

erator ran by all signals and actually replaced in the file a card with an error uncorrected. The next time the card was posted the cross-footing proof would reveal the error, and *would continue to reveal it*, every time a posting was made, until the error was corrected; for a characteristic of the method is that a cross-footing of the latest balances on the card not only proves that the work is correct for the particular entry affected, but also that *all of the preceding balances* up to that point are correct.

2. *The Proof Column.* Just a word here about the absent, and, from our standpoint, the unlamented proof column. We omitted it both for space considerations and principally because it is not a proof in any actual sense of the word. Our combined proof method is a real *balancing proof* in the sense that a trial balance in bookkeeping is a proof, whereas the proof column is nothing but a *checking* device for use in discovering at what point an error had been made after the fact of the error itself has been discovered by other means. Even in this limited function there is only one type of error with which it would be of the slightest use, viz., an error in picking up an old balance. We find from experience, however, that our special card design has almost totally eliminated this particular type of error in the first place. What mistakes we experience are of other sorts, almost never of this. So why the proof column?

The reason why our card design forestalls errors in picking up old business while, as I believe, designs which incorporate the proof column invite them, is a very simple one. The proof column is necessarily a different column from that in which the old balance occurs. This precludes the possibility of using the visible printing point at which the proof column stops for the pickup (and which, by the way, is the only visible indicator point on the machine), as a gauge for selecting the old balance. The old balance must therefore be selected by visual inspection of the entire field, and no argument is necessary to show how easy it would be to select the wrong figures for the pick-up. On simple card forms with medium width machines the standard Burroughs method for getting around this weakness of the proof column was to locate that column far enough to the left of the balance column to allow the latter to just show at the side of the machine when the proof column was at the printing point. The lowest figures in the first visible column to the right of the machine, then, would be picked up as the old balance. But this makeshift would be wholly impracticable with regular posting machines which are

so wide as to require a separation of about eight inches between columns for that purpose; and impossible with any width machine where the card design requires the proof column to be located next to or close to the balance column, as indeed our card design would require proof columns to be located, if they were used at all.

By omitting the proof columns entirely, on the other hand, as we have done, and picking up the old balance in the air, the pick-up is made *in the balance column itself*, and the figure to be picked up is stopped automatically by the carriage *immediately over the visible printing point*, where with the carriage back it is so clearly and conspicuously indicated to the operator, that the chance of his putting it into the machine wrong is, as we have proven by experience, practically negligible.

To the contention that on proofs of extremely long runs—say a day's postings—a means of checking or comparison should be provided to find *where* the error occurred after its existence has been discovered, two answers should be made:

First: In runs of *any length* the cross-footing proof pins the mistake down to the card on which it was made just as readily as the proof column, and in addition it does this *automatically* as part of the proof instead of by visual comparison as would be necessary with the proof column. Besides, the cross-footing will reveal a much wider range of mistakes than the proof column, as has already been pointed out;

Second: Extremely long runs should not be accumulated without proving. One of the strong features of the plan under discussion is the positive *control* it exercises over the store room. This is possible only by posting all tickets *before* they are presented to the store room to be filled, and proving them and releasing them in small lots. No ticket is released to the store room for issue, or even posted for issue, unless the ledger record shows stock on hand to meet it. In this way the ledger controls the store room. Otherwise the store room controls the factory, and the ledger becomes merely an "accessory after the fact."

C. DAILY VERIFICATION OF STOCK

As a verification that the stock is in agreement with the ledger records, the perpetual or daily inventory of a certain number of items of stock is maintained. These items which have been inventoried are compared with the ledger records and any disagreements traced

and corrected. In our own case we cover the items having an ordinary rate of movement once per month. Very heavy movers are inventoried twice a month, while the very slow movers may be inventoried only once in two months or once in three months.

IV. FILING, POSTING AND VERIFYING ROUTINE

(Special Plans for Obtaining Efficiency in Operation)

A. GENERAL PROVISIONS

In an extensive application of machine posting it is desirable to keep the investment for posting machines down to a minimum, and it is absolutely necessary to make special provisions for attaining technical efficiency in handling the work. In our particular application both these ends are attained by the following special plans:

1. *Two operators are assigned to each posting machine*, one of whom acts as a file clerk, finding the cards and obtaining the predetermined totals of the posting media for the operator who actually does the posting.

Under this arrangement the file clerk is also trained as a posting clerk, as an insurance against holding up the posting machine in case the regular operator should be absent from sickness or any other cause. Furthermore, it enables the file clerk and the posting clerk to change off with each other's duties two or three times during the day, thus making the work less tedious for both. It also affords a check on the part of a second clerk that the correct card has been drawn and the correct control bars used for posting.

2. *A small listing machine is provided to operate in conjunction with each of the posting machines.* By this arrangement the posting machines can be made to operate practically continuously, whereas if the posting machine operator were obliged to find her own cards and obtain her own predetermined totals from the posting media for verification, the posting machine itself would either be idle or engaged on non-posting work an unnecessary portion of the time. Our plan is to make the expensive machines work practically all of the time on actual posting work, and to provide cheap machines for doing work which the latter can handle as well as the posting machines and at much less expense in machine investment.

3. *All posting media are reduced to a unit basis*, i. e., a separate ticket for each individual posting. This is such an important point in posting efficiency

that I wish to give it very special emphasis here. I would even go so far as to say that in busy times where the machine installation were working nearly to capacity, the utilization or the non-utilization of unit posting media might mean the difference between the success or the failure of the entire system. Unit posting media permits preliminary sorting and collating of tickets previous to drawing the cards from the file, and means vastly more speed in posting. In our own installation we started to post the apportionments from the original factory copies of orders whereon as many as nineteen different items might appear to each sheet of the order. We found this such a handicap to the department, however, that we very soon changed this class of posting over to the unit media and the immediate pick-up in the department was astonishing.

4. *All posting is done in groups* of tickets representing the same posting operation, not promiscuously among different operations.

Furthermore, the groups themselves are divided into runs of not too many tickets each, as was explained before under the discussion of the Methods of Proof.

5. *Posting media should be thoroughly sorted, classified and sub-classified* before being passed to the file clerk. This serves to collect together all tickets of the same sort against which the file clerk will draw the corresponding card, and it enables the posting clerk to greatly abbreviate the posting operation by merely listing in the Transactions Field the individual postings, then taking the sub-total of these postings in the Transactions Field and completing the process by drawing a single set of balances for the lot, rather than individual balances for each separate posting. If the ledger is so large that it is divided into separate sections the plan of pre-sorting will also serve to allocate to each section the tickets applying thereon.

6. *Convenient furniture must be provided* for speeding up the operation of sorting, filing and posting. Speed and efficiency cannot be realized under inconvenient physical arrangements or equipment. Insufficient and illegible finders, for instance, will cut down all the additional speed over hand posting that a thousand-dollar posting machine should normally afford. All of the steps of the process from the sorting of the posting media to the final proof of the result should be thought out and worked out until they function as smoothly as the operations of a well-oiled machine. Three of the devices we have provided for our particular work have been so successful that they are worth mentioning here: