Since the Hydrar reaction is conducted at a temperature at which from about 2 to 6 per cent of methylcyclopentane might be formed if an isomerisation equilibrium with the cyclohexane product could be established, it was necessary to employ a catalyst that did not induce isomerisation. In addition, to assure virtually quantitative yields of cyclohexane, it was necessary to suppress all cracking to open-chain compounds.

It will be noted from equations (2) and (4) that the acid function of duofunctional catalysts plays a key role in both the isomerisation and cracking of naphthenes. The Hydrar catalyst which was developed for benzene hydrogenation is, therefore, one in which the platinum is disposed on a specially prepared support in which the acidity has been virtually completely suppressed. As a result, benzene is hydrogenated cleanly to cyclohexane of over 99.7 per cent purity in the Hydrar process. If a pure benzene is used as the feedstock, essentially quantitative yields of cyclohexane are produced during several years of continuous operation without contamination or deactivation of the catalyst.

Summary

The Platforming catalyst for reforming naphthas, the Penex catalyst for hydroisomerisation of pentanes and hexanes, the Butamer catalyst for hydroisomerisation of butane, and the Hydrar catalyst for conversion of benzene to cyclohexane, provide examples of four supported platinum catalysts of widely differing properties obtained by regulating the acidity of the catalyst composite. Through proper balance of the platinum hydrogenation-dehydrogenation function with the acid function, in co-action with the support, such duofunctional catalysts can provide a high degree of selectivity for hydrocarbon conversion processes operating under widely different conditions.

Oxygen Injection Engine for Space Research

PLATINUM ALLOY VALVE SEATS AND FACES

Formidable design problems are encountered in the development of a reciprocating power unit for use in space research programmes. One of the most severe of such problems met with by the Vickers Inc. Division of Sperry Rand Corporation in developing a lightweight hydrogen-oxygen internal combustion engine (shown on the right) concerned the selection of materials for the oxygen injector valve. As this valve, operating at very high speed, handles gaseous oxygen at high temperatures, it must be made of a material that will resist oxidation and also maintain adequate strength and impact characteristics.

Tests were carried out on austenitic stainless steel, a nickel-chomium-molybdenum alloy and 10 per cent rhodium-platinum alloy for the poppet valve face, and on stainless steel, 10 per cent rhodium-platinum and the latter alloy flame-plated with alumina for the valve seat. The best combination was found to be a rhodium-platinum poppet face against a flame-plated rhodium-platinum seat. This combination has endured several hours of operation without leakage or deterioration of the plating surfaces and with good ability to compensate for minor misalignment.