

β -amyryn group, for which a new formulation was proposed. A feature of this work, made possible by collaboration with P. Bilham, was the use of the surface film method for ascertaining the position of the functional groups in these large molecules.

William Hedley : Locomotive Pioneer

ON January 9, 1843, William Hedley, one of the pioneers of the locomotive and iron railway, died at Burnhopeside Hall, near Lanchester, Co. Durham, and was afterwards buried at his birthplace, Newburn on the Tyne. He was then sixty-three years of age, having been born on July 13, 1779. He seems to have had a good education and in his 'twenties became a viewer at the colliery in the village of Wylam, eight miles west of Newcastle-upon-Tyne, where George Stephenson was born in 1781. The colliery was the property of Christopher Blackett, a man with progressive ideas, who in 1804-5 had had a locomotive built at Gateshead to Trevithick's plans. This engine, it appears, was never put into service. In 1811, with Blackett's approval, Hedley made both model and full-size experiments to show that a locomotive with smooth wheels could operate successfully on smooth rails. These experiments led to the construction of some of the earliest locomotives, which were used for the transport of coal from Wylam Colliery to the staithes at Lemington, five miles lower down the river. One of these engines, supposed to have been built in 1813, is the historic *Puffing Billy*, now in the Science Museum, South Kensington. Hedley was as much concerned with the winning of coal as its transport, and during the last twenty years of his life worked or owned various mines in Durham and Northumberland. His own share in the development of the locomotive was clearly stated by him in a letter of December 10, 1836, to Dr. Lardner, who in a lecture at the Literary and Philosophical Society, Newcastle, had spoken of George Stephenson as the "Father of the Locomotive".

Chemical Industry in Europe

IN a recent issue of the *Chemiker Zeitung* an attempt is made to show that chemical industry in Europe is gradually increasing its productive capacity; to such an extent indeed that, after the War, Europe will be entirely independent of Anglo-Saxon domination. Presumably under the beneficent leadership of Germany, together with the organizing and technical skill that this is supposed to include, Europe would no longer need foodstuffs and raw materials from the British Empire: these would be replaced by synthetics, and the reign of *Ersatz* would be almost universal. A survey is made of the chemical industries of the chief European countries, from which Germany, and, of course, the U.S.S.R., are excluded, as also is Turkey. Many of the data, however, are pre-war, or hopeful forecasts of the future. This is more particularly the case with Italy, where some index figures are quoted for the period 1935-39 to show the rapid rise in her chemical output. In France also, practically all that could be said is that a large company has been formed for the production of synthetic fuel from lignite. It is said to be financed by the Banque de Paris, doubtless backed by German financiers or industrialists; but it will be three years before the requisite plant, using the Fischer-Tropsch process, can be installed.

If the intention was to show that European chemical industry, apart from spasmodic attempts

to increase output of war munitions, is laying firm foundations for post-war expansion or even taking any appreciable steps in that direction, then the record, on the German writer's own showing, indicates complete failure. As a piece of propaganda it could scarcely deceive even the Germans themselves. Much more space, indeed, is devoted to countries not yet overrun by the Nazis, such as Spain and Sweden, and it is clearly and indubitably shown that only in those countries has any real progress been made in the chemical and allied industries. This is confirmed by non-German and more reliable sources. As a matter of fact, in the German record, many important items are omitted, as if the writer had suddenly realized that he had already said too much and exhibited too painfully the great contrast between German-occupied and unoccupied Europe. Spain's progress in the matter of nitrogenous and other fertilizers is described at some length, and reference made to new factories for the manufacture of tanning materials, sulphur and copper from pyrites, leather, textiles and artificial fibres. Many of Sweden's recent developments in chemical industry are also noted. Compared with these, the few details given about the occupied countries are insignificant trifles, and relate mainly to more or less temporary expedients to replace with indigenous products those which can no longer be obtained from Germany.

The U.S.S.R. in War-time

THE broadsheet "Soviet Planning in War-Time" issued by P.E.P. (Political and Economic Planning) gives a useful objective account of the ways in which the Russian economy has advanced from one mobilized for war in 1941 to a battle economy, and of the general background of this economy. The machinery of Soviet planning functions through three main stages: first, a comprehensive survey of existing resources; secondly, the formulation of a plan, which is simply the laying down of a series of output programmes which must be carefully dovetailed into each other so that they are consistent; and, thirdly, a mechanism for checking their progress and for providing the elasticity necessary for periodic adjustments. This machinery was evolved over a considerable period of time, and the broadsheet gives a brief account of the purposes and achievements of the three Five-Year Plans. It was only during the Second Five-Year Plan that the consumption of foodstuffs and living standards generally rose to any appreciable extent, but an important aspect of that period was the development, partly for strategic reasons, of industrial and raw material resources east of the Urals. Both the First and the Second Five-Year Plans between them largely achieved their objectives of the creation of modern large-scale industry and a mechanized agriculture as the basis for raising living standards to a higher level and for national self-sufficiency in war-time.

The Third Five-Year Plan provided for further increases in the output of industry and agriculture, but its most striking feature was the huge increase in the resources devoted to defence. Moreover, the whole organization of Russian economic life, with its machinery for central planning and its high degree of military preparedness, makes for a greater degree of continuity between peace and war economies than in any other country except Germany. Owing to the absence of excess capacity, the war sector from the outset had to be expanded at the expense of the