pressures and temperatures, and turbine size. In the absence of more accurate data assume an increase of 13% for half load and 45% for quarter load.

If full-load steam rate is 23.4 lb per kwhr, 3413 ÷ 23.4 = 145 Btu per kwhr. But 5% is lost in bearing and generator, hence 145 ÷ 0.95 = 153 Btu to be taken out of the steam. Subtracting this from 1319 we have 1166, which is the result obtained from the Mollier diagram.

For half load the computation is as follows:

$23.4 \times 1.13 = 26.4$ lb per kwhr

$\frac{3413}{26.4} \times \frac{1}{0.90} = 143$ Btu used in turbine

$1319 - 143 = 1176$ Btu, enthalpy in exhaust

This point on the diagram shows 18 deg superheat. Since the enthalpy for 34.7 psia, saturated, is 1167, the difference of 9 Btu has gone into superheat, giving 18 deg. If there must be no superheat in the exhaust at half load, install a desuperheater or reduce the throttle superheat by about 18 deg. This gives about 1% moisture in the exhaust at full load, but no superheat at half load.

A line connecting throttle and exhaust points shows the steam condition at any pressure during expansion. To bleed at 50 psi (64.7 psia) we find by the intersection of the pressure line with the condition lines that there is 40 deg. superheat at full load and 56 at half load.

Steam rate of a bleeder, or extraction, turbine is about 3% higher than of one designed for no extraction. For more accurate temperature estimates at extraction points draw a new condition line for the higher steam rate.

We have had to omit a large number of refinements in this explanation. Some are covered in the turbine section of Dec 1945 POWER. Turbine efficiencies vary with size, load, throttle pressure and temperature, and exhaust pressure, all of which must be included in such calculations as multistage feedwater heating. We are interested in safe exhaust temperatures and these approximations give the temperatures within about 10 deg, which is as much accuracy as is needed.

Comments on Reducing Valve

By these methods the designer will select such a steam pressure and temperature that the steam can generate all electrical power the factory needs. At some electrical loads there will not be enough exhaust steam to meet the factory's [illegible] pressure steam [illegible] a reducing [illegible] exhaust. Since [illegible] be installed so that there will always be a deficiency of exhaust. A reducing valve that is always