From Imperial War Museum web site undated page.
http://www.iwm.org.uk/collections/item/object/30098636

Size and shape of British Brodie helmet, designed by George Brodie and patented in Aug/Sep 1915.

Dimensions of British "Brodie" design circular WW1 helmet. This helmet is catalog number UNI9573. Note that the WW1 version of this helmet was circular, but the WW2 version was slightly elongated front to back.

- Height: 106 mm
- Width: 295 mm
- Depth: 307 mm

"A steel helmet had been issued to the French troops in the spring of 1915. In August and September, the British authorities made experimental types of the helmet invented by Mr Brodie, of which the second, "B" was approved. Manufacture was begun towards the end of September and the first were sent to France for field testing. Known as the 'shrapnel helmet', these proved to be successful and initially 50 helmets per battalion were considered appropriate. There were two types, the Type 'A', being made of magnetic mild steel, and the Type 'B', of non-magnetic manganese steel (three times more resistant than the Type 'A'. Both of these forms featured identical liner and chinstrap systems and externally appeared similar, having a high domed profile with steep sides and a brim of shallow width. As the mechanical process of production changed the shape of the helmet altered slightly, seeing the angle of the brim reduced as well the height of the dome, being less pronounced. The paint finishes on Types 'A' & 'B' were similar, featuring a mottled camouflage of light green, light brown and orange on an apple green field. This form was also repeated on the 'War Office' pattern but by February 1916 a more non-reflective dull green was more prominent."
++++++++++++++++++++++++++
From: Engineering and Technology magazine online edition, volume 9, issue 6, 16 June 2014, by Dan Shadrake. http://eandt.theiet.org/magazine/2014/06/putting-a-lid-on-it.cfm

WW1: Combat helmet technology - the Brodie steel helmet

An iconic symbol of war, the Brodie was the first combat helmet to be specifically designed and engineered for Western Front battlefield conditions – and its legacy extends to the composite material military hard hats worn by today's fighting forces.

One of the many chilling facts that the First World War centenary reminds us of is that, for the first year of the conflict, soldiers of the British Expeditionary Force (BEF) went into combat without purpose-designed protective headwear of any kind, with only standard-issue soft peak fabric caps on top of their beleagured skulls.

The same risk was shared by their French and Belgian allies in the bloody battles of 1914 and 1915. Even the standard Imperial German Army's spiked 'Pickelhaube' – essentially a hard,

leather bowl adorned with the characteristic brass spike ornamentation – offered scant resistance to a shell splinter travelling at high velocity.

By the end of 1915 the three principal warring armies had produced some form of protective headwear, but it is the British Brodie that can lay claim to being the helmet that exemplifies the formidable qualities of engineering-led utility as it was developed towards 'market readiness'.

The Brodie has been described by the Imperial War Museum as "a masterpiece of simple design", while militaria expert Martin Pegler calls it "the most instantly recognisable symbol of the British Tommy", although most troops would not have referred to it by by the same name. The designation given at the time was closer to 'Helmet, Steel, Mark I', though it is also referred to in some period documents as 'Brodie's Steel Helmet, War Office Pattern'.

What made the Brodie distinctive was that it represented a properly engineered solution to a life-or-death requirement. The guiding principles of form, function and material development on which it was designed and produced made it not only hugely successful at what it was made to do, but also the forerunner of 21st Century advanced combat helmets made of state-of-the art composite materials and other advanced technological features.

Big guns, bigger war, more injuries

The modus operandi of the heavy ordnance deployed to create destructive waves of indirect fire, and the highly attritional nature of trench warfare, soon combined to create battlefield conditions where enemy fire often came from above as well as in front. Opposing forces were now likely to direct extensive bombardments of artillery and other types of ballistic weaponry (such as mortars) to attack entrenched positions, rather than seeking to primarily overcome enemy lines via mass troop advance.

Head and face injuries caused by airborne shrapnel, metal shell case shards, and other hazardous debris shooting through the air, soon became a major issue for those on the ground. The risk of being shot in the head by small arms fire became less of an issue as troops accustomed themselves to inhabiting networks of deep trenches.

As casualties from head wounds mounted, the need for some kind of protective combat helmet became compellingly evident. In 1915, armies on the Western Front set about developing a solution. The French came up with the 'Adrian' helmet and the Germans the 'Stahlhelm' but it was the Brodie helmet, eventually issued to the British Army, that became iconic to the 1914-1918 conflict and remained a potent symbol of British soldiering for decades after the Armistice.

