

The remains of a water mill at the Royal Gunpowder Factory. Three-quarters of the site is scheduled to be designated as an ancient monument *Photographs: John Voos*

## Door opens to mill with explosive secrets

A SECRET government defence establishment where gunpowder was made in the 16th century and rockets were developed in modern times will soon open to the public.

The 185-acre site, at Waltham Abbey in Essex, is described by English Heritage as the most significant in the world for the history of explosives. It says many technological breakthroughs in their manufacture were achieved there.

The first gunpowder mill at Waltham Abbey was built before 1561 and was privately owned. But the site became too important to national defence to remain in private hands and was nationalised in 1787, when it became known as the Royal Gunpowder Factory.

It continued to produce black powder until the Second World War, but during the 19th century modern explosives such as cordite

**A source of gunpowder, Dambuster bombs and rockets is about to welcome the public. Oliver Gillie reports**

were developed there by Army gunners.

There are 160 buildings on the property including the 19th century gunpowder "incorporating" factory, the grand magazine, where explosives were stored, and a number of smaller "expense magazines", used to store small quantities of explosives near the production areas.

Another 180 sites of buildings have been discovered, including several 17th and 18th century water mills. The machinery for several of these is believed to be buried by debris. The original drawings for many of the mills, made by the engineer John Smeaton (1724-1792),

have been found in government archives.

The gunpowder technology developed at Waltham Abbey was ahead of its time and was exported all over the world. In the second half of the 19th century, steam-driven incorporating mills were built — the first use of steam power to make gunpowder.

The powder was mixed in a long building with six grinding installations separated by walls two feet thick. Each installation ground 56lbs of powder at a time using machinery linked by remote-control clutch to a drive shaft beneath the floor.

If the powder exploded during grinding, as it frequently did, only one of the six installations was blown up. The others could continue working and the installation that was destroyed could be rebuilt within three days.

Five of these mills, which were used after the war as secret research laboratories, have survived. The massive steam beam engines were removed but the drive shafts remain beneath the floor. Also surviving is a water-powered press house where the gunpowder was made into cakes by compression between copper plates. The cakes were dried in stoves, two of which survive, before

being broken down by rollers into pellets. They were stored in barrels and kept in one of the magazines.

Later in the 19th century, gunpowder was superseded by cordite which enabled the development of guns with a much greater range. Cordite was developed, perhaps invented, at Waltham.

The process involved treating cotton wadding with chemicals to make guncotton which was unstable. The guncotton was combined with nitro-glycerine and binders to make the highly stable cordite. Many of the buildings used for this process survive.

Explosives were moved around the site on small barges using an elaborate system of canals. When road transport took over in 1943 the canals were filled or dried out. Several of the barges remain, tied up in dry canals.

RDX, the high explosive used by the "Dambusters", was developed at the Royal Gunpowder Factory in 1938. It may have been tested in the nearby woods where a large pool, known as Newton's Pond, is known to have been used to test explosives under water.

