SOLDIER MAGAZINE

WALTON J ENDE WALTHAM ABBEY MONKS, MILLS & MISSILES. SOLDIER MAGAZINE – FEBRUARY 1977 – VOLUME 33. NO. 2 ILLUSTRATED ARTICLE RE HISTORY & CURRENT ACTIVITIES OF ENDE 3 COPIES OF MAGAZINE. SET OF 42 B/W PHOTOS FROM WHICH THE ILLUSTRATIONS WERE TAKEN & PHOTOS USED. + IMAGES OF MAGAZINE COVER AND PAGES 26, 27 & 28.

February 1977 15p

Soldier

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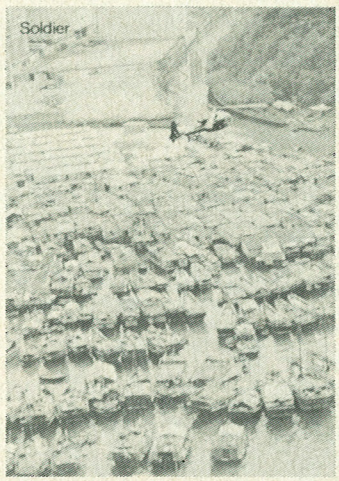
FEBRUARY 1977 Volume 33, No. 2

Contents

FRONT COVER

A Nepalese greeting 'Namaste' between Captain Carole Murray, a Queen Alexandra's Royal Army Nursing Corps sister, and a 17-year-old TB patient in the British Military Hospital at Dharan. 'Namaste' has a literal translation of "I salute all divine qualities in you."
Picture by Doug Pratt.



BACK COVER

Thousands of floating homes and above them one of the Army's latest Gazelle helicopters. The picture was taken at Aberdeen in Hong Kong and the Gazelle belongs to 656 Squadron, Army Air Corps, stationed in the colony.
Picture by Sergeant Brian Lawrence, Joint Services Public Relations Staff.

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ERDE Waltham Abbey

MONKS, MILLS AND MISSILES

Story: John Walton (no relation)
Pictures: Paul Haley

WALTHAM ABBEY is an innocent-looking, pretty little town on the Essex/Hertfordshire border. Yet for hundreds of years it has been a centre for developing explosive materials used in countless wars of death and destruction. Indeed it may well have been those very monks who peopled the Abbey in medieval times who started the whole thing off — legend has it that gunpowder used at the Battle of Crécy in 1346 was made by the holy men.

Records of this time are far from adequate so legend, and stories of the monks supplying gunpowder to the Armada and to Guy Fawkes and his gang, have all to be taken with a grain of saltpetre.

First concrete evidence of a link between the Abbey and gunpowder is dated 1561. By 1735, John Walton's Powder Mills were established in the old Abbey grounds. They were described as being "esteemed the largest and compleatest works in Great Britain."

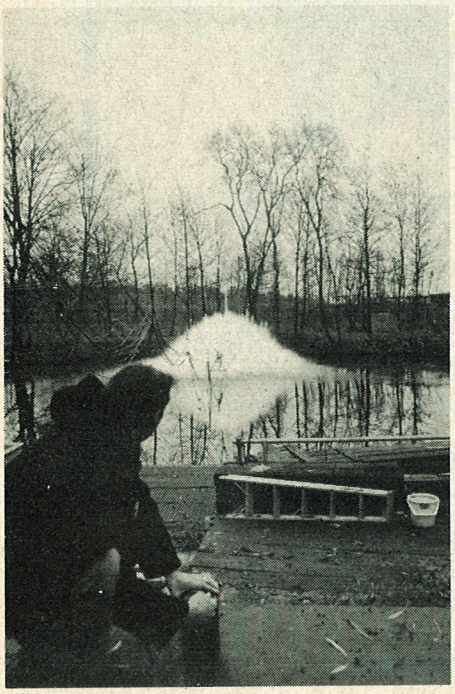
In 1787 the mills were sold by another John Walton to the Government for £10,000. They became the Royal Powder Mills and were under the control of Major William Congreve (father of William Congreve of rocket fame), then Deputy Comptroller of the Royal Laboratory at Woolwich.

From that time on, gunpowder production continued at Waltham Abbey. In World War One some 5000 people, mostly women on war work, were employed at the mills. During the early part of World War Two the Waltham plant was Britain's only source of production of RDX, "the high explosive of World War Two."

In the winter of 1940-41 an enemy land mine put out of action the last of the powder mills and the centuries-old production of gunpowder ended. After the war a new use — which continued the link and yet took it forward into an age of missiles — was found for the site. It became the home of the Explosives Research and Development Establishment which exists to carry out chemical research into rocket propellants and explosives. Most British Service innovations in this field since Warld War Two owe their origin to the ERDE's work at Waltham Abbey.

Relics of bygone days have been collected in a small museum by Mr Malcolm McLaren, Head of Library Services. Others, such as powder boats and an old water wheel, are

Below: SOLDIER's camera captures an underwater explosion during its succeeding stages.



dotted around the two sites, each of 250 acres. But the scientists who work at Waltham Abbey tend to look to the future rather than the past.

The establishment is divided into branches, each concerned with a different aspect of the propellants and explosives which go into today's shell, bullet or rocket.

Propellants 1 Branch deals with the development of propellants from nitro-cellulose or nitro-glycerine. Mr Ronald Ayerst agrees there are serious hazards involved when carrying out research work with this type of material.

"But nitro-glycerine is a tiger which can be controlled. There is no more risk in handling it once it is tamed than there is in handling ammunition. Nevertheless it is worth while spending money on safety and the buildings have mounds around them. We always keep the material in such a position that if it blows out it will miss other buildings. Every operation is written down and pasted up on the wall as a law and it is one of the jobs of the supervisors to make sure those laws are not broken."

One of the most important factors in these propellants is that they give off very little 'signature' — a smoke-free weapon is far less likely to be speedily put out of action. Swingfire, Vigilant and the Giant Viper, which propels charges across minefields, are among the current weapons which became available from research and development work done at Waltham Abbey.

