particulars, it is pretty plainly to be seen that the rosy and light-hearted view taken by the Nernst Company as to ousting the arc lamp will need some slight modification, especially on the score of first cost and economy. Unfortunately for the newcomer there are such things as cables to be taken into account and maintenance.

So, then, the manufacturers of open and enclosed arc lamps are not yet to put up the shutters, stop the machinery, and discharge the workmen; but it is not so pleasant an outlook to the carbon lamp manufacturer unless he commences to make the Nernst type of lamp (under license, of course) or improve the carbon lamp, as will appear later on. But there are other considerations to be taken into account where the advent of the Nernst lamp will be most beneficial, and where it will be appreciated, as we shall have for street lighting two illuminants to choose from, and where one is not applicable the other will be most serviceable. It may be considered that for lighting large areas such as squares, public markets, etc., and main streets and roads, the arc lamp will not be superseded, but for the lighting of narrow streets, public halls, etc., the Nernst lamp will be a most valuable acquisition, on account of the increased economy in running. In all the circumstances it must be considered that the lamp is automatic in its action, as the match-assisted lamp is out of question in 1899, excepting, of course, to the promoters. The engineer and manager of one of the most successful gas works in the country said to me, when discussing the merits of the Nernst lamp: "Why, you will be going back to the old barbarous times of gas lighting if you use a match to light your incandescent lamp, and all the advantages of the enclosed filament lamp will be dispensed with."

TRANSFORMER ECONOMY.*

F. H. LEONARD, JR., MONTREAL.

(Continued from last issue).

Central station practice has not yet settled down to uniform methods of installation, but the trend now seems to be in the direction of larger transformers with secondary networks preferably on the thin wire system. The general introduction of meter basis of charge, making it possible to safely connect double the rated transformer capacity in lamps to the secondary network—whereas with the older systems, providing a separate transformer for each connection, it was necessary to provide transformer capacity equal to the lamps connected. With separate transformers of small sizes, necessary for individual supply, the aggregate core losses become a serious drain upon the central station. We have frequently seen banks of small transformers serving a single customer or group of customers, this condition being brought about by the gradual growth of demand for light exceeding the capacity of the original transformer installed, a further growth exceeding the capacity of the second, and so on. In such cases the substitution of a single large transformer of modern design, displacing the small ones, would save its price in less than a year, if credited at the usual selling price, with the amount of current saved. Don't put a modern transformer of good regulation into a group of antiquated transformers of poor regulation; if you do you will lose your new transformer, which is likely to be unjustly condemned for trying to improve the regulation of its bad associates. Placed in such company, the new transformer tries to maintain the good regulation for which it was designed, while the lazy, old shirks, with which it is connected, steeped in the vice of bad regulation, throw their entire load on to the new comer, which good naturedly carries it all till it can no longer stand the strain, and literally roasts out and breaks down under the load.

In most of the smaller stations, and in many of the larger ones, money can be saved by remodeling the system of distribution, and at the same time improving the service by laying out a net work of secondary mains, starting first in the business portion of the town, with the installation of a few large transformers, reserving the small transformers, which these replace—if they are modern and worth keeping—for extensions in the more remote sections, where for the time the secondary network is impractical. It may occur in some cases the secondary network will be practical in several different sections, and these separate sections will, in most cases, gradually grow together, allowing taps to be made for new customers at intermediate points. In most cases, where prices are based on meter rates, such an arrangement can be installed at no greater first cost than the individual transformer system—the saving in cost of transformers, on account of their larger size and less total capacity required, paying for the copper mains. Such an arrangement always results in more satisfactory service to the consumers, at the same time greatly reducing the leakage current necessary to magnetize the transformers or supply the waste in core losses.

A few figures may serve to impress the idea more firmly in your minds. Let us take the case of a station having an average load, equivalent to 1,000 lights, most of which average four hours burning per night, and making due allowance for belting, dynamo, line, transformer and secondary wiring losses, we will allow that 10 lights are obtained per 1 h.p. at full load. In the first case we will suppose an individual transformer system is installed, using 10 10-light, 10 20-light, 10 30-light, 5 40-light, and 4 50-light transformers, even with modern transformers these would have an aggregate core loss of about 1,200 watts. If we substitute for this arrangement 6 150-light transformers, connected with a secondary main, retaining the 10 small transformers for isolated customers so scattered as to make it impractical to connect them to the secondary mains, our core losses will be reduced to 692 watts, or a saving of 448 watts for every hour the plant is run, which for twenty-four hours a day would amount to 3,920 k.w. hours per year, which at 10 cents per k.w. hour would be $392, or 6 per cent. on more than $6,500, a sufficient amount to more than pay for the change, if no consideration is made of the transformers left on hand, which would be superseded by the new arrangement. In the case just mentioned, we have assumed the original arrangement to be modern transformers. Had we assumed them to be old types, the saving would have been three or four times that shown, and would have allowed us to make a good or a better showing had we only charged 3c. per k.w. hour, which would be less than the cost of production in a station of 1,000 lights capacity. Some of our friends may argue that these losses cost them nothing, as they are running on water power, but we would like to remind them that the capacity in their generators, water wheels, or whatever prime movers they use, represent capital invested which add to the fixed charges their pro rata of interest and depreciation for which it makes no return, whereas, if the capacity used in overcoming these losses could be rented at the usual rates, a material difference in the capacity to pay dividends would be shown.

*Paper read before the Canadian Electrical Association.

CENTRAL STATION ACCOUNTING FROM A BUSINESS STANDPOINT.*

BY P. H. HART, MONTREAL.

The reasons why a standard system of accounting for central stations ought to be adopted 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

*A paper read before the Canadian Electrical Association.