The Unabridged Version

RMARGAZINE's editor shares his surname with a man whose inventiveness made a huge contribution to the Allied war effort during WWII. Examples of his genius are still being built today all over the world and some have been in continuous use for more than 70 years. A bronze plaque in the 11th century Christchurch Priory, Hants provides a lasting tribute to his remarkable achievement.

In 1939, one of the few major roads linking the Midlands to the South Coast was the A34, which at that time ran through the centre of Newbury and crossed the Kennet & Avon canal via the narrow humped bridge at the south end of Northbrook Street. In the months before D-Day Army engineers toiled to improve the road, here and at other similar choke points, so as to enable the thousands of tons of materiel and hundreds of thousands of troops to be trucked from inland assembly areas to the channel ports. Fortunately, this was just one of many problems for which provision had been made during the extensive pre-invasion planning.

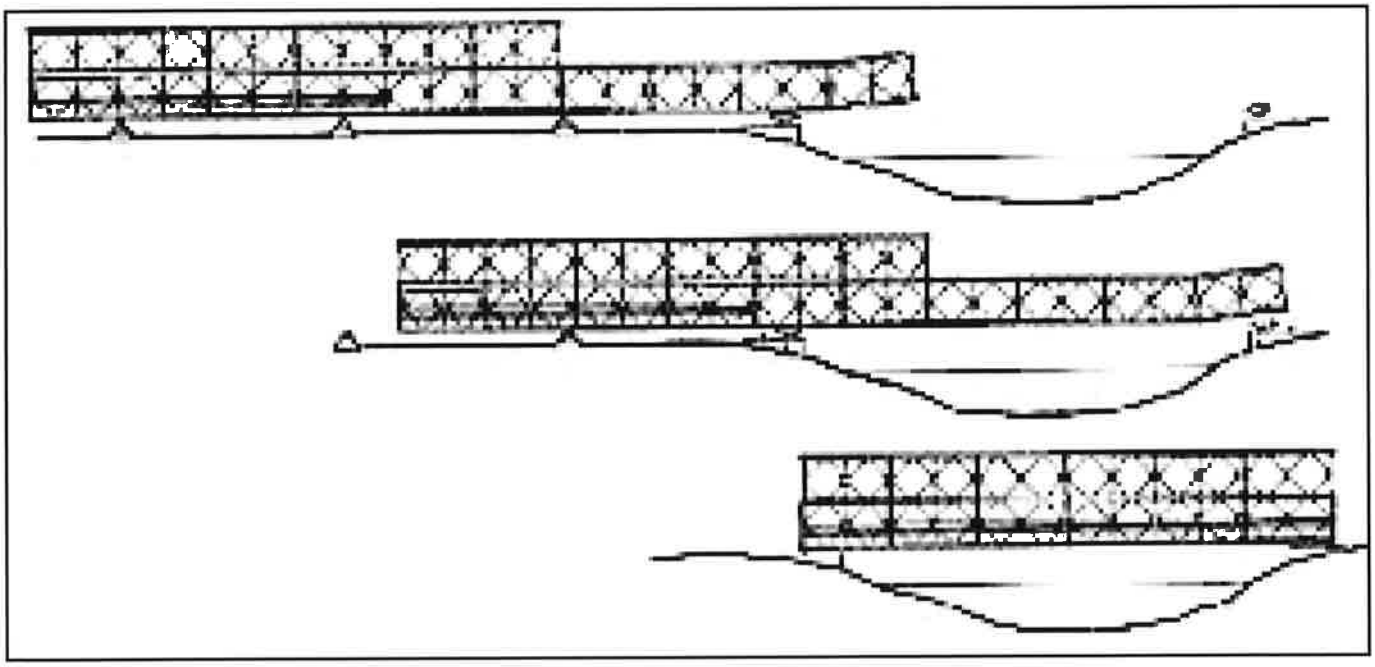
Dr. Bailey studies the model of a 4-element section of his brilliant design for a demountable bridge. Each full-scale element was 16 feet long and 24 feet wide. On the model the side structures are duplicated, which allows the span to be strengthened when required. Additional sidepieces could also be mounted on top of each other, as in the model, to provide extra rigidity. The side structures could also be used as bridge supports when needed, making the Bailey bridge system extremely adaptable. [Web photo]

Throughout history, retreating armies had destroyed bridges in their wake to delay pursuing forces. Successful military campaigns often depended on the ability to rapidly surmount such difficulties. With the increased mobility brought about by motorised transport, modern armies needed the capability to quickly replace demolished river and chasm crossings so as to enable the deployment of increasingly heavy weapons and equipment. The bridge-building facilities available to armies at that time were cumbersome and required cranes and special equipment to install, and even then could not bear the weight of modern army vehicles. The problem was one of the difficulties addressed for the British Army by a small team of civil engineers at the War Office's Experimental Bridging Establishment near Christchurch, Hants.

