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Standardization of mine accounting

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THE STANDARDIZATION OF MINE ACCOUNTING

Abstract: This paper presents the history of the international efforts to standardize mine accounting between 1895 and 1915. Extractive industries, such as mining and oil and gas, posed especially difficult problems for the accounting profession. In 1895 there was almost no literature to help in the resolution of these problems. During this following interval the issues of mine accounting were thoroughly discussed and limited standardization was achieved in some regions. Near the end of this period the Institution of Mining and Metallurgy unanimously adopted a set of accounting standards for the mining industry.

INTRODUCTION

From 1895 to 1915 there was a vigorous international effort to establish standardized methods of accounting for the mineral industry. The prime objective of this movement was to achieve comparability of financial statements throughout the industry. If greater accounting uniformity could be achieved, it was hoped that the public would have more faith in the financial reports of mining companies and therefore be more willing to invest in such ventures.

At the beginning of this period there was essentially no literature to guide in the design of an accounting system for a mine and as a result there was little, if any, uniformity. The only accounts that were likely to be comparable were cash and current liabilities. During the period from 1895 to 1915 the leaders of the mining industry discussed a wide range of topics, such as accounting for exploration, property acquisition, development and the related issues of depletion. As is often the case in accounting theory, these pioneers were unable to agree on several important questions. However, they succeeded in defining and clarifying many issues; promulgating a set of mine accounting standards and achieving some regional standardization within the industry.

Even a cursory review of the accounting literature will show that the mine standardization movement extended from approximately 1895 to 1930. However, the movement can be divided into two distinct phases, which were separated by the

disruption of World War I. The first period from 1895 to 1915 was international in scope; was not heavily influenced by income tax laws; and saw a significant level of participation by accountants, consulting engineers, and mine managers. The second phase lasted from 1915 to 1930 and was primarily an American movement; was heavily influenced by the federal income tax laws; and was dominated by accountants. Not only is the second phase quite interesting, it is very complex. Because of the differences between the two periods, the second phase of the standardization movement (1915-1930) will be left for a future study.

This study presents the history of the international mine accounting standardization movement (1895-1915). Its purpose is to determine how the complex accounting issues of the mineral industry were handled in an earlier age and to trace the path that led to modern practice. While this paper surveys accounting practices throughout the English speaking mining world, it focuses on two significant developments. The first is The standardization of mine accounts at the Bewick, Moreing & Co. mines in Western Australia. This is the best documented and earliest example so far identified of a large group of independently owned mines adopting uniform accounting standards. The second topic is the effort of the Institution of Mining and Metallurgy to establish accounting standards for the mineral industry.

JUSTIFICATION

There are a number of reasons why this is an important issue in accounting history. One reason is that efforts to standardize practice have dominated the development of financial reporting during this century. The movement to standardize mine accounting was one of the first such movements. This is also of interest because it is an example of the standard setting process in a generally unregulated environment. Another important reason is that the mining industry faces very difficult fundamental questions of when is a cost an asset and when is it an expense. These issues are among the most important and interesting in accounting history.

METHODOLOGY

This paper is based on a comprehensive review of the accounting and mining literature of the period. Since a discussion of every article on mine standardization would quickly

become tedious and possibly confusing, only the more important are included. Among the factors considered in the selection of articles were the following: the author's professional standing; how often the article was cited by others; did the article reflect the actions or views of professional societies; and how well did the author present his ideas. In addition to the literature review, several individuals provided very valuable research assistance. P.J.D. Ellery, Chief Executive Officer of the Chamber of Mines of Western Australia, was very helpful in providing information regarding the Chamber's efforts to standardize mine accounting. Dr. George Nash of the Hoover Presidential Library furnished a copy of an unpublished Herbert Hoover manuscript which proved to be extremely valuable. That manuscript describes many useful details of the uniform system of accounts that Hoover installed at eighteen leading mines in Australia. Don Reid, an executive of the Western Mining Corporation (Australia), provided us with a complete set of annual reports of the Lake View Consols Mining Company from 1896 through 1910. Certain questions could only be resolved by analyzing these financial statements. Leslie Exton, librarian at the Institution of Mining and Metallurgy (London), searched the records of that professional society for the files of the Mine Accounts and Cost Sheets Committee. The Institution of Mining and Metallurgy is a British society of engineers that was founded in the early 1890s. It is roughly comparable to the American Institute of Mining and Metallurgical Engineers. Although those files no longer exist, the work of that committee was widely discussed in the accounting and mining literature (between 1905 and 1915).