One of the most important things is to ensure that the weapon is safe to the handler. This is why progress is slow and painstaking, with experiments having to be repeated time and time again. Says Mr Ayerst: "It is impossible to get anything off the ground in less than five years."

All propellants deteriorate. Some soften and run out of their motors, others harden and burst when fired. All these potential dangers have to be explored by storage and other trials to make sure they do not occur when the propellant is in service.

Propellants 2 Branch deals with composite propellants of two main types — plastic, development of which is confined almost entirely to this country, and rubbery. They are used in guided missiles, British space research rockets and Service motors. Plastic propellant looks like Plasticine and has the same malleable qualities whereas rubbery propellant retains its shape.

Above: Women on war work. This picture is of guncotton moulding at Waltham Abbey in 1917.

Recently the ERDE has developed plastic propellants which can be used at very low temperatures. Some indication of the size of the plastic propellants industry can be gauged by the fact that the main production authority, the Royal Ordnance Factory, Bridgwater, has filled more than 40,000 rocket motors in the last 20 years or so.

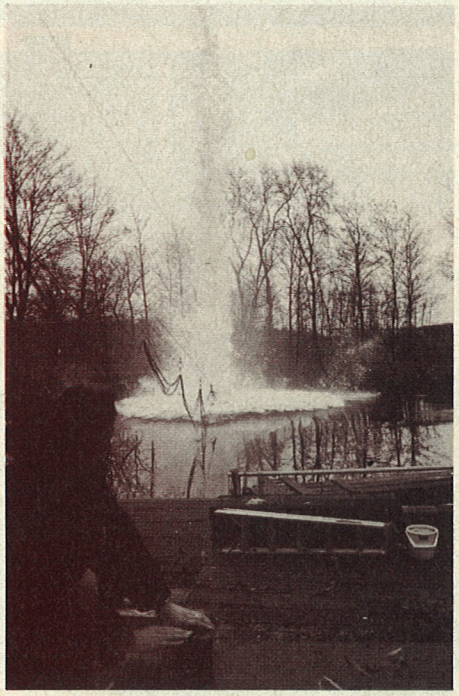
The Process Research Branch develops processes for manufacturing specialised materials for the Ministry of Defence. It takes them up to pre-production quantity and, if only a small amount is required, it may do the entire manufacturing job.

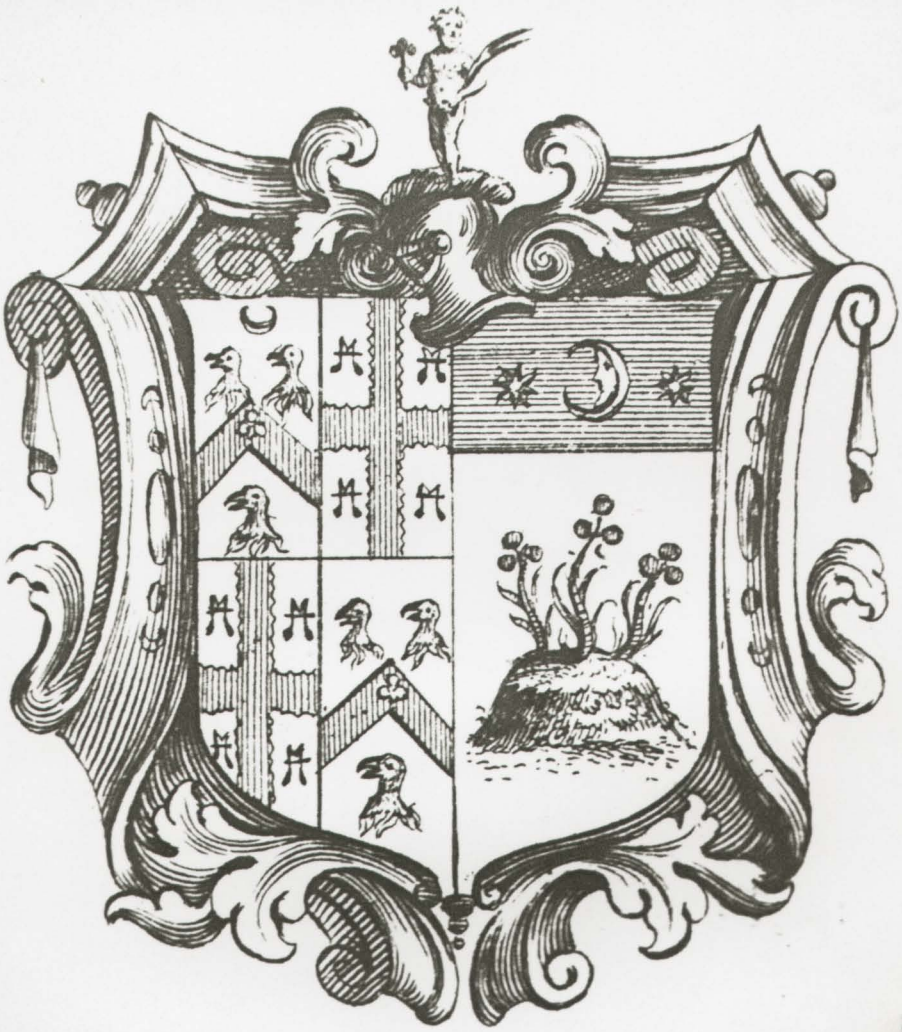
Work on polymers has grown considerably in recent years — particularly as private enterprise is often no longer willing to meet specific Ministry requirements. Among the items being produced by Waltham Abbey at present are binders for defence purposes.

Fibre processing has involved grading asbestos fibre and more recently work on selecting fibres from waste paper pulp for high-grade use. This has been so successful that the National Research Development Corporation has financed further work and it is hoped eventually to design a plant to sell commercially.

