

8-1925

Students' Department

H. A. Finney

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Students' Department

EDITED BY H. A. FINNEY

[NOTE.—The fact that these solutions appear in THE JOURNAL OF ACCOUNTANCY should not lead readers to assume that they are the official solutions of the board of examiners. They are merely the expression of the opinion of the editor of the *Students' Department*.]

AMERICAN INSTITUTE OF ACCOUNTANTS

EXAMINATION IN ACCOUNTING THEORY AND PRACTICE—PART I (*Concluded*)

MAY 14, 1925, 1 P. M. TO 6 P. M.

The working papers on the following page were omitted from the published solution of problem 5 which appeared in the July issue. These working papers show the values resulting from application of correct exchange rates in the conversion of the balance-sheets of the foreign subsidiaries.

No. 6 (*25 points*):

A series of 5% bonds totalling \$100,000 is issued, dated January 1, 1925, redeemable at par by ten annual payments of \$10,000 each, beginning December 31, 1935. What equal annual sinking fund is required to be provided on a 4% basis to pay off the bonds as they mature?

The first payment to the sinking-fund trustees is to be made December 31, 1925, and annually thereafter.

What is the status of the sinking fund on December 31, 1934, 1935 and 1936?

$$\begin{array}{r}
 \text{Given at 4\%: } (1+i)^{10} \text{ I. } .48024428 \quad (1+i)^{20} \text{ 2. } .19112312 \\
 \qquad \qquad \qquad v^{10} \text{ .67556417} \qquad \qquad \qquad v^{20} \text{ .45638695} \\
 \text{at 5\%: } (1+i)^{10} \text{ I. } .6288946 \quad (1+i)^{20} \text{ 2. } .6532977 \\
 \qquad \qquad \qquad v^{10} \text{ .6139133} \qquad \qquad \qquad v^{20} \text{ .3768895}
 \end{array}$$

Solution:

The problem requires the computation of the sum to be deposited in a sinking fund at the end of each of twenty years which, accumulating at 4% compound interest, will be sufficient to provide for the withdrawal, during each of the last ten years, of annual sums of \$10,000 each to be applied to the retirement of an equal amount of the principal of the bonds.

The peculiar feature of the problem, and the feature which causes difficulty, is the fact that the instalments are to be made during twenty years, while withdrawals are to be made during each of the last ten years, the result being that at the end of the twentieth year there will be nothing in the fund, instead, as is usual in the case of sinking funds, of a fund equal to the principal of the bonds to be paid.

The computation may be made in either of two ways; one, by working with present values, and another by working with amounts. The solution using present values will be given first.

If a single sum were to be invested at the beginning of the eleventh year, to be compounded annually at four per cent, and to be withdrawn in ten equal instalments at the end of the eleventh and each succeeding year, this single

Consolidated Working Papers—Suggested Method

December 31, 1923

<i>Assets</i>	American	British	French	Eliminations	Consolidated
Investment in stock of British company.....	\$24,300			\$24,300 (A)	
Investment in stock of French company.....	114,000			114,000 (A)	
Due from British company.....	4,350			4,350 (B)	
Due from French company.....	250			250 (B)	
Fixed assets:					
At date of incorporation.....		\$21,870	\$90,250		\$112,120
Acquired during 1923.....		2,175	1,250		3,425
Current assets.....		84,000	7,600		91,600
Deferred charges.....		4,200			4,200
		<u>\$112,245</u>	<u>\$99,100</u>	<u>\$142,900</u>	
					<u>\$112,120</u>
					<u>3,425</u>
					<u>91,600</u>
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Students' Department

sum would be the present value of an ordinary annuity of ten rents of \$10,000 each. This present value is computed as follows:

$.67556417$ is the present value of 1 due 10 periods hence at 4%.

$1 - .67556417 = .32443583$ compound discount.

$.32443583 \div .04 = 8.1108957$ present value of annuity of 1.

$\$10,000 \times 8.1108957 = \$81,108.96$ single investment which could be made at the beginning of the eleventh year, and which would be sufficient to provide for ten withdrawals of \$10,000 each, at the dates when bonds are payable.

