; and this certainly tends, as above suggested, to encourage and give official sanction to the annual distribution, by corporations and other public undertakings, of amounts in excess of the actual annual profits earned, resulting in widespread financial evils, the magnitude of which is little understood.

British income tax

British income tax is levied under the provisions of the Income Tax Act, 1918, modified by many subsequent enactments ; and according to the statute law, it is assessable annually on annual profits arising. The present Income Tax Act, 1918, consolidates the

Acts of 1842, 1853, etc. The Income Tax Act, 1842, was a reprint of the Income Tax Act, 1806, with a few additions. The tax was, for many years after its re-introduction in 1842, considered to be of a temporary nature, and only in comparatively recent times has it been regarded as being a permanent tax. It has now become the chief instrument for obtaining State revenue in this and other countries.

Original difficulties and scheme of assessment

In 1842, when the present income tax was re-imposed as a temporary measure, the conditions of commerce were very different from those now existing, and systematic accounting was practically unknown; thus at that time it was a matter of impossibility to compute with any near approach to accuracy the annual profits or losses arising from the vast number of separate businesses then carried on by individuals. An official scheme of assessment of annual profits was, however, gradually evolved to meet the then existing conditions, under which rules were laid down for the guidance of the staff of the Inland Revenue Department to enable them to determine what annual expenses were to be allowed as deductions from revenue receipts in assessing annual profits, and what, at that time, were to be disallowed.

Antiquated precedents

This scheme of assessment of annual profits was gradually developed, and the necessarily arbitrary rules made under it were upheld in the early cases decided by the Courts of Law, thereby forming precedents which have evidently influenced many recent decisions in these more enlightened times. Thus the present British income tax law is based largely upon the original scheme of assessment, framed for the collection of a supposed temporary tax, at a time when

commercial conditions were very different, and when systematic accounting was unknown. It certainly needs further revision as regards the allowance of deduction from annual revenue receipts of expired capital outlay on inherently wasting assets.

Expired capital outlay largely ignored

In the circumstances, it is not surprising that there is often a wide difference between the official view of annual profit and the view of the taxpayer on the subject. This arises principally from the fact that the official method of assessing profits under the scheme of assessment too often seeks to confine the deductions allowed from annual revenue receipts to those expenses which are payable in cash in or about the year of assessment, and sometimes ignores—or only recognises grudgingly—that important factor of economic cost represented by expired capital outlay on inherently wasting assets.

Inadequate allowances and inadequate methods of accounting

Deduction is allowed (*see* Income Tax Act, 1918, Schedule D, Rule 6, of Rules applicable to Cases I and II) for diminished value by reason of wear and tear of machinery and plant ; and, in certain cases, deduction is allowed for diminished value due to obsolescence ; but the legal definition of plant is still too narrow. Inherently wasting assets cover a much wider field, and even the allowances granted for wear and tear of machinery and plant are often inadequate, owing, no doubt, largely to the inadequate and irregular manner in which this important factor of cost is still treated in commercial accounts.

Wear and tear computed on reducing balance of cost

The allowance granted for diminished value by reason of wear and tear, during the year, of machinery and plant is most commonly computed by the Income Tax Authorities by deducting a percentage from the

reducing balance of cost of the machinery and plant. It has already been demonstrated in Chapter VI that this method is absurdly inadequate; but while it remains in common use in commercial accounting, the Income Tax Authorities can scarcely adopt another method. Complaint is often made that the rate per cent. allowed on this basis is too low, but it should not be overlooked that the rate allowed must not provide more than the fair wear and tear for the first year; thus, on this basis, if the estimated life of the plant is twenty years, the rate allowed in the first year must be limited to 5 per cent., for otherwise the allowance, for that first year, will be excessive. The fact that it takes about fifty-eight years to write off the cost of plant, having a scrap value of 5 per cent., if a rate of 5 per cent. on the reducing balance of cost be employed, is no reason for allowing more than an adequate amount, being one-twentieth of the cost, out of the revenue receipts of the first year.

Amount of wear and tear allowance is in absolute discretion of Commissioners

It seems to be commonly overlooked that under the provisions of Rule 6, referred to above, the determination of the amount of the allowance for diminished value by reason of wear and tear of any machinery and plant is in the absolute and unfettered discretion of the Commissioners for general or special purposes. The Commissioners—chosen from the general body of taxpayers—have power, therefore, finally to determine the amounts of allowances for wear and tear, without consulting or referring to the taxing officers. This power does not seem to be often independently exercised, but it is well that its existence should be borne in mind. The Commissioners may sometimes refer a case to the Board of Referees.

Special concession under Section 53 of Income Tax Act, 1918

Welcome evidence of the growing recognition by the Income Tax Authorities of the need for allowance of more adequate deductions for depreciation is contained in Section 53 of the Income Tax Act, 1918, which provides for repayment of income tax on sums equal to certain special deductions allowed, under the Munitions of War Act, 1915, to controlled establishments in ascertaining net profits. These deductions are in respect of exceptional depreciation or obsolescence of buildings, plant, or machinery; and if such deductions have been disallowed in computing the amount upon which income tax has been paid, repayment of income tax upon an amount equal to the deductions may be claimed. The repayment is to be made in respect of the income tax year which includes the end of the period of assessment in respect of which the deductions have been allowed under the Munitions of War Act, 1915.

Nature of allowances for diminished value which cannot properly be claimed

In considering the deduction of expired capital outlay which should be allowed from annual revenue receipts, it is important to bear in mind that expired capital outlay on wasting assets, other than inherently wasting assets, cannot properly be claimed as a deduction from annual revenue receipts in assessing annual profit for income tax purposes. As already explained in previous chapters, all these other wasting assets consist exclusively of purchased rights to future pure income expected to arise over a series of later years, when it will become taxable. If deduction were allowed from annual revenue receipts for this kind of expired capital outlay, British income tax could be largely evaded by the simple process of selling to another person the rights to the future income. Such

sale would enable the original owner to secure that future income, free of tax, in a lump sum, in advance of the years in which it would arise and become normally chargeable with British income tax. It would also enable the new owner to secure it free of tax, for, if such deductions were allowed, he would be entitled to set off his expired capital outlay, represented by the consideration paid by him for the future profits (a lump sum not assessed to income tax at the time of payment), against the actual profits as they afterwards arose each year, and so the annual income or a large part of it would escape taxation altogether.

Wasting assets which are not inherently wasting assets

Such wasting assets, which are not inherently wasting assets, include, for income tax purposes, the following—

Capital invested in purchased terminable concessions,
Leaseholds,
Copyrights,
Patent Rights,
Goodwill and Trade-marks;

but it is important to notice that deduction of expired capital outlay invested in wasting assets of this nature should be allowed for income tax assessment purposes, whenever the original owner would not have been subject to British income tax, if the source of income had remained in his hands. An instance of such an exception would be capital invested in a purchased terminable concession outside the United Kingdom, for here the original owner of the source of the future annual profit to arise would not have been subject to British income tax, and, therefore, the expired capital outlay necessary to be refunded

out of revenue receipts, before any annual profit can result, should be allowed as a deduction from revenue receipts in assessing British income tax. The assessment to British income tax of the whole of the annual profits arising from such foreign concessions must tend to restrict, and sometimes even to prohibit, as between a foreigner and a British subject, all transfer business of this nature, which is, of course, always open to the bids of purchasers in other countries of the world.

Leasehold property

It has already been pointed out, in Chapter X, that leaseholds, under which the lessor not only grants to the lessee the right to the use and enjoyment of the property during the term of the lease, but also himself undertakes, either wholly or partially, to repair the property, free of charge to the lessee, during that term, are to some extent exceptional. Thus the capital outlay on leasehold property of this particular kind appears to represent the only description of wasting assets which cannot be classified with precision as belonging either to the class known as inherently wasting assets (*see* chapter on " Wasting Assets ") or to that other class of wasting assets whose value, based on unexpired cost, is represented wholly by rights to pure profit, increase of value, or advantage expected to arise in future years. It is necessary, therefore, to consider the treatment of this kind of property in connection with the scheme of assessment of British income tax.

Deduction allowed for repairs

British income tax is assessed upon lands and houses under what is known as Schedule A, the annual value being estimated otherwise than by relation to profits. The annual value is estimated without allowing any deduction for the cost of repairs, or for

depreciation, and formerly the income tax had to be paid upon that amount. But now, under the Income Tax Act, 1918, Schedule A, No. V, Rule 7, the assessment on lands, inclusive of the farmhouse and other buildings (if any), is reduced by one-eighth, and upon any house or building (except a farmhouse or building included with lands in assessment) by one-sixth in respect of the cost of repairs, both deductions being subject to certain restrictive safeguards contained in the rule. The relief granted by this rule is evidently, and according to official interpretation, intended to cover the cost of repairs only.

No further allowance for depreciation of leaseholds is permissible

It has been said that the owner of leasehold property which the landlord has undertaken to keep in repair is the owner of a wasting asset, the value of which, based on cost, includes something more than rights to future pure profits, and is, therefore, to that extent an inherently wasting asset. But, under the provisions of Rule 7, above mentioned, the owner of such leasehold property gets, by way of deduction from the assessment, an annual allowance for repairs equivalent to the annual waste of that part of the consideration paid for the lease which was in respect of the cost of future repairs to be done by the lessor. The lessee has, in effect, merely paid the cost of repairs in advance as part of the cost of the lease, and is not entitled to any more consideration on this account than the lessee, who, having paid less for his lease, himself pays the cost of repairs as and when incurred from year to year. Owners of leasehold property of both classes get in fact an allowance from the gross assessment to cover the cost of annual repairs.

Deduction allowed for maintenance, repairs, insurance, and management of land, farm buildings, and houses

Further relief from income tax under Schedule A is granted under Schedule A, No. V, Rule 8. This rule applies only to any land (inclusive of farmhouses and other buildings, if any) the assessment on which is reduced, for the purpose of collection; and under Section 29 of the Finance Act, 1920, to any house, the annual value of which, as adopted for the purpose of income tax under Schedule A, does not exceed £105 Metropolis, £90 Scotland, and £78 elsewhere, and the assessment on which is so reduced. Section 25 of the Finance Act, 1922, abolishes the rent limit for 1923–4 and after.

Maintenance includes cost of replacement of farm buildings, etc.

It is interesting to note that, for the purposes of Rule 8, above mentioned, the term " maintenance " includes the replacement of farmhouses, farm buildings, cottages, fences, and other works where the replacement is necessary to maintain the existing rent. This is a clear statutory recognition that depreciation must be allowed as a deduction, in some way or another, in computing the net annual value of land and house property. The allowance in this case is, however, treated as if the depreciation occurred at the date of the renewal, instead of, as the fact is, gradually over the efficient life period of the buildings, fences, and other works.

Shortcomings of present scheme of British income tax assessment as regards depreciation allowances

As regards depreciation allowances, however (an important part of economic cost), it is evident that the present scheme of British income tax assessment falls short of a system which would enable income tax to be levied on a near approximation to true annual economic profit in many important respects, and these may be summarised as follows—

(*a*) The allowance for depreciation of machinery and plant,

granted under Schedule D, Rule 6, of Rules applicable to Cases I and II, is often inadequate, and the legal definition of machinery and plant is too narrow.

(*b*) Depreciation is allowed only on buildings if and when renewed, instead of over the efficient life period of the buildings, and whether they are renewed or not.

(*c*) No depreciation is allowed on the mass or source of any natural raw material, such as coal, iron, nitrate, etc., or in respect of timber and other kinds of growing plants yielding recurring crops.

(*d*) No depreciation is allowed in respect of the cost of sinking vertical shafts undertaken to obtain access to natural raw material.

(*e*) No depreciation is allowed on the capital element in purchased terminable annuities.

In 1914 instructions were issued to surveyors of taxes that claims may be admitted for depreciation on furniture, fixtures and fittings of a durable nature, provided the cost has not already been allowed as a deduction from taxable profits.

It is suggested, on grounds of public policy, that in assessing income tax, deduction should be allowed for expired capital outlay invested in the purchase of wasting assets (which are not inherently wasting assets), such as purchased terminable concessions, patent rights, and the like, in all cases where the original owner would not have been subject to British income tax if the source of income had remained in his hands. The reason for this has already been stated in this chapter. In conclusion it must be said that while it is clear that, as regards the deductions allowed from gross income for annual depreciation (expired capital outlay), the present scheme of British income tax assessment leaves much to be desired, it must be admitted that this is largely due to the almost universal neglect on the part of the commercial

community to make systematic and regular provision for this important part of economic cost.