Initial development

The Brodie, however, was not the first combat helmet to appear on the Western Front. The French Army's M15 Adrian, introduced in July 1915, led the way. This was a composite manufacture, considered cheap and fairly straightforward to produce. The Adrian was also designed to fit in with the wearer's uniform. Its shape resembles a simplified take on a French fireman's protective headgear of the period.

Weighing approximately 1.08lb-1.10lb, it was made of mild (plain carbon) steel 0.7mm thick and consisted of a rim or brow band enclosing two halves riveted together and clasped under a bowl that covered the wearer's head. An additional component of an applied 'dorsal' deflector ridge added strength, and an embossed 'Republican' badge was often added to the front for divisional identification.

Although the Adrian did offer some protection from indirect fire, it was not sufficiently impervious to the projectiles that were causing the injuries and, of course, fatalities. Despite this, it proved popular with the military authorities, and comparable headwear was eventually adopted by other nations. The British War Office Invention Department evaluated Adrians as part of its own search for protective military headwear. It concluded that the Adrian helmet was "both too flimsy and too expensive to manufacture", according to First World War historian John Hughes-Wilson, and so it looked instead for "something stronger and cheaper" to mass produce for fighting forces numbering in the hundreds of thousands.

The British War Office, nonetheless, was aware of the proliferation of the Adrian and may also have been concerned about any disquiet among British troops who wondered why they did not have something comparable. There was another hat in the ring, however: self-styled engineer John Leopold Brodie, at the time apparently employed at the Army and Navy Store in London, who became aware that the search was on for a new combat helmet, and submitted his own patented design – the Brodie helmet – for consideration.

The fact that the first Brodie helmet was tougher than the French one that preceded it was probably less important than its ease of manufacture, according to Martin Boswell, the Imperial War Museum's curator uniforms, personal equipment and flags, because it could be stamped-out using existing machine tools: "The Adrian took 70 complex operations to manufacture, [so] it would appear that Brodie's design, with simplicity in mind, was clearly favourable".

Hard hat manufacture

Brodie's concept never claimed to be entirely original: it was informed by the medieval infantryman's 'kettlehat' or chapel de fer (in use in England between the 11th and 14th Century), but was constructed from a single outer component that was pressed from a thick sheet of steel, which gave it additional strength. It was a shallow near-circular bowl'with a

wide brim around the edge, containing a simple padded crown, and an oilcloth liner riveted to the centre of the bowl'via a transverse belt. A leather chinstrap held in place by 'bales' connected to split pin lugs.

The first Brodie design, the 'Type A', had a 'raw' or 'un-edged' brim of about 1 3/4-2in wide, and was also made of mild steel. Type A Brodies were in production for just a few weeks, and only a limited run of 4,400 units was made, destined for the Allied Front Line.

Initial production was halted when distinguished metallurgist Sir Robert Hadfield (1858-1940) stepped in with a proposal to alter the method of manufacture slightly. This next version was called the 'Type B', and its production began in October 1915.

The Type B shell used mangalloy, or Hadfield's steel as it came to be known – a manganese steel alloy that Hadfield discovered in 1882. The 10-15 per cent manganese content contained about 1 per cent carbon, making it a non-magnetic steel with higher impact strength and improved abrasion resistance when the correct work-hardened state was achieved.

The process of Type B manufacture had to be precise or the alloy would have become too brittle and therefore useless for the battlefield. The bowl was formed from pressings from 20 gauge (or .036in) sheets of the 12 per cent manganese alloy.

Hadfield's steel was highly resistant to shrapnel, airburst fragments and other debris such as stones and solid plant material thrown-up by bombardments. Some sources suggest that Type Bs increased protection by up to 10 per cent over Type As, and 50 per cent over French Adrians.

"The Brodie, although cheap and simple to manufacture, gave good protection from falling shrapnel and secondary, low-velocity fragments," explains the Imperial War Museum's Martin Boswell. "The liner system, although not entirely satisfactory from a wearer's point of view, was perhaps arguably the best [available] at that time."

He adds: "The attached buffer tubes helped to decrease the blunt trauma of a dent that otherwise would have caused substantial wounding to the wearer's skull – and thus saved countless lives."

The Brodie's wide inverted bowl shape, approximately 12in long by 11 1/4in wide, with a lined weight of around 2.4lb (variance between surviving examples suggest precise size consistency was not always a major issue in regard to quality control – although, in theory, less than 'in could make a life-or-death difference in combat), was fashioned to provide protection for the wearer's head and, to some extent, also their neck and shoulders. The curved bowl shape could prove deflective to lower-velocity objects; its relative shallowness, however, offered less protection to the lower skull and neck than the deeply-flanged German Stahlhelm helmet.