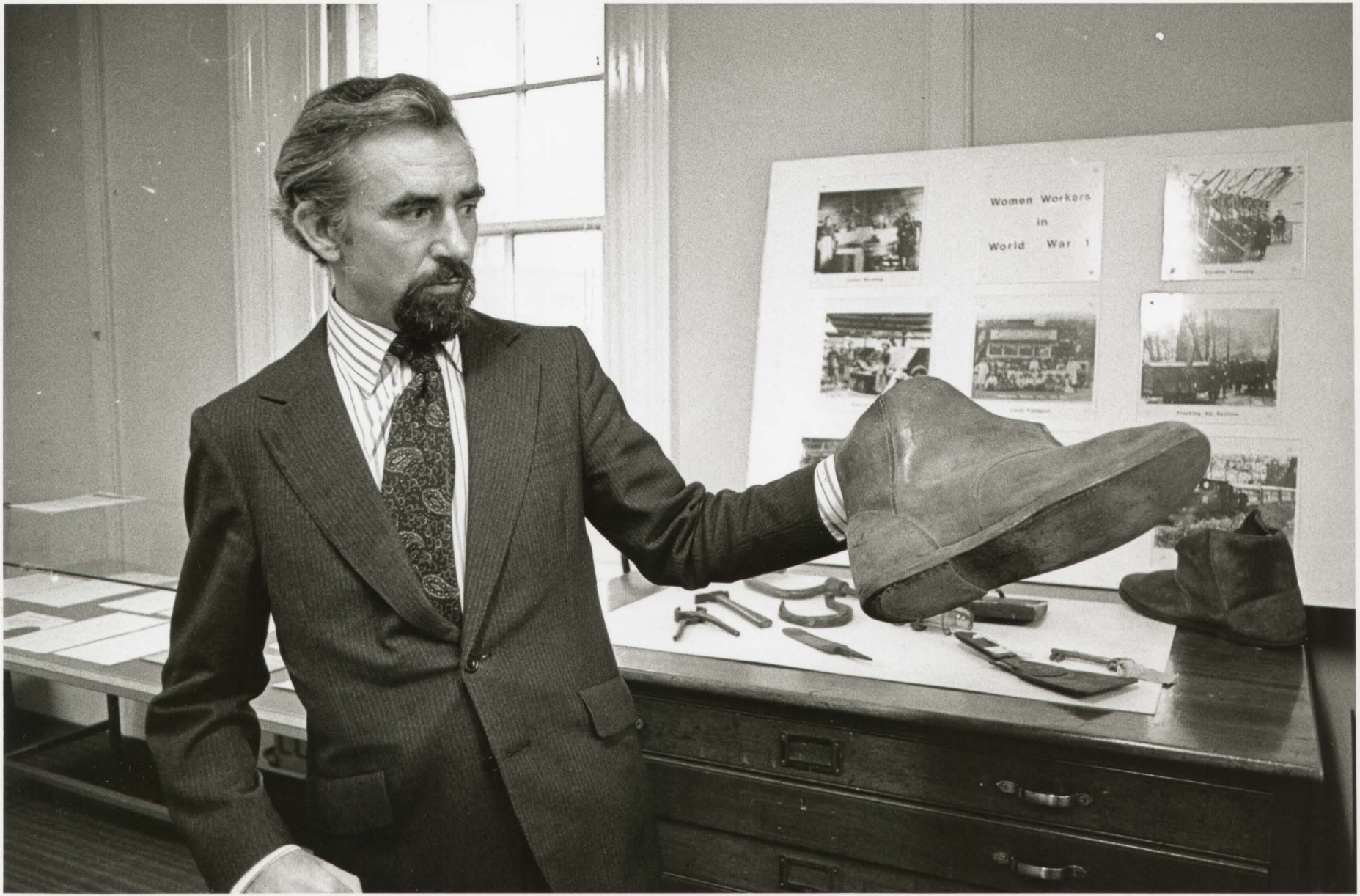
In the General Chemistry Branch, scientists spend much time in studying the decomposition reactions and stability of various explosives and propellants. Explains Mr N J Blay: "When the most common explosive was gunpowder, the most important thing was keeping water out. Nitro-glycerine etc decompose spontaneously and after a few years become hazardous and there is likely to be spontaneous combustion. Propellants containing the same ingredients can now be relied upon to remain safe for many years providing they are properly made in the first place and looked after reasonably well."

Some explosives tend to become inert rather than dangerous through the passage of time and again the object is to extend the product's Service life. For nothing to happen when a soldier pulls a trigger in action can be almost as dangerous as his weapon exploding.