Memorandum on wasting assets and income tax

The following Memorandum on Wasting Assets and Income Tax was prepared by the Author in advocating the revision of the law and practice relating to the assessment of income tax—

Interesting and important debates have taken place in the House of Commons on the income tax, and the urgent need which exists for amendment of the law in order to allow a deduction from taxable profits for depreciation of inherently wasting assets, which depreciation is, in fact, part of the expense of earning profits.

The Chancellor of the Exchequer has agreed that the subject should be seriously considered, and has pointed out that for income tax purposes, wasting assets must be divided into two distinct classes, as under—

(*a*) Capital invested in the purchase of temporary sources of profit.

(*b*) Capital invested in the purchase of temporary interest in a permanent source of profit.

The Chancellor of the Exchequer did not deny the need for amendment of the law, in order to provide that a proper deduction should be allowed for capital invested in wasting assets falling under the first class.

It is important that the difference between the two classes be clearly understood, for its comprehension will explain why, for instance, deduction ought certainly to be allowed for wasting coal measures, but might not be permissible in the case of leaseholds, and therefore some further definition of the two classes of wasting assets may usefully be attempted.

The first class—"Capital invested in the purchase of temporary sources of profit"—means capital invested in all *inherently* wasting assets, that is to say, in all assets represented by a corpus or fund (apart from the value of mere rights to future taxable profits or increase) which wastes in the process of earning income or profits. Wasting assets of this character include therefore—

Buildings.

Plant, machinery, and ships.

(*Note.*—Depreciation is now allowed on these, although in an arbitrary and variable manner.)

Natural raw materials, including coal, minerals, stone, gravel, earths, oil, nitrate, and when intended for sale, land.

Shaft-sinking and development undertaken to obtain access to all such raw materials.

Purchased terminable annuities.

Capital invested in terminable foreign concessions, which, if they had remained in the hands of the seller, would not have been subject to British income tax.

In all the above cases the source of profit is temporary, in the sense that it cannot continue without the employment of the inherently wasting assets, and therefore ceases to yield profit when these have been exhausted. There is no valid reason for refusing to allow the inevitable depreciation or reduction in value of wasting assets of this kind. The Income Tax Act is clearly intended only to tax annual income or profits, and should not be used to fasten an income tax upon capital sums which happen to be received back in company with profits.

The second class—" Capital invested in the purchase of temporary interest in a permanent source of profit " —would include capital invested in all other wasting assets, that is to say, in wasting assets which are not represented by a corpus or fund apart from the value of rights to future taxable profits or increase, and therefore are not inherently wasting assets. All these other assets will be found on examination to consist exclusively of purchased rights to future taxable income arising over a series of later years, and their depreciation is not allowed, otherwise income tax might be largely avoided by the simple process of selling rights to future income to another person, who is at present not taxed. Such wasting assets include—

Leaseholds.
Copyrights.
Patent Rights.
Goodwill.
Capital invested in terminable concessions within the United Kingdom.

Income arising from acquired interests of this kind remains as permanent as before, in the sense that it arises, or is capable of arising annually in equal volume, whether it has been anticipated by sale in advance to another person or not. The seller may be said to assign to the purchaser his liability to future income tax as well as his right to receive future income, and this fact is, or should be considered, in fixing the price paid to the seller. It is only when the future income sold would not, except for such sale, be subject to British income tax, as in the case of foreign concessions, that deduction should be allowed to the

purchaser for the gradual waste of his capital outlay, which allowance is, however, at present refused.

The annual value or income arising from land and buildings is permanent (subject to depreciation of the buildings), and is not in itself diminished by reason of the freeholder granting a right (called a lease) to another person to enjoy or receive the income during a number of future years, and when a premium is paid for a lease the case falls into the same category, as the premium is merely payment in advance for an increase in annual value over the existing rent. In the same way the taxable profits which may arise in future years from the work of the author (represented by copyrights), the inventor (represented by patent rights), or the industrial and business organiser (represented by goodwill), will not be diminished by the circumstance that the owner, or creator of the source, has himself anticipated the receipt and enjoyment of those taxable profits, by assigning to others his right to receive them when they arise.

In the above cases, the charging of income tax on the full income or profit arising each year would seem to bear unjustly upon those who have invested their capital in the purchase of temporary rights of this description, except when due allowance has been made to the purchaser on fixing the purchase price, for the future liability shifted on to him to pay income tax. No doubt it may be argued that although the tax must be paid, it falls on the wrong shoulders, but until some practical means can be found to charge with income tax those who have received taxable profit in advance of the year of its arising, there seems to be no remedy. However that may be, it is certainly

important that this particular class of wasting assets should be distinguished, and excluded when urging the unanswerable claim for the allowance of deduction from taxable profits of the depreciation of inherently wasting assets.

Alternative definition of the two classes of wasting assets

As stated, the Chancellor of the Exchequer has pointed out that, for income tax purposes, wasting assets must be divided into two distinct classes which he roughly defined. An alternative method of defining these two classes of wasting assets is as under—

(*a*) Capital invested in the purchase of assets necessarily required to be wasted in earning the profits of future years.

(*b*) Capital invested in the purchase of rights to the enjoyment of the profits of future years.

CHAPTER XIII

THE "THEN VALUE" OF PLANT

THE case of the *National Telephone Co., Ltd.* v. *His Majesty's Postmaster-General* is of particular interest, not only because of the nature of the undertaking, but also because the question of the measurement of depreciation was fully considered. Judgment was delivered on the 13th January, 1913, being the seventy-fourth day of the hearing. The Court had to determine in accordance with the purchase agreement dated the 8th August, 1905, the value of the property of the National Telephone Co. upon its transfer to the Postmaster-General at the expiration of the Company's licence, which expired on the 31st December, 1911. The property involved was large, extending over a great part of England, Scotland, and Ireland; and the items were so numerous and the agreed inventory or list containing them so bulky, that it was not found possible to bring it into Court. At the time of the transfer, the Company had a system serving 561,356 stations. The total amount claimed by the Company was £20,924,700, the greater part of which was for the value of plant.

The National Telephone Co.'s Case

The question to be determined was set out in the purchase agreement thus: "The value on the 31st day of December, 1911, of all plant, land, buildings, stores and furniture, purchased by the Postmaster-General in pursuance of the provisions hereof, shall be the then value (exclusive of any allowance for past or future profits of the undertaking or any compensation for compulsory sale or other consideration whatever) of such plant, land, buildings, stores and furniture, having regard to its suitability for the

Question to be determined

purposes of the Postmaster-General's telephonic service, and in determining the value of any plant no advantage arising from the construction of such plant by leave of the Postmaster-General upon any railway or canal over which the Postmaster-General possesses exclusive rights of way for telegraphic lines shall be taken into account." This clause reproduces with but slight modification Section 43 of the Tramways Act, 1870.

Life of plant

The length of life to be attributed to plant of each class was discussed in this case at great length. The judgment of the Court does not state what lives were ascribed to the various classes of plant, but it is clear that the physical life was reduced by reference to many considerations other than the mere question of how long the plant would be capable of continuing to work. These considerations included precariousness of wayleave, defects in conduits and wires, overloading of poles, increased cost of maintenance in later years of life, absence of bonding at manholes, and obsolescence. It must be borne in mind that, in this case, the issue tried by the Court was not what was the true economic or going-concern value of the plant, but what was the then value computed in the manner defined and limited by the words of the purchase agreement.

Depreciation of plant on straight line method

The question of depreciation gave rise to great divergences of view between the parties, not only as to the character of the life to be ascribed to the various classes of plant, but also as to the method of calculating depreciation, assuming life and age to be agreed. The Postmaster-General adopted the method which has been followed unchallenged in tramway cases.

He contended that the depreciation was properly measured by the ratio which the expired life bore to the whole life of the plant; or, in other words, that the value on the 31st December, 1911, was represented by the proportion which the life still anticipated bore to the whole life. This method of calculating depreciation has been called the straight line method.

Depreciation of plant on sinking fund method

The Company proposed an altogether novel method of estimating depreciation. They urged that, when the life of a class of plant was, as far as possible, ascertained, a sinking fund should be formed by the investment every six months of an amount which, accumulating at compound interest, would produce at the end of the estimated life an aggregate sum equal to the original value of the plant when new. At any point in the life they contended that the difference between the original value and the amount which at that point had been accumulated in the sinking fund was the value which should be paid by a purchaser. The Company's witnesses were, however, compelled to admit that they had never known the method adopted as between a vendor and a purchaser of plant.

Illustration of Company's argument

The Company's argument in support of their method of estimating depreciation may be illustrated by a simple case. Assume plant costing £100 to install with a life of twenty years and an output yielding a net revenue of £8 a year for the whole of its life, and that a sale takes place at the end of ten years. Assume further that both vendor and purchaser borrow the capital needed.

The vendor, having borrowed the £100 to install

the plant, has devoted his annual revenue of £8 thus—

Interest on £100 (at 5%)	£5
Sinking Fund to produce £100 in twenty years, on a 5% basis.	£3

At the end of ten years the sinking fund has reached £38.

If the purchaser pays £62 (which he also has borrowed) for the plant, the vendor gets, with the £38 in the sinking fund, the original £100 to discharge his debt.

The purchaser is then in possession of plant yielding an annual revenue of £8, which he allocates as follows :

Interest on £62 (at 5%)	£3
Sinking Fund to produce £62 in ten years, on a 5% basis	£5

And, on the expiration of the life of the plant, the purchaser can renew the plant costing £100 to enable him to continue business by re-borrowing the £62 yielded by the sinking fund and borrowing a further £38. He is then in the position of the vendor when the original plant was installed.

Sinking fund method rejected by the Court

No fault can be found with this arithmetic, and the argument may seem unanswerable ; but the Court, after hearing the evidence for the Postmaster-General, rejected the sinking fund method as wholly inapplicable for the purpose, and adopted the straight line method advocated by the author on behalf of the Postmaster-General. It is calculated that the saving to the Postmaster-General by the award of the straight line method of depreciation as compared with the Company's basis of a 5 per cent. sinking fund was over £1,000,000. Some of the arguments suggested in support of the Postmaster-General's view of the proper method of measuring annual depreciation are set out below.

Absence of regular provision for depreciation, and methods of meeting this difficulty

First, in regard to the absence of regular provision in the Company's accounts for depreciation of plant, and the plea of the Company that they had spent large sums on construction and charged them to revenue instead of to capital, it was pointed out that if the whole of the money spent by the National Telephone Co. on plant (exclusive of land and buildings, and acquisition of patents and goodwill) during the thirty years of its existence, be abstracted from the balance sheets, and if to this amount be also added the whole cost of maintenance and renewal of lines and instruments, and depreciation allowances as debited to the Company's revenue accounts, the result is a sum of £20,827,814. This must necessarily represent the whole of the sum spent on the plant, whether for construction or for repairs and maintenance. The figures are shown on the next page.

Excluding expenditure on Patents and Goodwill, the sum of £14,329,671 is there shown to be the full surviving value of the plant computed on a life of thirty years, even treating the whole sum of £6,966,992 charged by the Company to revenue under the head of maintenance and renewal of lines as though it were the cost of new plant, thus leaving nothing whatever to answer the heavy cost of maintenance and repairs, which is, of course, absurd.

Thus, by abstracting from the actual records in the Company's books all the money alleged to have been spent on the purchase of new plant or in connection with its upkeep and repair during the whole time of the Company's existence, the amount is found to be £20,827,814. Treating the whole of this amount as being cost of new plant—to do which is to enter the realm of obvious absurdity—and submitting this sum to the (inadequate) deductions mentioned above, the Company's claim for the value of the plant cannot under any conceivable circumstances exceed £14,329,671, this being subject only to any fluctuation in the cost of material and labour which is understood to be a comparatively small sum.

	£
Capital expenditure on plant as per the Company's Balance Sheet at the 31st December, 1911	15,677,810
Deduct expenditure on Patents and Goodwill included therein	1,816,988
	13,860,822
Add revenue expenditure under the head of maintenance and renewal of lines and instruments and depreciation allowances	6,966,992
	£20,827,814

Estimate I.

If this amount of Capital Outlay on plant be treated as having an average life of thirty years (the Company's estimate of the average life being rather less), the depreciation accrued from the respective years of outlay to the 31st December, 1911, on the straight line method amounts to the sum of	6,467,664
Leaving a surviving value of . .	14,360,150
This amount is subject to adjustment in respect of the residual value of the plant, which, according to the estimates, amounts to minus £97,533. This minus residual value will, according to the Company's contention, constitute an ultimate addition to the cost of the plant to be borne by the purchaser, and as the whole outlay on plant must be equitably distributed over the life of the plant, there must be deducted a portion of this minus residual value, which amounts to the sum of	30,479
Value of Plant assuming thirty years' life, and that the whole cost of maintenance is the cost of new plant	£14,329,671

Estimate II.

