COALBURSTING

As the coal mines of Great Britain were mechanized, the standard practice became to undercut the coal seam by means of a coalcutting machine and then to bring down the coal by drilling holes in the seam above the cut, inserting charges of 'permitted explosives' and then detonating these. This method of winning coal, however, suffers from grave disadvantages. Every shot that is fired is a potential danger, especially when detonation results in what is technically known as a blown-out shot. Even if no explosion results, the cloud of coal dust produced tends to make the mine atmosphere unpleasant and dangerous. Furthermore, when shots are being fired, the workmen must be withdrawn from the coal face to a place of safety, thus interrupting work. Finally, the shock of the explosion may damage the roof so that the men on returning to the face are confronted with a changed set of conditions which may be very dangerous, especially when the roof is friable. When it is realized that in a single colliery 100,000 shots may be fired per annum, the magnitude of the potential danger is obvious.

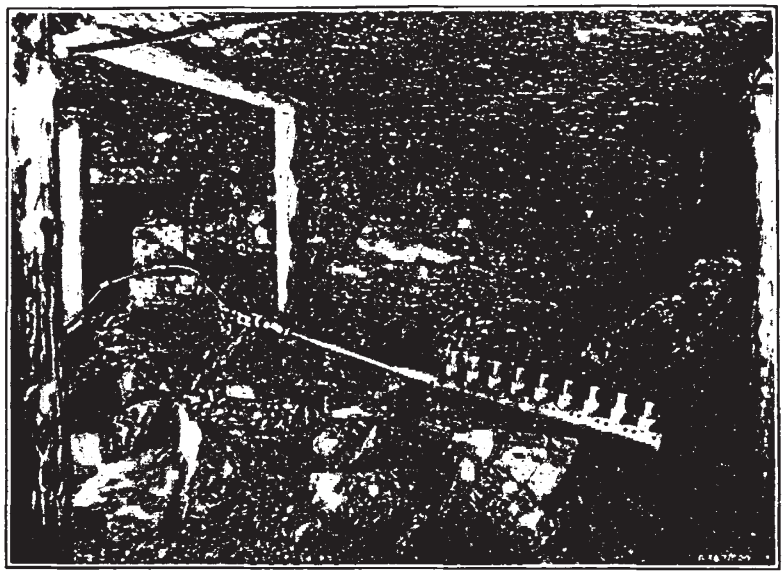

Fig. 2.

Dislodgment of coal completed: note the pistons of the coal-burster fully extended and the chunky nature of the coal brought down.

Any method which obviates the necessity for firing shots is of interest to the mining community, and furnishes an opportunity for pure science to be of assistance to industry. A great variety of chemical and physical methods of bringing down coal have been tried during the last fifty years, one of these being the Tonge hydraulic wedge. The modern 'coal-burster' is a development of Tonge's hydraulic wedge which has been made possible by the developments in metallurgical science and engineering practice in relation to the transmission of hydraulic power at high pressure. It entirely eliminates shot-firing and has been used over a sufficiently long period of time for its usefulness and efficiency to be assessed; several hundred coal-bursters are now in use in the British coalfields.

Fig. 1.

Building up pressure in the coal-burster.

In coalbursting, the seam is undercut as before with a mechanical cutter and holes are bored in the coal above the cut by electric drills or compressed air drills of the turbine type. Now, however, the coalburster is placed in the hole instead of a charge of explosive. Briefly, the coalburster consists of a round stainless steel barrel (about 3 ft. in length and 3 in. in diameter being a common size) chambered on one or both sides to accommodate a number of pistons, or plungers, each about 2 in. long, which can be forced out radially from the barrel by hydraulic pressure. This hydraulic pressure is developed by a small hand-pump, connected to the burster by a length of armoured hose, a pressure of some

15,000 lb. to the square inch being developed and communicated to the pistons. Since the hole in the coal has been drilled as a snug fit for the bar and steel liner which goes beneath it, the forcing out of the pistons involves the disrupting and breaking down of the coal. After the burster has been placed in the hole, the miner retires to the pump some 10–20 ft. away and operates the hand pump to generate the pressure required to burst down the coal. As a rule, the coal comes down within two or three minutes of commencing to operate the pump, and several tons of coal are brought down at each operation.