Arms of John Walton
1735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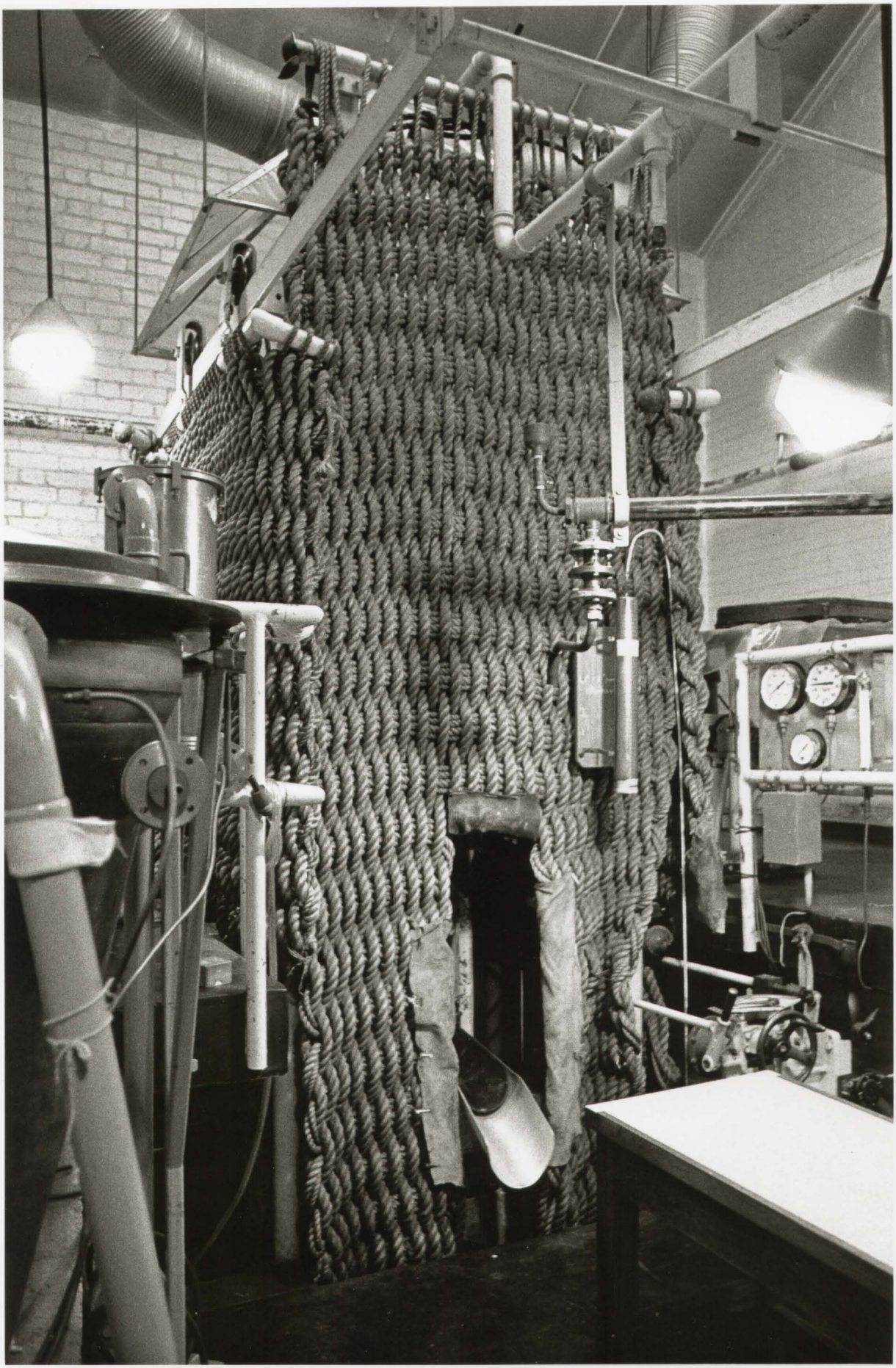

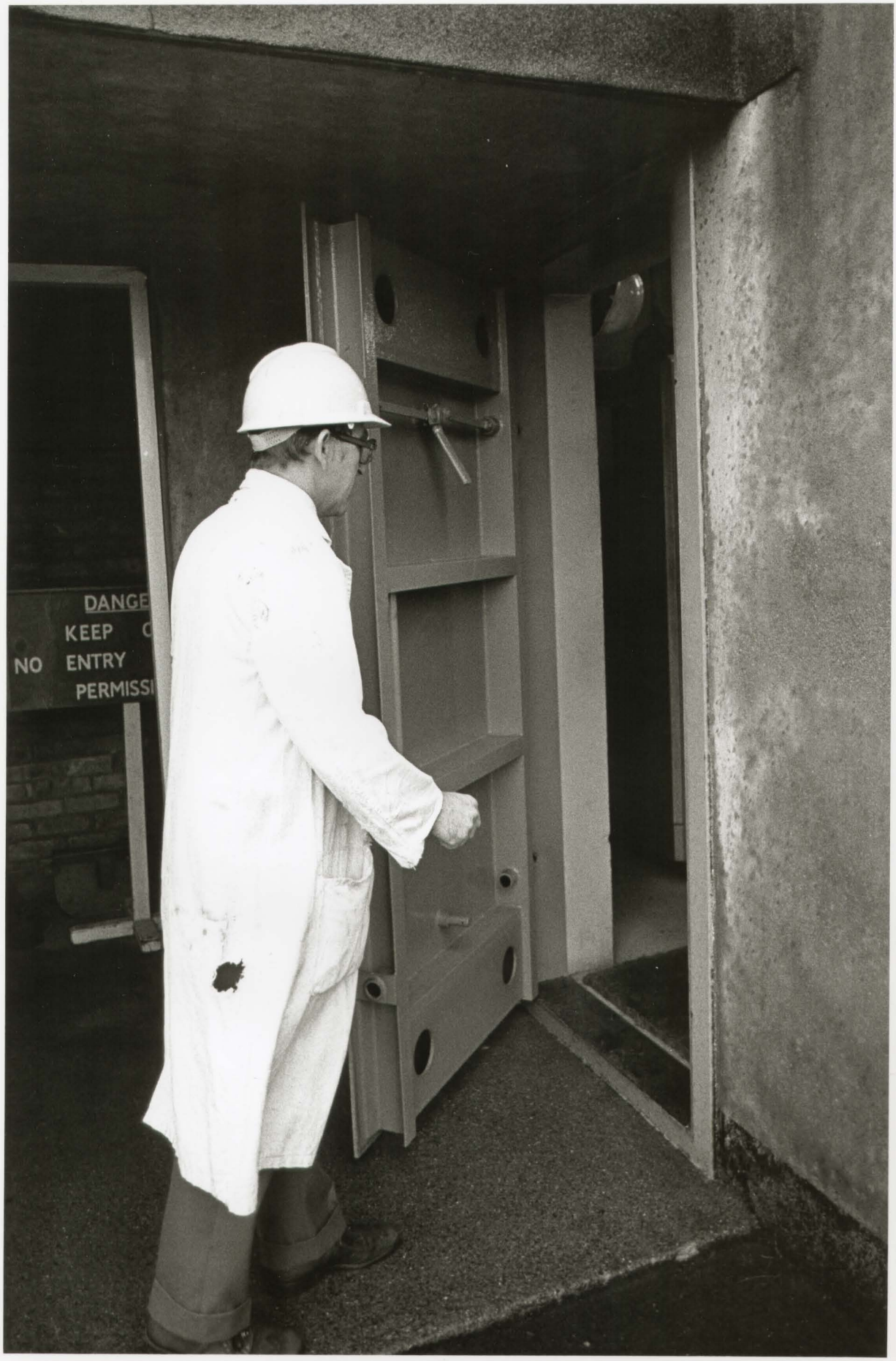
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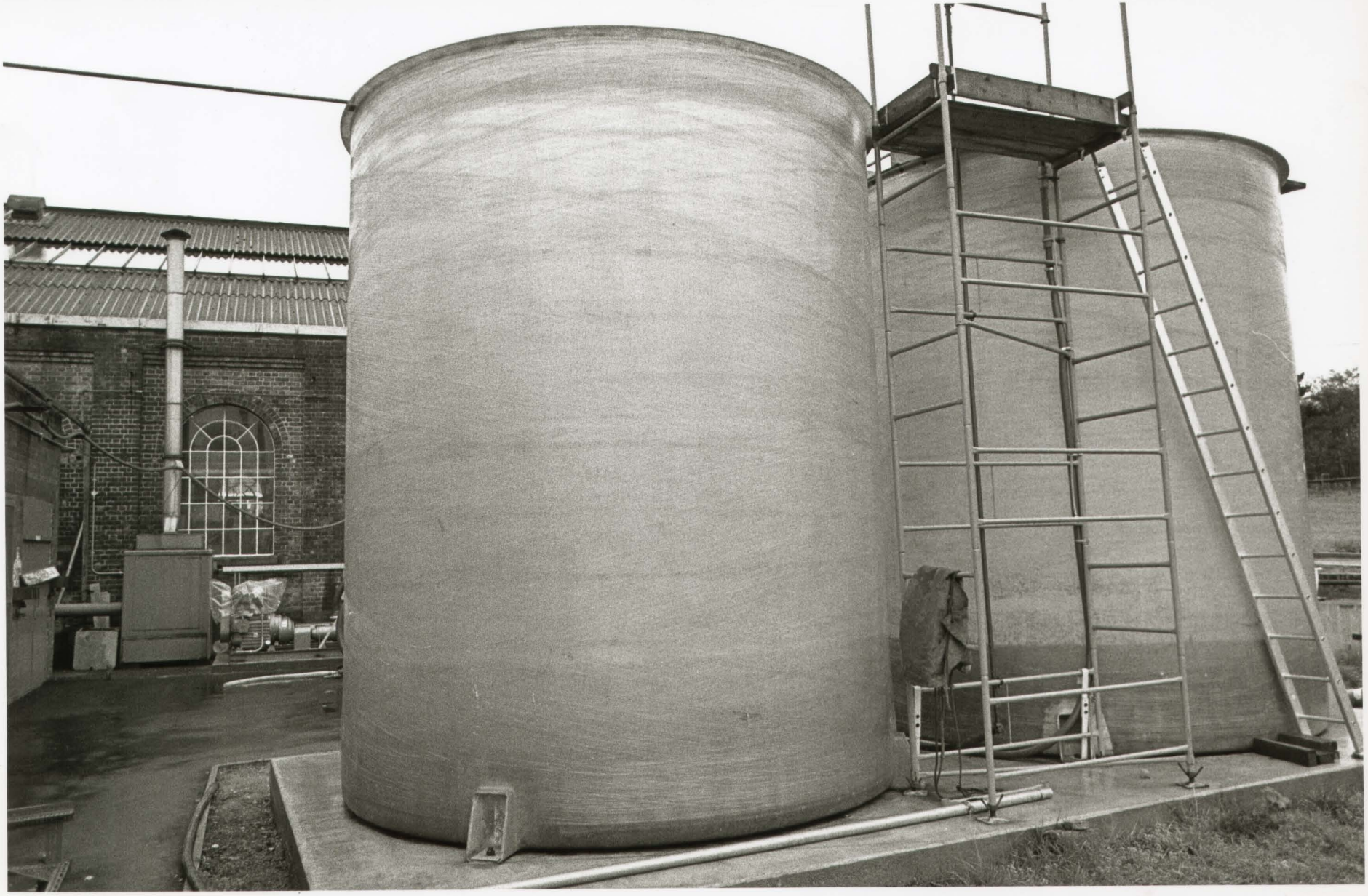

