

than upon another, but it is as good a subdivision as any other and is independent of any personal equation; and as the item is, or always should be, an exceedingly small one, it does not effect materially the accuracy of the ultimate cost.

In the case of air drills and the amount to be charged for them, I have been in the habit of keeping a "Power" account; to this account is charged all fuel, water, oil and other supplies used, and all repairs to boilers or machinery plant, and all labor of firemen and engine-drivers (excepting in certain cases the man at the hoisting engine and mill engine). The total of the Power account is then subdivided into "Hoisting," "Pumping," "Compressed Air," "Lighting," and other accounts where power is used such as "Repair Shop," "Sampling Mill, &c., &c." This subdivision should be in the ratio of the power used by the different accounts, and to get at this approximately it is well to have each engine indicated properly, and to use recording gauges, revolution counters and such other devices as will make the measurement of the power more accurate.

For large engines running continuously, like mill engines, revolution counters are not necessary, but for large air compressors operating under variable loads I have found a counter of the greatest service in making up the power consumed by the machine. In the case of hoisting engines the number of buckets, skips, or cages hoisted furnishes the necessary factor for determining a proportion. For pumps or pumping engines a card near by, upon which is noted time of starting and stopping, and the number of strokes made, gives the required information.

The data from these revolution counters, cards, etc., is of course sent daily to the office.

In this subdivision of the Power Account much will depend upon aggregation of the plant in one spot, or upon having it scattered over the property; whether all the boilers are in one house and make steam for the whole plant, or whether there are separate boiler plants for the hoist, the mill and the air compressor; the method of keeping this account and its subdivisions must, therefore, be arrived at by the manager himself. If this account is accurately kept it is a source of great gratification (and of many surprises) to the manager to know just what it is costing him for power to pump the mine water, to hoist a ton of rock or to mill a ton of quartz, and in my own experience has made economies (previously unsuspected) possible and profitable.

I have been particularly struck in one or two cases which have come under my notice recently in British Columbia, with the laxity with which blacksmith shop accounts are kept. I give herewith a page from a company keeping a smithy account in a very good fashion.

All fuel sent to the shop is weighed and charged to it; all iron, steel and other material is requisitioned for to the storehouse; after shaping and working it is credited to the shop when sent out and debited to the account for which it is used. In addition to this, the smith is obliged to keep tally of every pick that is sharpened, of every hand drill sharpened, or every air drill sharpened, and the nippers or steel men are obliged to keep tally of all the sharpened steel and picks delivered into the mine. Wherever possible the steel is rounded up and weighed, once a month in the east usually, but in some western mines it is frequently impossible to do this more than once or twice a year. From the total cost of the blacksmith shop for labor and supplies, is determined the actual cost of each pick sharpened or steeled, for each hand drill sharpened, and so on; furthermore, a special account is kept in the smithy of the time and material used in repairs to old work, and material for new work. In this way a smithy account is not entered directly into the cost sheet, but is closed by being charged in the right proportions to the different cost headings underground and on the surface. I may say here that in my own practice I have found the

blacksmith shop one of the first places in which a saving can be effected.

The surface accounts are simple; in case the ore is trammed from the mouth of the shaft or tunnel to ore bins or direct to the mill, such tramping charge is figured on the basis of total number of tons trammed. In the case of a free milling proposition, this tramping charge is considered as part of the milling expense, and not as part of the mining cost; in the case of shipping ore it may be reckoned as part of the mining cost. Similarly, all men on the surface employed in keeping the yard straight or in good shape are charged under any convenient heading that the manager may desire, say, "surface work," and the final closing in of this account depends to a great extent upon what these men have been doing during the period involved.

A carpenter shop account in large mines is as necessary as the blacksmith shop account, and should be closed in a similar fashion—that is, directly to the various cost headings in the mine or underground, for which the work may have been done; or, directly to the buildings on the surface, at which supplies and labor may have been used.

*Cost Ledger.*—At the end of each month the various pages or accounts in the Cost Minute book are closed as indicated above on page , the cost per unit being noted in red ink on the page. These accounts are then closed or posted into the Cost Ledger, which is simply an ordinary ledger, in which the items on the debit side of each account are the totals for labor, supplies, expense and superintendence as obtained from the minute book, and the credit items are the number of feet sunk, raised, driven, etc., and the number of tons won.

In my own practice I have endeavored to have the credit side also show, in dollars and cents, the value of the ore won and credited to the account, a matter which is comparatively simple in the case of shipping ore, if correct sampling and assaying is done, and in the case of milling ore, equally simple, if a sufficient provision of ore bins has been made to enable lots from different headings to be kept separate.

From this ledger it is easy at any time to make out a very complete and satisfactory cost sheet for any number of weeks, months or years.

From the books in which are kept the account of stores received and delivered, one can check the "stock-takings" which should be made periodically.

As regards cost books for smelting or milling accounts, they should be arranged on identical principles, the labor, supply and expense items being classified to the different accounts, and power being subdivided as necessary.

The furnace or mill is debited with all ore received, and credited with bullion produced. The assay value of the slag or tailings must be taken account of, if they are saved (or banked) for further treatment, as must of course all concentrates, speiss or other intermediate products which are not thrown over the dump.

In the case of a mine having its own furnace or mill, care must be taken that the unit used in the mine is the same as that in the reduction works, a ton of 2,000 lbs. in one place must be of the same number of pounds in all other places.

*Checking with Home Office Accounts.*—While this system of accounts is one which is most desirable for the manager of a mine, it is not usually intelligent to the shareholder, nor, I might say, to the Directors, and therefore, to obviate the trouble and expense of keeping two sets of books it is desirable to be able to close these various cost accounts into the accounts usually kept by the home office: the average manager will find little difficulty in doing this. In this connection I desire to bring to your notice the admirable analysis of costs to be found in the reports of some of the South African mining companies, notably, the Crown Reef, Henry Nourse, Simmer & Jack, and