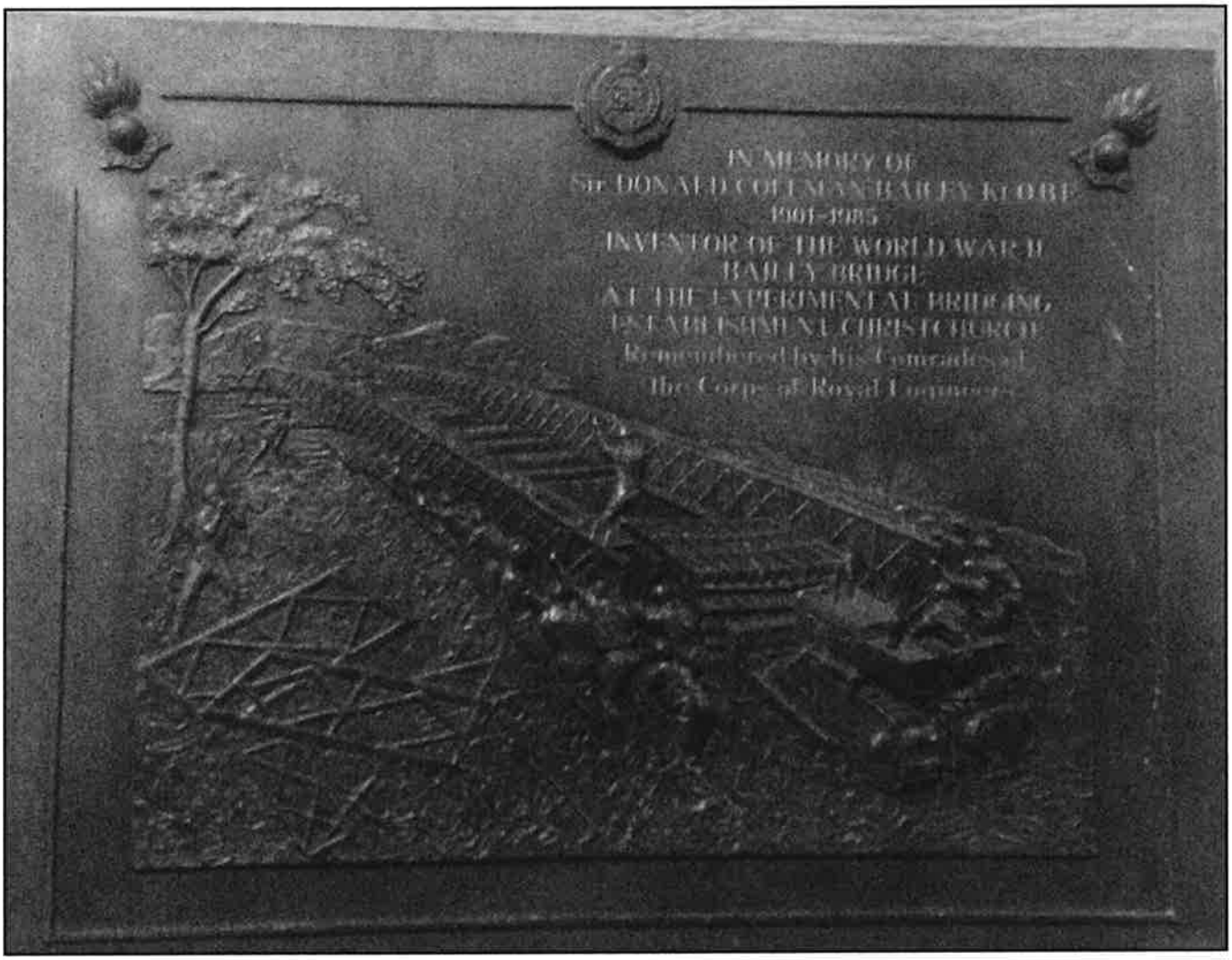
Among their number was a doctor of engineering named Donald Coleman Bailey. During the 1930's he led a team which developed a variety of military bridge-building equipment; pontoons, cranes, pile-driving rigs and associated transporting trailers. By 1936 he had produced his own ideas for a military bridge system, although at the time, an alternative scheme was introduced, which turned out to be unsatisfactory. In 1940 the army was planning to introduce a new tank, the Churchill, which was projected to weigh 39 tons, greatly exceeding the capabilities of the current temporary bridges. The War Office called a conference to resolve the problem. A radical idea comprising a strong but relatively light steel truss that could be prefabricated in sections was at once approved for development and manufacture.

Sir Donald Bailey (he was knighted in 1944) was the inspiration behind what became known as the Bailey bridge, and with his team, developed it into a world beating design, incorporating many novel features as well as refinements of previous designs. Within months, various adaptations were tried and tested in Hampshire and Cumbria until a system evolved that could bear loads of up to 70 tons.