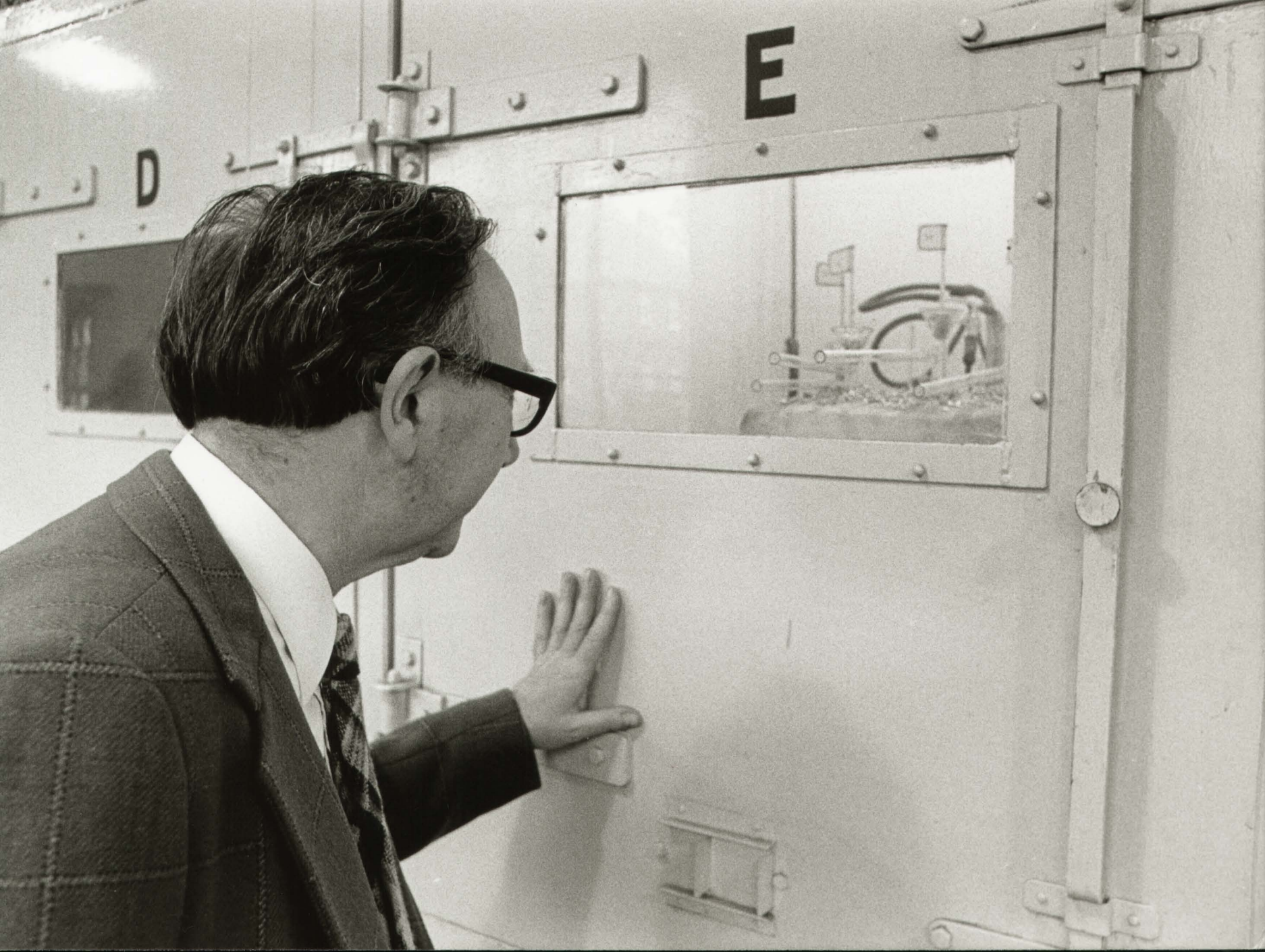
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