Mark I helmets weighed approximately 2lb 4oz. When prototypes were being developed and tested, attention was given to weight and balance issues: the Brodie had to be tolerable for constant wear over a period of hours, maybe even days. If a combat helmet was so uncomfortably heavy that a wearer was minded to take it off if it became too much, or felt that it encumbered their fighting effectiveness, it would, of course, obviate its purpose.

Brodies into battle

The advent of the Brodie helmet was not received with unanimous approval within the British Army of 1915, possibly due to the fact that, in some cases, senior officers were not consulted during its development and introduction, and may have been resentful for having it foisted upon them. "A rumour circulated that some generals thought [Brodies] looked 'unsoldierly'," reports historian John Hughes-Wilson, "and that they would make the men go 'soft'."

More practical criticism came from Field Marshal Herbert Charles Onslow Plumer (1857-1932), who as commander of the BEF Second Army in May 1915, won an overwhelming victory at the Battle of Messines in June 1917. This battle started with what was then described as "the loudest explosion in human history", created by the simultaneous explosion of 19 mines by the Royal Engineer tunnelling companies.

According to military historian and curator of military history at Lancashire County Museums, Dr Stephen Bull, Plumer considered the Brodie's surface to be "too shallow, too reflective, too sharp at the rim", with a lining that was "too slippery" – i.e., the basic leather belt-fixed liner meant that it was slipping on wearers' heads.

Modifications were certainly made to the Mark I Brodie helmet when it entered mass production later that year. These included a 'rolled' rim – covering the raw edges and making the helmets less hazardous in confined spaces, and a 'cushioned' liner that was later to include rubberised cushion blocks. A textured paint, often mixed with sawdust or sand grains, finish was also applied. Wearers were also permitted to fit an exterior sacking cover that camouflaged the outer bowl.

The initial version of the Brodie was issued for active service in April 1916 at the Battle of St Eloi. "Initially there were nothing like enough helmets to go round," according to Dr Bull, "so they were designated as a 'trench store', to be kept in the Front Line and used by each unit that occupied the sector. It was only by the summer of 1916, when the first million Brodies had been produced, that it could be regarded as general issue."

The Mark I Brodie was also subsequently adopted by Commonwealth and American Expeditionary Forces following their entry into the war. Produced in many overseas factories, it continued in service long into the 1920s and beyond – in the late 1930s some Mark Is were

refurbished with new liners and chin straps and chin strap lugs and then redesignated the 'Mark I*').

It was gradually replaced by the Mark II in the early years of the Second World War. The distinctive Brodie shape was retained, but the method of fixing the much-improved liner was now a small brass nut and screw, the chin strap fixings or bales were now tougher, and yet easier to preplace.

This meant that a damaged liner and straps could be changed far easier in the field without access to a workshop. The Mark II was slightly wider and shorter in overall dimension than its antecedent the Mark I; it was also slightly heavier, weighing-in at approximately 2.5lb, though collectors have found some variance, and liner weight has to be factored in or out.

An icon is born...

As soon as UK steel manufacturers in the Sheffield region began to mass produce the Brodie in sufficient numbers for each British soldier to be issued with their own, it was on its way to becoming an item of battlewear that was inseparably identified with the fortunes of the 'fighting Tommy'. It received favourable press attention, and became a standard feature in Front Line photography.

"Cases have occurred in which the wearers have been hit, but saved by these helmets from what without them would have meant certain death," the *Illustrated London News* reported in November 1915. "Even in cases of extreme risk, not only has death been avoided, but injuries have been confined to bruises or superficial wounds."

The appearance of Brodies also created many, what would nowadays be termed, 'photo opportunities', and fighting troops of the First World War are usually depicted wearing helmets rather than the uniform caps that preceded them for the first part of the conflict. Indeed, by the First World War's end the Brodie had, to all intents and purposes, become part of a soldier's uniform and not purely an item of essential equipment. Combat helmets were worn in ceremonial parades and march-pasts – something that would likely have been unthinkable to top brass commands of the pre-1914 generation. The Brodie was adopted (and adapted) by other armies both during and after the First World War, and its later variant Mark III was standard forces issue until the closing stages of the Second World War. Brodies were also worn for a range of civil defence roles such as Air Raid Precautions and National Fire Services (an ironic twist on the French Adrian's lineage).

