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## Students' Department

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## Students' Department

EDITED BY H. A. FINNEY

### APPRAISALS

In the June, 1924, issue of *THE JOURNAL OF ACCOUNTANCY*, the editor of this department invited contributions discussing questions relative to the accounting for appraisals. Two of the articles received are printed below.

It will be noted that the two authors are not in agreement as to the legal right to declare stock dividends from surplus arising from appraisals, and it is thought that further and more exhaustive discussion of this question may be of value.

Another question to which these contributions do not seem to give adequate consideration is that of depreciation. Mr. Bairstow quotes a recommendation of the fabricated production department of the chamber of commerce of the United States in which it is strongly urged that depreciation should be based on actual cost. But what about the manufacturer whose plant was constructed in a low-price-level period and whose costs, based on depreciation of a relatively inexpensive plant, enable him to undersell the manufacturer whose plant was constructed during a high-price-level period? Is this manufacturer giving depreciation a consideration which is adequate to his own necessities? And if the fact that his lower costs force competitors to sell below cost or at an unreasonably low profit, is the public receiving a temporary benefit for which it will ultimately have to pay when business faces the problem of capital-asset replacements for which inadequate reservations have been made from earnings?

This department is open for further contributions discussing these and related questions.

### ADJUSTING THE BOOKS TO THE APPRAISAL

By C. W. BAIRSTOW, Dayton, Ohio

An appraisal made in these days of high prices invariably shows the total value of plant and equipment to be considerably in excess of the book value, assuming of course that cost prices were used in building the ledger accounts and that some of the assets were acquired before the world war. The temptation to place this increase in value on the books naturally presents itself strongly to the owner or executive who is anxious to show a substantial net worth on the balance-sheet of his business.

For a long time it was a fundamental principle of accounting that an asset account should never be increased by the amount of appreciation, this being considered an "anticipation of profits." The auditor who would have found an entry setting up the increase in value of a company's land would have lost no time in reversing the entry. We now find some of the leading authors of accountancy, admitting the propriety of entering appreciation of assets on the books, but only under certain conditions.

In Robert H. Montgomery's *Auditing, Theory and Practice*, he says: "Capital assets should be carried at cost values, and until some change occurs which justifies a revaluation."

Charles B. Couchman, in his valuable new book, *The Balance-Sheet*, on page 116, says:

Certain properties, such as those containing coal, metal, oil or gas, acquire a greatly increased value because of development. It has been conceded that the owners of such properties have the right to display appreciated values on their balance-sheets, provided the proprietorship accounts are not diverted from their true function. A special item representing the estimated probable production of minerals may be introduced among the asset accounts. The offsetting credit to this asset would appear as "unrealized appreciation," "surplus from revaluation," or under some similar title.

In the last few years, it has been necessary for many concerns to refinance in order to obtain working capital. Some of these businesses suffered losses for two or three successive years and their balance-sheets showed a very small surplus or even a deficit. By setting up revised asset values, based on the reproductive values shown by an appraisal of their plant, surplus has been increased or the deficit has disappeared. If this unrealized appreciation is credited to the surplus account, a poor balance-sheet can be made to take on a healthy appearance in a very short time. However, such facts should never be covered in the balance-sheet. The unrealized appreciation should be credited to an account, the name of which would plainly divulge its nature, such as the name "revaluation surplus." There could be no real objection to showing the amount of revaluation surplus among the net-worth accounts, with a deficit subtracted therefrom, and the net revaluation surplus carried into the column with the capital stock and other net-worth accounts.

Summing up, we might say that one advantage of setting up appraisal values is that a surplus can be created or increased causing the balance-sheet to reflect a satisfactory appearance. This has often been done where a concern has been refinancing, selling additional stock or bonds or seeking credit extension.

Another advantage in placing appraisals on the books is in the capitalizing of freight, set-up labor and material, development costs and betterments, which are so often overlooked by the bookkeeper and are as much a part of the plant investment as the invoice or first cost of the individual items.

