discharge of energy which produces the large current flow will be accompanied by a release of heat. This energy is not entirely lost in that the consequent heating of the electrolyte solution increases the mobility of the ions which tends to increase the rate of electrolysis.

The configuration of the anode and cathode arrangement of electrolytic cell **41** is of significant importance. The fluted external periphery of the anode causes a concentratiton of current flow which produces a better gas yield over a given electrode area. This particular configuration also causes the surface area of the anode to be extended and permits an arrangement in which the anode and cathode have equal surface areas which is most desirable in order to minimize electrical losses. It is also desirable that the anode and cathode surfaces at which gas is produced be roughened, for example by sand-blasting. This promotes separation of the gas bubbles from the electrode surfaces and avoids the possibility of overvoltages.

The arrangement of the secondary transformer in which the central anode is surrounded by the cathode is also of great importance. The anode, being constructed of a magnetic material, is acted on by the magnetic field of transformer TR2 to become, during the period of energization of that transformer, a strong conductor of magnetic flux. This in turn creates a strong magnetic field in the interelectrode space between the anode and the cathode. It is believed that this magnetic field increases the mobility of the ions in solution thereby improving the efficiency of the cell.

The heat generated by transformer TR2 is conducted via the anode to the electrolyte solution and increases the mobility of the ions within the electrolyte solution as above mentioned. The cooling fins **180** are provided on casing **171** to assist in dissipation of excess generated heat. The location of the transformer within the anode also enables the connections of the secondary coil **89** to the anode and cathode to be made of short, well protected conductors.

As mentioned above the hydrogen and oxygen gas generated in electrolytic cell **41** and collected in ducts **244, 251** is delivered to a gas mixing chamber of the mixing and delivery unit **38.** More specifically, these gases are delivered from ducts **244, 251** via escape valves **283, 284** (FIG. **15**) which are held in position over discharge ports **285, 286** from the ducts by means of a leaf spring **287.** The outer ends of spring **287** engage the valves **283, 284** and the centre part of the spring is bowed inwardly by a clamping stud **288** screwed into a tapped hole in a boss **289** formed in the cell casing **171.**

Valve **283** is detailed in FIGS. **28** and **29** and valve **284** is of identical construction. Valve **283** includes an inner valve body **291** having a cap portion **292** and an annular end ring portion **293** which holds an annular valve seat **294.** A valve disc **295** is biased against the valve seat by a valve spring **296** reacting against the cap portion **292.** An outer valve cover **297** fits around the inner member **291** and is engaged by spring **287** to force the inner member firmly into a socket in the wall of the cell casing so to cover the hydrogen discharge port **285.** The end ring portion **293** of the inner body member beds on a gasket **298** within the socket.

During normal operation of the apparatus valves **283, 284** act as simple one-way valves by movements of their spring loaded valve plates. However, if an excessive gas pressure should arise within the electrolytic cell these valves will be forced back against the action

of holding spring **287** to provide pressure relief. The escaping excess gas then flows to atmosphere via the mixing and delivery unit **38** as described below. The pressure at which valves **283, 284** will lift away to provide pressure relief may be adjusted by appropriate setting of stud **288,** which setting is held by a nut **299.**

The construction of the gas mixing and delivery unit **38** is shown in FIGS. **30** and **40.** It comprises an upper body portion **301** which carries an air filter assembly **302,** an intermediate body portion **303,** which is bolted to the casing of electrolytic cell **41** by six studs **304,** and successive lower body portions **305, 300,** the latter of which is bolted to the inlet manifold of the engine by four studs **306.**

The bolted connection between intermediate body portion **303** and the casing of the electrolytic cell is sealed by a gasket **307.** This connection surrounds valves **283, 284** which deliver hydrogen and oxygen gases directly into a mixing chamber **308** (FIG. **34**) defined by body portion **303.** The gases are allowed to mix together within this chamber and the resulting hydrogen and oxygen mixture passes along small diameter horizontal passageway **309** within body portion **303** which passageway is traversed by a rotary valve member **311.** Valve member **311** is conically tapered and is held within a correspondingly tapered valve housing by a spring **312** (FIG. **38**) reacting against a bush **313** which is screwed into body portion **303** and serves as a mounting for the rotary valve stem **314.** Valve member **311** has a diametral valve port **315** and can be rotated to vary the extent to which this port is aligned with passageway **309** thereby to vary the effective cross-section for flow through that passageway. As will be explained below, the rotational positions of the valve member is controlled in relation to the engine speed.

Passage **309** extends to the lower end of a larger diameter vertical passageway **316** which extends upwardly to a solenoid freed valve **310** incorporated in a valve and jet assembly denoted generally as **317.**

Assembly **317** comprises a main body **321** (FIG. **32**) closed at the top by a cap **322** when the assembly is clamped to body portion **303** by two clamping studs **323** to form a gas chamber **324** from which gas is to be drawn through jet nozzles **318** into two vertical bores or throats **319** (FIG. **31**) in body portion **303.** The underside of body **321** has a tapped opening into which is fitted an externally screw threaded valve seat **325** of valve **310.** A valve member **326** is biased downwardly against seat **325** by a spring **327** which reacts against cap **322.** Spring **327** encircles a cylindrical stem **328** of valve member **326** which stem projects upwardly through an opening in cap **322** so that it may be acted on by solenoid **56** which is mounted immediately above the valve in upper body portion **301.**

Solenoid **56** is comprised of an outer insulating casing **366** which has two mounting flanges **367.** This casing houses the copper windings constituting coil **55.** These are wound on a plastic bobbin **369** disposed about a central mild steel core **371.** The core has a bottom flange **372** and the bobbin and coils are held clamped in the casing through insulating closure **373** acted on by flange **372** on tightening of a clamping nut **374** which is fitted to the other end of the core.

Upper body portion **301** of unit **38** is tubular but at one side it has an internal face shaped to suit the exterior profile of solenoid casing **366** and mounting flanges **367.** Two mounting screws **375** screw into holes