MINING INDUSTRY

The mining industry changed dramatically during the period from 1880 to 1920. The structure of the industry changed from organizations devoted to single properties to firms that controlled many properties [Mikesell, p. 28; Watermeyer and Hoffenberg, pp. 827-28]. It was a time of great advances in the technology of the mineral industry [Charleton, p. 329]. Practical miners were increasingly replaced by college trained engineers in the industry's positions of authority [Lindgren, p. 702]. This new and growing class of well educated managers displayed a greater appreciation of the importance of accounting. For the first time in history, considerable attention was directed to mine accounting issues by accountants, engineers and managers. The mining industry of that day was very cosmopolitan. It was not

unusual to find European mining experts in North America or American experts working at mines in the British empire. As a result, the history of this topic reflects a worldwide exchange of ideas. Australia, Great Britain, South Africa, and the United States figure prominently.

A TYPICAL VIEW OF MINE ACCOUNTING

Although J. H. Curle, a journalist and mining expert, was not the first to address this issue, the following quotation [Curle, 1905, pp. 29-30] states an attitude toward standardizing mine accounts that was typical of the times:

I hope the time is approaching when the system of standardization will be extended to mining costs and to mining accounts. At the present the methods for each of these are legion, and seem designed to conceal rather than reveal the financial position; but there must be some one method, in accounts especially, which is best of all, and with the assistance of skilled accountants and an actuary or two the Institute should be able to draft here a great reform.

The belief that there is "some one method" that is "best of all" has been held by many accountants and has had an important influence on the history of the accounting theory.

The following sections will describe the contributions from various mining centers to the standardization movement.

SOUTH AFRICA

One of the earliest and best discussions of nonstandard accounting practices in the mining industry is found in *The Gold Mines of the Rand* by Hatch and Chalmers [1895]. The Rand is the principal gold mining district in South Africa. Chalmers and Hatch were mining engineers who wanted to compare the working costs of the leading mines of South Africa. However, they discovered this was not a simple task because of the significant differences in the accounting methods of those mines.

At the mines of the Rand, a wide variety of accounting practices were used to account for the cost of excavating mine shafts. For example, the Robinson Gold Mine wrote off the total cost expended on shafts at the end of each month. The Crown Reef Mine capitalized the cost of shafts and amortized these costs on a level by level basis. Most Rand mines capitalized these costs and amortized them, but the amount amortized was often a function of the firm's profits.

There was greater uniformity in accounting for the cost of drives and winzes (secondary shafts) than there was for main shafts. Most Rand mines capitalized and depleted these costs on a level by level basis. At some mines (e.g., the Crown Reef, Robinson, and Jubilee) the total expended on drives and winzes during each month was charged to development expense. Depreciation charges tended to be unpredictable and somewhat arbitrary. The size and regularity of depreciation charges was related to the prosperity of the mines. Rates varied from 5 to 25 percent of cost.

In 1897 the Institute of Accountants and Auditors in the South African Republic met for the purpose of promoting the adoption of a uniform system of mine accounting. Since its founding three years earlier, the Institute had fostered this objective. At the request of the Institute, W. H. Dawe, an expert mine accountant, presented a paper on the issue. According to Dawe [1897a and 1897b], in the late 1800s there existed a "chaotic want of system" in the mine accounts of the Rand. Despite significant improvement in the region's accounting systems, a lack of uniform accounting practices was a serious and unresolved problem of this South African industry at the end of the 19th century. With regard to methods in other regions of the world, Dawe criticized Australian mine accounting, but had high praise for American practices.

The issue of whether or not to capitalize a cost was the central question of mine accounting in Dawe's opinion. He asserts [1897b] that the "question of the treatment of capital expenditure is the obstacle which must be disposed of before a uniform standard of mining accounts can be adopted: that settled, the rest will be simple." His own recommendation was that all development costs incurred during the production stage should be expensed. Prior to adjourning the meeting [1897b, p. 8] the following resolution was passed unanimously:

That the Council of the Institute of Accountants and Auditors approach the Chamber of Mines and the Association of Mines with a view to the appointment of a joint committee of those bodies and of this institute to consider the recommendation to companies of a uniform system of submitting their accounts to shareholders.

A careful review of the literature uncovered no evidence that such a joint committee was ever formed.