Now if a single sum were to be invested at the beginning of the first year, to be compounded annually at four per cent, and to be withdrawn in ten equal instalments at the ends of the eleventh to twentieth years inclusive, this single sum would be the present value of \$81,108.96, due ten periods hence, or

$\$81,108.96 \times .67556417 = \$54,794.31$ the sum which would have to be deposited at the beginning of the first year.

Now if a single investment of \$54,794.31 would be sufficient to provide for the withdrawal of ten rents of \$10,000 each during the last ten years, it would also be sufficient to provide for the withdrawal of twenty annual rents which could be put into a sinking fund in accordance with the terms specified. That is to say, \$54,794.31 is the present value of an annuity of twenty payments of unknown amounts, at 4%, and these unknown amounts or rents are the sinking-fund contributions required by the problem. The annual contribution can therefore be computed by dividing \$54,794.31 by the present value of an annuity of 1 for twenty periods at four per cent.

$.45638695$ is the present value of 1, due 20 periods hence at 4%.

$1 - .45638695 = .54361305$ compound discount.

$.54361305 \div .04 = 13.590326$ present value of annuity of 20 rents at 4%.

$\$54,794.31 \div 13.590326 = \$4,031.86$ annual sinking-fund contribution to be made during each of 20 years.

The second computation, working with amounts instead of present values, is as follows: If, instead of withdrawing each of the ten amounts of \$10,000 at the end of the eleventh to twentieth years, inclusive, these amounts were allowed to remain in the sinking-fund, the fund would amount at the end of the twentieth year to \$100,000 plus the interest which, under the plan actually adopted, is lost on the amounts withdrawn. Or, stated in another way, the fund would be equal to the sum of the ten withdrawals plus compound interest thereon. Or, stated in still another way, the fund would be equal to the amount of an annuity of ten rents of \$10,000 each, compound at 4%. This amount is computed as follows:

1.48024428 amount of 1 at 4% for 10 periods.

$1.48024428 - 1 = .48024428$ compound interest.

$.48024428 \div .04 = 12.006107$ amount of annuity of 1.

$\$10,000 \times 12.006107 = \$120,061.07$ amount which would be in the fund.

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ents is piped to department B, at a constant rate, for further treatment. The remaining ten per cent of the original materials represents evaporation loss in this department.

In department B, material is received from A in the proportion of 4 tons of the mixture to each ton of material "T" issued. The process used in B is complicated and requires several days. While the process is continuous and the mix is effected and delivered to department C at a constant rate, there are always, approximately, 100 tons of the mix in process in the retorts of this department when the plant is being operated to capacity.

In department C, ingredients to the amount of ten per cent of the total mix are separated and transferred to department D, where, after further refinements involving a ten per cent loss, the by-product "Z" is recovered. The processes in both departments C and D require only a short time and are continuous, so that, ordinarily, at the close of each day no goods in process remain in either.

The main product, equal to ninety per cent of the materials handled in department C, goes to department E where it is stored until the manufacturing process is completed by grinding and packing.

On January 1st the plants resumed operations, after a month's shut-down for general overhauling, and when the processing was begun again were run to capacity throughout the month.

A summary of the inventories on hand at the beginning of the month was as follows:

Raw materials:		
"R"	100 tons	\$5,200 (cost)
Goods in process:		
None		
Finished goods:		
Product "X" boxed and ready for shipment to the selling branch		4,210 (cost)
Product "Z" 10 tons		820 (market)
During the month of January, the purchases of raw materials were:		
"R"	300 tons	\$7,200
"S"	500 "	2,500
"T"	120 "	4,800
Issues of materials at cost for the same period were:		
"R"		\$11,200
"S"		1,750
"T"		4,000
	Total	\$16,950

Analysis of payrolls for the month shows:

Department	Total hours	Total wages
A.....	6,000	\$ 2,400
B.....	7,000	4,200
C.....	3,600	3,600
D.....	1,200	840
E.....	5,000	2,500
Totals	<u>22,800</u>	<u>\$13,540</u>

Departmental burden, amounting to \$11,400, was distributed to the departments on the basis of labor hours.