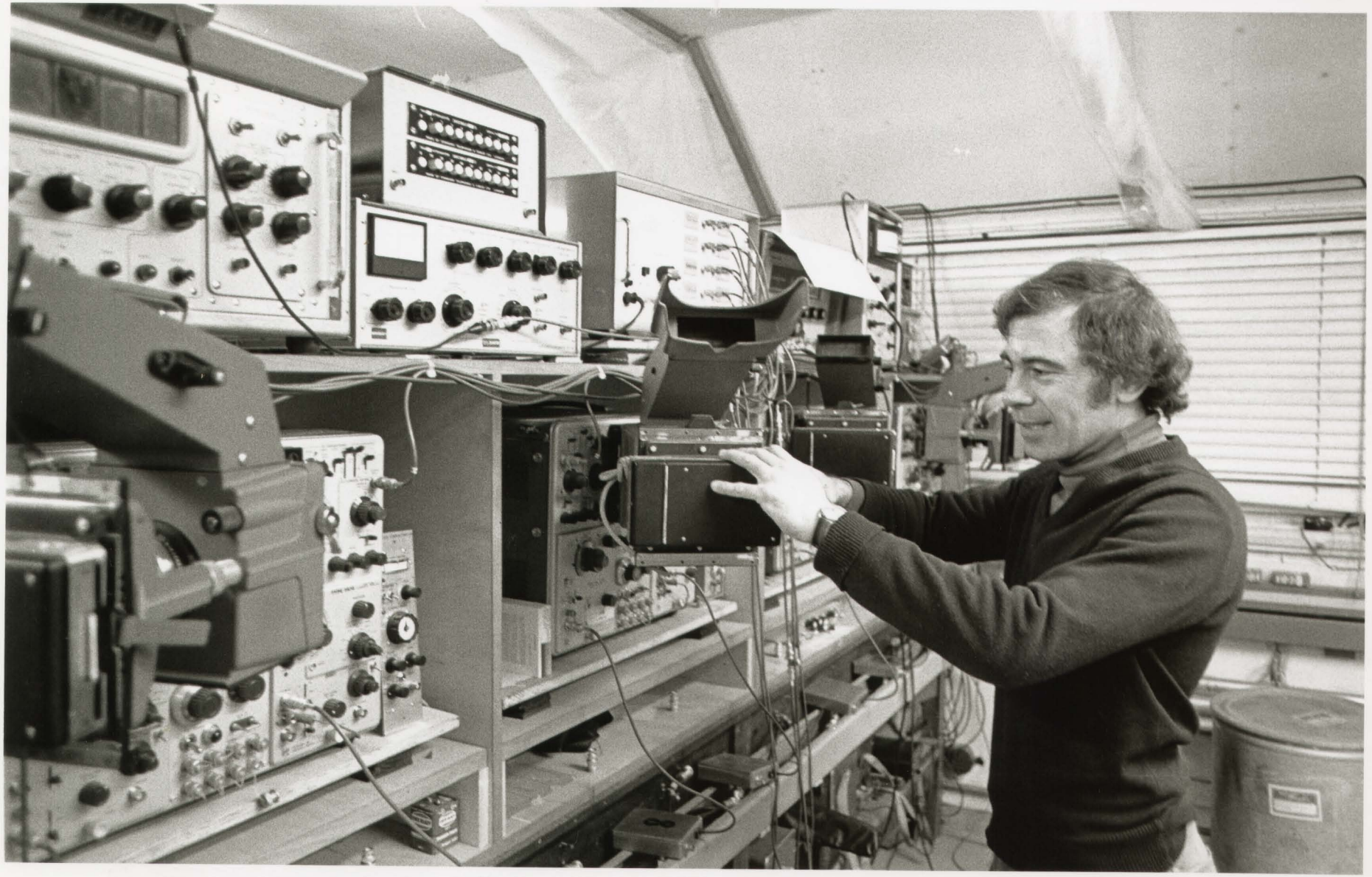
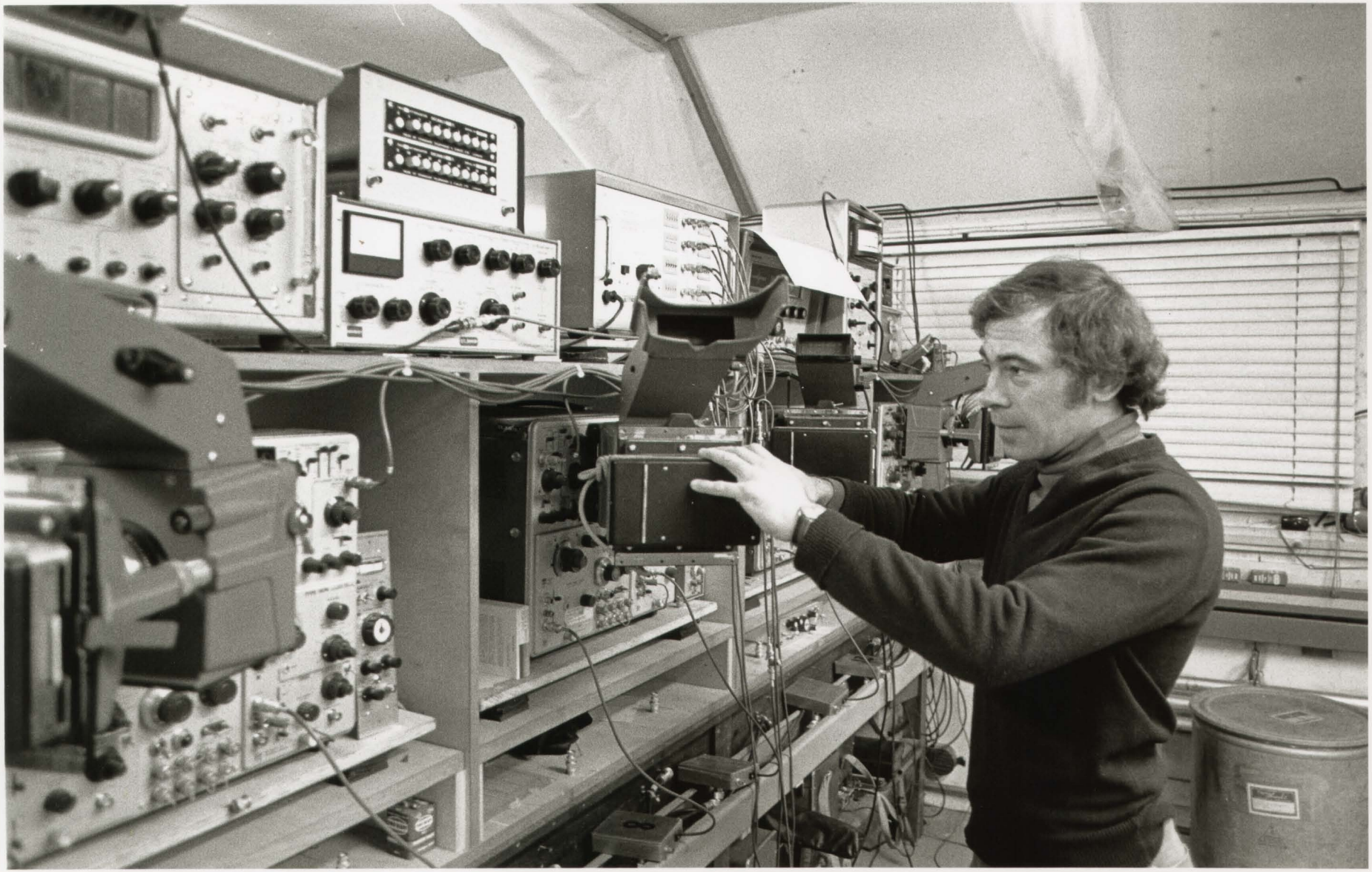
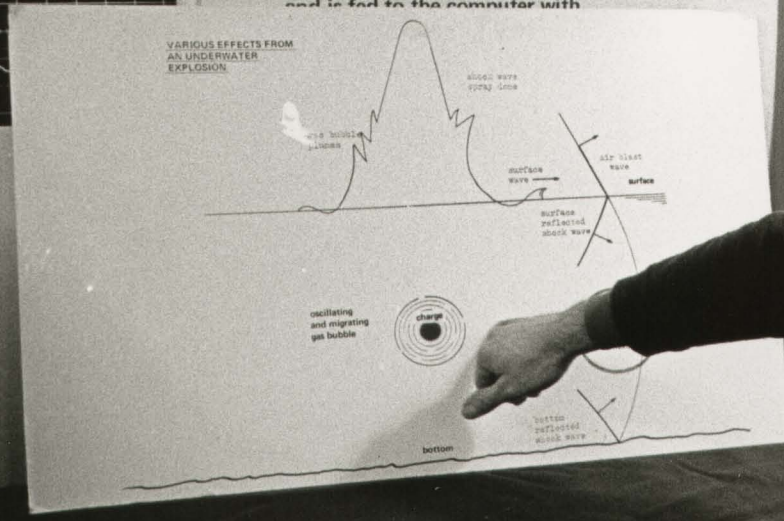