If one-third of the above amount of £6,966,992 charged by the Company to revenue, under the head of Maintenance and Renewal of Lines, etc., be treated as capital expenditure, to meet the Company's contention that large sums which are really capital expenditure have been charged in the accounts to revenue, the capital expenditure on plant will then be as follows—

	£
Capital expenditure on plant as above stated	13,860,822
Add one-third of £6,966,992, the total of the sums charged in the accounts to revenue under the head of Maintenance and Renewal of Lines, etc. . . .	2,322,331
	16,183,153
If this amount of capital outlay on plant be treated as having an average life of thirty years (the Company's estimate of the average life being rather less), the depreciation accrued from the respective years of outlay to the 31st December, 1911, on the straight line method amounts to the sum of	5,381,251
Leaving a surviving value of . .	10,801,902
This amount is subject to adjustment in respect of the residual value of the plant, which, according to the estimates, amounts to minus £97,533. This minus residual value will constitute an ultimate addition to the cost of the plant to be borne by the purchaser; and as the whole outlay on plant must be equitably distributed over the life of the plant, there must be deducted a portion of this minus residual value, which amounts to the sum of .	32,511
Value of plant, assuming thirty years' life and allowing one-third of revenue expenditure to have been capital expenditure	£10,769,391

Estimate III.

If the total capital outlay on plant plus one-third of the cost of maintenance, etc., amounting as shown above to the sum of be treated as having an average life of 13·3 years, in accordance with the estimates prepared on behalf of the Post Office, the depreciation accrued from the respective years of outlay to the 31st December, 1911, on the straight line method amounts to the sum of . .	16,183,153 10,288,728
Leaving a surviving value of . .	5,894,425
This amount is subject to adjustment in respect of the residual value of the plant, which, according to the estimates prepared on behalf of the Post Office, amounts in all to £1,512,176. This residual value is included in the original capital expenditure shown above, and as it has been partly written off in the depreciation item, it is necessary, in order to restore the residual value, to add back again the proportionate amount	961,445
Value of plant, assuming 13·3 years' life and allowing one-third of revenue expenditure to have been capital expenditure. .	£6,855,870

It was suggested that the limits of generosity were reached in the second and third estimates in treating one-third of the revenue expenditure on maintenance, etc., as being the cost of actual renewals of plant chargeable to capital expenditure. The depreciation accrued, as set out above, was in each case measured by means of the Register of Industrial Plant described in Chapter VII.

Obsolescence

It was suggested, on behalf of the Postmaster-General, that with few exceptions, the value of plant

depends chiefly upon its suitability to fulfil economically the needs of the changing conditions affecting the objects of the undertaking for which it was purchased. The factors which must be regarded therefore in estimating the efficient life of plant include not only natural decay, and wear and tear, but, most important of all, the advance of obsolescence due to new inventions, the extension and growth of the business, and other change. With undertakings carrying on a new and developing industry, the rate of destruction of value of plant due to the advance of obsolescence is generally the dominating depreciation factor, being greater than the rate of destruction due to natural decay, and wear and tear.

Loss by accident, etc

Loss by accident is outside ordinary depreciation provision, and, unless covered by insurance, such loss is generally charged to revenue as and when an accident occurs. This applies equally to losses by fire, tempest, earthquake, war, or riot, which are all outside the current expenses inherent to the carrying on of an undertaking, and are usually either left out of consideration altogether or covered by a contract of insurance.

Revision of estimates of efficient life

In any undertaking using plant, constant revision of all estimates of length of efficient life is necessary; and, consequently, an undertaking which has in past years made a supposed full provision for the depreciation of its plant may find at any time that the plant stands in the books at too high a value owing to the efficient life having been originally over-estimated in the light of the knowledge available at the time of making the original estimates. In such a case, when the error in judgment is discovered, the only

practicable course for the undertaking to pursue, assuming that it continues to carry on its business, may be to arrange to distribute, as a charge against the annual revenue, the still surviving book value of the plant equally over the remaining years of its efficient life according to the latest shortened estimate of the life. If, however, the plant be sold at any time during the remainder of the shortened life on the basis of the "then value" to a purchaser proposing to continue to carry on the business, the amount of the "then value" (subject to any fluctuation in the cost of material and labour) will be less than the book value of the plant, and the selling undertaking will then suffer a loss on realising the plant owing to its original failure to make an accurate forecast and to adjust the life period of the plant to the changing conditions affecting the objects of the undertaking. This loss on plant represents expenditure not properly provided for during the transferor's part of the period owing to his inability to form a correct judgment; and the transferee of plant, as such, will not consent to bear this loss by consequently paying more for the plant.

Reply to Company's sinking fund argument

In reply to the Company's sinking fund argument, it was shown that if the annual instalments of a sinking fund running during the estimated life of plant are used to measure depreciation, the value of the plant remains overstated in the books of the undertaking, and this overstated value reaches its maximum in the case of a twenty years' sinking fund accumulated at 5 per cent. interest about the end of the eleventh year of the period. The unexpired value of the plant to a going concern is at that time overstated by more than 25 per cent.

Subject to the employment of a suitable rate of interest, the method shown in the Company's mathematical tables of liquidating a wasting capital investment in a given period may sometimes safely be used in ascertaining the surviving value, provided that the particular investment is non-speculative and yields automatically during a period certain, without the investment of further capital, some form of equal annual consideration for which a constant demand exists, the classes of wasting assets most likely to fulfil these conditions being (*a*) the right to an annuity certain in money for a given number of years; or (*b*) the right to the annual rent of land for a given number of years.

But wasting assets vary widely in character, and this difference in character is, by the operation of economic forces, an inevitable factor in determining their market value, thus—

The price of an annuity varies with the term of years and with the agreed rate of interest;

The price of a lease of land varies with the term of years and with the agreed annual value;

The price of plant includes plant only, and depends upon the outlay necessary to produce the plant.

Commercial view of going-concern value of plant

The common commercial view of the economic value to a going concern of plant in use is based upon the unexpired capital outlay on that plant, computed by deducting an equal annual instalment from the cost, less the estimated residual value, in respect of each year of the estimated efficient life which has expired, and in the case of a sale and transfer from one undertaker to another, the unexpired capital outlay ascertained in this way, subject to adjustment in

respect of fluctuations in the cost of material and labour (as bearing upon the possible price of new plant), would be the "then value" of the plant. While the sinking fund method of measuring depreciation causes the surviving value of plant to remain overstated, so, on the other hand, the method of deducting a percentage from the reducing balance of cost operates, assuming the employment of an adequate rate, to understate the surviving value of plant at all times within its life-period, and both these methods are inevitably disregarded in determining the value of plant.

The "then value" of plant

Deducting a percentage from reducing balance of cost

In industrial undertakings using a large amount of plant, it is common to find the occurrence of recent heavy outlays on the construction of additional plant or of long-lived plant of improved type, upon the ultimate renewal of which it may not be necessary to incur further outlay for many years. This condition cannot be equitably adjusted on the happening of a sale and transfer from one undertaker to another by computing the surviving value of plant, as such, by the sinking fund method, which operates to retard the provision for depreciation in the earlier years of the life and to accelerate this in later years by appropriating, in advance, under the name of interest, in reduction of the proper provision, sums on account of the income expected to be earned in future years.

Outlay on additional or on improved plant

When money is invested in plant, it is from the use of the plant alone that a return can arise, and no part of this must be forestalled. Considerations of interest disappear as effectively as if the money was locked in a box. One cannot talk of interest in connection with plant, but only in connection with money or its

When money is invested in plant, considerations of interest disappear

equivalent. There are important distinctions between the character of future income arising from an annuity and future income expected to be earned from the use of plant. An annuity certain provides money automatically, independently of contingencies, and without the need of outside co-operation ; and the unexpired portion of an annuity is always equivalent to money, because it may at any time be turned into money, which, subject to the effect of any change in the value of money, will be equal to the value computed on the sinking fund basis. Plant, on the other hand, gives no automatic yield, and is to a large extent useful only to co-operate in fulfilling the objects of the undertaking owning it, apart from which it will have little value, owing to the absence of any general demand for such property.

Value of goodwill distinguished from value of plant

Whenever it is a question of determining the value of an undertaking (as distinguished from the value of plant) for the purpose of transfer from one undertaker to another, the fact that the business may in recent years have absorbed an increasing amount of capital for construction of additional plant and for substituting longer-lived plant of improved type for shorter lived plant becoming obsolete, to the extent that it causes more capital to be locked up in that particular part of the plant during the seller's part of the life-period than during the buyer's part, may be good ground for claiming the payment of a sum for goodwill, but it does not add to the value of the plant. *Goodwill is the present value of super-profits expected to arise in future years out of the presently existing condition and state of development of an undertaking,* the term " super-profits " meaning profits likely to be

earned in excess of those required to attract and retain the necessary capital and ability to carry on the enterprise successfully in future. A common condition of the plant such as that referred to above, to the extent that it tends to add to the future profits, tends also to add to the present value (if any) of the goodwill of the business, but such existing value is marketable only as part of any goodwill.

Capital invested in plant compared with capital invested in stock or debts

In the case of an established business, using a plant which has been gradually accumulated, the amount of further capital absorbed by extensions and additions will generally be small in comparison with the total outlay on plant which, as to its bulk, represents capital always remaining permanently invested in plant, although the units of plant are always passing away and being renewed in the same way that other portions of the capital of industrial undertakings remain permanently invested in such assets as stock and debts, the constituent items of which are also always changing. The profit earned year by year is itself the full interest or increment accruing to the capital of the undertaking, and it is as unsound to forestall and apply future interest in a manner which operates to add to the value of plant, as it would be to apply it to add to the value of unsold stock or unpaid debts in which a large part of the capital of industrial undertakings is locked up.

Effect of annuity or sinking fund method illustrated

In order to compare the effect of measuring the surviving value of current plant in the same way that the surviving value of an annuity is measured, suppose that ten years ago the capital of the Company, instead of existing at that time in the form of plant, had been then in the form of cash, say, £1,000,000, and that

the cash was used to purchase a twenty years' annuity of £80,243, yielding therefore, 5 per cent. per annum. Eliminating other items, the balance sheet at the present time would in that case stand thus—

	£		£
Capital . . .	1,000,000	Value of annuity for the remaining ten years. . .	619,612
		Sinking Fund Investments, assuming the cost to be the present value of the investments . .	380,388
	£1,000,000		£1,000,000

And during the ten years which have elapsed since the purchase of the twenty years' annuity, the annuity of £80,243 has been applied each year as to £30,243 to purchase sinking fund investments, and as to £50,000 to pay a dividend of 5 per cent. on the capital of £1,000,000.

But ten years ago the capital of the Company existed not in the form of cash, but in the form o various classes of plant of different ages which hac been gradually accumulated year by year. Plant is in practice, accumulated yearly; and the plant of all ages which existed ten years ago is not capable of continuing to yield, during a given number of later years, an assumed constant annual income, unless the quantity in use is maintained yearly by applying part of the income to purchase new plant. If, therefore, ten years ago the assumed capital of £1,000,000 had existed in the form, for instance, of 400,000 instruments, switches, etc., which had been gradually

accumulated, with an original efficient life of twenty years, then assuming the number of efficient instruments, switches, etc., to have been duly maintained by regular renewal in the meantime, without which the constant income could not be received, the balance sheet at the present time would stand thus—

	£		£
Capital . . .	1,000,000	Unexpired value of 400,000 instruments, switches, etc.: 200,000 being of age ten years and over, and 200,000 being of age under ten years.	1,000,000
	£1,000,000		£1,000,000

Assuming, therefore, the annual income from the 400,000 instruments, switches, etc., to be a constant sum of £80,243, it will be found that this income cannot be applied in part to the purchase of sinking fund investments, but must be retained to answer depreciation and applied as to £50,000 to purchase one-twentieth of 400,000, or 20,000 new instruments, switches, etc., to replace those which, assuming equal annual conditions, will go out of service each year, in order to maintain the number of efficient instruments, switches, etc., needed to earn the equal annual income, and as to the balance of £30,243 to pay a dividend on the capital. In any established undertaking, similar conditions will be found to apply to the bulk of capital outlay on plant.