There were 5 basic considerations of the design: -
One. Flexibility was all-important. The final design could create variable length spans in various configurations, and could be strengthened in situ if needed.
Two. Materials. All parts were made from readily available materials and welded, without using aluminium alloys which were in heavy demand for aircraft production.
Three. Simplicity. All parts were manufactured using standard engineering practices and production companies without the need for extremely fine tolerances, although close quality control was needed to ensure interchangeability.
Four. Lightweight. All parts were transportable using standard 3-Ton General Service lorries and no individual component weighed more than 600 lbs. In practice, this meant that complete bridges could be assembled if necessary by teams of six men.
Five. Ease of installation. A simple arrangement for launching and jacking was developed so that bridges could be installed with minimum preparation and without requiring specialist tools. Among the greatest advantages was the elimination of the need for pile driving for the support structures. Bailey's system allowed support to be spread over as wide an area as was required, and it could be raised if necessary to compensate for spanning where the bases were at different heights.
After successful demonstrations, full-scale production was authorised, while at the same time, intense training began for the army engineers who would erect the structures. The engineers welcomed the astonishing flexibility of the Bailey bridge as a great success, and in an impressive demonstration, a fully trained team of 40 Royal Engineers erected a 40 ft span 20-ton rated bridge in three hours. Within a further three hours, the same bridge could be upgraded to carry 70-ton loads as well as an infantry walkway. The design allowed construction of a variety of bridge types, 'standard', suspension and pontoon, with spans of up to 200 feet at full load. Examples of all of these were among the many thousands of Bailey bridges subsequently built by the Allies.
Within a year, thousands of Royal Engineers had been trained and were ready to erect temporary bridges wherever they were needed. By the time the new Bailey bridge beside Newbury's Victoria Park was installed, the army was well accustomed to building them, and this and numerous similar installations completed prior to D-Day merely provided practice for newly trained units. Although they allowed a huge increase in road capacity, most were very minor examples of what could be achieved.
The success of the Bailey bridging system is legendary. As the Germans retreated across Europe, and the Japanese from their island fortresses, bridges were systematically destroyed in their wake. However, whilst it was relatively simple to blow up the spans, it was more difficult to destroy the support structures. In almost every case, the Allies' highly adaptable bridge system could reuse the damaged supports so that demolished crossings were replaced very quickly,



Schematic diagram of a Bailey bridge installation. Base plates with rollers were installed on the near bank, on which the bridge elements were assembled. The launching nose was the lightest section of the bridge, which included upward-angled side panels without the roadbed. This ingenious innovation compensated for the inevitable 'drooping' of the bridge as it extended across the gap, and was vital in the many circumstances when no crane was available on the far bank. The rest of the bridge acted as a counterbalance to prevent it falling into the gap as it was pushed forwards. For longer spans, a heavy vehicle, sometimes even a tank, was driven onto the main section of the bridge as a counterweight. [Web photo]



The tribute in Christchurch Priory to Sir Donald Bailey consists of a bronze relief version of Terence Cuneo's famous painting "Bridging the Rapido River at Monte Cassino". It depicts the Royal Engineers launching an 80ft bridge under continuous shellfire during the night of 12th May 1944. [Photo D. Summers]

allowing the advancing Allied armies to be kept supplied. It was found, the hard way, that the modular design allowed speedy repair of Bailey bridges damaged by shellfire, a featured that further endeared them to the troops.

The Bailey bridge system was promptly adopted by the US Army and manufactured in small quantities in USA.

237 Field Company R.E. built the first operational Bailey bridge, over Medjerda River near Medjez el Bab in Tunisia under cover of darkness on 26th November 1942. During the course of the battle for Sicily, Canadian army engineers erected 38 Bailey bridges, one of which was the first to be built under fire. In all, over 2,800 Bailey bridges were erected during the subsequent Italian campaign, the longest being more than 1,100 feet in length.

It is hardly surprising that the roadways extending shoreward from the Mulberry Harbours in Normandy were comprised of Bailey bridge sections, or that some 1500 examples were built in northern Europe. The longest was reported to be the pontoon version built over the estuary of the river Maas in the Netherlands in 1945, which extended some 4,000 feet. Many more were erected all over the world, from Birmingham to Bangkok. Some of these remain in use today, and new examples continue to be installed.

By the end of WWII almost 2000 miles of Bailey bridging had been produced, mainly in Britain. After the war, Allied military leaders were unanimous in their praise of the invention; some declared that the advance across Europe could not have been achieved without it.

Within RMARG's area of interest, there are examples of Bailey bridge still in use. The one in Newbury has been replaced with a more modern design, but the one erected in 1947 (in less than 3 hours) by army engineers, spanning a Thames backwater in Port Meadow in Oxford, shows no sign of deteriorating after almost 70 years.