Figure 11.—Exterior view of the PHILIPS Type G.125 Gasfilled Rectifying Valve showing moulded Philite Condensers which encircle the discharge unit.

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THE PHILIPS GASFILLED VALVE

Despite the improvement effected by the hollow anode construction of the "METALIX" Valve, the purely electronic valve still possesses the drawback of complete dependence of emission upon correct and unvarying filament heating.

This deficiency is completely overcome with PHILIPS' Gasfilled Valves (see figs. 11 - 13). Unlike ordinary (electronic) types, the passage of current is, in these new Valves, brought about by " collision ionisation " of a low pressure gas filling. The ionised condition results from bombardment of the gas molecules by electrons emitted from a small subsidiary dull emitter filament. Bombardment of the gas and, therefore, the passage of current through the Valve occurs during one half cycle only. During the reverse half cycle, the gas is non-conducting since the electrons adhere to the filament and ionisation of the gas does not occur.

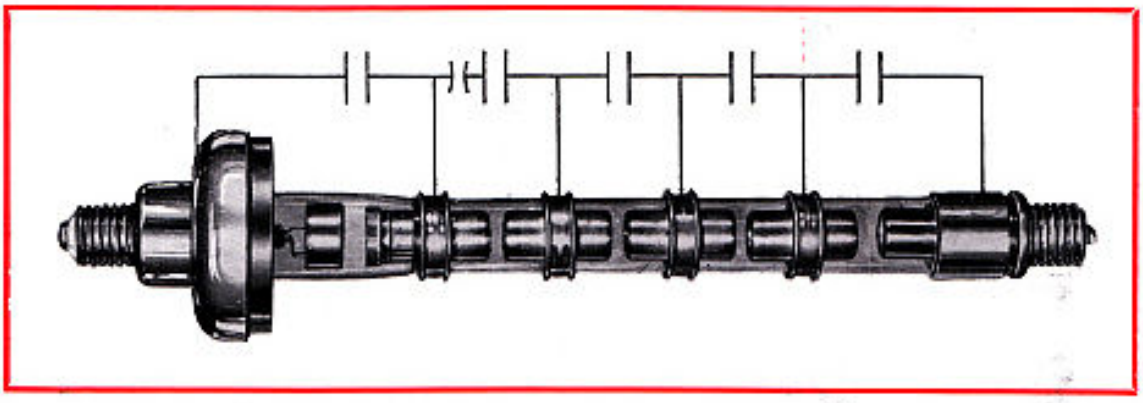

Figure 12.—Interior discharge unit of the PHILIPS G125 Gasfilled Rectifying Valve.

This system has the advantage of making the instantaneous current almost entirely independent of variations in filament heating. Once the gas is sufficiently ionised, any quantity of current will pass. Even when the filament current falls considerably, the current carrying capacity of the Valve is maintained for a sufficient period owing to the construction of the Valve and to high thermal lag in the oxide coated dull emitter filament. The possibility of a sudden increase in the volt drop across the Valve during short heavy current exposures is exceedingly remote.

Hollow intermediate conductors, situated at intervals along the interior of the discharge tube (see fig. 12) are interconnected by condensers which encircle the unit (as shown in figs. 11 and 13) and perform the function of distributing the potential by equal stages along the length of the Valve. The risk of puncture—which in an ordinary Valve is due to excessive tension stress at one point on the glass wall—is thereby reduced to a minimum.

A further advantage of the PHILIPS' Gasfilled Valve is that the volt drop across it remains constant at a figure of the order of 50 volts only, irrespective of the emission

Figure 13.—The Philips type G.160 Gasfilled valve for tensions up to 160 kVp and for therapy.

current. At full emission therefore (the G125 and G160 types are each rated to carry 1,000 mA.) the energy dissipated is in the region of 50 watts—a fraction of that with even a " METALIX " Valve. No provision is necessary, therefore, for cooling the anode.

To summarize, the Gasfilled Valve is the ideal type for any equipment and possesses none of the inherent deficiencies of the electronic type. Although capable of very high emission, the energy dissipated in the Valve is so low that cooling is entirely unnecessary for normal purposes. Its emission is unaffected even by violent mains fluctuations. Filament compensating devices are dispensed with entirely. Tension losses across the Valve are minimized and remain virtually constant at all loadings from Screening to Radiography at maximum emission and for Therapy. The puncture risk is reduced.

The colossal wastage of energy involved in the production of X-rays, is lessened by this important new development. By the simple addition of a Gasfilled Valve, the efficiency of any unit, even if working under the worst conditions, can be materially improved.

Figure 14.—H. T. Transformer-valve unit of the Philips Quatralix Apparatus showing arrangement of the Phillips Gas-filled Valves.

The following pages contain useful diagrams of the circuits more usually employed for X-ray purposes. Theoretical wave forms of tube tension are shown in each case. The additional oscillograms of current wave form with "METALIX" "grid action" therapy tubes will be found of particular interest. The lately developed circuit of the Philips' 400 kV. generator—which has the merit of being easily extended for much higher tensions if desired—is an important example of improved practice made possible by the Philips' Gasfilled Rectifying Valve.