The plant of the National Telephone Co. had been

gradually accumulated year by year in the usual way, and thus one of the fallacies underlying the proposed method of measuring the surviving value of the plant is that the Company's mathematical tables assumed a given class of plant may be fairly represented by supposing it to consist of one block, installed on a given date, like a terminable annuity certain, which, while having equal revenue-producing capacity in each of the twenty years, is constantly diminishing in value during that time. On this supposition, it was claimed that, as in the case of an annuity or of a lease of land, more capital was locked up in each class of plant during the seller's part of the period than during the buyer's part of the period. But the fact is, as shown above, that, as regards the bulk of a plant accumulated yearly, each class of plant includes units of all ages in the life-period, a proportion of which will expire yearly and must be renewed yearly; and thus, whenever a sale and purchase takes place, the price paid will be for plant of all ages in the assumed twenty years' life, from nineteen years' old plant yielding efficient service for only one more year, to new plant yielding efficient service for twenty more years. For this reason, it is a fallacy to assume that the buyer of second-hand plant can set aside sinking fund instalments, or that he will recover out of the revenue of succeeding years the whole sum he pays for the second-hand plant in any shorter time than the whole-life period of the given class of plant.

CHAPTER XIV

MEMORANDUM AND CRITICISM ON THE FINANCIAL PROPOSALS OF THE LONDON COUNTY COUNCIL REPORT ON LONDON ELECTRICITY SUPPLY

Criticism of financial proposals of London County Council

THE following notes on the financial proposals contained in the Report of the Special Electricity Committee of the London County Council on London Electricity Supply published in the year 1914, and a further illustration of the effect of the annuity or sinking fund theory of measurement of depreciation of plant, may be of interest to students of the subjects which are discussed in this work.

Character of proposed new undertaking

A new undertaking is to be established which shall gradually centralise the production and unify the distribution of electricity in Greater London, and ultimately absorb all the existing undertakings in the area. It is proposed that the machinery to be set up with the object of bringing the new undertaking into existence shall provide for a combination of municipal control and private operation, the capital required to be provided in definite proportions by the authority and a Company. The company is to have possession of the whole of the undertaking (including any undertakings acquired) for a definite period, probably fifty years, subject to full powers of control and supervision by the authority. It is proposed that the authority shall advance by way of loan, two-thirds of the capital required for fresh works, the remaining one-third of such capital being found by the company. The capital involved in the acquisition and transfer of existing undertakings is to

be provided by the authority. The authority is to be empowered to resume possession of the undertaking at the end of the term of the contract on payment to the company of a sum equal to the capital provided by it for the purposes thereof. It is recognised, in view of the amount of public money involved, that continuity of organisation, management, and policy are of very great importance, once the broad lines of action are determined.

Proposed sinking fund method to maintain capital value

This matter is of great public interest because of the magnitude of the undertaking. The capital required will be many millions sterling, and the greater portion will be spent on electrical plant, the value of much of which is particularly liable to deterioration owing to the progress of invention and other change, as well as to the extent and character of the wear and tear to which it is subjected. Unless the going-concern value of all this plant is maintained at a sum which, with the other assets, shall equal the sum of the capital issued, the undertaking will not be soundly financed; and, with a view to securing that the value of the plant shall be so maintained, it is proposed to establish a sinking fund by taking a fixed annual sum out of each year's revenue to be invested and accumulated in the hands of the authority, the idea being that, as the plant depreciates—that is, as the capital outlay on the plant expires—a sum of not less than the sum of the expired outlay will have accumulated in the sinking fund. The fallacy of this is illustrated later on.

It is proposed that this sinking fund shall provide for the capital expenditure on the several classes of property being written off in the stated periods—

Land and engineering works . . .	60 years
Cables	40 ,,
Power stations and sub-stations with all plant therein	25 ,,
Service lines	12 ,,
Interest paid out of capital	30 ,,
Purchase of existing undertakings . .	30 ,,

And it is stated in the report that the sinking fund to be provided will be at the rate of about 2 per cent. per annum, showing that the average life of the plant is estimated at rather more than twenty-eight years.

Need of a method giving closer touch with existing conditions

But in view of the nature of the assets of the undertaking, consisting of scores of different classes of plant, it is impossible to rely safely upon a single forecast made now; and, in place of this, practical means ought to be provided for keeping a close and continuous connection at all times between the existing condition and prospects of each class of plant, and the rate at which the expiring value is being made good out of the yearly revenue receipts. This can be easily arranged with the aid and co-operation of the engineers and accountants, suitable provision being made for—

(1) The regular observation and record by the engineers of the behaviour of, and the changing conditions affecting, each class of industrial plant representing capital outlay;

(2) The use of suitable accounting equipment, capable of enabling the results of such observation and record to be closely reflected in the annual accounts;

together with the adoption of a settled and continuous financial policy under which each year's revenue account shall be charged with a regularly measured

sum, based on the engineers' observations as to the state of the plant. Nothing except current attention of this kind can ensure the maintenance of the capital value, and the correlated correct computation of annual profits.

Reasons for this

The annual instalment of a sinking fund is not a sound measure of the annual depreciation of plant, not only because it has the effect of retarding the provision made in the earlier years of the life of the plant and correspondingly accelerating this in the later years, thus retaining the value at too high a sum and incidentally overstating the profits, but also because the capital invested in plant will, as to its bulk, be permanently required by the undertaking to carry on its business. Any scheme, therefore, which purports to accumulate the whole of the money in a sinking fund extending over the estimated average life of the plant is both inconvenient and impracticable, because the money cannot all be spared, but will be wanted in varying amounts during the period of accumulating the sinking fund to pay for the renewal of the various classes of plant having lives of less than the sinking fund period.

Possible distinction between long life and short life plants

Although for the reasons stated, and which are clearly demonstrated below, the annual instalment of a sinking fund is not a sound measure of the annual depreciation of industrial plant, it may in this case be convenient—and also, having regard to the special nature of the monopoly and to the security of the revenue derivable from it, open to no serious objection —to set up a sinking fund to provide for the writing off of that large part of the capital outlay on plant which will not require renewal for long periods of

years, as distinct from that part which will require renewal within comparatively short terms, and which also is more liable to become obsolete owing to changing conditions, as a consequence of which the life of each class is more difficult to forecast with approximate success. This suggested distinction between the method of dealing with these two classes of plant is only justifiable on the grounds of possible convenience, as also is the grouping of the value of engineering works, which will ultimately require renewal, with the site value of land, which is not a wasting asset, and does not inevitably fall in value as a result of its use by the undertaking, being, in fact, afterwards equally available for other purposes.

Illustration by an assumed case

To make the effect of this possible distinction clearer, it may be convenient to consider the balance sheet of an assumed undertaking as follows—

BALANCE SHEET.

Liabilities.		*Assets.*	
Capital—		Land	£500,000
Shares . . .	£16,000,000	Wasting assets, consisting chiefly of plant—	
Debentures, 4% .	10,000,000	Renewable within periods under 30 years . . .	15,000,000
Creditors . . .	500,000	Not so renewable	10,000,000
		Stocks	250,000
		Debtors	500,000
		Cash.	250,000
	£26,500,000		£26,500,000

The portion of the above capital invested in wasting assets which will not require renewing for upwards of thirty years, is assumed in this case to be represented chiefly by outlay on engineering works and cables; and if provision is made on the sinking fund

principle for repaying this part by the end of fifty years (an assumed average period), an annual provision out of revenue of £65,500 will be needed if interest be reckoned at 4 per cent.

Distributed sinking fund method applied to cost of long life plant

Instead, however, of investing and accumulating the annual instalments in a sinking fund to be retained in the hands of the authority, it would seem to be better to repay that part of the capital by annual drawings, and to enable this to be conveniently done, debentures or some similar form of security might be issued to raise the money required for that part of the capital outlay. Under this plan, which may be described as the "distributed" sinking fund method, the amount available each year for reduction of the loan by drawings would be the annual instalment of £65,500, plus an amount equal to the year's interest on the proportion of the loan already repaid; and thus, with the annual interest paid, an equal annual charge to revenue results in respect of the use of this long-period part of the capital outlay on plant over the period of the sinking fund, because as the interest paid each year on the balance of the outstanding loan decreases, so does the amount equal to the annual interest on the proportion of the loan repaid increase, and this latter sum is added to the equal annual amount of the ordinary sinking fund instalment. Amongst the advantages of this method over the ordinary or "retained" sinking fund may be mentioned the fact that gradual repayment at par by annual drawings steadies the market in the securities, and, further, the method relieves the authority of the needless responsibility of selecting and holding large amounts of fluctuating securities.

Special provisions needed to meet conditions inherent to short life plant

The other part of the capital outlay on plant, amounting in the case assumed to £15,000,000, is supposed to be represented by the cost of power stations and sub-stations with all plant therein, and by service lines. The existing condition of all this value will urgently require constant watching, not only because it is particularly subject to more or less continuous change, but also because much of it is specially liable to become obsolete and out of date before it is worn out. Such a condition is unavoidable in an undertaking of this character, and the inevitable resulting loss in value is a part of the cost of carrying on the undertaking equal in importance to other revenue expenditure. It is impossible to deal successfully with this very large factor of annual cost by means of a single forecast made in advance, but this difficulty may easily be overcome by adopting the use of a system provided with a suitable recording equipment to enable the results of the regular observations of the engineers as to the condition and prospects of the different classes of plant to be recorded, and proper financial provisions made in measuring the annual sum to be taken out of revenue each year to make good the actual fall in going-concern value which is taking place in this part of the plant.

Apart from other considerations, it should not be overlooked that the different classes of this part of the plant will need renewal within comparatively short periods, and that the money to pay for these renewals will not be available if the provision set aside out of revenue for this purpose is to be invested in the accumulation of a sinking fund, for, in that case, unless the amounts which must be expended in

renewing the plant are taken out of revenue in addition to the amount of the sinking fund instalment—a plan which causes endless confusion and operates to distort the profits as between one year and another—they must be found by the issue of new capital, which is a most undesirable alternative. The fact already referred to that, in the long run, capital invested in plant is, as to its bulk, permanently needed for plant by a continuing concern, becomes plainer when considered in connection with comparatively short-life classes of plant, and in any practical scheme the money must be retained in hand for this purpose and not dedicated to the accumulation of a sinking fund. Moneys so retained in the earlier years in excess of the cost of any renewals—which will at the time be small—may properly be temporarily used for the cost of additional plant, thereby benefiting the undertaking for the time being by deferring the issue of additional capital which would otherwise be required for this purpose.

Financial position at end of fifty years in assumed case

It may be interesting to consider the financial position at the end of fifty years in the assumed case of the undertaking, the initial balance sheet of which is set out above. Apart from further extensions, and supposing for the sake of demonstration that the undertaking, starting with a full volume of business now, is then still in existence and conducting a business of the same volume, and that the estimates of the life of each of the various classes of plant have been so adjusted as to prove approximately correct, the capital of the undertaking at that time will be £16,000,000 in shares plus any amount in fresh debentures or other securities which may have been

issued to provide money required for renewal of the cables included in the long-life plant, but estimated to have a life of only forty years. The original issue of £10,000,000 4 per cent. debentures will have been paid off by the operation of the "distributed" sinking fund, and the cost of the land and engineering works and of the original cables will by this means have been written off, although the site value of the land (which is not a wasting asset) will remain unimpaired and the engineering works may still remain suitable and efficient. The share capital of £16,000,000 will still exist and will, as to £15,000,000, be still fully represented by the then going-concern value of short-life plant renewable within periods under thirty years.

Maintaining capital value in addition to repaying capital out of revenue

If it is desired to provide for gradually paying off the portion of the £16,000,000 of share capital assumed to be invested in short-life plant, by contributions out of revenue, then revenue must be charged each year not only with the full amount of expired capital outlay (depreciation) on the short-life plant as measured by the proposed accounting equipment, but also with the necessary annual sinking fund instalment. By this means, but not otherwise, the money required from time to time to pay for the renewals of the short-life plant will be available without further borrowing, in addition to the money needed to pay off £15,000,000 of the share capital, so that the indebtedness of the undertaking to shareholders will then be gradually reduced while at the same time the value of the plant will be maintained, as the plant must be maintained if the undertaking is to be a continuous one. This so maintained value would in

that case ultimately exist as a surplus in the hands of the authority for the benefit of those whom they represent at that time.