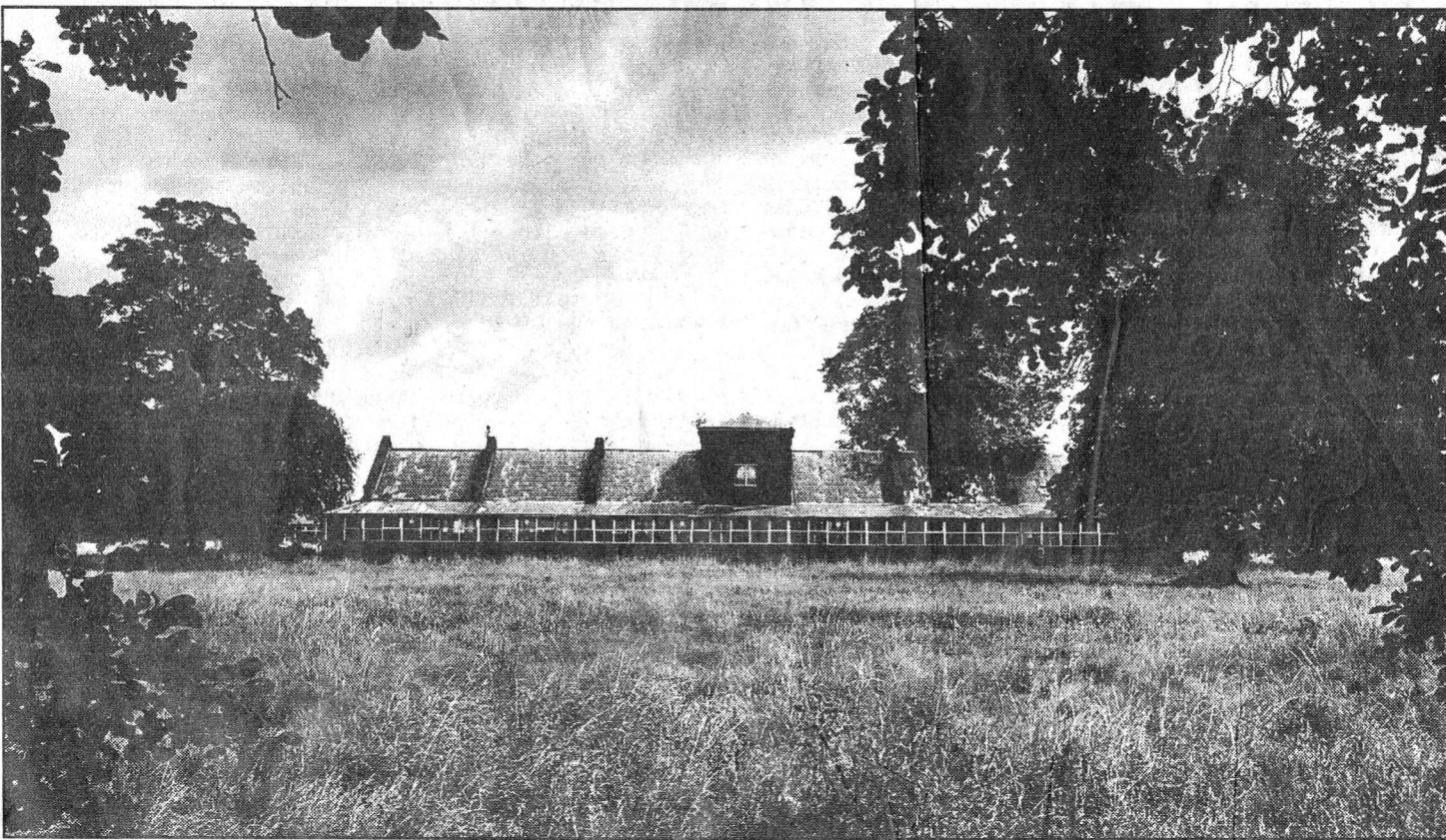
The woods are rarely disturbed by human visitors and contain otters and herons and Britain's largest population of siskins, a rare bird that feeds on alder seeds.

After the war, propellants for the British rocket Blue Streak were developed at Waltham Abbey but little has been revealed of this work.