In the case of a merger, it is often found advisable to have appraisals made and set up on the books of each of the merging companies, as in this manner the concern which purchased most of its equipment at low prices is on an equal footing with the ones whose equipment was acquired during the period of inflated prices. Complete audits should be made at the same time. Each of the companies is thus assured of an impartial inventory of its plant and inaccuracies of bookkeeping in any of the plants would be eliminated.

A decided disadvantage is that actual costs of equipment, which are recorded facts, would be displaced by estimates which may be good or may be bad and would have to be revised from time to time to care for fluctuations in cost prices, freight rates, set-up labor, etc. This disadvantage seems to outweigh any general advantages that may be claimed. The ever-changing value of the American dollar is the source of these variations and until some economic method of controlling this value is found, we had best stick to the dollar as the accountant's measuring stick; for to record all variations in money-value on the books would be to invite serious difficulties, when there are still so many mooted questions of accountancy, which might be decided.

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If the equipment accounts, as they stand on the ledger, are lacking in freight and cartage on machines, installation costs, betterments, etc., it is very possible and also advisable to correct them to agree with facts, but they need not be adjusted to reproductive values to do it. A cost inventory can be made by any good appraisal company, and if, after careful checking, it is decided that the cost inventory is accurate as to items and prices, the equipment accounts can and should be changed to agree with this inventory.

It should be remembered when placing an appraisal on the books that the asset-account values should be increased to equal the "cost to reproduce new" as shown by the appraisal, and the reserves for depreciation should be increased or decreased to show total accrued depreciation on these reproductive values as shown in the appraisal, the net result being that the revised asset values, less the revised depreciation reserves, will equal the amount shown as total sound value in the appraisal.

Granting that under certain conditions it may be permissible or even advisable to set up an appraisal on the books, the accounting procedure is somewhat complicated and can best be explained in a concrete example. Assume a corporation with the following balance-sheet on January 1, 1923:

<i>Assets</i>		<i>Liabilities</i>	
Cash.....	\$5,000	Reserve for depreciation.....	\$5,000
Plant and equipment....	50,000	Capital stock.....	25,000
		Earned surplus.....	25,000
Total.....	\$55,000	Total.....	\$55,000

An appraisal of the sound values of this plant was made as of January 1, 1923, and the books were adjusted. The appraisal showed the following totals:

Cost to reproduce new.....	\$85,000
Accrued depreciation.....	10,000
Sound value.....	\$75,000

The following journal entry was made:

Dr. Appreciation of plant and equipment.....	\$35,000	
Cr. Revaluation surplus.....		\$35,000
Dr. Revaluation surplus.....	5,000	
Cr. Reserve for depr. on increase.....		5,000

To place values shown by appraisal of this date on the books of the company.

The depreciated or residual value of the plant and equipment as shown by the books before making this entry was the difference between the asset value of \$50,000 and the reserve for depreciation of \$5,000, or a net amount of \$45,000. Therefore the sound value (\$75,000) shown by the appraisal is \$30,000 in excess of the book value, and this excess will be carried in the new account called "appreciation of plant and equipment" (\$35,000), offset by the "reserve for depreciation on increase" (\$5,000), and the "revaluation surplus" (\$30,000).

On December 31, 1923, it was found that the gross profits for the year, before making any allowance for depreciation, were \$15,000. A depreciation rate of 5% has been used on cost values in the past, but the appraisal shows an

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average estimated life of 14 years, with two years' depreciation accrued. The allowance for 1923 is therefore computed as follows:

5% on original book cost of plant and equipment (\$50,000) . . . .	\$2,500
7½% on appreciation of plant and equipment (\$35,000) . . . . .	2,500
	\$5,000

The entries for this depreciation would be as follows:

Dr. Profit and loss (depr. on plant and equipment) . . . .	\$2,500	
Cr. Reserve for depreciation . . . . .		\$2,500
Dr. Profit and loss (depr. on increased value) . . . . .	2,500	
Cr. Reserve for depreciation on increase . . . . .		2,500

To enter depreciation for year 1923.

(If it is not desired to compute depreciation on reproductive values in the cost accounting plan, the depreciation on the increased values might be carried in the miscellaneous-deductions group of accounts on the profit-and-loss statement, instead of in the factory ledger.)