On February 1st, there were on hand 46 tons of product "Z" which can be sold at the current market for \$75 per ton. None of the product has been sold or shipped during the month.

All of product "X" completed during the month of January, amounting to 200 tons, together with that on hand at the beginning of the month, ready for shipment, has been delivered to the selling branch.

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You are required:

- (a) To make a summary of all inventories as at February 1st, showing both tonnage and value of the goods in process remaining in each department
- (b) To give the billing price per ton of product "X" manufactured during the month.

Solution:

The first step in the solution is to determine the quantities of the various raw materials used during the month. These quantities are determined as follows:

ROLLINS COMPANY			
<i>Summary of raw-material accounts for the month of January, 192-</i>			
	Tons	Price	Amount
Raw material "R":			
Inventory, January 1.....	100	\$52.00	\$5,200.00
Purchases.....	300	24.00	7,200.00
Total.....	400		<u>\$12,400.00</u>
Issued:			
From inventory of January 1.....	100	\$52.00	\$5,200.00
From January purchases.....	250	24.00	6,000.00
Total.....	350		<u>\$11,200.00</u>
Inventory, February 1.....	50	\$24.00	\$1,200.00
Raw material "S":			
Purchases.....	500	\$5.00	\$2,500.00
Issued.....	350	5.00	1,750.00
Inventory, February 1.....	150	\$5.00	\$750.00
Raw material "T":			
Purchases.....	120	\$40.00	\$4,800.00
Issued.....	100	40.00	4,000.00
Inventory, February 1.....	20	\$40.00	\$800.00

The second step is to ascertain the amount of burden chargeable to each department. This is determined as follows:

ROLLINS COMPANY		
<i>Distribution of departmental burden, Month of January, 192-</i>		
Department	Labor hours	Burden chargeable on basis of labor hours
A.....	6,000	\$3,000
B.....	7,000	3,500
C.....	3,600	1,800
D.....	1,200	600
E.....	5,000	2,500
Total.....	<u>22,800</u>	<u>\$11,400</u>

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The operating statements of the various departments for January are as follows:

Department A

	Tons	Price	Amount
Raw material "R".....	350	\$32.00	\$11,200
Raw material "S".....	350	5.00	1,750
Labor.....			2,400
Burden.....			3,000
<hr/>			
Total.....	700	\$26.21	\$18,350
Less by-product "Y" at selling price.....	70	20.00	1,400
<hr/>			
Balance.....	630	\$26.90	\$16,950
Evaporation losses.....	70
<hr/>			
Product of department A.....	560	\$30.27	\$16,950
Piped to department B.....	400	30.27	12,108
<hr/>			
Inventory, department A, Feb. 1.....	160	\$30.27	\$4,842

The quantity of product of department A piped to department B is determined as follows. The problem states that in department B, material is received from A in the proportion of 4 tons of the mixture to each ton of material "T" issued. The foregoing summary of raw-material accounts shows that 100 tons of raw material "T" was issued. Hence 400 tons of the mixture of department A must have been piped to department B.

Department B

	Tons	Price	Amount
Material from department A.....	400	\$30.27	\$12,108.00
Raw material "T".....	100	40.00	4,000.00
Labor.....			4,200.00
Burden.....			3,500.00
<hr/>			
Total.....	500	47.61	\$23,808.00
Delivered to department C.....	400	49.33	19,730.90
<hr/>			
Inventory in department B, Feb. 1.....	100	40.77	\$4,077.10

The method of determining the cost of product delivered to department C and that remaining in inventory requires explanation. While 500 tons of ingredients are introduced into the process, only 400 tons of ingredients are taken out, the balance, 100 tons, remaining in process. In the absence of information to the contrary it must be assumed that the 100 tons in process average fifty per cent completed. In that case it is unlikely that in a half completed state these goods in process have incurred all the labor and burden charges incident to the process. For this reason the labor and burden charges

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applicable to department B are distributed over 400 tons fully processed and 100 tons fifty per cent processed. Material costs are of course distributed according to weight. In the following summary the material costs are divided between finished product and product in process in the ratio of 400/500 and 100/500, while the labor and burden costs are divided in the ratio of 400/450 and 50/450.