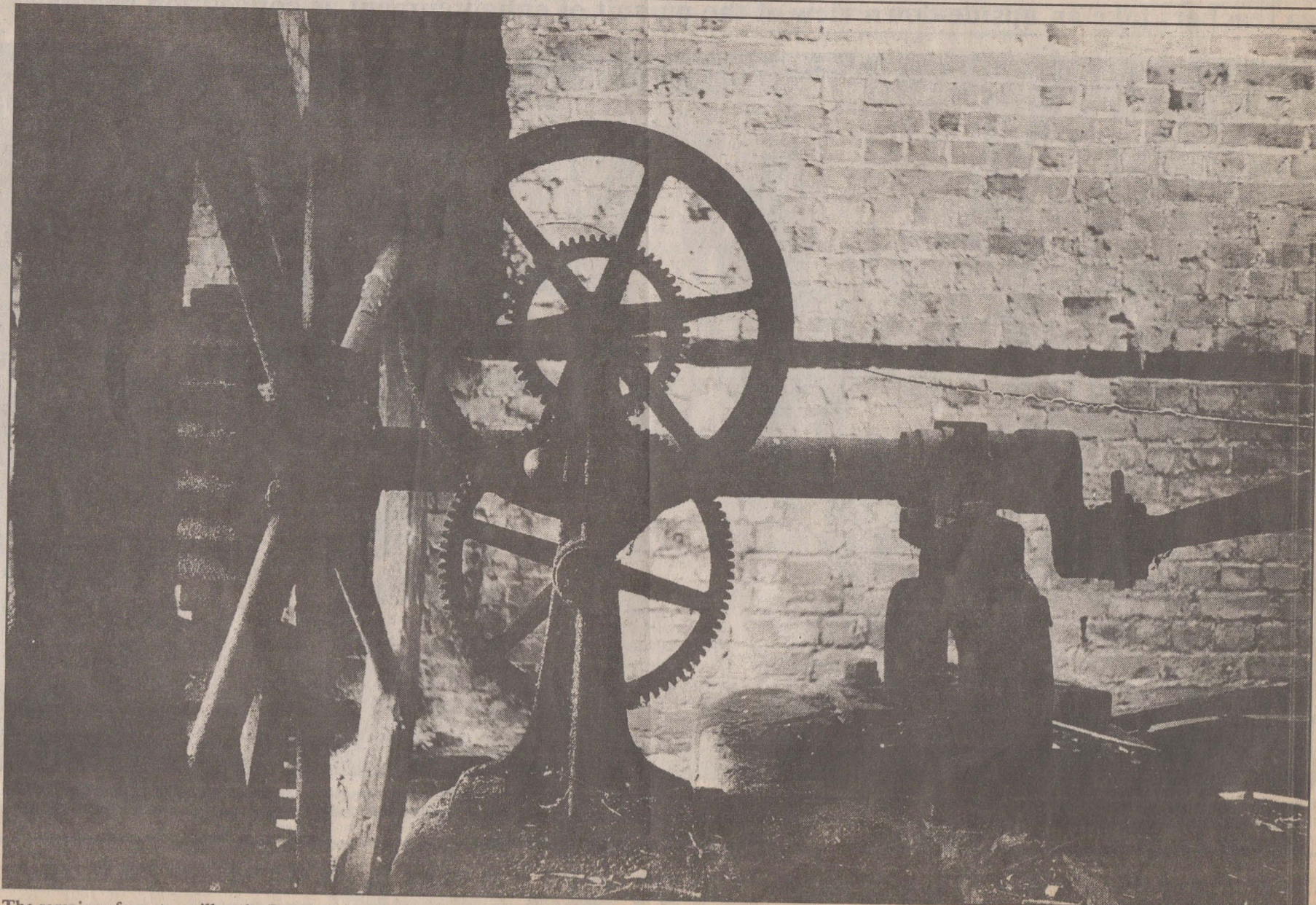
The site was littered with pieces of cordite which were cleared up last year. Asbestos and other pollutants, which were dumped in the canals, are still being cleared by a decontamination squad organised by Royal Ordnance. The Ministry of Defence has employed an archaeologist to advise them how best to preserve the buildings while the site is cleaned.

Three-quarters of the site is to be scheduled as an ancient monument and many of the buildings will be listed. One of the mills is expected to be Grade 1.

The future of the Royal Gunpowder Factory is being negotiated by English Heritage, English Nature, local authorities and the Ministry of Defence.