We have now reduced our profit of \$15,000 by \$5,000, leaving \$10,000 as the net profit for the year. However, by taking depreciation on the amount of increased valuation, we have realized, through this depreciation, a portion of the revaluation surplus which was placed on the books. Therefore, we should make an entry as follows:

Dr. Revaluation surplus . . . . .	\$2,500	
Cr. Earned surplus . . . . .		\$2,500

To transfer from revaluation surplus to earned surplus the portion of appreciation which has been realized through the depreciation charge for the year 1923.

After posting these entries, the balance-sheet on December 31, 1923, would appear as follows:

BALANCE-SHEET			
<i>Assets</i>		<i>Liabilities</i>	
Cash . . . . .	\$5,000	Reserve depreciation . . . .	\$7,500
		(on cost values)	
Inventory . . . . .	15,000	Reserve depreciation . . . .	7,500
		(on increase)	
Plant and equipment . . . .	50,000	Capital stock . . . . .	25,000
Appreciation of plant and equipment . . . . .	35,000	Revaluation surplus . . . .	27,500
		Earned surplus . . . . .	25,000
		Profit for year . . . . .	10,000
		Realized	
		Appreciation . . . . .	2,500
			37,500
Total . . . . .	\$105,000	Total . . . . .	\$105,000

By taking 7½ per cent. depreciation on the increased valuation of \$35,000, in twelve more years the reserve for depreciation on the increased valuation will have grown from \$5,000 to \$30,000 (which was the amount of excess

sound value), and by making the entry for \$2,500 realized appreciation each year, the revaluation surplus will have disappeared.

The net profit in this case is \$2,500 less than if the appraisal had not been used, but this amount is offset by the transfer from revaluation to earned surplus, so that the amount available for dividends is not affected.

The revaluation surplus should not be used for cash dividends. This appreciation is not an earned or realized profit and should not be distributed to stockholders. For this reason alone, it should be plainly ear-marked and not credited to the surplus account which has been created through operating profits. A good reason for not paying cash dividends out of plant appreciation can be seen when it is realized that the real estate used by a manufacturing plant might increase in value considerably, but, if it is not sold, a few years might see the value return to its former level. If this temporary appreciation were paid out in dividends, how could it be recovered? This revaluation surplus may properly be used for stock dividends. Stock dividends are really not a distribution of the net or excess amount of assets over liabilities, and, although a stockholder may think he is getting something with such a dividend, as a matter of fact he is dividing the total value of his holdings into more aliquot parts.

The subject of depreciation is becoming more prominent each year, and rightly so. The depreciation which enters into our computation of profits is often the largest individual item of expense on the profit-and-loss statement. Practically every charge against profits is based on an actual disbursement of cash and is therefore definite in amount; but depreciation is an estimate, and, although it is as real as if measured by an expenditure of a certain amount of money, it is impossible to make this measurement as definite as others. The best that can be done is to make the estimate as close as possible.

This charge cannot be determined fairly when a flat rate is used to cover items varying greatly in estimated life. Every concern which computes depreciation should have a detailed equipment record and calculate its annual depreciation charge on the individual items. Whether this computation should be on the original cost or the appraisal value is a question which has arguments for and against. The most quoted argument against the use of appraisal values for computing depreciation is probably the recommendation made by the fabricated production department of the chamber of commerce of the United States:

The replacement theory substitutes for something certain and definite, the actual cost, a cost of reproduction which is highly speculative and conjectural and requiring frequent revision. It, moreover, seeks to establish for one expense a basis of computation fundamentally different from that used for the other expenses of doing business. Insurance is charged on a basis of actual premiums paid, not on the basis of probable premiums three years hence; rent on the amount actually paid, not on the problematical rate of the next lease; salaries, light, heat, power, supplies are all charged at actual, not upon a future contingent, cost. . . . As the product goes through your factory it should be burdened with expired, not anticipated, costs.

In the September, 1923, issue of *THE JOURNAL OF ACCOUNTANCY*, Albert G. Moss, in an article entitled *Treatment of Appreciation of Fixed Assets*, goes

into the subject of appreciation and depreciation of assets in a manner that is very instructive and extremely interesting.