J. Howard Pim presented a paper before the Carttered Accountants Students' Society of London on April 27, 1898,

concerning the accounting implications of the wasting nature of South African gold mines. He advocated the capitalization of property acquisition costs and preproduction stage development costs. He was against amortizing these costs. The reason is that a mine is a single asset and production is equivalent to selling the asset by installments. The actual total sales price is not known until the mine is exhausted. Therefore the accountant should defer the property costs until the transaction is completed.

In 1902 G. A. Denny [pp. 91-92] recommended that all preproduction costs be capitalized and never amortized, which was also Pim's suggestion. All ordinary development expenditures and maintenance costs should be charged to income once production began. All new extraordinary outlays should be paid by issuing new shares of stock (and presumably capitalized permanently). Property acquisition costs should not be depleted, because one cannot accurately estimate the life of the mine. However, equipment costs should be depreciated. He also favored the use of secret revenue reserves for the purpose of smoothing income.

Mine Accounts and Mine Book-keeping by James G. Lawn, professor of mining at the South African School of Mines, was the best and probably most influential book on this topic written before 1910. This is a very well researched and scholarly book. Lawn briefly discusses some variation in accounting methods, but he was not concerned with this issue. His purpose was to state how mine accounting should be handled. He cites the Alaska Treadwell gold mine as having a model accounting system. Lawn maintained [p. 110] that both depreciation and depletion should be charged to income, whether or not a loss would result, so that income could be properly determined. Lawn was the first authority on mine accounting to argue that depletion charges were needed for the proper measurement of income.

NORTH AMERICA

The financial reports of the Alaska Treadwell Gold Mining Company were praised by the editor of *The Engineering and Mining Journal* [1896, p. 170-1]. The details of the Alaska Treadwell's accounts are not entirely clear, but the development stage expenditures appear to have been capitalized. All production stage development and construction expenditures were charged to operations. *The Engineering and Mining Journal* suggests that this firm's reports illustrate an axiom of mine

accounting [p. 170]: "What is not dividend is cost." This accounting system was designed by Hamilton Smith, an American consulting engineer who was closely associated with the Rothschild mining interests. The article goes on to say that the reports of many mines were uninformative and often concealed extravagance or dishonesty.

A. J. Yungbluth [1898a, b, and c], at a meeting of the Lake Superior Mining Institute, repeated the call of others for the establishment of a "uniform system of mine accounts." However, J. Parke Channing [1897], one of America's leading mining engineers, felt that one single system of accounts was not appropriate for all mines because of the great differences among mines.

Charles V. Jenkins was the accountant of the War Eagle Consolidated Mining and Development Co., Ltd. and the Centre Star Mining Co., Ltd., both of Rossland, B.C. His mines [Jenkins, 1901] capitalized plant and depreciated the cost over several years. He expensed the development costs as incurred. Jenkins [1903, p. 105] stated that there was a "noticeable lack of uniformity in the system of keeping mine-accounts." He felt that this was due to a scarcity of practical literature on the subject. The problem was worse in mining than in other industries. He called on mining engineers to establish the needed standards.

In 1903 Herbert Hoover, a leader of the London mining community, was asked by the editor of *The Engineering and Mining Journal* to prepare a paper on mine accounting. Hoover [1903, p. 44] stated that "there is a crying need for greater uniformity in the formulation of mine accounts." He acknowledged that this was not a new idea, but its importance was becoming increasingly evident. According to Hoover, most English firms capitalized construction and development costs while they charged mining costs to income. The methods of allocating costs to these categories differed most "harassingly." Some firms charged the cost of winzes and raises (secondary shafts) to mining while others charged it to capital. Firms might or might not capitalize a portion of pumping, repairs and general charges. Capitalized costs were usually amortized over a number of periods.

Hoover called on the American Institute of Mining Engineers and the English Institution of Mining and Metallurgy to appoint a commission to formulate a system of uniform accounting standards. Hoover appears to have been the first to call on these organizations to take such action. Charles V. Jenkins [1903], an accountant, seconded Hoover's call for the establish-

ment of a commission on accounting standards. He believed that uniform methods of determining working costs could and should be developed. Yet, he doubted that uniformity would ever be achieved in accounting for development costs. Theodore Comstock, founder and former dean of the University of Arizona School of Mines, said [1903] that mine accounting was in a state of "woeful chaos." He felt that American mine accounting was even more chaotic than English practice. He credited Hoover with being the first person to propose action by the American Institute of Mining Engineers and the Institution of Mining and Metallurgy. He supported Hoover's proposal. R. Gilman Brown [1903] endorsed Hoover's call for a commission on accounts. However, he felt that the most that could be achieved were broad statements of accounting principles and a requirement for full disclosure of accounting methods on financial reports.