One of the mills on the Royal Gunpowder Factory site. Six separate buildings were used in case the powder exploded during mixing



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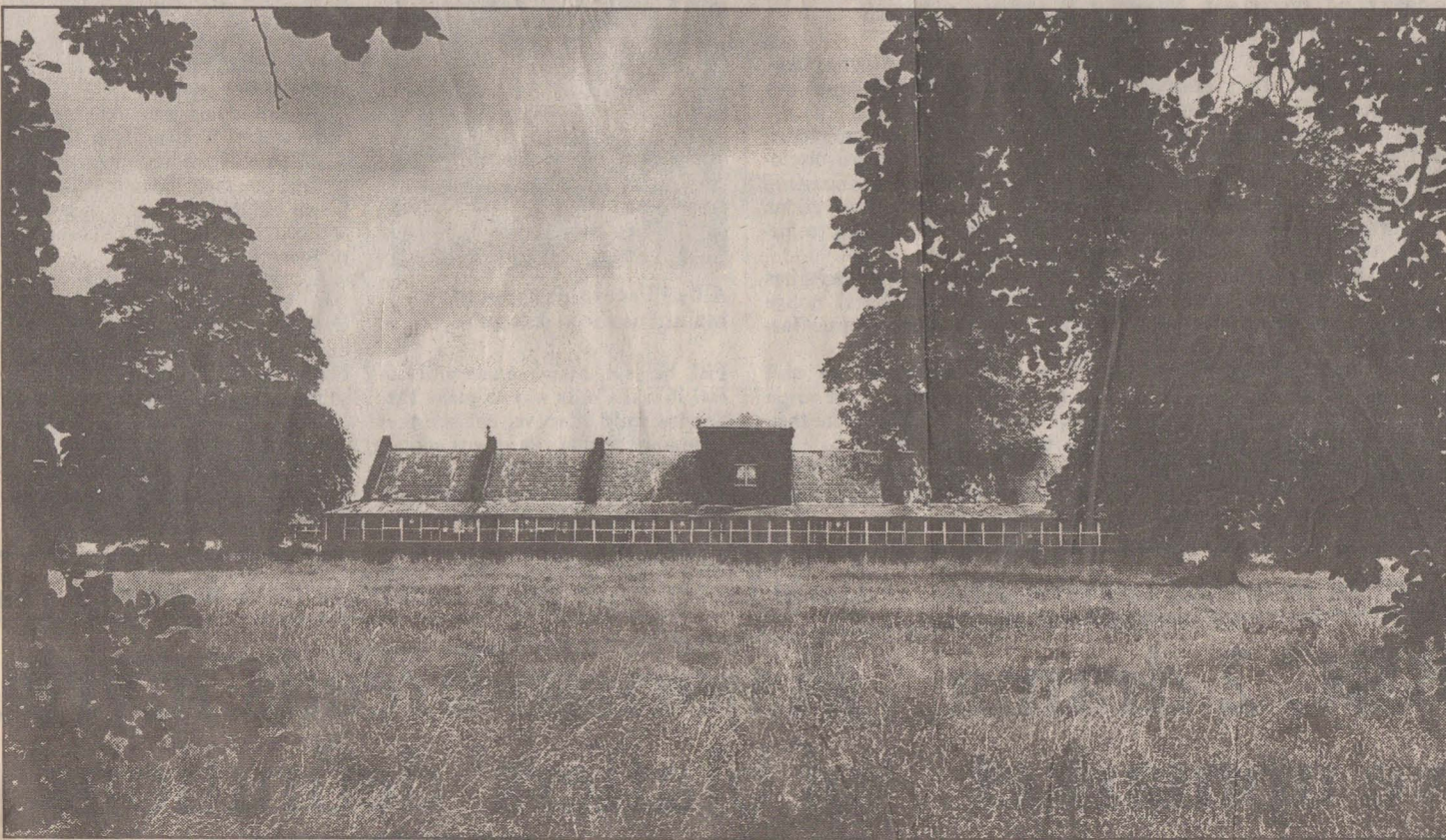
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