As in the consideration of all other special or extraordinary accounting procedures, the question of changing the books to agree with the appraisal is one that should be decided only after careful consideration of all the accounts affected and the special conditions which are always peculiar to each business organization.

## APPRAISED VALUES: THEIR TREATMENT FROM AN ACCOUNTING VIEWPOINT

By J. H. WORMAN, Memphis, Tennessee

The first question for consideration, when taking up the matter of the advisability of writing appraised values on the books of a concern is whether these appraised values have been determined on a basis of actual investment or cost of reproduction, modified by accrued depreciation as evidenced by age, expected life, condition and utility of the particular property.

Assuming this basis to have been actual investment, in the case of new property, for the purpose of testing the investment itself and of allocating costs and values to the proper accounts it is sound business practice. A foundation is also laid for carrying forward the plant accounts, and misunderstandings are eliminated in regard to what classes of property are charged to each account, and the original cost, together with the deductions and changes, which should be made in each. Another of the advantages accruing is the establishment of a sound basis for proper allocation of costs, since without specific details it is next to impossible to determine depreciation or other fixed charges affecting the respective manufacturing operations and types of product manufactured.

In cases of haphazard methods of bookkeeping, wherein the policy of "expensing" capital items in profitable years and capitalizing them in lean years has been followed, until sight has been lost of actual investment, an appraisal on the basis of actual investment, together with the writing of these values on the books, is good business policy.

Where appraisals are made on the basis of reproduction costs and such values are written on the books, it is difficult to show many business men the fallacy of such a procedure. The great disadvantages, as consequences of this action are, first, the increased cost of production due to the necessary increase in the depreciation, as applied to the reproductive values of the properties instead of cost of investment, and, second, the probability that such increased valuation will be credited to surplus as an offset, and eventually be paid out in dividends, either cash or stock.

The depreciation-reserve accounts should necessarily be adjusted to the extent evidenced by the appraisal, when the appraised values are taken up on the books, in order that the plant accounts, less the adjusted depreciation reserves, may accurately reflect the sound value of the properties.

Where the books are adjusted to agree with an appraisal on the basis of investment costs, it would seem proper to make the necessary adjustments to the surplus account, since the overstatement or understatement of plant accounts affects true surplus, when considered from this viewpoint.

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However, at the time an increase due to appraisal on the basis of reproduction costs is taken up on the books, an account under the caption "surplus arising from appraisals" should be credited. The increase may be credited to any properly designated account so long as a definitely clear distinction is made between surplus arising from appraisals and surplus available for dividends. It is difficult to understand how anyone can conscientiously declare a dividend, in cash or stock, from other than an earned surplus. No matter how great an increase might be shown by an appraisal on a reproduction-cost basis, such increase cannot be an earning until the concern disposes of the property, thus valued, and realizes thereon. The mere fact that dividends have been previously declared from appreciated surplus does not make the procedure logical or sound.

Depreciation should be computed on the adjusted value. In the case of investment-costs basis, the depreciation thus computed is of course an accurate production cost, assuming that proper rates have been established. In the case of the reproduction-costs basis, the depreciation computed results in an increased cost of production or operation, even after correct rates are established. The proper procedure would be to divide the depreciation in two parts: that which is applicable to investment, or original cost, and that applicable to the appreciation in value of the asset. The portion applicable to original cost should be charged to cost of production, and that applicable to appreciation should be a charge against the surplus arising from appraisals, thus reducing this account during the remaining life of the asset subjected to revaluation. Another method is to charge the whole of the depreciation to cost of production, thereby increasing the costs for the period to that extent, and, at the same time, to make an adjustment entry charging surplus arising from appraisals and crediting surplus account with the so-called "realized appreciation," as measured by that part of the depreciation applicable to the increased value of the asset due to appraisal.