AUSTRALIA

A. G. Charleton [1903, p. 476], a former president of the Institution of Mining and Metallurgy, stated that a uniform system for subdividing mining costs would be highly desirable for the gold mines of Western Australia. He recommended that the Chamber of Mines of Western Australia establish accounting standards and he suggested that the accounts of the Lake View Consols Mine represented an example of "admirable" practice. The editor of *The Accountant* [November 7, 1903, p. 1355] also commented on the excellence of the Lake View Consols accounting reports. Charleton [1903, p. 198] believed that the question of how much cost to capitalize and how much to expense was so difficult that it would always be argued. However, he recommended that all post production stage development expenditures be expensed, even though revenue and costs might not be properly matched.

Perhaps as a result of Charleton's encouragement, an important effort to establish accounting uniformity occurred in Western Australia, one of the world's leading centers of gold mining. In 1903 the Chamber of Mines of Western Australia [*Monthly Report*, July, 1903] passed a resolution "affirming the desirableness of adopting a uniform system of keeping mine accounts." It was stated that such a system would be a benefit to both the investors and the management of the mines. The managers of the large mines were quite interested in this subject. To stimulate the consideration of this topic. J. W. Sutherland, general manager of the Golden Horseshoe Estates Co., Ltd., presented a paper that compared the costs of several of

the leading mines of Western Australia. W. A. Prichard [1903a, 226-7] objected to the method used by Sutherland and he offered an alternative system of account classification based on the system used at the Lake View Consols gold mine.

The Lake View Consols was a great mine that was located on the Golden Mile of Kalgoorlie in Western Australia. It had been one of the few good properties in the financial empire of Whittaker Wright, an infamous mine promoter. Whittaker Wright's downfall occurred in 1900-01 and resulted in a sensational scandal as evidence was uncovered of insider trading, secret ore reserves, falsified balance sheets, borrowing money to pay dividends and the overcapitalization of companies [Nash, p. 229]. In 1901 Francis Algernon Govett, a British financier, led a stockholder revolt that succeeded in seizing control of the mine from Wright. Govett inspected the mine in December of 1901 and on that trip he met Herbert Hoover. A month later he engaged Bewick, Moreing & Co., Hoover's firm, to manage the Lake View Consols.

Hoover appointed W. A. Prichard, a young American mining engineer, to manage the mine. About a year later Prichard became a joint manager (with W. J. Loring) of the Western Australian operations of Bewick, Moreing & Co. During 1903 plans were made to standardize the accounts of the rapidly increasing number of mines that were managed by Bewick, Moreing & Co. Prichard stated [1903b] that he had designed a standardized system of cost classification for his firm. However, the records of the Lake View Consols indicate that Prichard did very little designing and had essentially adopted with slight modifications the accounting system of that mine. The Lake View Consols' accounting system had been installed in 1901 when T. F. Hartman was the mine's general manager and before Bewick, Moreing & Co. had taken over. While Prichard may have chosen this system because of its merits, it was also the system with which he was most recently familiar.

In 1903, as a test, Prichard ran this system in parallel with the original accounting systems at four leading mines. The mines were the Lake View Consols, Great Boulder Main Reef, Oroya-Brownhill, and the Great Fingall. The mines differed significantly from each other in their ores and treatment processes. Prichard wished to demonstrate that one system would fit all mines. This system classified all expenses as either working (operating) expenses or nonworking expenses. Working expenses included ore extraction, ore treatment (reduction), and general expenses. General expenses combined three categories

that had been listed separately on the profit and loss account of the Lake View Consols. These were maintenance expenses, realization expenses (marketing expenses) and management expenses. The management expenses included both Australian and London administrative expenses. Current expenditures on development, plant, buildings and equipment were all expensed, but were not considered to be working costs. At the Lake View Consols there was no depletion of the original property account which remained fixed at over 213,000 pounds sterling until 1910. Most of the preproduction stage costs of buildings, plant, equipment and development were written off to retained earnings in 1901. Prior to 1901 the mine's practice had been to capitalize and amortize these costs. After 1901 there are no accounts for depletion or redemption.