	Finished product	Product in process	Total
Material.....	\$12,886.40	\$3,221.60	\$16,108.00
Labor.....	3,733.35	466.65	4,200.00
Burden.....	3,111.15	388.85	3,500.00
 Total.....	 \$19,730.90	 \$4,077.10	 \$23,808.00

Department C

	Tons	Price	Amount
Material from department B.....	400	\$49.33	\$19,730.90
Labor.....			3,600.00
Burden.....			1,800.00
 Total.....	 400	 62.83	 \$25,130.90
Transferred to department D.....	40	62.83	2,513.09
 Transferred to department E.....	 360	 62.83	 \$22,617.81

Department D

	Tons	Price	Amount
Material from department C.....	40	\$62.83	\$2,513.09
Labor.....			840.00
Burden.....			600.00
 Total.....	 40	 98.83	 \$3,953.09
Loss.....	4		
 Balance.....	 36	 109.81	 \$3,953.09
Inventory, Jan. 1—at market.....	10	82.00	820.00
 Total.....	 46	 103.76	 \$4,773.09
Excess of cost of by-product Z over market value, transferred to department E as additional cost of main product X.....			1,323.09
 Inventory of by-product Z, Feb. 1.....	 46	 75.00	 \$3,450.00

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By reference to the preceding statement of operating costs of department C, it will be noted that the cost of the mixture passed on to the succeeding departments for conversion into the main product was reduced by an amount of \$2,513.09, the proportionate cost of the mixture going into the by-product. But after this by-product has been completed it is found that its market value is less than its cost. This loss may be taken as a loss on the by-product, or it may be taken as a correction of the value placed on the ingredients credited in department C against the cost of the main product. The nature of this correction may perhaps be more clearly shown as follows:

Market value of 46 tons of by-product Z.....	\$3,450.00	
Less market value of inventory over from Jan. 1:		
10 tons at \$75.00.....	750.00	
		\$2,700.00
Remainder—market value of 36 tons produced in January		\$2,700.00
Costs of completion in department D:		
Labor.....	\$840.00	
Burden.....	600.00	1,440.00
		1,440.00
Net amount realizable from material taken from department C.....		\$1,260.00
Amount credited in department C to cost of main product for material transferred to by-product.....	\$2,513.09	
Less amount realizable therefor.....	1,260.00	
		\$1,253.09
Loss.....		\$1,253.09
Loss in market value of inventory brought over from Jan 1:		
10 tons, dropped from \$82.00 to \$75.00, or \$7.00 per ton.....		70.00
		70.00
Total loss, taken as a correction of the cost of the main product.....		\$1,323.09

It is evident from the foregoing that the cost of the product X manufactured in January has been affected to the extent of \$70.00 by the drop in value of by-product Z brought over from the beginning of the month. Perhaps this is not strictly accurate, but if the procedure of correcting the cost of the main product X on account of differences between the cost and realizable value of by-product Z is adopted, it is probably not necessary to give consideration to such refinements of theory as a distinction between losses on by-products manufactured during the month and losses on by-products manufactured in a preceding month.

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<i>Department E</i>			
	Tons	Price	Amount
Material from department C.....	360	\$62. 83	\$22,617.81
Excess of cost of by-product Z over market value, treated as a correction of the cost of the main product.....			1,323.09
Labor.....			2,500.00
Burden.....			2,500.00
Total.....	360	80. 39	\$28,940.90
Completed and shipped.....	200	91. 50	18,300.50
Inventory in department E, Feb. 1.....	160	66. 50	\$10,640.40

Inasmuch as the problem states that material from department C is stored in department E until completed, it is assumed that only the 200 tons completed have received any processing in department E, and therefore the total labor and burden costs in this department are charged to the 200 tons completed, the 160 tons remaining in inventory being valued at the material cost only. It may be that the 160 tons remaining in the inventory were partly processed. In that case the 160 tons would be charged with a proportion of labor and overhead, determined by a method similar to that used in department B.