Retirements should be made by a charge to cash for the amount realized, to depreciation reserve for amount already set up in past periods on that particular asset, and a credit should be made to the account with the asset retired, for the original cost or reproduction value as the case may be; an adjustment, debit or credit, must be made to profit and loss for the gain or loss, if any, at the time of retirement. Such procedure will properly clear the accounts in case of either basis of valuation and method of handling depreciation.

### BONUS AND TAX

Judging from the number of letters received by the editor of this department asking for help in the solution of tax and bonus problems, this subject appears to be one of rather general interest. Space is therefore devoted to both an arithmetical and an algebraical solution of the problem submitted in the following letter.

*Editor, Students' Department:*

SIR: Would you be good enough to solve a problem in your department on the subject of computation of bonus and tax? The problem is as follows:

A concern having a net income of \$27,625.33 desires on account of a certain contract to pay a bonus of 10% after deducting federal tax of  $12\frac{1}{2}\%$ , the bonus to be deducted in computing said tax. It will be noted that said income does not contain any unallowable deductions or non-taxable income.



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To my mind this concern is entitled to an exemption of \$2,000.00, and must also consider the additional tax which comes between \$25,000.00 and \$25,250.00 of net income. My answer is—

Bonus .....	\$2,457.91
Tax liability .....	3,046.22

Please advise through THE JOURNAL OF ACCOUNTANCY if I am correct, and show analysis. I have solved this by arithmetic, disregarding algebra entirely.

Brooklyn, N. Y.

Yours very truly,  
C. E. A.

The problem states that the bonus is to be regarded as a deductible expense in determining the profits subject to tax, and that the tax is to be regarded as an expense in determining the profits subject to the bonus. The problem does not state, however, whether the bonus is itself to be regarded as an expense in determining the profit subject to a bonus. Hence the problem will be solved on the following two assumptions:

- First:    The tax is an expense before computing the bonus;  
          The bonus is an expense before computing the tax.
- Second:   Both the tax and the bonus are expenses before computing the  
          bonus;  
          The bonus is an expense before computing the tax.

The problem makes a particularly good illustration because the net profits, before tax and bonus, are only slightly in excess of \$25,000.00, and the method of computing the tax will depend on whether the deduction of the bonus leaves net profits subject to tax of less than \$25,000.00, between \$25,000.00 and \$25,250.00, or over \$25,250.00. If the profits, after deduction of the bonus, are less than \$25,000.00, the tax is computed by allowing an exemption of \$2,000.00 and taking 12½% of the remainder; if the profits are between \$25,000.00 and \$25,250.00, the tax is computed by adding to the tax on \$25,000.00 the amount of income in excess of \$25,000.00; and if the profits are in excess of \$25,250.00 the tax is a straight 12½% thereof without any exemption.

Since many people who have computations of this kind to make apparently do not have a command of algebra, the problem will first be solved by an arithmetical method of repeated approximations, and will then be solved by algebra.

### SOLUTION ON FIRST ASSUMPTION

The tax is an expense before computing the bonus;  
The bonus is an expense before computing the tax.

*First approximations:*

Profit before bonus or tax .....	\$27,625.33
Bonus—10% thereof (First approximation) .....	2,762.53
	\$24,862.80
Profit after deducting bonus .....	\$24,862.80
Tax:	
Exemption .....	2,000.00
Remainder .....	\$22,862.80
Tax—12½% thereof (First approximation) .....	\$2,857.85

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*Second approximations:*

Profit.....	\$27,625.33
Less tax—first approximation.....	<u>2,857.85</u>
Profit subject to bonus.....	\$24,767.48
Bonus—10% thereof (Second approximation).....	<u>\$2,476.75</u>
Profit.....	\$27,625.33
Less bonus—second approximation.....	<u>2,476.75</u>
Remainder.....	<u>\$25,148.58</u>
<b>Tax:</b>	
On \$25,000.00:	
12½% of (\$25,000.00—\$2,000.00)....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>148.58</u>
Total tax (Second approximation).....	<u>\$3,023.58</u>

