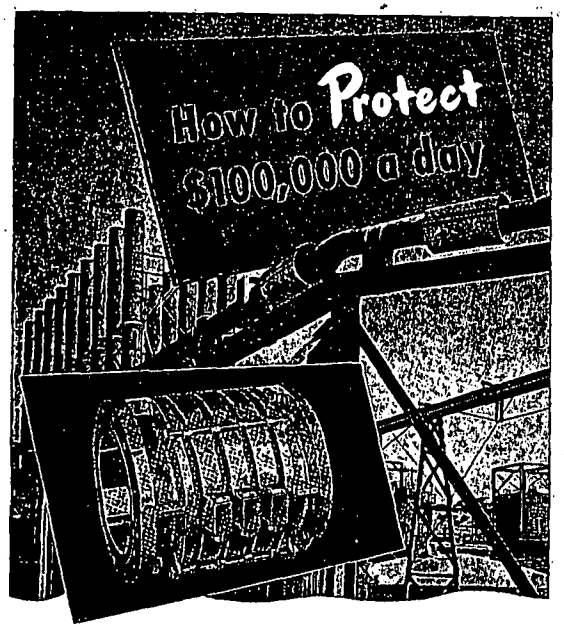


THE ZALLEA Stainless Steel Expansion Joint shown above is one of many installed in the outdoor steam distribution line of a large eastern industrial plant which has a production capacity of over $100,000 per day.

The failure of one of these joints would halt production and result in costly delays. But these Zallea Expansion Joints, installed years ago, are still doing a "bang-up" job today of "protecting" daily production by absorbing movement due to contraction and expansion of the steam line.

Long life, dependability and trouble-free performance are built into Zallea Expansion Joints to make them last, even in the severest service. *There's no packing to deteriorate . . . no maintenance* required. Be *sure* of your expansion joints . . . specify Zallea.

Zallea Corrugated Expansion Joints are made in non-equalizing, self-equalizing and duo-equalizing types, depending upon operating conditions . . . of copper, stainless steels and corrosion-resistant alloys . . . up to 72" diameter for a very wide range of temperatures and pressures. Send NOW for complete information *contained in the new Zallea Catalog 47.* ZALLEA BROTHERS, 814 Locust St., Wilmington 99, Del.



Zallea
EXPANSION JOINTS

WORLD'S LARGEST MANUFACTURERS OF EXPANSION JOINTS EXCLUSIVELY

Electronics

(*Continued from page 100*)

bon gives them thermal qualities approaching those of carbon. Nickel melts at a comparatively low temperature and can be used only in tubes that operate at moderate temperatures.

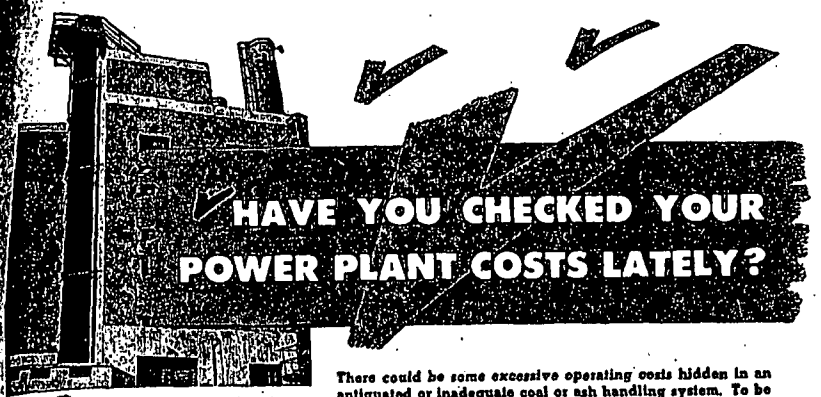
Tantalum has many properties that make it a *desirable metal for anodes.* Like nickel, tantalum anodes are usually made with fins, Fig. 19 and 20, and with a rough surface to increase *their heat-radiating area.*

Grid Material. To control current flow through electron tubes a third element, known as a grid, is added. Some tubes may have two or three grids. Grids are made in different shapes, Fig. 25 to 27, to suit the cathode and anode shape and their arrangement in the tube. In Fig. 25 the grid takes the form of a flat oval formed by winding fine wire on two supporting rods. Fig. 26 shows a cylindrical grid made from fine-wire mesh. The design, Fig. 28, is circular spiral of wire on two vertical supporting rods, and in Fig. 27 and 29 the grid is a carbon disk with holes in it through which the electrons pass.

Most metals and alloys employed for anodes can be used for grids. Material must be suitable for drawing into wire because grids are often formed of spirally wound wire supported on side rods, as in Fig. 25 and 28. Metals used for grids include tungsten, tantalum and molybdenum and alloys of nickel and manganese, also molybdenum and tungsten. Grid materials are sometimes coated with carbon to reduce secondary emission effects (acting like a cathode) and to increase their heat-dissipating qualities.

Envelopes for the cathode, anode, grids and other parts of electron-producing and controlling devices are of many forms and sizes, and made of glass or metal. The smaller sizes are usually some form of a glass or metal envelope, Fig. 5, 28 and 29, whereas the larger sizes, such as are used for mercury-arc rectifiers, are metal tanks, Fig. 30. Fig. 29 shows one form of large electronic tube in a glass envelope. This tube has an indirectly heated cathode, the heater and cathode being marked. The carbon-disk grid with a hole in its center is confined within a metal cylinder in which the anode enters at the top.

Fig. 30 is a cross section of a large single-tank watercooled mercury-arc rectifier. Even though seldom called an electronic tube the mercury-arc rec-



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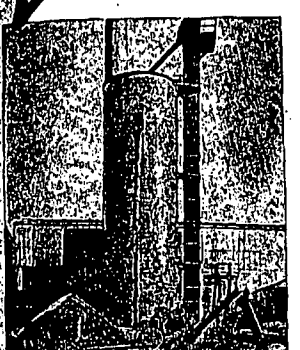

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