In 1904 this system of accounts was adopted by 18 mines managed by Bewick, Moreing & Co. in Western Australia [Hoover, 1905]. It had been changed slightly since 1903. Realization charges were listed as a separate item of working costs and London office expenses were no longer considered to be a working cost. However in 1906 the form of the Profit and Loss Account was modified again so that no distinction was made between working and nonworking expenses on this statement. Working costs continued to be calculated on a separate schedule, but they now included exploration, development and mine equipment costs. This reveals a change in Hoover's views on mine accounting issues.

Hoover's article in the *Engineering and Mining Journal* [1903] appears to have been an explanation or justification for his plans to standardize the accounts of the mines in Western Australia. Bewick, Moreing & Co. did not own these mines in Australia. Instead it was a firm of professional mining experts which was engaged to manage the mines of others because of its reputation for managerial skill and honesty. Thus the mines were associated through their management team but not through ownership. This was a fairly new and increasingly important form of business organization in the mining industry. While Hoover's firm dominated Western Australia, other similar firms figured prominently in India and South Africa. Hoover stated that the South African groups had standardized their accounts just as Bewick, Moreing & Co. did in Australia.

Hoover's theories of mine accounting evolved over time. Originally he favored immediately expensing all development costs because of the difficulty of matching these costs to the revenues generated. In 1909 Hoover [p. 171] elaborated on his

theories of mine accounting by stating that only regularly recurring items should be included in working costs. Thus he excluded plant and equipment costs. He argued that working costs would be distorted if development was expensed as incurred which had been his firm's accounting practice in Australia. Therefore, Hoover recommended that development costs should be capitalized and amortized. He stated that the depletion rate should be calculated annually and that the redemption of development is a working cost. Development stage expenditures ought to be capitalized, but Hoover believed that it is a matter of company policy only whether these costs are to be amortized. In Australia it was Hoover's policy to charge off development stage expenditures very rapidly.

The Chamber of Mines disclosed in its August, 1903 *Monthly Report* that a Special Committee was appointed to investigate the standardization of accounts. P. J. D. Ellery, Chief Executive Officer of the Chamber of Mines of Western Australia [Nov. 25, 1987] stated that the committee had not completed its deliberations by 1905 and it appears to have died without issuing any pronouncement. There are several reasonable explanations for this. Bewick, Moreing & Co., which managed over half of the gold production of Western Australia, standardized the accounts of the mines it controlled in 1904. Thus, the committee may have felt that sufficient standardization had been achieved. In addition the Institution of Mining and Metallurgy established a committee to consider this question for the entire British mining world, so the Chamber of Mines may have felt that its committee was no longer needed. Finally, P. J. D. Ellery stated that it would not have been unusual for such a committee to have disbanded without taking any action.

INSTITUTION OF MINING AND METALLURGY

The most influential organization that worked for the standardization of mine accounting during this period was the Institution for Mining and Metallurgy. A. G. Charleton, a prominent member of the Institution, led this effort. In 1897 he wrote an article which was one of the most complete discussions on mine accounting of the last century. The paper reflects a management accounting and accounting system orientation. At that time Charleton did not display any noticeable concern with the problem of non-uniform accounting practices. He relied heavily on the work of Chalmers and Hatch. Commenting on Charleton's paper James MacTear, president of the Institution, felt that the issue of mine accounting was of great importance

which was increased by the "utter ignorance" [1897, p. 314] of the importance of accounts displayed by London businessmen. Although Charleton's paper [1897] tended to be descriptive there are a few prescriptive sections. Charleton [p. 279] proposed to capitalize primary development and then amortize these costs once production commenced. He also argued [p. 285] that depreciation of plant and equipment must be provided for "if a company desires a fair statement of accounts."

The presidential address of S. Herbert Cox [1899] contains the first evidence that the Institution of Mining and Metallurgy was interested in the standardization of mine accounting. Cox called on the members of the Institution of Mining and Metallurgy to work toward the standardization of mine accounts. Cox [p. 218] recommended that mine acquisition costs should be capitalized and not amortized. Once milling began, he suggested, development costs should be capitalized and amortized over the ore developed by those specific expenditures. On the other hand the cost of main shafts should be amortized over the entire life of the mine.