*Third approximations:*

Profit.....	\$27,625.33
Less tax—second approximation.....	<u>3,023.58</u>
Profit subject to bonus.....	\$24,601.75
Bonus—10% thereof (Third approximation).....	<u>\$2,460.18</u>
Profit.....	\$27,625.33
Less bonus—third approximation.....	<u>2,460.18</u>
Remainder.....	<u>\$25,165.15</u>
<b>Tax:</b>	
On \$25,000.00.....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>165.15</u>
Total tax (Third approximation).....	<u>\$3,040.15</u>

*Fourth approximations:*

Profit.....	\$27,625.33
Less tax—third approximation.....	<u>3,040.15</u>
Profit subject to bonus.....	\$24,585.18
Bonus—10% thereof (Fourth approximation).....	<u>\$2,458.52</u>
Profit.....	\$27,625.33
Less bonus—fourth approximation.....	<u>2,458.52</u>
Remainder.....	<u>\$25,166.81</u>
<b>Tax:</b>	
On \$25,000.00.....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>166.81</u>
Total tax (Fourth approximation).....	<u>\$3,041.81</u>

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*Fifth approximations:*

Profit.....	\$27,625.33
Less tax—fourth approximation.....	<u>3,041.81</u>
Profit subject to bonus.....	<u>\$24,583.52</u>
Bonus—10% thereof (Fifth approximation).....	<u>\$2,458.35</u>
Profit.....	\$27,625.33
Less bonus (Fifth approximation).....	<u>2,458.35</u>
Remainder.....	<u>\$25,166.98</u>
<b>Tax:</b>	
On \$25,000.00.....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>166.98</u>
Total tax (Fifth approximation).....	<u>\$3,041.98</u>

*Sixth approximations:*

Profit.....	\$27,625.33
Less tax—fifth approximation.....	<u>3,041.98</u>
Profit subject to bonus.....	<u>\$24,583.35</u>
Bonus (Sixth approximation).....	<u>\$2,458.34</u>
Profit.....	\$27,625.33
Less bonus—(sixth approximation).....	<u>2,458.34</u>
Remainder.....	<u>\$25,166.99</u>
<b>Tax:</b>	
On \$25,000.00.....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>166.99</u>
Total tax (Sixth approximation).....	<u>\$3,041.99</u>

*Seventh approximations:*

Profit.....	\$27,625.33
Less tax—sixth approximation.....	<u>3,041.99</u>
Profit subject to bonus.....	<u>\$24,583.34</u>
Bonus—10% thereof (Seventh approximation).....	<u>\$2,458.33</u>
Profit.....	\$27,625.33
Less bonus—seventh approximation.....	<u>2,458.33</u>
Remainder.....	<u>\$25,167.00</u>
<b>Tax:</b>	
On \$25,000.00.....	\$2,875.00
Add excess of income over \$25,000.00.....	<u>167.00</u>
Total tax (Seventh approximation).....	<u>\$3,042.00</u>

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*Eighth approximations:*

Profit.....	\$27,625.33
Less tax—seventh approximation.....	<u>3,042.00</u>
Profit subject to bonus.....	<u>\$24,583.33</u>
Bonus—10% thereof.....	<u>\$2,458.33</u>

This is the same bonus as determined by the seventh approximation, and is therefore the correct figure, since the use of this bonus in the seventh approximation of the tax resulted in the computation of a tax which reduced the profits to an amount on which the bonus was again \$2,458.33.

For convenience, the work may be set up as follows:

TABLE OF APPROXIMATIONS

	<i>First</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>
Profit.....	\$27,625.33	\$27,625.33	\$27,625.33	\$27,625.33
Less tax.....		2,857.85	3,023.58	3,040.15
Remainder.....		<u>24,767.48</u>	<u>24,601.75</u>	<u>24,585.18</u>
Bonus.....	2,762.53	<u>2,476.75</u>	2,460.18	<u>2,458.52</u>
Profit.....		27,625.33	27,625.33	27,625.33
Less bonus.....		2,476.75	2,460.18	2,458.52
Remainder.....	<u>24,862.80</u>	<u>25,148.58</u>	<u>25,165.15</u>	<u>25,166.81</u>
Tax.....	2,857.85	3,023.58	3,040.15	3,041.81
	<i>Fifth</i>	<i>Sixth</i>	<i>Seventh</i>	<i>Eighth</i>
Profit.....	\$27,625.33	\$27,625.33	\$27,625.33	\$27,625.33
Less tax.....	3,041.81	3,041.98	3,041.99	3,042.00
Remainder.....	<u>24,583.52</u>	<u>24,583.35</u>	<u>24,583.34</u>	<u>24,583.33</u>
Bonus.....	<u>2,458.35</u>	<u>2,458.34</u>	<u>2,458.33</u>	<u>2,458.33</u>
Profit.....	27,625.33	27,625.33	27,625.33	
Less bonus.....	2,458.35	2,458.34	2,458.33	
Remainder.....	<u>25,166.98</u>	<u>25,166.99</u>	<u>25,167.00</u>	
Tax.....	3,041.98	3,041.99	3,042.00	

