

THE DESIGN OF ALTERNATE-CURRENT TRANSFORMERS

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The Design of Alternate-current Transformers by R. W. Weekes

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R. W. WEEKES

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ALTERNATE-CURRENT
TRANSFORMERS**

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TRANSFORMERS.



BY

R. W. WEEKES, WHIT.SCH., ASSOC.M.INST.C.E.

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PREFACE.

THE invention of the alternate-current transformer some years ago led to the introduction of the system of high-tension distribution of electric energy for lighting purposes. The saving in the first cost of the copper mains being the chief advantage of the system in the eyes of the promoters, the question of the efficiency of this method of supply, except at full load, was not considered. Now, experience has shown that the cost of the annual supply depends largely on the efficiency of the transformers used, and that the loss at light loads is the most important factor in determining this cost.

Hence the design of alternate-current transformers needs more careful attention as the demand for higher efficiency arises.

I have endeavoured in the following pages to describe as simply as possible the principles involved in the construction of transformers on economic lines, both as regards first cost and power wasted when working. To the formulæ deduced from these principles I have added several others which are useful when determining quickly the dimensions of the various circuits. To enable more to follow the reasoning, higher mathematics have been avoided, although this omission has necessitated the acceptance of certain well-known formulæ without proof.

The examples worked out and illustrated show the general procedure of designing transformers of different types to fulfil definite conditions.

R. W. WEEKES.

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THE DESIGN
OF
ALTERNATE CURRENT TRANSFORMERS.

The reliable information available on the subject of alternate-current transformers has until recently been very scanty. When the high tension system of distribution, with transformers in parallel, was introduced some eight years ago, the good points of the transformers as then made, were much exaggerated. It was generally stated that the efficiency at all loads was very high, and that the current taken by the primary when no lamps were on the secondary circuit was so small as to be almost negligible. The last statement may be excused to some extent when it is remembered that small current measurements could not be made so readily then. Still, the engineers in charge of central stations have found that the small currents required to energise each transformer soon become a serious item in the cost of production. In consequence of their experience they now specify what the various transformers should be capable of doing, and by raising the