

that if the so called insulating joints properly performed their function, fires from this cause would be extremely rare.

If on the other hand low potential systems are so arranged that there is no chance for high potential currents to rupture to ground, there remains the danger of some person receiving a fatal shock while handling the apparatus.

In view of these facts, it would seem advisable to equip all low potential systems, which are exposed to the contingencies herein mentioned, with an automatic device that in time of need will operate effectively.

CENTRAL STATION ACCOUNTING FROM A BUSINESS STANDPOINT.

By P. H. HART, Montreal.

MR. PRESIDENT AND GENTLEMEN, Before proceeding to a description of the system of accounting which I will offer for your consideration, it seems appropriate to state a few of the reasons why a standard system of accounting for central stations ought to be adopted.

The reasons why are many and substantial.

The individual owner of a small plant is as much interested in having accurate knowledge of the condition and details of his business and a determinate method of obtaining such condition and details, as the manager or directors of a large joint stock company.

A proper system of accounting should show to the directors, manager, proprietor or other interested party (and for the sake of brevity I will hereafter refer to such parties as manager) besides the profits or losses of the business, the cost of producing what is sold, and should demonstrate this cost in such manner as to enable him to learn what the product costs in its various details, and particularly the costs separately of generation and distribution.

These being determined and ascertained in the ordinary progress of business and due account being had of interest on investment and depreciation of plant, the manager can compare costs and determine where excesses arise, whether in the generation or distribution, and the reasons therefor. It should also show promptly and definitely the condition of affairs of a business at any and for given periods, which is a decided requisite and absolutely essential to sound business administration. It should be such as to enable the manager to determine the advisability of soliciting or catering for any particular line of business that may be offered or obtainable and indicate the most profitable, and be a guide, preventing indiscriminate investment in pole line construction, apparatus, etc., and show at all times the value of the investment for such purposes as insurance, arbitration, assessment, etc., etc. With such information created, compiled and formulated in the regular progress of the business, the manager will be enabled to consider intelligently operating costs and the advantages or disadvantages of further investment.

I may here call your attention to some interesting information which appears in the 14th annual report of the Board of Gas and Electric Light Commissioners of Massachusetts, Public Document No. 35. This shows that out of 58 electric light companies operating in that state, with a total investment of over \$17,000,000, five of the companies appear not to have earned expenses, and 32 have not earned sufficient to warrant the declaration of any dividend; thus very near 10% of the electric light companies operating in that state do not earn expenses, and 53% are not earning sufficient to make a return to the investors on their capital. Many of them, no doubt, may have believed they were doing well until a rigid system of accounting had been applied.

These commissioners are doing much to standardize the system of accounting in use by electric lighting companies in that state, and this statistical information is the direct result of a uniform method adopted by these commissioners in adjusting the statements submitted by the various companies.

Mr. H. A. Foster, who investigated in detail 160 electric lighting stations of the United States, for the United States census, in a work based on the information gathered by him in the taking of this census and recently published, entitled "Central Station Bookkeeping," regrets the lack of system in accounting shown by the various electric lighting stations which came under his notice, and lays particular stress on the necessity of accurate accounting in central station work, for obvious reasons.

In addition to other reasons for and the advantages of a standard system of central station accounting, I might say that in the event of the question of municipal ownership or purchase arising the manager should have definite knowledge as to the cost of investment, cost of operating, etc., to compare with assumed cost of municipal operation.

I will now present to you a system of accounting at present in use, having the objects above outlined in view, the results of which have been highly satisfactory, and in connection with it a system of records which form necessarily a part of a thorough accounting system. In the presentation I will indicate some of the various books and forms in use.

Central station accounting from a business standpoint should proceed from and be based upon an order system, guiding, directing and allotting in advance, the distribution of expenditure for investment, operation or maintenance and of revenue to the several distributions or sub-divisions of those general items that may be deemed desirable. And here I may say that such sub-divisions should be as numerous as the several details of a business and when arranged for and determined upon beforehand, becomes, in practice, very easy of allotment or apportionment.

A written order should be issued covering each and every transaction, indicating the character of the transaction and the accounting to which the expenditure incurred therefor is to be

charged, or the revenue derived therefrom is to be credited. This to be determined and declared in the order before the expenditure is made or the revenue derived.