In 1901 Charleton for the first time clearly expressed a concern for accounting uniformity. According to Charleton [1901, p. 687] accounting "uniformity could do no possible harm to the proprietors and would be of the greatest possible advantage to mining-men generally." He recommended that the mine managers' associations or the chambers of mines in important districts should endeavor to establish uniform accounting standards. Because of his prominence (Charleton was elected as president of the Institution of Mining and Metallurgy), the Chamber of Mines of Western Australia may have been prompted to address this issue. With regard to accounting principles, Charleton proposed that production stage development expenditures should be expensed as incurred.

During the first decade of the twentieth century, the Institution of Mining and Metallurgy engaged in a number of projects aimed at standardizing the mining industry. By 1908 mine accounting had been added to this agenda. A. G. Charleton was appointed to chair the Mine Accounts and Cost Sheets Sectional Committee. Alfred James, president of the Institution of Mining and Metallurgy [James, p. 376] called on the mining men of Africa, Australia and America to assist the Institution in its efforts to standardize mine accounting.

One of the best discussions of mine accounting was a submission by John Dennison in 1908 to the Mine Accounts and Cost Sheets Committee of the Institution of Mining and Metal-

lurgy. By focusing separately on development stage and production stage capital expenditure, he displayed a clear understanding of the issues. In South Africa of 1908 the normal treatment of development stage capital expenditures was as follows: the property acquisition costs were not amortized; plant and equipment costs were depreciated only at some of the mines; even when depreciation was charged it usually was excluded from the calculation of profits and losses; shafts were not amortized; and initial development was not amortized at most mines. During the production stage many mines expensed all development costs as they were incurred. An important segment of the industry capitalized production stage development and amortized these costs on a unit of production basis. Dennison recommended the simpler alternative of expensing these costs at once. His attitudes on depreciation were less consistent with modern views. He suggested accruing the costs of additions to plants and equipment. If this was done, he felt there would be no need for depreciation. He said that mines registered in London were forced by their auditors to charge depreciation but that South African mines seldom made this charge.

Several members of the Institution engaged in a lively discussion of Dennison's paper. Dennison commenting [p. 119] on his own paper stated that mine accounting practices were in a state of chaos and that everyone could not be correct. Additionally the lack of standards permitted the manipulation of financial reports. Hugh Marriott thought that depreciation was not necessary if the plant was properly maintained. He felt [p. 122] that suspense accounts were the "invention of the devil," but he thought that manipulating revenues by means of secret reserves was a good idea. S. J. Truscott argued that the property account should be depleted because the mine was a wasting asset. W. Fischer Wilkinson thought [p. 127] that the property account should not be amortized and he opposed the use of secret gold reserves. E. R. Field said [p. 127] that he "was not very sanguine that they could standardise the accounts of mines which differed on almost every point on which difference was possible."

REPORT OF THE MINE ACCOUNTS AND COST SHEETS COMMITTEE

The Council of the Institution of Mining and Metallurgy on December 21, 1910 unanimously adopted the report of the Mine Accounts and Cost Sheets Committee. The recommendations

were based on a careful consideration of the opinions of a "large number of engineers and other authorities in various parts of the World." The report tended to be overly cautious and ambiguous. A memorandum (that accompanied the report and was supposed to clarify some of the issues) actually contradicts the report several times and contradicts itself occasionally. People could easily become confused as to which practice was endorsed by the Institution. The memorandum also added to the confusion by questioning the practicality of many of the report's recommendations.

The practices which the committee recommended as theoretically correct are quite similar to modern American practice. For example, development stage expenditures should be capitalized under the following categories: property, main shafts, machinery, buildings, surface works (e.g. roads and reservoirs), and underground equipment. The committee stated that it is theoretically correct to amortize all of these costs once production begins. In addition it asserted that a proper program of repairing and maintaining buildings and equipment did not reduce the necessity for depreciating these assets. Unfortunately the memorandum contradicts the report by stating that in practice depreciation is not necessary if the equipment is properly maintained. The report also recommends that amortization should begin as soon as there are some accumulated profits. This seems to imply that depreciation is a discretionary item that may be adjusted as profits change. Charles Hewitt [1914b] strongly condemned this concept.