The billing price per ton of product X manufactured during the month, is shown above to have been \$91.50.

ROLLINS COMPANY

Summary of inventories, February 1, 192—

	Basis	Tons	Price	Amount
Raw material "R".....	Cost	50	\$24.00	\$1,200.00
Raw material "S".....	"	150	5.00	750.00
Raw material "T".....	"	20	40.00	800.00
Department A.....	"	160	30.27	4,842.00
Department B.....	"	100	40.77	4,077.10
By-product Z.....	Market	46	75.00	3,450.00
Department E.....	Cost...	160	66.50	10,640.40
Total.....				\$25,759.50

Students' Department

No. 2 (14 points):

Two companies, A and B, enter into an agreement to develop mineral properties at present owned by B. The agreement provides that A shall furnish cash capital of \$1,000,000 which is to be used in the development of the properties, that the profits are to be shared equally but that B is to receive the sum of \$1,000,000 out of A's share of profits before A receives any of the profits.

It is estimated that the property will have a life of 20 years.

At the end of the first year of operation, the profits amounted to \$600,000.

The accounting records relative to these transactions are kept by company B.

You are required to prepare journal entries giving effect to the above on the books of company A and state how the liability for the \$1,000,000 payable out of earnings should be set up on company A's balance-sheet.

Solution:

Before this problem can be solved it is necessary to reach a conclusion on each of two somewhat doubtful points. First, are the stated profits of \$600,000 earned during the first year profits before or after depletion? If provision for depletion is being made on B's books, then the capital invested by A is being kept intact, and A will receive his capital at the end of the period of operations, in addition to receiving his share of the profits during the period. But if, on the other hand, no provision is being made for maintenance of capital, then A will not get back his capital at the end, and hence it will be necessary for him to write off his investment gradually during the period of operations.

In favor of the assumption that depletion is being provided on B's books it may be noted that the problem says that the profits were \$600,000 during the first year. Now, strictly speaking, profits are not profits until after the provision for depletion, and hence a literal interpretation of the problem would lead to the conclusion that the \$600,000 is after depletion. But on the contrary it is necessary to remember that distributions may be made out of the income realized from the operation of wasting assets without making provision for depletion. That is to say, dividends may be paid equal to the actual profits and the depletion provision. Joint ventures of the nature described in this problem are usually conducted on this basis. For what would be the object of piling up a funded depletion reserve against the time of conclusion of operations? And the participants would not be adequately safeguarded if the persons operating the venture were allowed to withhold assets equal to the depletion provisions without creating a segregated fund to be available in final liquidation of the capital.

The next question is: Is there any difference between the million dollars invested originally by A and the additional million dollars to be later paid by him to B out of A's share of the profits? Or to put the question more precisely, assuming that depletion is being provided on B's books with the expectation of later returning to A the entire amount of his capital investment, does A have a right to expect a return of the first million dollars and also of the second million, or is only the first million to be regarded as returnable capital and the second million as a non-returnable bonus to be paid to and retained by B in consideration of his allowing A to share in the profits of the operation of the mineral properties now owned by B?

These two questions are inter-related. If it is assumed that the entire \$2,000,000 is to be regarded as an investment and if it is also assumed that depletion is being provided on B's books, then A would have a right to set up

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and carry an investment account of \$2,000,000 as an asset, which he could expect to recover at the expiration of twenty years; and he could regard his share of the joint earnings as income without making any provision on his books for the extinguishment of his \$2,000,000 investment. On this assumption, the following would appear to be a proper solution:

Investment in mineral land venture	\$2,000,000	
Cash		\$1,000,000
Contingent liability (etc.)		1,000,000

To record investment of \$1,000,000 cash in a joint venture with B in certain (described) properties, under a contract providing for equal participation in profits, and for an additional investment of \$1,000,000 out of our share of the profits.

Contingent liability	300,000	
Profits from mineral land venture		300,000

To take up our one half of the profits of the venture, the same being retained by B in partial liquidation of the liability for additional investment.

