turns per pole as $.707\,an\frac{1}{2}$, where "a" equals conductors per phase per pole "n" equals number of phases and "I" is the current per conductor. This applies to the form of winding usually employed in alternators. For rotary converter windings better results are obtained by calculating the armature reaction in direct current terms.

General Synchronous Motor Diagram.

The quantities involved in the general synchronous motor diagram are so numerous and so interdependent that one is at a loss, when starting to construct the diagram, to decide what quantities to assume as fixed. We can always assume a constant source of E.M.F. E_g, and if we assume the load the motor is carrying and its losses, we immediately have the watt component of the current.

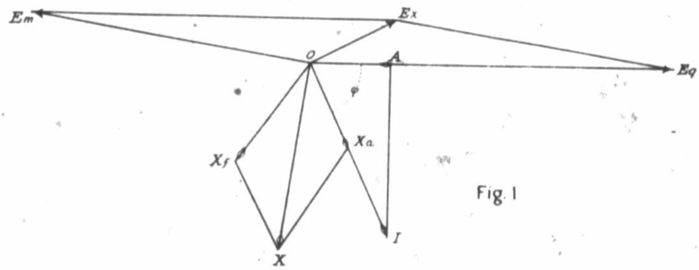

Fig. 1

It is a fact well known to all switchboard operators that with the given load on the synchronous motor, the power factor may be varied over a certain range by altering the field excitation of the motor. We have to start with, therefore, the impressed generator E.M.F. E_g the total current and power factor. Lay off E_g equal to the generator E.M.F. to any desired scale, also the watt component of current O.A. Lay off the total current O.I. making the angle between it and $E_g = \varphi$ whose cosine is equal to the power factor which we have assumed. (See Figure No. 1.) At right angles and leading the current 90°, lay off E_x, the reactance voltage which is the product of total current and total reactance in the circuit, the resistance being small in most cases is negligible. Combining E_g and E_x gives E_m, the counter E.M.F. of the motor. Lay off X_a in phase with the current, representing the armature reaction to any desired scale. Lay off X, leading the counter E.M.F. 90° representing the excitation required to produce the counter E.M.F. on open circuit, as read from the no load saturation curve