One advantage of this technique is obvious—there is no possible risk of an explosion. Moreover, very little coal dust is produced, so that conditions predisposing towards an explosion are absent, and, of course, the mine atmosphere is much pleasanter and healthier for the workmen. Again, round coal of maximum market value is produced and it is not shattered or rendered 'tender' by an explosion; therefore it does not suffer from disintegration in transport. Finally, but not least important, the roof is in general not disturbed. Should any change in conditions take place, however, the fact that the men are present all the time, and not withdrawn as in shot-firing, means that there is a very much better chance of detecting changes in roof conditions.

It is found in practice that the coalburster has very few limitations, that it will operate successfully on all types of coal, hard or soft, in stalls as in wide-work, and will function well under a variety of conditions. One colliery in Great Britain has for some years now been getting its whole output (8,000 tons per week) by means of coalbursters, shot-firing being completely eliminated. The device must be looked upon as a notable contribution to the safer working of coal mines and to the production of coal of higher market value than has been possible by the use of explosives.

A. Harvey.

SCIENTIFIC AND INDUSTRIAL RESEARCH IN NEW ZEALAND*

THE thirteenth annual report of the Department of Scientific and Industrial Research, New Zealand, which covers the year 1938–39, refers to the initiation of a number of new research activities. One of the most important of these is the formation of a Timber Protection Research Committee of the Council to direct and co-ordinate research on the preservation of timber from the attacks of wood-boring insects and fungi. The depreciation of building securities from the attacks of these pests presents a serious problem in New Zealand, and the research programme planned by the committee contemplates work by the Entomological Division and Plant Diseases Division of the Plant Research Bureau, including biological studies of wood-infesting insects, penetration tests for wood preservatives, and toxicity tests with insects and fungi, as well as further work in the Dominion Laboratory on the analysis of wood preservatives and the chemical aspects of penetration tests.

The serious effects of uncontrolled soil erosion have led to the establishment of an expert technical committee on soil erosion and land deterioration, to report on the measures necessary to maintain vegetative cover in New Zealand and prevent irreparable damage. The report of this committee is in process of publication and indicates that in few cases is the damage beyond repair, although in many areas soil erosion has reached a serious state, and a programme to handle the problems that are now apparent is outlined.

In addition to its intensive studies on cheese starters, the Dairy Research Institute has carried out a number of investigations on butter-making, including the oxidation of the fat of butter in cold storage, starters for butter, and the factors affecting hardness of butter. Other work has been concerned with the chemistry of incipient oxidation defects in butter, and the control of mould in dairy products, including the resistance to mould attack offered by different pigments, and the effect of various paint vehicles and driers. The Plant Diseases Division of the Plant Research Bureau has continued its investigations on the control of dry rot in swedes and turnips, the control of club-root, and the use of arsenate, derris and nicotine sprays and dusts for the control of diamond-back moth. Other work of this Division has been concerned with timber preservation and the testing of seed disinfectants; a fourth list of certified sprays has been issued. The Entomological Division has continued its work on the introduction of parasites for the control of the diamond-back moth, on the sheep maggot fly problem, and on timber borers. Animal research at Massey College has been concerned with the application of accurate scientific methods for measuring wool characteristics to the grading of individual stud sheep, and arrangements are being made with the Wool Manufacturers Research Association at Dunedin for the commercial processing of wool with known and accurately measured characteristics.

Fruit research has covered fertilizer, rootstock and pruning experiments on apples, and studies for the chemical control of bronze-beetle and red-mite, physiological studies of internal cork of apples, spraying experiments and the testing of certified sprays. The Fruit Cold Storage Committee has investigated the use of copper-treated wraps for the control of the spread of grey mould in winter cole pears, as well as the effect of fertilizer treatment on the keeping quality of Cox's Orange Pippins and other varieties of apples. Storage trials have been continued with Ballerat and Washington apples. Experimental work on boron in relation to physiological diseases has been directed towards the persistence of boron dressings in soil.

The Tobacco Research Advisory Committee has been concerned with seed-bed experiments, seed germination studies and investigations on mosaic disease. The plant selection work has yielded a natural Italian perennial rye grass cross ecotype,

* Thirteenth Annual Report of the Department of Scientific and Industrial Research. Pp. 134. (Wellington, N.Z.: Government Printer, 1939.) 2s. 9d.