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# THE SCIENTIFIC ACHIEVEMENTS AND THEIR USE IN THE RADIAL METHODS OF WELDING IN USSR (THE SECOND HALF OF THE XX CENTURY)

**Summary**

To exploite, in unusual conditions of high voltage, ultrahigh or on the contrary, cryogenic temperatures, nuclear and space irradiation, electromagnetic fields, it is necessary to find ways of connecting constructions with new metals: zirconium, molybdenum, tantalum, and tungsten. These and similar to them metals and alloys differ not only in high melting temperature but also in high chemical activity at heating. Welding methods in rare gases did not guarantee sufficient quality – oxidization was succesfully avoided, but welding areas overheat remained. Besides, except for the exotic metals, the use of aluminium and titanic alloys considerably increased, exploiting qualities of which went down at heating to welding temperatures. A technological breakthrough could satisfy these requirements of scientific and technical progress in the field of fusion. EPW was that breakthrough.

In USSR in the mid 1950s, E.O. Paton Institute of Welding started a research of cathode-ray processes and the development of equipment for such kinds of cathode-ray technology as welding, melting, and evaporation.

EPW was gradually used at making unique constructions of special purpose; particularly, under the direction of B.E. Patona it was developed and applied in industry tubular constructions from titanic and molybdenum alloys for NPP (O.K. Nazarenko and others), pistons of powerful engines, fuel tanks and the like,

carrierrockets constructions made of ultrastrong aluminium alloys (A.A. Bondarev, O.K. Nazarenko), trimetal ribbons for the kinescopes of coloured television sets, rotor knots of aviation turbo-engines etc. EPW is widely used in radio electronics and engineering (details of television sets, medical equipment, knots of devices), aerospace equipment and shipbuilding (panels, stringer shell constructions and the like), power and metallurgical equipment (rotors, heat-exchange vehicles, turbine shoulder-blades, detail of reducing gears and rental rollers, crystallizer and the like) etc.

The newest improvements have allowed to create a highly productive remotely controlled equipment for welding in any spatial positions. The technological quality of most value is possibility to bring a laser ray closer to a few areas of welding. A lot of countries take efforts to develop laser technological technique, lasers and laser systems like laser – machine-tool, laser – automatic, laser – robot, and laser – processing center.

Computer programs have been designed to calculate geometrical parameters of reflectors for specific technological tasks, which allows us to put into practice the principle of moduleness while developing light-beam equipment.