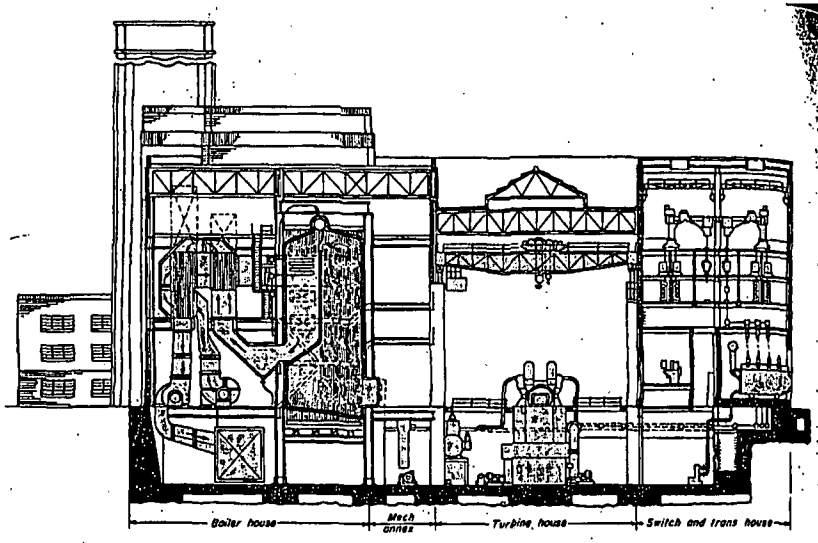
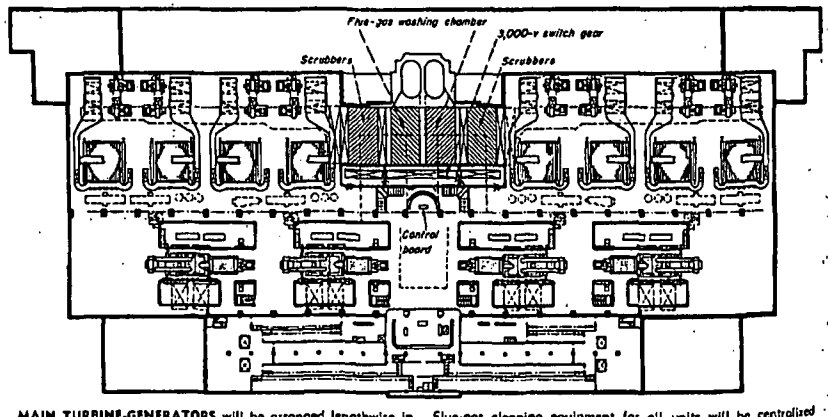


USE OF OIL FOR FUEL greatly simplifies plant layout. Eight boilers rated 300,000 lb per hr serve four 900-psig 900-F 1-in.-Hg backpressure turbines. The boilers are served by tubular air heaters and bare-tube economizers, two sets of fans



MAIN TURBINE-GENERATORS will be arranged lengthwise in turbine room with boilers in a single row in the boiler room. Flue-gas cleaning equipment for all units will be centralized about the stack located at plant center toward the river side

up of four 60,000-kw units. The first two are under construction. The units will operate with 900-psig 900-F steam and exhaust at 1-in.-Hg back-pressure. Five bleed points will give a final feedwater temperature of 380 F. The 2-casing tandem-compound units will have double-flow low-pressure casings and will turn at 3000 rpm. The alternators are designed for 3-phase 50-cycle 15,000-v 0.875-pf operation. Separately driven external fans will air cool the main generators.

Each unit will have twin condensers with a total surface of 50,000 sq ft arranged in two passes using 40,000 gpm (imperial). Duplicate 3-stage steam-jet air ejectors serve each unit.

Feedwater System. The 5-stage feed-heating system will have a drain cooler, low-pressure heater, gland steam condenser and deaerator on the suction side of the boiler feed pumps and three high-pressure heaters on the discharge side. This completely closed circuit will have water flow controlled by a closed feedwater valve, actuated by water level in the condensate receiver below the main condensers.