Brodie-type helmets also cropped-up on civilian heads: a variant fashioned of the pioneering plastic Bakelite or compressed leather/fibre was made to be worn by engineers engaged in areas of electrical work where metalicised head protection could present a hazard. A mild steel helmet bearing resemblance to the Brodie, but with a deeper crown – branded as 'The

Zuckerman' – was also offered to the civilian population from December 1940, priced at five shillings and sixpence.

Phasing out from the British Army began in 1944 as it was replaced by the Mark III (or 'Turtle') helmet, which offered better protection to the neck and sides of the head. The Mark III was initially called the 'Canadian Helmet' because large numbers had been issued to Canadian troops for D-Day. Variants of this design were successively issued in the decades following'post-war era. The Mark III itself, and its Cold War-era successors, the Marks IV and V, were decommissioned by 1986 when the UK Ministry of Defence made the decision to move to helmets composed of nylon fibre.

The Brodie Mark II, meanwhile, continued to be produced outside of the UK. Until comparatively recently the Indian Army, as well as the Israeli defence forces, manufactured and issued helmets still based on this classic design; indeed, some Indian factories make them for historical re-enactors, TV and movie productions, and, of course, collectors of militaria.

Further information

- thebrodiehelmet.weebly.com
- www.iwm.org.uk/ww1
- www.iwm.org.uk/
- thebrodiehelmet.weebly.com/war-office-pattern.html
- josephs-militaria-and-homefront-collection.co.uk/PAGE21.HTML

New designs, new materials

Until the early 1980s, most army helmets were modifications of the Brodie helmet – made out of pressed steel. By the late 1970s, it became clear that helmet technology needed to catch-up with the increasingly destructive high-velocity projectiles from the detonation of munitions such as rocket launchers, as well as more traditional ordnance.

Armies in the UK and USA decided to replace steel with composite. A composite helmet is made from multiple layers of lightweight woven pre-impregnated synthetic material compressed to form the helmet's shell at a pressure of 3,000 tonnes-per-square-metre. The bonding system used in the UK and US is a thermoset phenol formaldehyde resin and polyvinyl butyral resin.

Such a construction gives ballistic protection in three phases: a fragment moving at the helmet's V50 velocity (the velocity at which the probability of a 1.1g fragment penetrating target is 50 per cent) first punches into the composite; the impact then causes delamination

of the layers; finally, the fibres break to arrest the fragment. These stages combine to slow down projectiles and protect the head.

The US Army's first fully composite helmet – the PASGT (Personal Armor System Ground Troop) – was constructed from 19 layers of DuPont's Kevlar fabric, a ballistic aramid. The British Army's composite design – the Mark VI – used 22 layers of ballistic nylon, a fibre developed by DuPont for Second World War flak jackets. "Nylon was all we could get our hands at the time, because Kevlar was classified as a strategic material," explains Roger Medwell, former CEO for NP Aerospace Ltd (previously National Plastics, and originally Courtaulds) who from 1978 to 2011 led the British team that manufactured these helmets in Coventry. Since then, the Coventry plant has produced nearly 100 per cent of all composite helmets for the British Army, as well as for more than 20 other countries.

Brought into service in 1984, the British Mark VI helmet, including its liner, weighed 1.3kg – the same as the Mark IV steel helmet it replaced, while providing far better ballistic protection. For the Mark VI the V50 performance was 400m/s, compared to 280m/s for the Mark IV. The US PASGT helmet, which became standard issue in 1985, was heavier at 1.48kg and had a V50 rating of 610m/s.

A further difference between the US and a UK helmet was impact protection. The Mark VI has a 20mm-thick high-impact-absorbing liner of high-density polyethylene foam whereas the PASGT had a traditional helmet webbing system.

Manufacturing skill is critical to a composite helmet's performance, and that encompasses the quality of the synthetic fibres, the weave of the material, how you cut the fabric to ensure there are no weak points, and so on. "Ballistic nylon is notorious for retaining stresses which can result in distorted helmets," Medwell says. "You need to ensure the warp and weft have equal stresses."

The British Mark VI remained in service until 2005, with an extra tough model for Special Forces introduced in the early 1990s made from aramid. In 2005, a modification called the Mark VIA was introduced for the Iraq war. This used a composite of ballistic nylon and aramid, which increased the V50 performance test to very high levels, outperforming the US forces' purely Kevlar-based composite helmets. At 1.4kg, the Mark VIA weighed more than the Mark VI but putting a percentage of aramid in with the nylon built on research done many years before.