Once the production stage is reached only a few types of costs should be capitalized which include the following special items: the purchase of a new property, a major development that opens a new ore body, the acquisition of new equipment, and the construction of additional buildings. The committee recommended that expenses be listed under the following categories: development, mining, sorting, ore treatment, administration, marketing costs, taxes and head office charges. It proposed two methods of accounting for development costs incurred during the production stage of a mine. These costs could either be expensed immediately (Charleton's position in 1897) or capitalized and amortized as the developed ore was mined (a common practice in South Africa). Hoover employed the first method in Western Australia, but had apparently changed his position by 1909 when he endorsed the second practice. The report also recommends that unfinished products should be valued at the lower of cost or market. Finished goods

such as bullion awaiting shipment should be valued at net realizable value.

The committee called for periodic independent audits of the mine accounts. It also called for the establishment at the Institution's library of a file of mine accounts and cost sheets of leading mines from around the world which could be referenced and studied by the rest of the industry. Unfortunately this file no longer exists at the library of the Institution of Mining and Metallurgy. The committee appears to have been strongly influenced by Herbert Hoover who was by then America's leading mining engineer. The only quotation in the committee's official report is from Hoover and many sections show a striking similarity to passages in his book *The Principles of Mining*.

The committee's recommendations were reported by the following accounting and mining journals: *The Accountant*, *The Incorporated Accountants' Journal*, *The Australian Mining Standard*, and *The Engineering and Mining Journal*. For several years the report was also published as an appendix at the back of the *Transactions of the Institution of Mining and Metallurgy*. Lawrence R. Dicksee strongly endorsed the report's recommendations in his book *Mine Accounting and Management*. This book was used as a textbook to train mining engineering students. The complete text of the Institution's report and accompanying memorandum were printed in the back of Dicksee's book.

In May of 1911 *The Accountant* printed the report of the Mine Accounts and Cost Sheets Committee. In addition the editor printed a series of four articles evaluating the proposals of the Institution. The editor endorsed the report stating "that these recommendations should be adhered to, as far as possible, in all cases" [May 6, 1911, p. 692]. The editor of *The Accountant* made several suggestions on how to improve or clarify various sections of the report. For example, the editor wanted the Institution to define more clearly when the production stage begins. The practice of expensing production stage development costs as incurred was favored over the alternative of amortizing these costs. The principle of valuing bullion inventories at their net realizable value and unfinished product inventories at the lower of cost or market was endorsed. The amortization of the property account was opposed by *The Accountant* on the grounds that a mine is not a going concern. The editors also pointed out that the Institution's report displayed some confusion and ambiguity concerning depreciation. The editors declared the absolute need for a depreciation charge. Dicksee adopted the suggestions of *The Accountant* in his textbook. The

editor of *The Accountant* expressed very strong support for the report's classification of working cost accounts and the call for the integration of the financial and cost accounting records.

In 1911 *The Incorporated Accountants' Journal* printed the report and an extract of the accompanying memorandum issued by the Institution of Mining and Metallurgy. While the editor of this journal generally supported the report of the Institution of Mining and Metallurgy, he severely criticized the coverage of the topic of depreciation. The *Australian Mining Standard* and the *Engineering and Mining Journal* printed summaries of the report in 1911, but did not provide editorial analysis.

Such widespread influential support for the Institution's report must have magnified the influence of these recommendations. Yet considering the cost of changing an accounting system, one would not expect many mines to adopt these voluntary standards immediately. It seems more likely that when a new mining company was established the report could have served as a guide. The two main weaknesses in the report of the Mine Accounts and Cost Sheets Committee were that it lacked clarity and it was voluntary. Evidence [*The South African Mining Journal*, 1912; Hewitt, 1914a and 1914b; and McGrath, 1918] from around the world indicates that a lack of uniformity in mine accounting continued to be viewed as a major problem in the years that followed the release of this report. In the 1920's America's mining industry renewed the effort to standardize mine accounting. However, by the 1930's the few articles [Peloubet, 1937; and Fernald, Peloubet, and Norton, 1939] dealing with this subject, seem to accept non-uniform accounting practices as an inevitable result of the complexity of the industry.

CONCLUSION

During the period from 1895 to 1915 there was an international movement to standardize accounting in the mining industry. Despite the best efforts of many leaders in the mining industry, this movement was not totally successful, but much progress was made in that direction. Among the accomplishments of this period were the development of an extensive literature on the theory of mine accounting, the standardization of the accounts of certain groups of mines (such as the Bewick, Moreing & Co. mines), and the promulgation of a set of accounting standards by the Institution of Mining and Metallurgy.

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