has been written to provide this. Because the computer requires a numerical input the trace reading machine is necessary to convert the graphical shock wave to numerical form.

The trace reader describes a point by defining its X and Y co-ordinates within a certain grid reference. A closely spaced series of points on the shock profile provides an adequate numerical description of its shape. This string of points is punched directly on paper tape



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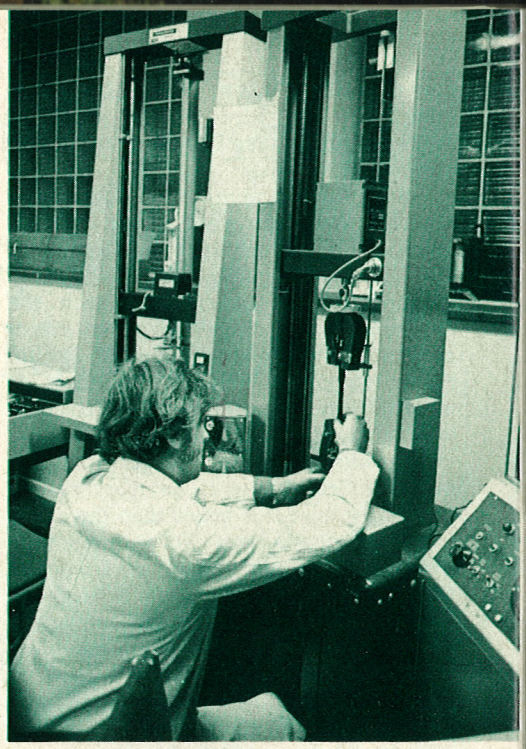
Above: Television programme with a difference. In control room of rubbery propellant mixer.