Plan to secure close co-operation between engineers and accountants in maintaining value

In order to reduce these suggestions into the form of a practical scheme, it would be necessary to lay out a suitable plan for dividing the whole of the capital outlay on wasting assets into classes according to character and length of life, excluding only the long-life plant, the cost of which is to be written off by the operation of the distributed sinking fund. It would also be necessary to adopt the use of a suitable accounting equipment, supplementary to the ordinary financial ledgers, to record the current estimates of the engineers or other technical advisers, and enable the accountants to give due financial effect to such estimates in measuring the varying amount necessary to be charged to revenue account each year for depreciation of the short-life plant, in addition to the annual sum which will be provided by means of the "distributed" sinking fund method of writing off the capital outlay on the long-life plant.

Under this system, the cost of all renewals of the short-life plant is charged, not to revenue, because revenue will be charged with the cost gradually year by year as the cost or outlay expires, but to capital outlay account, and at the end of each year the cost of such renewals, together with the cost of all additional plant—which may be very extensive—is analysed and distributed under the various classes into the accounting equipment referred to above, and in subsequent years the capital outlay for that year on each class of plant is regularly written down in the operation of measuring and deducting the depreciation

at a rate necessary to write off such capital outlay at the end of the life of each class of the plant according to the up-to-date recorded estimates of the engineers. The accounting equipment is simple, and the annual work of measuring each year's depreciation can be performed with ease by an intelligent clerk in a few hours, even when there are scores of different classes of plant to be dealt with.

Treatment of cost of additions and extensions

No specific reference has been made in these notes to the treatment of the heavy capital expenditure for additions and extensions which will doubtless be incurred year by year by an undertaking of this character, but the system suggested herein provides an orderly method of recording all this more or less continuous capital expenditure in a manner which will cause it, at the proper time, to begin to swell the measured amount of expired capital outlay (depreciation) to be taken out of revenue each year. Such a system entirely avoids the dangerous and unsolvable questions which, under present conditions, arise so frequently as to how much of each year's outlay on new plant is to be charged to revenue as being in the nature of renewals, and how much to capital as representing additions or "betterments."

Importance of nearest possible approximation to annual profits

One advantage of the above suggestions is that they enable the nearest possible approximation to the true annual profits of the undertaking to be made because a sensitive and efficient means is provided of accurately measuring that important part of working cost which is represented by expired capital outlay on plant. It is probable the authors of the scheme do not claim that the sums proposed to be taken out of revenue each year for sinking fund.

reserve fund, and probably also for any future capital outlay estimated to be in respect of renewals of plant, will give an accurate measure of the amount of expired capital outlay properly belonging to each year, although if this is so it will not be possible to compute with accuracy the profits of each year.

London County Council proposals for dealing with "net revenue"

The London County Council proposals are that the scheme shall give power to deal with the "net revenue from the undertaking" as follows—

1. The payment of interest at an assumed rate of 4 per cent. per annum on the proportion of capital found by the authority.

2. The provision of a sinking fund to be owned by the authority, at the rate of about 2 per cent. per annum on the whole of the capital of the undertaking.

3. The payment of interest on the capital found by the company, assumed at the rate of 4 per cent. per annum.

4. The formation of a reserve fund calculated at ½ per cent. per annum on the whole of the capital of the undertaking.

5. The surplus profits over and above the deductions for interest, sinking fund, and provision for reserve to be divided equally between the authority and the company until the company receives a share sufficient to pay a further 4 per cent. interest upon its capital expenditure, making in all a return of 8 per cent. interest to the company. Any further profits would, as regards 75 per cent., be utilised in giving a rebate on the prices charged to consumers, and the remaining 25 per cent. would be divided equally between the authority and the company.

Uncertainty of annual "surplus profits" under the proposals

These proposals take for granted that it will be possible to ascertain the "surplus profits" of each year, but unless it is possible to compute the whole profits (which include the surplus profits) of the undertaking every year, or, alternatively, unless there is at least reasonable certainty that the sums proposed to be taken out of the balance of revenue receipts (referred to as "net revenue") before arriving at the "surplus profits" exceed the cost of producing the revenue plus 4 per cent. interest on the capital, it will be impossible either to ascertain the amount of the "surplus profits," which it is proposed to dispose of in the manner set out in Clause 5, or to be sure that any surplus profits have been earned. In the circumstances, it is not safe to assume that the "surplus profits" can be ascertained without adopting some better means to ensure that the unexpired capital outlay on plant coincides from time to time with the still remaining usable or going-concern value of that plant.

Haphazard nature of proposals for dealing with capital outlay

It should be noted that the proposals contained in the London County Council's report as to the periods within which the capital expenditures on the several classes of property shall be written off are of such a general character as to treat interest paid out of capital as having a common life of thirty years, instead of providing that this interest shall be equitably distributed and added to the cost of the different classes of plant in the construction of which it will be incurred, and in like manner the purchase moneys of existing undertakings are to be written off in thirty years, although the sums paid will obviously be very large and will be represented by values of many

descriptions. Under a suitable system, all these values would be distributed and recorded together with other similar values under the various classes of plant, and a connection would be maintained between the sum of the unexpired capital outlay (as stated in the annual balance sheet) and the details contained in the register of plant of the engineers' estimates of the going-concern capacities of the plant actually existing.

The importance of maintaining such a connection becomes additionally plain in view of the proposal contained in the report that "the authority shall be empowered to resume possession of the undertaking at the end of the term of the contract on payment to the company of a sum equal to the capital provided by it for the purposes thereof." If, during its term of possession, the company has failed to provide adequate sums out of each year's revenue receipts to answer expired capital outlay (depreciation) on the plant, it may have eaten out the heart of the "capital provided by it." Such a condition frequently exists in the case of undertakings using perishable industrial plant, and is the result of computing the profits year by year at a sum larger than the true profits, the consequence being that the sums paid away in the form of dividends are paid partly out of true profits and partly out of the proceeds (included in the revenue receipts) of the realisation of portions of the value originally represented by capital outlay on plant, which are not profits, but represent a return of capital wrongly treated as profits.

It is stated above that the annual accretion to a

Further illustration of the effect of the sinking fund theory

sinking fund is not a sound measure of the annual depreciation of industrial plant, and it is further stated that this fact can be clearly demonstrated. In view of the extent to which the sinking fund method of accumulation is used, not only by electrical undertakings but by other municipal trading undertakings, it is of general interest to understand the true effect of this method, which is known as the Annuity or Sinking Fund Theory of Measurement of Depreciation.

What is an annuity ?

Industrial plant, during its efficient life, gives efficient, and therefore approximately equal, annual service, a fact admitted by the advocates of this theory; and in order to understand the true effect of the theory, the question "What is an Annuity ?" must first be answered. Suppose a man has a capital of £100 and wants to lay it out to be exhausted in such a way as to bring him in the largest possible equal annual income over a period of twenty years. Then, taking interest at 5 per cent. per annum, this man will find that by parting with his £100 now he can secure an equal annual income of £8 over a period of twenty years, the first instalment of £8 being payable to him at the end of the first year and the last, or twentieth, instalment being payable to him at the end of the twentieth year.

A man who enters into a contract of this kind has purchased an annuity, and should know what part of his capital outlay has expired or is exhausted at the end of each year. If he keeps accounts, his annuity ledger account will stand thus for the first three years of the term—

Dr.		*Cr.*	
Cost of annuity . . .	£100	Annuity, consisting of	
Interest on £100 for one year	5	Interest per contra. £5 Capital 3	£8
		(*Note.*—This £3 is equal to the annual instalment of a sinking fund to replace £100 at the end of twenty years.)	
		Balance	97
	£105		£105

Dr.		*Cr.*	
Balance, unexpired cost	£97	Annuity, consisting of	
Interest on £97 for one year	4·85	Interest per contra £4·85 Capital . . . 3·15	£8
		(*Note.*—This £3·15 is equal to £3 plus one year's interest on sinking fund investments.)	
		Balance	93·85
	£101·85		£101·85

Dr.		*Cr.*	
Balance, unexpired cost	£93·85	Annuity, consisting of	
Interest on £93·85 for one year	4·68	Interest per contra £4·68 Capital . . . 3·32	£8
		(*Note.*—This £3·32 is equal to £3 plus one year's interest on sinking fund investments)	
		Balance	90·53
	£98·53		£98·53

Balance, unexpired cost 90·53

And so on, year by year, until the last instalment of the annuity of £8 at the end of the twentieth year will exactly wipe out the balance of the constantly diminishing unexpired cost standing on the annuity ledger account, and will consist of interest £0·38 and capital £7·64.

If this man wishes to sell or transfer his annuity at the end of any one of the twenty years, the balance of a ledger account constructed in this way will be the amount he will receive as the unexpired capital value of the annuity, assuming, of course, other things remain equal.

In order to avoid minute fractions, the annuity is taken at £8 instead of £8·024, and the sinking fund at £3 instead of £3·024.

There is, as we know, a mathematical connection between an annuity and a sinking fund accounting for the fact that the annually increasing amount of the capital element contained in each succeeding instalment of an annuity (*see* above) is always exactly equal to that year's accretion to a sinking fund invested at a similar rate of interest, to replace the original cost of the annuity at the end of the period of years. And therefore, if we strike out from both sides of the annuity ledger account illustrated above, the interest debited and the interest credited, both being equal, the ledger balance representing the unexpired value of the annuity at the end of each year will remain unaltered, and there will remain on the credit side, to diminish the original cost, only the amounts equal to the annual accretions to a sinking fund. This explains the puzzling fact that when applied to reduce a ledger record of cost, the annuity theory and the sinking fund theory of measurement are identical in result.

The accelerating annual decrease in value of a twenty years' annuity of £8 per annum with interest at 5 per cent., and the corresponding accelerating annual increase in the accretions to a sinking fund, are as on the next page.

It will be observed that the sum of the annual accretions to the sinking fund replaces the £100 capital at the end of the twenty years, but that the amount of each annual accretion increases from £3·02 for the first year to £7·64 for the last year of the period.

Period of years still to run.	Decreasing value of annuity.	Annual accretion to a sinking fund.	Period of years still to run.	Decreasing value of annuity.	Annual accretion to a sinking fund.
					38·04
20	100·0	3·02	10	61·96	4·93
19	96·98	3·18	9	57·03	5·17
18	93·80	3·33	8	51·86	5·43
17	90·47	3·50	7	46·43	5·70
16	86·97	3·68	6	40·73	5·99
15	83·29	3·86	5	34·74	6·29
14	79·43	4·05	4	28·45	6·60
13	75·38	4·26	3	21·85	6·93
12	71·12	4·47	2	14·92	7·28
11	66·65	4·69	1	7·64	7·64
		38·04			100·0

Annuity scale of value unsuitable to measure value of plant

Now, what justification is there for using a scale which correctly applies to the surviving value of an annuity to measure the surviving value of material wasting assets such as plant? The cost, and therefore the value, of material wasting assets is always based on the quantity of material and labour which they contain. It has nothing whatever to do with the value of an annuity, which is based on future income certain, over a period certain, receivable in equal annual sums. Value locked up in the form of material plant cannot earn interest any more than value locked up in the form of sovereigns deposited in a box can earn interest. If plant contributes twenty years' efficient, and therefore approximately equal, annual service to a profit-seeking undertaking, its "going-concern" value will be equal to half its cost at the end of the first ten years of the period, and no more, just as the sovereigns, if drawn out by equal annual instalments over twenty years, will be reduced by one-half at the end of ten years.

To show that value locked up in the form of material

does not earn interest, take, as an example, the value of a coal field for which the owner originally paid £100,000, the estimated contents being at that time 1,000,000 tons, so that it cost him 2s. a ton ; suppose that 50,000 tons output is raised regularly each year. It is clear that, other things remaining equal, the "going-concern" value of the coal field at the end of ten years, when half the contents will have been raised, will be based on the contents still remaining in the coal field, and will be £50,000. In the event of a transfer from one undertaker to another, this consideration would hold good, regardless of the fact that a larger amount of capital has been locked up in this wasting asset during the seller's part of the assumed life period of twenty years, than during the buyer's part. Such a state of affairs might, perhaps, in the case of a developed business, be good ground for the transferor to claim payment from the transferee of a sum for goodwill, but the fact that the transferor has temporarily owned the whole of the coal field will not induce the transferee at the end of ten years to pay £62,000, which is the surviving value at the end of ten years ascertained on the annuity theory of measurement. The coal field, now containing 500,000 tons of equally accessible coal, will be worth no more than £50,000. The commercial value of the coal capacity has not been increased by interest on the value while held by the transferor, and neither is the commercial value of plant and machinery or any other material wasting asset increased by interest.