In solving the problem by algebra, it must be remembered that there are three possible computations of the tax, depending on whether the net income after deduction of the bonus is more than \$25,250.00, between \$25,000.00 and \$25,250.00, or less than \$25,000.00. Hence equations must be formulated under each of the three assumptions.

Let  $B$  = the bonus.

Let  $T$  = the tax.

( 1 )  $B = 10\% (\$27,625.33 - T)$

If the income after deducting the bonus, or  $\$27,625.33 - B$ , is more than \$25,250.00,

( 2 )  $T = .125 (\$27,625.33 - B)$

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If  $\$27,625.33 - B$  is less than  $\$25,000.00$ ,

$$(3) \quad T = .125 (\$27,625.33 - B - \$2,000.00)$$

If  $\$27,625.33 - B$  is between  $\$25,000.00$  and  $\$25,250.00$ ,

$$(4) \quad T = [.125 (\$25,000 - \$2,000.00)] + (\$27,625.33 - B - \$25,000.00)$$

$$\text{or } T = \$2,875.00 + \$2,625.33 - B$$

On the assumption that the income after deduction of the bonus is more than  $\$25,250.00$ :

$$(1) \quad B = .10 (\$27,625.33 - T)$$

$$(2) \quad T = .125 (\$27,625.33 - B)$$

Substituting value of  $T$  is (2) for  $T$  in (1):

$$(5) \quad B = .10 [\$27,625.33 - .125 (\$27,625.33 - B)]$$

$$(6) \quad B = .10 (\$27,625.33 - \$3,453.17 + .125B)$$

$$(7) \quad B = \$2,762.53 - \$345.32 + .0125B$$

$$(8) \quad B - .0125B = \$2,417.21$$

$$(9) \quad .9875B = \$2,417.21$$

$$(10) \quad B = \$2,447.80$$

$$(2) \quad T = .125 (\$27,625.33 - B)$$

$$(11) \quad T = .125 (\$27,625.33 - \$2,447.80)$$

$$(12) \quad T = .125 \times \$25,177.53$$

But this can not be, as it is contrary to the tax law, for the income is between  $\$25,000.00$  and  $\$25,250.00$ , and the tax on incomes between these two amounts is not computed by taking twelve and a half per cent. thereof. It is apparent, therefore, that the solution should be made by using equation (3) as the expression of the value of  $T$ .

On assumption that income after deduction of bonus is between  $\$25,000.00$  and  $\$25,250.00$ :

$$(1) \quad B = .10 (\$27,625.33 - T)$$

$$(4) \quad T = \$2,875.00 + \$2,625.33 - B$$

$$(13) \quad B = .10 [\$27,625.33 - (\$2,875.00 + \$2,625.33 - B)]$$

$$(14) \quad B = .10 (\$27,625.33 - \$2,875.00 - \$2,625.33 + B)$$

$$(15) \quad B = \$2,762.533 - \$287.50 - \$262.533 + .10B$$

$$(16) \quad B - .10B = \$2,212.50$$

$$(17) \quad .90B = \$2,212.50$$

$$(18) \quad B = \$2,458.33$$

Then the income after deduction of the bonus is  $\$27,625.33 = \$2,458.33$ , or  $\$25,167.00$ , and since this amount is between  $\$25,000.00$  and  $\$25,250.00$  the assumption as to the value of  $T$  as expressed in equation (4) is correct. Hence:

$$(4) \quad T = \$2,875.00 + \$2,625.33 - B$$

$$(19) \quad T = \$2,875.00 + \$2,625.33 - \$2,458.33$$

$$(20) \quad T = \$3,042.00$$

*Students' Department*

SOLUTION ON SECOND ASSUMPTION

Both the tax and the bonus are expenses before computing the bonus;  
The bonus is an expense before computing the tax.