Such system necessarily means that for every debiting entry to an account, something must be credited and all entries and accounts must result in a perfect balance, so that double entry bookkeeping is absolutely necessary to the practical working and comprehension of this system.

The system referred to herein, and partially illustrated by various forms or blanks, can be readily put into operation by any company and practically at any time desired. Under the system described as at present carried out, the accounting is eventually grouped into what may be designated as general accounts, which are kept in a general ledger. All the other accounts, subordinate to these general accounts, and forming what may be designated as the working accounts, and which lead up to and are finally grouped into general accounts, are kept in other or subsidiary ledgers. This subdivision of books or ledgers is done in this instance simply as a matter of convenience, because the volume of business is large and necessarily requires to be attended to by a number of persons; but the principle involved would permit carrying all the accounts in one set of books if the volume of business were so small as to make that desirable.

The general accounts consist of the assets and liabilities, and may be sub-divided in accordance with the wishes of the manager—as, for instance, the asset account of merchandise might, if desired, be sub-divided into fuel, line supplies, station supplies or wiring supplies, etc., such accounts representing materials on hand for use as required, either for any addition to construction or for operation or maintenance of plant.

The asset account of plant and construction account may be subdivided into station construction, lines and poles, real estate, buildings, etc.

The feature of the general accounts is practically no different from that of any other double entry bookkeeping system of accounts. The method in which this system may vary from ordinary methods of bookkeeping is principally in what may be known as the working accounts, and it is here that the formulation of the accounting and the determination to which account work under any given order shall be entered, arises. In the forms shown will be noticed the titles of sub-divisions of the working accounts representing expenditures. They show construction accounts, operating accounts and maintenance accounts subdivided into the various details, upon which it has seemed desirable to accumulate and record information.

All orders issued involving expenditure recite thereon the account and sub-account to which the expenditures made thereunder are to be charged, and all returns of labor, material or expense incurred upon such order are reported, quoting the number of such order (all such orders being numbered serially.)

Expenditures which are continuous during the entire year, such as, for instance, labor and material and expense for the operation and maintenance of the station, or labor and material required for the trimming and inspection of arc lamps and lines, may be dealt with by orders covering the entire year or parts thereof, say monthly, the latter being preferable. Monthly orders for work of this character are preferable to yearly orders, because as soon as the expenditure authorized under an order has been completed, such order is turned in to the office or bookkeeper, marked as completed, and thereafter no expenditure can be made chargeable to that order.

It will be observed that the purpose sought to be accomplished by these orders is the localizing and sub-dividing of the expenditures to the particular parts of the work being done upon which the management deems it necessary to have accumulated and specific information. In the forms submitted, there are sub-accounts representing different parts of the operation within the station, sub-dividing it into boiler room, engine room and the electrical generating room; similarly it sub-divides the work outside, the inspection, trimming of lamps, lines, the additions to the plant, whether within the station or outside, and also seeks to separate the different classes of service.

It is, of course, important that the returns made upon these orders be in accordance with the instructions contained in the order. Thus, for instance, an order authorizing the inspection of lines should not have charged to it or reported against it the coal consumed under the boilers, and experience has demonstrated that employees very soon become accustomed to reporting and sub-dividing their work in accordance with the designations of the orders under which they are acting, so that in practice the allotment of expenditures for labor, material or other expense becomes automatic, with the result that the bookkeeper can indicate at any time the amount expended for any sub-account. By using subsidiary ledgers for this purpose, arranged similar to blank or Form No. 1, which, as will be perceived, is a re-arrangement of the items upon the Form No. 2, and total up month by month or day by day as they may be recorded therein, the costs of each sub-account. Periodically, say monthly, the totals of these accounts are transferred either to asset accounts or to the debit of the revenue accounts, according to their character.

The bookkeeper in debiting the returns on these orders to their various accounts, must make corresponding credit to certain other accounts; labor to credit of labor account; material or merchandise to credit of material or merchandise accounts, sub-divided as it may be; expense to expense account, and the totals of the credit of these accounts must, of course, balance with the totals debited to the accounts represented by the orders. When the labor is paid, the amount paid is debited to the labor account, thereby checking the accuracy of the pay rolls, which may be made up either from the returns upon the orders or by independent returns, but all labor represented by either the independent re-