In order to show the effect on the "going-concern" value of plant of employing the annuity theory of measurement, take the case of plant costing £100,

having a life of twenty years, assuming interest at 5 per cent. per annum, and no scrap value at the end of the period. By the annuity theory, the "going-concern" value of the plant at the end of ten years, or half the life period, is £62, as shown by the following summary of the plant ledger account if kept in the same way as the annuity ledger account already set out—

Cost of plant		£100
Add.		
Interest at 5% to the end of the tenth year on the diminishing balance of capital locked up in the plant		42
		£142
Deduct.		
Ten annuity instalments of £8, consisting of—		
Proportion, accrued to the end of the tenth year, of £60, being the sum of interest at 5% chargeable in twenty years on the diminishing balance of capital remaining locked up in the plant	£42	
Ten sinking fund instalments of £3.	30	
Proportion, earned to the end of the tenth year of £40, being the sum of interest earnable in twenty years from the regular investment at 5% of £3 per annum	8	
		80
		£62

The balance of this plant ledger account should be £50 and not £62. The reason of the difference will be seen on reference to the annuity scale of value already set out, which operates to provide only £3·02 in the first year, the provision gradually increasing

to £7·64 in the twentieth year, so that, in ten years, the sum of the annual accretions to a twenty years' sinking fund—taken in this case as the measure of depreciation to date—is only £38 instead of £50. Of the £100 to be replaced by the sinking fund, £60 is ultimately provided by the sum of the twenty sinking fund instalments of £3 each, and £40 by the interest earnable thereon in twenty years, of which less than half—by £12—accrued in the first ten years, and the £12 is, by the use of this theory, retained in the value of the plant to be taken out of the earnings of future years.

Surplus interest of later years, if any, is a factor of goodwill

An argument which is often used in support of this theory is that the surviving value should be based on cost, and that cost includes interest. It is true that one of the elements of economic cost is a normal rate of interest on capital invested, but we have seen that the market value of material wasting assets is not increased by interest. But in connection with a profit-seeking undertaking using material wasting assets, two distinct classes of value may co-exist, one the "going-concern" value of the material plant, and the other goodwill, which is the present value of future super-profits expected to be earned during the remainder of the useful life of the plant. The term "super-profits"—as applied to profits which may arise out of the use of the plant—means the amount by which the profits or interest assumed by the annuity theory to be earnable in the last ten years exceeds the profits or interest assumed to have been earned in the first ten years of the period, and in the case illustrated this amount is £12.

The unit of cost has been taken in the illustration

as £100, and on this the overstatement of the "going-concern" value of the plant at the end of ten years is £12, but when questions arise as to the value of extensive plant installations, the matter assumes very great importance. Thus, in the case of plant costing £10,000,000, the overstatement of value at the end of ten years by the use of this theory of measurement might amount to no less than £1,200,000. Another important point to be borne in mind is that the only possible justification for the use of this theory on any ground whatever is that the relative sinking fund has, in fact, been set up and regularly maintained out of moneys gradually released as the expiring cost of the plant is refunded out of revenue. But it will generally be found that this cannot be done because that part of the capital of an undertaking which is invested in plant remains, as to its bulk, always permanently invested in plant, the units of which are continuously passing out of service and being renewed in the same way that other portions of the capital of an industrial undertaking remain permanently invested in such assets as stock and debts, the constituent items of which are always changing, while the value and, therefore, the amount of capital which they represent remains a fairly constant sum.

It is obvious that where there is not, in fact, a sinking fund, the setting up of a claim to use the annuity theory of measurement on the ground that more capital has been locked up in a plant during past years than will be needed in future years, cannot be justified on any ground at all, being based on a mere fairy tale.

There are other objections to the use of the annuity

theory of measurement of depreciation, such as the many classes of plant which have to be dealt with, and the difficulty under this method of subsequent alteration and adjustment of the life periods. Industrial plant often consists of scores of different classes with different life periods attaching to each class, and the estimates of the life periods of each class may have to be revised by the engineers from time to time owing to changing conditions, and to a variety of circumstances which cannot be foreseen over a long period of future years.

The fact is that the only form of wasting assets which can be safely written down year by year as the value expires by the annuity or sinking fund theory of measurement is—the annuity, because this is the only kind of property which yields future income certain, over a period certain, receivable in equal annual instalments. The degree of objection or risk incidental to the use of this theory for other wasting assets, which are not material wasting assets, varies with the degree of precariousness of the future income. The kind of property which approaches perhaps most nearly in some respects to that of an annuity is a lease of land and buildings, entitling the owner of the lease to the use and enjoyment of the premises for a fixed term. If the leasehold property is of such a character that the annual value is likely to remain constant during the whole term, there is not much risk or practical objection to measuring and writing off the annual expired capital outlay on the annuity or sinking fund theory, but as the future is never certain, it is better not to do so.

Although a great deal is sometimes heard of the

annuity or sinking fund theory of measurement of expired capital outlay for ascertaining the surviving value of plant, and although it was put forward and the case very ably, though unsuccessfully, argued on behalf of the National Telephone Co., whose claim, exclusive of goodwill which was barred, amounted to upwards of £20,000,000, in the recent Arbitration to determine the "then value" of the plant, it is hard to find a record of any commercial undertaking actually using this method. Nevertheless, it is unfortunately very largely used by municipal authorities for their trading concerns. They borrow money to pay for wasting assets in the nature of plant required for tramways, gas, electric light, and water undertakings, to be repaid at the end of a long period of years by accumulating a sinking fund, and they often measure the provision for expired capital outlay on their plant by the amount of the annual instalment of the sinking fund. It has been shown that this is unsound, and that it results in retaining in the value of the plant, and so capitalising, an assumed goodwill, which should never be done, and in view of the enormous sums of money involved, the subject urgently needs attention.

There is little doubt that the use of the sinking fund instalment as a measure of the annual depreciation of plant was originally adopted because the sinking fund provides the amount required by the end of the estimated life period. In those days the possible effects upon the computation of intermediate annual profits, and upon the current records of the unexpired value of plant, were of secondary importance, and indeed these questions were then regarded as incapable of treatment on the basis of an exact science.

CHAPTER XV

MINERAL DEPOSITS: THEIR BASE VALUE AND DEPLETION BY WORKING

THIS chapter contains a revised digest of the statement prepared and submitted by the Author to the Royal Commission on the Income Tax (1919) as the Evidence in Chief of the Institution of Mining and Metallurgy, acting through a Joint Committee representing the Mining Industry. The interests represented include the development and working of all minerals under British control except coal. The properties are situated in the United Kingdom, in the Overseas Dominions, and in foreign countries. The capital represented amounts to some hundreds of millions of pounds sterling.

Inherently wasting assets of mining undertakings

It will be convenient in the first place to set out in summary form a description of the inherently wasting assets of mining undertakings, and of the annual deductions, in the nature of depreciation (expired capital outlay), claimed by mining companies as deductions from revenue for income tax purposes, and then shortly to explain the meaning of the term " base value of mineral deposits " and of other terms used, and the methods suggested for measuring the annual amounts of the deductions so claimed.

The inherently wasting assets of mining undertakings, in regard to which deduction for annual depreciation (expired capital outlay) is claimed, may be described as follows—

Base Value of Mineral Deposits. Deduction should be allowed of a measured amount either per ton of minerals raised or otherwise.

Cost of Shaft Sinking and Access. Deduction should be allowed of a measured amount either per ton of minerals raised or otherwise.

Cost of Plant other than Shaft Sinking and Access. Deduction should be allowed of a measured amount determined by reference to the efficient life of each class of plant.

Cost of Development. Deduction is already allowable.

Economic expenditure incurred in earning revenue

It is fully recognised by the mining industry that in assessing to income tax annual profits as they actually arise year by year, the deductions which can properly be claimed are strictly limited to the economic expenditure necessarily incurred within each year in earning the revenue of that year. This economic expenditure includes not only current revenue outlays in cash, such as salaries and wages, and the cost of consumable stores used in the working of a mine, but it also includes the depletion of capital—or expired capital outlay—which inevitably takes place in the course of each year's working.

Meaning of "base value of mineral deposits"

The meaning of the term "base value of mineral deposits" may be defined as an amount equal to the present value of any expected annual surplus likely to be yielded by the product at whole-term average price after providing all economic expenditure incidental to production and marketing (excluding depreciation of base value) and providing for the payment of a normal rate of interest on the capital invested (excluding base value). To illustrate this, two cases may be stated—

(*a*) A tin mine in the United Kingdom, the estimated product of which at fair whole-term average price would yield not more than sufficient to provide all economic expenditure incidental to production and marketing and to pay a normal interest on capital invested, may have only a nominal base

value, which may be compared with the well-known "peppercorn" legal consideration.

(*b*) A copper mine in the United Kingdom, the estimated product of which would yield a surplus of £2 per ton of ore, after providing all economic expenditure and paying a normal interest on capital invested, may have a base value equal to the present value of the amount of £2 per ton on the estimated contents of the mine.

Meaning of "normal rate of interest"

The term "normal rate of interest on capital invested," as here used, means a rate which should be just sufficient to attract and retain the capital needed for each class of mining industry.

Meaning of "whole-term average price"

The term "whole-term average price" means the expected average selling price over the life of the mine computed by smoothing the market price curves due to seasonal or abnormal demands, or to recurring boom-periods affecting particular minerals. In estimating whole-term average price it may be necessary also to have regard to the fact that increase in cost of production due to a general rise in commodity prices and in wages may tend to maintain an increase in the market price of the product over a long period of years.

The factors of quality, quantity, accessibility, and time

The most important factors in determining the base value of all mineral deposits are: the average quality and quantity of the product, and its accessibility both in regard to distance from the earth's surface and from the world's markets. The period of time within which the estimated contents of the mineral deposits can be advantageously recovered and marketed is also of great importance.

Estimates are needed for all enterprises

All the factors involved in the measurement of the base value of mineral deposits are of necessity mere matters of estimate. But estimates are also necessary in computing values of the assets of all other enterprises. Future probabilities—in regard to the contents

of a mine and selling prices—can always be estimated closely enough to induce venturers to risk their capital in the enterprise. Carefully prepared estimates of future probabilities should, in like manner, be used in computing the annual results of a mine.

Drastic check required on alleged value of mineral deposits

It is admitted that there is need of efficient safeguards against the evasion of income tax which might be practised if, in computing annual profits for the purpose of assessment to income tax, deduction is allowed for depreciation of mineral deposits without some drastic check on the value put upon those mineral deposits.

The consideration paid by a mining company to a vendor purports to be the value of the mineral deposits, and this may generally be so, but there is nothing to prevent the payment to a vendor by rash and over-credulous speculators of an amount sufficient to include the base value—plus a large sum on account of expected future profits. Such expected future profits are, in fact, part of the normal interest or mining profits which should properly go to the venturers. It is to be observed that any amount by which the consideration paid to a vendor of mineral deposits exceeds the base value, would be profit to the vendor, but would rank as a casual profit, and therefore would not be chargeable in the vendor's hands with British income tax unless he is a dealer in mining property. But if and when the expected profits of the company (of which part has been so paid to the vendor in advance of arising) are actually earned in future years, they will, to the extent that the vendor has not already been assessed thereon, be properly chargeable in the hands of the company with income tax. In speaking of

profits, the amount is, of course, after providing for depreciation of base value.

The consideration paid to a vendor often consists partly of cash, and partly of fully-paid shares, or it may consist wholly of fully-paid shares, which again may be either preference, ordinary, or deferred shares. It is clear that the nominal amount of such consideration cannot be accepted as representing the base value of the mineral deposits without being tested by reference to all the known facts in each particular case.

Profits available for distribution

The annual profits actually arising from a mining undertaking may not all be properly available for distribution. This is so whenever the consideration paid to a vendor is greater than the base value of the mineral deposits. If, for instance, mineral deposits—the base value of which is, say, £100,000—are sold by a vendor to a mining company for £150,000, the mining company has paid £50,000 in addition to the base value. In computing annual profits for distribution in such case, the mining company should—if its capital is to be kept intact—deduct from its annual revenue the annual expired capital outlay on the whole purchase consideration, which includes the base value of mineral deposits, together with £50,000, being part of the expected future normal mining profits. For the purposes of British income tax, however, which purports to tax only profits as and when they arise, the company can claim deduction of no more than the annual expired capital outlay on £100,000, the base value of the mineral deposits, unless the vendor, being a dealer in such property, has been assessed to British income tax on his profits arising out of the sale to the company. If that be so, it is

contended that the company should be entitled to deduction of £100,000, the base value, plus the £50,000, the balance of the vendor's consideration.