The problem will first be solved by arithmetic, using successive approximations, and then by algebra. Since the bonus is itself an expense before determining the profits subject to the bonus, the profits after deducting the tax but before deducting the bonus are 110% or 11/10 of the profits subject to the bonus. Then, if the bonus is 1/10 of the profit after deducting the bonus, it is 1/11 of the profit before making the deduction.

TABLE OF APPROXIMATIONS

	<i>First</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>	<i>Fifth</i>
Profit.....	\$27,625.33	\$27,625.33	\$27,625.33	\$27,625.33	\$27,625.33
Less tax.....		2,988.94	3,173.21	3,175.30	3,175.33
Profit subject to bonus....	<u>27,625.33</u>	<u>24,636.39</u>	<u>24,452.12</u>	<u>24,450.03</u>	<u>24,450.00</u>
Bonus — 1/11 thereof.....	<u>2,511.39</u>	<u>2,239.67</u>	<u>2,222.92</u>	<u>2,222.73</u>	<u>2,222.73</u>
Profit.....	27,625.33	27,625.33	27,625.33	27,625.33	
Bonus.....	2,511.39	2,239.67	2,222.92	2,222.73	
Remainder subject to tax..	<u>25,113.94</u>	<u>25,385.66</u>	<u>25,402.41</u>	<u>25,402.60</u>	
Tax.....	2,988.94	3,173.21	3,175.30	3,175.33	

In making the solution by algebra, we are again confronted by the uncertainty of the amount of the taxable profit and consequently of the method to be applied in determining the tax. Hence there are three possible expressions of the amount of the tax.

( 1 ) 
$$B = .10 (\$27,625.33 - B - T)$$

If the income after deducting the bonus is more than \$25,250.00,

( 2 ) 
$$T = .125 (\$27,625.33 - B)$$

If the income after deducting the bonus is between \$25,000.00 and \$25,250.00,

( 3 ) 
$$T = [.125 (\$25,000.00 - \$2,000.00)] + (\$27,625.33 - B - \$25,000.00)$$

If the income after deducting the bonus is less than \$25,000.00,

( 4 ) 
$$T = .125 (\$27,625.33 - B - \$2,000.00.)$$

Proceeding on the first assumption, namely that the income after deducting the bonus is more than \$25,250.00,

( 1 ) 
$$B = .10 (\$27,625.33 - B - T)$$

( 2 ) 
$$T = .125 (\$27,625.33 - B)$$

Substituting the value of  $T$  in (2) for  $T$  in (1):

- ( 3)  $B = .10 [\$27,625.33 - B - .125 (\$27,625.33 - B)]$
- ( 4)  $B = .10 (\$27,625.33 - B - \$3,453.17 + .125B)$
- ( 5)  $B = \$2,762.533 - .10B - \$345.317 + .0125B$
- ( 6)  $B + .10B - .1025B = \$2,762.533 - \$345.317$
- ( 7)  $1.0875B = \$2,222.73$
- ( 2)  $T = .125 (\$27,625.33 - \$2,222.73)$
- ( 8)  $T = .125 \times \$25,402.60$  Which is consistent with the law.
- ( 9)  $T = \$3,175.33$

It will be noticed that the question as to the propriety of deducting the bonus as an expense in determining the profits subject to the bonus, has been ignored. This has been done for two reasons. In the first place, there is no specific information in the problem indicating any intention in the minds of the parties to the particular contract in question. In the second place, the importance of having this point definitely covered in contracts of this nature, and the editor's opinion as to the proper treatment of the matter in cases where the point is not definitely covered by the contract, have already been discussed in this department.