(*Continued on page 166*)

ELECTRONICS FOR THE POWER ENGINEER

By F A ANNETT, *Associate Editor*

8—Reactors and Transformers

▶ WE CONTINUE our study of inductance by considering some of the devices whose design and operation involve either self-inductance or mutual inductance. *One of these is an inductive reactor, used in several forms in electronic and control circuits.*

Inductive Reactor. An inductive reactor may have one coil, Fig. 1, or two, Fig. 2. When it has two coils they are wound so they magnetize the core in the same direction. In that way each coil assists in magnetizing the core. If the coils were connected in opposition as in Fig. 3, one would neutralize the magnetizing effect of the other and prevent them acting as an inductive reactance in the circuit. Sometimes resistance coils are connected that way to obtain a resistor in which the effects of inductance are negligible. Such a device is a noninductive resistor.

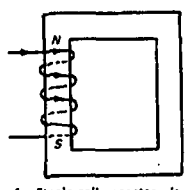
An inductive reactor in an ac circuit has the same effect as a resistor. For example, in Fig. 4, assume that when 2 amp flow in the circuit 35 v are induced in the reactor coil, which we will assume has negligible resistance. If 115 v is *applied* across the circuit only 115 — 35 = 80 v is effective across the 40-ohm resistor.

We get the same results in Fig. 5, where the reactor is replaced by a 17.5-ohms resistor. Total circuit resistance is 40 + 17.5 = 57.5 ohms. Current in amperes equals volts divided by ohms, or 115 ÷ 57.5 = 2 amp. A current of 2 amp through 17.5-ohms resistance causes a voltage drop of 2 × 17.5 = 35 v, the same as with the reactor, Fig. 4. But the reactor has the advantage of being constructed so it is easily adjusted by simple means like a saturating coil in what is called a saturable reactor. Also, the power losses are much smaller in a reactor than in an equivalent resistance.

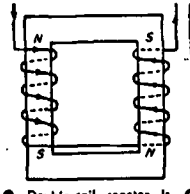
Saturable Reactor. A saturable reactor is a special inductive one through whose ac coil the current is controlled by a small dc current in a saturating coil. Since an inductance stores energy in its magnetic field, when current is increasing, and returns it to the power source when current decreases, its *energy losses are low.* Thus, *with a* saturable-core reactor many kilowatts of power load through its ac coils can be efficiently controlled by a few hundred watts of power in its dc coil.

When we start to magnetize a closed iron core the magnetic flux increases rapidly—in fact, almost directly in proportion to the current in the coil. Beyond a certain magnetizing current value, increase in flux becomes less and less for a given current increase. Event-

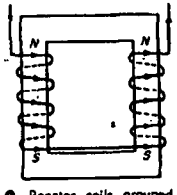
Simple and Saturable Reactors



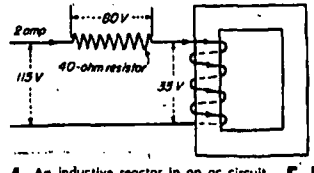
1 Single-coil reactor is fitted with 2-leg core



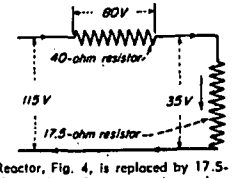
2 Double-coil reactor is fitted with 2-leg core



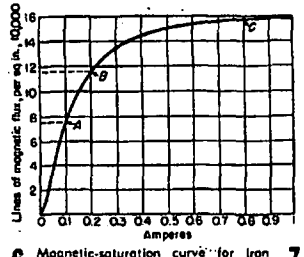
3 Reactor coils grouped for opposed polarities



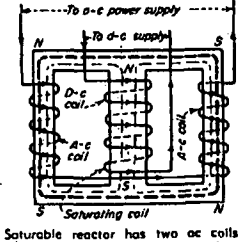
4 An inductive reactor in an ac circuit has the same effect as a resistor



5 Reactor, Fig. 4, is replaced by 17.5-ohm resistor for same voltage drop



6 Magnetic-saturation curve for iron core like that in saturable reactor



7 Saturable reactor has two ac coils and a dc coil on a 3-legged iron core