Consideration paid for future mining profits distinguished from commercial goodwill

Notwithstanding the present income tax practice of assessing the dealer on his profit arising out of the £50,000, it is clear that, in the above-mentioned case, no true profit has arisen at the date of sale out of the enterprise. The dealer has sold to others for the £50,000—paid in excess of the base value—only the right to receive the future mining profits, if and when any profits arise. The transaction is thus a forward sale of a part of expected future normal mining profits —comparable with the sale of commercial goodwill— except that the latter is a forward sale of expected future "super-profits." Investors in mining enterprises are speculators, and they are perhaps sometimes rather easily induced to share with the vendor the exceptionally high profits expected from mining, although these profits represent no more than profits at a normal rate—to the whole of which the venturers themselves are fairly entitled. A transaction of this kind must be clearly distinguished in its nature from a sale of commercial goodwill, the venturers having, in fact, in this case paid £50,000 more than the normal value.

Overseas vendors

If mineral deposits abroad have been purchased from an overseas vendor not subject to British income tax on his profits, it is claimed that deduction should be allowed on the whole cost of the mineral deposits to the company. This cost should be accepted as the base value of the mineral deposits, provided that there has been no intermediate owner domiciled in the United Kingdom and liable to pay British income tax

on his profits arising out of the sale to the company. Where royalties are paid on overseas mineral deposits to persons overseas, not domiciled in the United Kingdom, and not liable to British income tax, the royalties paid should be allowed as deductions from revenue receipts in assessing profits to income tax.

Fallacy of argument that minerals *in situ* have no value

It is sometimes alleged that deduction cannot properly be claimed in respect of minerals *in situ* in the United Kingdom because they have cost nothing to the owner of the land under which they lie. This is a fallacy. Mineral deposits are part and parcel of the land, and the possession of the land always means prior cost. To claim for the State the right to confiscate part of a man's land because it may prove to be unexpectedly valuable, would tend to destroy the foundations of security and value in all property. Rights to minerals *in situ* have an exchangeable value, and that exchangeable value is capital.

The contention of the mining industry that in computing profits for income tax purposes deduction should be allowed for expired capital outlay on the base value of mineral deposits is quite unaffected by political questions as to whether or not the value of minerals which may be discovered on lands within the United Kingdom belongs to the particular individual upon whose lands the discovery is made, or whether it belongs to the State. If it belongs to the individual it will be a windfall to him—like any other unexpected increase in the value of his property—and therefore not an annual profit chargeable with income tax—and if it belongs to the State, it will be a windfall to the Crown. Such questions are apart altogether from the clear and logical claim that in computing, for

income tax purposes, annual profits arising from a mining enterprise, deduction must be allowed for expired capital outlay on all inherently wasting assets, including the base value of mineral deposits.

Suggested Permanent Commission to adjudicate in regard to base value

With income tax at the rate of 5s. in the £, it is true to say that the State has, in effect, assumed the position of a partner in all profit-seeking undertakings, including the mining industry. The State takes one-fourth of the profits, and leaves three-fourths to the venturers. The State is, further, in a privileged position in that it takes one-fourth of the profits, but in the case of unprofitable enterprises, it does not bear one-fourth of the losses. In view of the position of the State as a preferred partner, taking one-fourth of the profits arising in the mining industry, it is not unreasonable for the venturer companies to ask for the setting up of a competent and unbiased Permanent Commission to adjudicate in regard to the base value of the mineral deposits, and the amount per ton of ore raised, to be deducted from the revenue before computing the profits for division between the State and the venturers—the State's share being levied as income tax.

Adjustment of base value on after-acquired knowledge

Each venturer company should be entitled, failing agreement with the tax authority, to make application to the suggested Permanent Commission to determine the base value of the mineral deposits, after considering the evidence applicable to the particular case; and thereafter either party (the State or the taxpayer) should have the option of applying again with a view to obtaining any subsequent adjustment of the base value which may be rendered necessary by after-acquired knowledge. Statistical records, in regard to

all classes of mining enterprise, are already available, and could speedily be collected and developed on scientific lines. Such statistics would be of great use in estimating whole-term average price, average cost of production and marketing in relation to average quality of ore and accessibility, normal rate of interest on capital, etc.

United States Internal Revenue Bureau Section of Mine Valuation

According to an announcement made by the American Institute of Mining and Metallurgical Engineers (Incorporated), dated the 20th August, 1919, the United States Internal Revenue Bureau had established in the Income Tax Branch a Section of Mine Valuation, in which all questions of particular complication and difficulty relating to the wasting assets of mines would be handled by competent engineers.

British law and practice

The fact that the English law permits of the distribution in dividends of the whole surplus annual revenue of mining undertakings, without first deducting the annual expired capital outlay on the base value of mineral deposits, does not affect the soundness of the claim to be allowed such deduction for income tax purposes. And again, the fact that there is considerable divergence in the practice of different companies in the methods of drawing their annual Profit and Loss Accounts and Balance Sheets, and that some companies make provision for expired capital outlay, which is more or less accurately measured, while others may carry unmeasured sums to reserve, is also immaterial to the claim

United States Revenue Act, 1918, allowed deductions for exhaustion of deposits of natural raw materials

The right that for income tax purposes deduction should be allowed for the gradual exhaustion of mineral deposits is admitted in other countries, thus—

The United States Government recognises that, in

working a mine, mineral deposits are depleted and used up, and a charge for exhaustion is allowed in computing the profits of a mining concern for the purposes of income tax.

The United States Revenue Act of 1918 provided that in computing net income there shall be allowed as deductions in the case of mines, oil and gas wells, other natural deposits, and timber, a reasonable allowance for depletion. The methods of measuring this allowance were set out in Articles 201-233 inclusive, of a publication called "Treasury Department, United States Internal Revenue, Regulations 45, relating to the Income Tax and War Profits and Excess Profits Tax under the Revenue Act of 1918." This was published at Washington—Government Printing Office, 1919.

United States' method of estimating market value of mineral deposits

These regulations provided, *inter alia*, that in determining the fair market value of mineral deposits as a basis for depreciation deductions, such value must be determined in the light of the conditions and circumstances known at the time. No rule or method of determining the fair market value of mineral property is prescribed, but the Commissioner lends due weight and consideration to any and all factors and evidence having a bearing on the market value. (Part I, Article 206.)

United States' provisions for new estimates of recoverable units

The regulations also provided that in determining the quantity of mineral in a mine for purposes of depletion allowance, the property must be considered in the condition in which it was within thirty days after the date of discovery, but if—subsequently—additional recoverable mineral deposits have been discovered, or developed, which were not taken into account in estimating the number of units for purposes

of depletion, or if it shall be discovered by working, development, or exploration, that ground previously estimated to contain commercially recoverable mineral is barren, or contains only commercially unworkable mineral, a new estimate of the recoverable units of ores or minerals was to be made, and when made thereafter constitutes a basis for depletion. (Part I, Article 208.)

United States' definition of "discovery of a mine", and claimant's statement of size, character, value, etc., of deposit

With regard to the discovery of a mine or a natural deposit of mineral, it is provided that whether it be made by an owner of the land, or by a lessee, discovery shall be deemed to mean—

(*a*) The *bona fide* discovery of a commercially valuable deposit of ore or mineral of a value materially in excess of the cost of discovery in natural exposure or by drilling or other exploration conducted above or below the ground; or

(*b*) The development and proving of a mineral or ore deposit which has been abandoned or apparently worked out or sold, leased or otherwise disposed of by an owner or lessee prior to the development of a body of ore or mineral of sufficient size, quality, and character to determine it, in connection with the physical and geological condition of its occurrence, to be a mineable deposit of ore or mineral having a value materially in excess of the cost, or of the proving and development. . . . and every taxpayer claiming the value of a mineral deposit on the date of discovery or within thirty days thereafter for purposes of depletion, will be required to attach to his return a statement setting forth the conditions and circumstances of the discovery, and the size, character, and location of the deposit, together with the cost of discovery, its value and the precise method used in determining the value. (Part I, Article 219.)

New Zealand's rough and ready method of estimating expired capital outlay on mines

The New Zealand Government also recognised the necessity of allowing for expired capital outlay on mines, and exempted from taxation 50 per cent. of the dividends paid by gold and scheelite mining companies. The New Zealand Land and Income Tax Act, 1916,

an Act to consolidate and amend the law relating to land tax and income tax, provided as under—

(1) Notwithstanding anything to the contrary in this Act if the Commissioner is satisfied that the sole or principal source of the income of a company, whether incorporated in New Zealand or elsewhere, is the business of gold-mining or scheelite-mining in New Zealand, the taxable income derived by that company in any year shall be deemed to be one-half of the total sum paid as dividends during that year to the shareholders of the company and the company shall be assessed and liable accordingly.

(2) The term "dividends" includes all sums distributed in any manner and under any name among shareholders of a company on account of profits made by the company.

Capital value of minerals is admitted by British Government for mineral rights duty

The British Government admitted the capital value of minerals *in situ* in the provisions of the Finance (1909-10) Act, 1910. Section 20 of this Act imposed mineral rights duty on the rental value of all rights to work minerals.

Statutory definition of capital value of minerals

Section 23 of the Act defined the term "capital value of minerals" as follows—

(1) For the purposes of this part of this Act the total value of minerals means the amount which the fee simple of the minerals, if sold in the open market by a willing seller in their then condition, might be expected to realise, and the capital value of minerals means the total value, after allowing such deduction (if any) as the Commissioners may allow for any works executed or expenditure of a capital nature incurred *bona fide* by or on behalf of any person interested in the minerals for the purpose of bringing the minerals into working, or where the minerals have been partly worked, such deduction as is, in the opinion of the Commissioners, proportionate to the amount of minerals which have not been worked.

(2) For the purposes of valuation under this part of this Act, all minerals shall be treated as a separate parcel of land; but, where the minerals are not comprised in a mining lease or being worked, they shall be treated as having no value as minerals, unless the proprietor of the minerals, in his return furnished to the Commissioners, specifies the nature of the minerals and his estimate of their capital value.

Minerals which are comprised in a mining lease or are being worked shall be treated as a separate parcel of land, not only for the purposes of valuation, but also for the purposes of assessment of duty under this part of this Act.

Illustration of method of determining base value of mineral deposits

Where mineral deposits—either being worked or about to be worked—are of such a nature, and are so situated as to offer the opportunity of yielding profits or increase over and above the cost of production and marketing and a normal rate of profit or interest on the capital invested, these mineral deposits have a base value other than nominal.

In valuing mineral deposits there are a number of conditions and circumstances to be taken into account, each of which should receive separate consideration. The factors and evidence include the following—

The character of the mineral deposits as to—

Description.

Quality.

Quantity.

Accessibility.

Time needed for advantageous recovery and marketing.

The whole-term average price at which the product may be sold.

The whole-term average cost of recovery, excluding normal profit or interest on capital.

The normal rate of profit or interest needed to attract and retain the capital required.

The average amount of capital required, excluding the base value of the mineral deposits.

The time factor

In computing the base value of mineral deposits, the treatment of the time factor presents considerable difficulty. For instance, take the case of a mining proposition expected to yield an average annual surplus of £10,000 after providing the normal mining profit or interest required to attract and retain the necessary capital. An annual surplus of £10,000 per annum

over a period of twenty years would amount to £200,000, but it is clear that having regard to the period to elapse, the present base value of such mineral deposits is nearer to £85,000 than it is to £200,000. If, on the other hand, the whole of such mineral deposits could be advantageously recovered and marketed in one year, the present base value might be nearer to £200,000. But in computing base value the time factor is always important, and it is probable that an average period of time required for recovery is perhaps twenty years.

In computing annual profits—as distinct from the base value of mineral deposits—in the mining industry, however, the time factor is absent. Mining undertakings sell the metal produced to buyers on the metal market, and the metal which is won in the last year of the twenty years period will, other things remaining equal, command no larger price than metal won in the first year of the period. The metal broker pays the same price on the market for metal whether it com s from a mine which is twenty years old or one year old

Suppose the case of mineral deposits containing 100,000 units in which the time factor is estimated at twenty years, and the estimated average capital outlay, exclusive of base value, amounts to £100,000, made up as under—

	£
Shaft-sinking and access . . .	25,000
Plant	25,000
Development	50,000
	£100,000

Suppose further that the normal rate of profit or interest agreed as necessary to attract and retain the

capital required for the enterprise is 10 per cent. per annum, and that it is estimated the annual sales of the product, less the cost of production and marketing, will leave a balance of no more than £10,000. This balance is sufficient only to provide the normal rate of profit or interest on the average capital, and therefore the base value of the mineral deposits will be a nominal sum of, say, £1.