In the balance-sheet the contingent liability of \$700,000 remaining unpaid could be deducted on the face of the statement from the \$2,000,000 book balance of the investment, carrying out \$1,300,000 as the present actual investment. The nature of the contingent liability should be clearly described.

An alternative method under this assumption would be to charge the investment account and credit cash at the beginning of the year with only \$1,000,000. Then at the end of the year the profits would be taken up by charging the investment account and crediting income with \$300,000. The contingent liability for the remaining \$700,000 would be shown as a footnote.

If it is assumed that B is providing depletion on his books (as above) but that only \$1,000,000 is returnable to A at the end of twenty years, while the remaining \$1,000,000 is a bonus paid to B for the right to participate in the profits, A would have to write off this second million dollars against the income received by him during the twenty years. The entries would then appear to be as follows:

Investment in mineral land venture	\$1,000,000	
Cash		\$1,000,000

To record investment, etc.

Bonus to B	1,000,000	
Contingent liability (etc.)		1,000,000

To record the liability for payment of one million dollars to B out of the first income of that amount due us from the venture.

Students' Department

At the end of the year the profits would be taken up and a portion of the bonus would be written off, as follows:

Contingent liability (etc.)	\$300,000	
Profits from mineral land venture		\$300,000
To take up our share of the profits from the venture, the same being retained by B in partial liquidation of the liability for additional compensation for the right to participate in the profits.		
Profits from mineral land venture	50,000	
Bonus to B		50,000
To write off against this year's profits one twentieth of the bonus paid to B.		

This bonus should really be written off in proportion to the quantity of mineral extracted; but as no information on this point is given in the problem, the write-off is made on an equal annual basis.

On the balance-sheet, the investment account of \$1,000,000 and the \$950,000 balance of the bonus account would be added, and from the total would be deducted the \$700,000 balance in the contingent-liability account.

The alternative method of postponing any entry for the bonus until the end of the year could also be applied here—that is, no entry for the bonus would be made at the beginning of the year. At the end of the year the profits would be taken up by a debit of \$300,000 to the bonus account. The \$50,000 would then be written off from this bonus account. The balance-sheet would then show the \$1,000,000 investment account plus the \$250,000 balance in the bonus account. The contingent liability would be mentioned in a footnote.

But if it is assumed that no depletion is provided on B's books, then it is immaterial what view is taken of the second million dollars payable by A, for nothing is returnable to him at the end of the period of operations, and both millions are sunk. Under that assumption it would be necessary to write off one twentieth of two million dollars each year, and the entries would be:

Investment in mineral land venture	\$2,000,000	
Cash		\$1,000,000
Contingent liability (etc.)		1,000,000
Contingent liability	300,000	
Profit on mineral land venture		300,000
To take up our share of the profit for the year, by application against the contingent liability.		
Profit on mineral land venture	100,000	
Investment in mineral land venture		100,000
To write off one twentieth of the investment in the venture, as no depletion is provided on B's books.		

The contingent liability would be shown by deduction on the asset side of the balance-sheet, as above.

Another entirely different assumption is possible. A invests \$1,000,000 and shares equally in the profits after the first two million dollars. In other words, the provision for the withholding of one million dollars by B is merely an amendment of the equal profit-sharing agreement. On that assumption A would charge the investment account with one million dollars and would make no further entries until such time as he began to receive cash profits. At that time he would debit cash and credit income and would write off depletion against his profits, unless such depletion provisions were being made on B's books. On this assumption there would be no contingent liability to show, as the provision for the withholding would be regarded as merely a qualification of the profit-sharing agreement.

The editor favors the third solution given above. He is inclined to interpret the contract as having followed negotiations somewhat as follows: B approaches A with a proposition whereby A is to invest two million dollars for a half interest in the profits during twenty years, with the understanding that nothing will be returnable to A at the end of that time because divisions of profits will be made without provision for depletion. Of the amount thus paid by A, one million dollars is to be used for business purposes, and the other million is to go to B to compensate him for the rights which he regards as highly valuable. But A is not convinced that it would be a good venture; whereupon B states that he is so certain that the venture will be profitable that he is willing to wait for his million dollars until A earns it out of the venture.