Right: Using a tensometer — a machine which is used to establish the breaking point of plastics.

The Army provides most of the work for the Non-Metallic Materials Branch. This deals mainly with long-term research projects in rubbers and plastics as well as testing them for tropical exposure and weathering. This section is at present busy on a part-plastic pump for the Chieftain tank which will probably be cheaper than its present metal counterpart, and on a fan blade for the same tank. Already in Chieftains are ERDE-developed see-through lids for ammunition boxes.

And it was at Waltham Abbey that the idea was devised of filling with foam the plastic butt of the Army's current self-loading rifle to keep the butt rigid. At present some manufacturing is being done of ethyl cellulose tube for the Giant Viper and, at the same time, ERDE scientists are looking at the next generation tube.

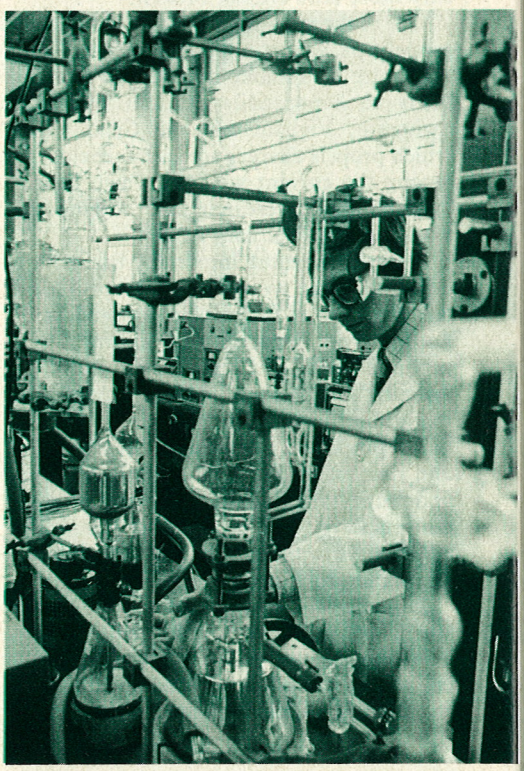
It was in explosives that Waltham Abbey first made its name and there are still some big bangs going on ... In the 20-foot-deep Newton's Pool, eight pounds of torpex is lowered halfway down ready for detonation. The ground shakes and a waterspout rises to 70 feet. There is surprisingly little noise. Meanwhile, inside a nearby building, the pressure waves are being measured and studied.

These explosions, like most of the work at Waltham Abbey, are repetitive and carried out frequently. As a result of the data acquired the ERDE recommends specific explosives for specific tasks.

Today it is not only the explosive content of missiles which concerns ERDE. Now the outer casing and the motors are also within the province of the Establishment's Director, Dr F H Panton. He has become Director of the Rocket Propulsion Establishment at Westcott, Buckinghamshire, and the two establishments are in effect amalgamated.

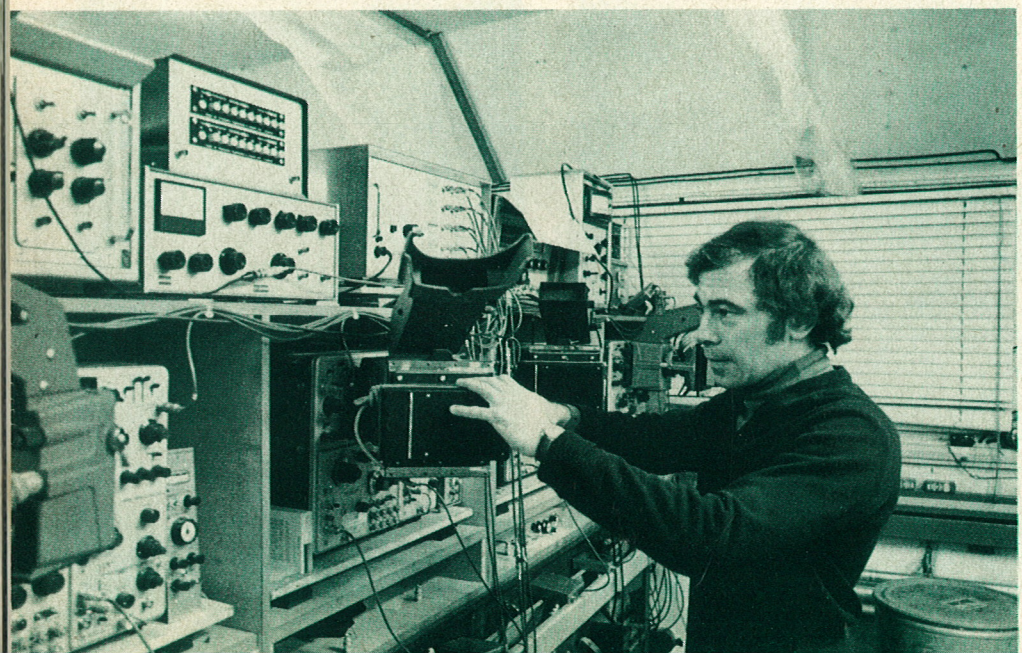
Eighty years ago a Strand magazine writer ended his feature on the old powder mills: "The tremendous energy that lay dormant in every building oppressed us, even though that energy slept behind massive traverses and walls ten feet thick; so we came away."

Those tremendous forces are not so evident as one goes through the laboratories of today's Explosives Research and Development Establishment. Yet if that writer was horrified by the explosives potential of the 1890s, what would his reaction be to today's secrets of Waltham Abbey?



Above right: In the chemistry laboratory many are the experiments to analyse gases in propellants.

Below: Processing pictures of underwater bang.



Right: Blast mats surround a propellant press.