But suppose that a careful computation of the estimated average annual results over the twenty years shows a considerable surplus after providing £10,000—the normal profit or interest—then there exists a base value depending upon the amount of the surplus. The time factor involved in estimating this base value may be computed by reference to the amount of the annual surplus in each particular case discounted at 10 per cent. over a period of twenty years as under—

Annual Surplus.	*Base Value.*	*Estimated contents in units.*	*Capital outlay per unit.*
£	£		£ s. d.
10,000	85,000	100,000	17 –
50,000	425,000	100,000	4 5 –
150,000	1,275,000	100,000	12 15 –

The mass-unit

When the base value of mineral deposits—which are to be treated together as a whole or mass-unit—has been ascertained, either for the purpose of sale and purchase, or for the purpose of computing the future annual expired capital outlay, such base value should be treated as the purchase price of the whole mineral contents of the mine and computed at a flat rate of so much per ton. When once the proposition has become a profit-seeking undertaking, the mine-owner proceeds to erect the necessary plant, and has

then definitely applied the mass-unit to the purpose of profit-seeking by the gradual sale and using up of the material. The mass-unit is no more on the market for sale as such. It has now assumed the character of a store of material forming part of the capital of the profit-seeking undertaking. The profit earned over the whole period of recovering and selling the material—which may extend to a number of years—must not be forestalled by valuing too high the unsold material. Such over-valuation results inevitably from the use of such devices as the annuity or sinking fund method—sometimes called amortisation—for measuring the annual expired capital outlay on the base value.

For instance, a merchant buys what may be called a mass-unit of timber—contents unknown, but estimated to contain 100,000 standards. This can be sold only over a period of future years, and he must therefore have due regard to the time factor in agreeing the price to be paid by him for the mass-unit of timber. But in valuing the unsold stock of this timber at the end of each year no question of interest can then arise. The timber will have cost him so much a standard. He must not write off the cost by amortisation, because this method operates to add to the value of the stock of unsold timber an amount of interest equal to the supposed possible earnings of the money realised by the sale of the timber in the earlier years of the period. The timber, after its purchase in bulk, has become stock-in-trade, forming part of the capital of a profit-seeking undertaking, and the profit actually earned each year is itself the only interest on the capital employed.

Ill-effect of amortisation

The result of employing the amortisation method is that in the earlier part of the term of years the amounts written off as the cost of the material sold are too small, thus causing the material still unsold to be over-valued. On the other hand, in the later years, sums larger than the cost of the material sold in those later years are written off, and in this way the earlier deficiency in the amounts written off is made up by the end of the period. It is quite clear that, assuming all the estimates to have been correctly made, the base value of a mining proposition at the end of one-half the estimated working period is not to be measured by reference to the value of an annuity calculated over the remaining period of years. The surviving value is not dependent upon interest considerations, such as are involved in the annuity or sinking fund method of valuation, and due regard must always be had to the dominating fact that the owners, at the commencement of the period, must lay down and install the plant required for the working out of the particular mining proposition as it then exists. Those who wish to study the effect of the amortisation method in detail will find it useful to refer to the table opposite.

A mass-unit of timber, costing £85,136, consists of 100,000 units or standards, the cost being thus about 17s. 0½d. per standard. It is assumed that 5,000 standards (one-twentieth of the whole) are sold each year over a period of twenty years. The position at the end of each year is shown opposite.

A reasoned method of dealing with the important factor of time in estimating base values has now been outlined and illustrated by example which assumes a

Year.	Units or Standards sold.	Actual depletion of Stock by sale.	Actual Cost value of Stock on hand at end of year.	Depletion of Stock by amortisation.	Resulting value of stock on hand at end of year.	Interest assumed to accrue on sinking fund instalments of £1,486·47.	Under-charge for depletion causing over-valuation.	Over-charge for depletion which rectifies over valuation.
		£	£	£	£	£	£	£
1	5,000	4,256·8	80,879·2	1,486·47	83,649·53	—	2,770·33	
2	5,000	4,256·8	76,622·4	1,635·12	82,014·41	148·65	2,621·68	
3	5,000	4,256·8	72,365·6	1,798·63	80,215·78	312·16	2,458·17	
4	5,000	4,256·8	68,108·8	1,978·49	78,237·29	492·02	2,278·31	
5	5,000	4,256·8	63,452·0	2,176·34	76,060·95	689·87	2,080·46	
6	5,000	4,256·8	59,595·2	2,393·97	73,666·98	907·50	1,862·83	
7	5,000	4,256·8	55,338·4	2,633·37	71,033·61	1,146·90	1,623·43	
8	5,000	4,256·8	51,081·6	2,896·71	68,136·90	1,410·24	1,360·09	
9	5,000	4,256·8	46,824·8	3,186·38	64,950·52	1,699·91	1,070·42	
10	5,000	4,256·8	42,568·0	3,505·02	61,445·50	2,018·55	751·78	
11	5,000	4,256·8	38,311·2	3,855·52	57,589·98	2,369·05	401·28	
12	5,000	4,256·8	34,054·4	4,241·07	53,348·91	2,754·60	15·73	
13	5,000	4,256·8	29,797·6	4,665·18	48,683·73	3,178·71		408·38
14	5,000	4,256·8	25,540·8	5,131·70	43,552·03	3,645·23		874·90
15	5,000	4,256·8	21,284·0	5,644·87	37,907·16	4,158·40		1,388·07
16	5,000	4,256·8	17,027·2	6,209·35	31,697·81	4,722·88		1,952·55
17	5,000	4,256·8	12,770·4	6,830·29	24,867·52	5,343·82		2,573·49
18	5,000	4,256·8	8,513·6	7,513·32	17,354·20	6,026·85		3,256·52
19	5,000	4,256·8	4,256·8	8,264·65	9,089·55	6,778·18		4,007·85
20	5,000	4,256·8	—	9,089·55	—	7,603·08		4,832·75
	100,000	85,136·0		85,136·00		55,406·60	19,294·51	19,294·51
				Add Sinking Fund Instalments £1,486·47 × 20 =		29,729·40		
						£85,136·00		

case in which the period to be taken is twenty years, and the normal rate of profit or interest required on capital is 10 per cent. per annum. During the period of working any mining undertaking expired capital outlay on the base value should be regularly charged against revenue, and allowed as a deduction for income tax purposes, according to the capital cost per unit as explained. Assuming that over the period of twenty years, the annual output is uniform and amounts to 5,000 units per annum—or one-twentieth of the estimated contents of the mass-unit—then the amount of expired capital outlay on the base value to be charged against revenue and allowed as a deduction for income tax purposes is one-twentieth of the base value, namely—in the cases given—either £4,250, £21,250, or £63,750.

Pro formâ accounts

The *pro formâ* balance sheets and profit and loss accounts, set out below, illustrate further the four mining propositions already referred to—A, B, C, and D—each having a different base value. In each case the estimated average capital outlay, exclusive of base value, is the same, namely, £100,000.

It will be observed in column A that the estimated average annual results over the twenty years provide no surplus, being sufficient only to pay the normal rate of profit or interest on capital which is here assumed to be 10 per cent. In this case, therefore, the base value is nominal, and for income tax purposes no effective deduction of expired capital outlay on base value can be claimed in computing the profits. The company carrying on undertaking A might have paid £20,000 (not shown on the *pro formâ* balance sheet) for the mining rights, and in such case there

Pro Formâ Balance Sheet at Commencement

	A. £	B. £	C. £	D. £
Capital required (exclusive of base value)	100,000	100,000	100,000	100,000
Reserve, equal to base value	1	85,000	425,000	1,275,000
Creditors	50,000	50,000	50,000	50,000
	£150,001	£235,000	£575,000	£1,425,000
The base value computed as equal to present value of the annual surplus over a period of twenty years discounted at 10% per annum	£1	£85,000	£425,000	£1,275,000

	A. £	B. £	C. £	D. £
Mineral deposits base value	1	85,000	425,000	1,275,000
Shaft-sinking and access	25,000	25,000	25,000	25,000
Plant	25,000	25,000	25,000	25,000
Development	50,000	50,000	50,000	50,000
Stocks, debts, and cash	50,000	50,000	50,000	50,000
	£150,001	£235,000	£575,000	£1,425,000

Pro Formâ Annual Profit and Loss Account

Estimated Average Annual Results over a Period of Twenty Years

	A. £	B. £	C. £	D. £
Cost of production and marketing, after adjusting unsold stocks, including expired capital outlay on shaft-sinking, plant, and development, but excluding depreciation on base value	90,000	90,000	90,000	90,000
Normal profit or interest on capital, 10%	10,000	10,000	10,000	10,000
Annual surplus	—	10,000	50,000	150,000
	£100,000	£110,000	£150,000	£250,000

	A. £	B. £	C. £	D. £
Sales of product	100,000	110,000	150,000	250,000
	£100,000	£110,000	£150,000	£250,000

Note.—An equal annual surplus over the period of twenty years assumes, of course, equal annual output, costs, prices, and other conditions, and would be applicable in each case, thus—

	A. £	B. £	C. £	D. £
Expired capital outlay	—	4,250	21,250	63,750
Balance being further distributable profit	—	5,750	28,750	81,250
		£10,000	£50,000	£150,000

should be deducted from revenue each year, in computing the amount available for distribution (but not for income tax purposes), a sum to refund to the company the £20,000 so paid to the vendor. The reason is that the £20,000 is, in fact, a payment by the company in advance out of the normal mining profits expected to arise during the twenty years from the venture, and, therefore, as and when these profits actually arise, a portion of them should be applied in reduction of the payment so made in advance.

In columns B, C, and D, the amount actually paid for mining rights by an undertaking carrying on either of the enterprises here illustrated may be either more or less than the computed base value of the mineral deposits shown in the *pro formâ* accounts. In any case, where an undertaking has paid less than the computed base value, it will be in a position to distribute to the proprietors a larger sum as profits each year than the profits on which it should pay income tax ; but when an undertaking has paid to the vendor for mining rights an amount greater than the base value it should, if soundly financed, distribute a less sum out of the profits of each year than the amount upon which it will properly be assessed to income tax.

Form in which mining capital might be issued

If, in the above mining undertakings, the amount paid in each case to the vendor is assumed to be equal to the base value as shown in the *pro formâ* accounts, the best way to issue the capital representing such base value in each case might be in the form of 10 per cent. debentures or redeemable shares made repayable by annual drawings. The debentures or shares would then be gradually paid off over the period in amounts not less than the amounts of expired capital outlay on the base value

charged to revenue, and available each year for repayment of capital. The balance sheet at the commencement of each of the undertakings B, C, and D would show on the liabilities side the issue of the 10 per cent. debentures or shares—amounting to £85,000, £425,000, or £1,275,000, as the case may be—and these would be gradually paid off as liquid assets became available.

Cost of shaft-sinking and access

Main shafts, main adits, and other underground works and surface developments fall strictly under the head of "plant," but, for the purposes of measuring annual depreciation thereon this kind of property should be treated separately, and the outlay should be gradually refunded out of the revenue receipts in the proportion which the quantity of the contents won each year bears to the estimated total quantity to which access is expected to be gained by such works.

Cost of plant other than shaft-sinking and access

The legal definition of plant in income tax practice has hitherto been far too narrow. Plant comprises in fact all perishable material property applied to the purpose of seeking profits other than that primarily intended for re-sale. It therefore includes all buildings, plant, machinery, fixtures and furniture, and all surface works, reservoirs, water service, railways and railway sidings, roads, bridges, works, stations, and—as stated above—main shafts, and adits, also fall strictly within the definition of plant. The cost of plant includes, of course, freight, foundations, and installation, and also interest on capital during construction.

In measuring the annual depreciation (expired capital outlay) of plant, by far the nearest approach to accuracy is obtained by estimating the efficient whole-life period in years of each class of plant, with

due regard to all known facts as well as to future probabilities, and distributing the cost, less the estimated remainder value, to future revenue accounts in equal instalments over each year of the estimated whole-life period. The cost of all renewals would then be charged to plant account and not to revenue account. The cost of current maintenance and repairs would be charged to revenue account each year. It is claimed that the present principles of income tax should be so modified as to admit the definition of plant as stated above, and that the annual depreciation of plant should be measured by reference to the cost and efficient whole-life period, and not by reference to a percentage applied to the reducing balance of cost.

Cost of development

The cost of development of ore is already allowable as a deduction in computing annual profits for income tax purposes, but the present practice is not considered to be satisfactory.

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