The latest British helmet is the Mark VII, made of aramid fibre with a very fine weave for lower weight and more strength. It offers a similar ballistic protection to the Mark VIA, but is shaped to allow more comfort to soldiers when in the prone position. It is also designed to take a range of headsets and equipment interfaces. The US PASGT was replaced in 2003 by the Advanced Combat Helmet made of similar materials to the Mark VII.

For the next generation of helmets, lighter stronger composites are under development based on UHMPE (ultra high modulus polyethylene). Strength-to-weight ratios for these materials are 8 to 15 times higher than steel (Kevlar is around five times higher than steel). But getting sufficient structural strength has been tricky. "Polyethylene yarns have a very low coefficient of friction, so bonding to them is extremely difficult. DSM Dynema, for example, have done a lot of research into UHMPE yarns and resin systems and recently made a significant breakthrough in structural performance using their material," reports Medwell. Some years ago CGF Gallet (now MSA Gallet) successfully developed a composite UHMPE helmet for the French Army. At 1.4kg, it is heavy, but gives 680m/s V50 protection. Last year Morgan Advanced Materials published details of a helmet weighing only 1kg that maintained the high ballistic and impact protection required by the British Defence Forces.

By Christine Evans-Pughe

John Leopold Brodie, mysterious inventor: what do we know about the man behind the helmet?

Part 1: Brodie before the war

John Leopold Brodie's steel combat helmet helped save hundreds of thousands of lives, but biographical information about its inventor is surprisingly sparse. During the course of researching this article about the Brodie helmet *E&T* has been able to piece together some biographical facts which probably constitute the most detailed information about the inventor currently brought together on a single webpage.

Two basic pieces of information that we have not been unable to confirm are Brodie's year of birth and date of death, although unconfirmed sources suggest that he was born on 10th July in Riga, the capital of what is now the Republic of Latvia. A photograph of Brodie published in the mid-1920s shows a man who appears to be in his late forties/early fifties, which would speculatively place his birthdate at around 1875-1880.

According to a US newspaper profile of John Leopold Brodie, first published (in the Buffalo Times) in April 4th 1926, and which contains the most detailed contemporaneous account of his life up till that point, he began his career in South Africa, where he acquired some ownership in diamond and gold mines there, and eventually 'made a fortune' at the Kimberly and Johannesburg mines. The same profile also suggests some kind of close association between Brodie and the British-born businessman, mining magnate, and politician Cecil Rhodes, who died in 1902 aged only 48.

At some point, probably in the early 1900s, Brodie settled in the United Kingdom, and – again according to the Buffalo Times newspaper profile – developed 'a chemical process for the

manufacture of salt', a business operation that he seems to have remained engaged in until 1914.

What happened to this business around this time is unclear, but some sources say that by 1915 Brodie was either employed by, or professionally connected to, well-known retailer the Army and Navy Store, located in Victoria Street, London. Some unverified sources suggest that once his Type A and Type B helmets were in production, the Army & Navy store supplied the fabric linings that were fitting inside them, and which created a vital protective layer between the wearer's head and the steel exterior; but whether this arrangement (if correct) was as a direct result of John Leopold Brodie himself is not clear.

Brodie's first application to patent his helmet design (No 11,803, dated August 16th 1915) gives his contact address as York House, York Street, Portman Square, London W1. York Street is a long thoroughfare that runs south of Marylebone Road between Baker Street and Seymour Place; York House either no longer exists, or the property that used to be York House has lost this part of its identity over time as front door fanlights of the kind that displayed the name of the premises painted on the glass have been replaced. Brodie also declares his occupation on the patent application as 'Engineer'.

How Brodie occupied himself while the rest of the First World War ran its course is unclear, but presumably his income was improved by the fact that his patent was being drawn upon for the production of thousands of combat helmets for the British War Office, and he was as a result receiving a royalty on each one made and issued.

It's claimed that at some point around this time Brodie was offered a knighthood – presumably for his services to the Allied war effort – but turned it down for reasons unstated.

By James Hayes

John Leopold Brodie, mysterious inventor: what do we know about the man behind the helmet?

Part 2: Brodie after the war

Royalties from his helmets and income from other business interests may have enabled Brodie to relocate in the United States, and eventually to the town of Buffalo in the state of New York. It seems that Brodie relocated to Buffalo in late 1918 or early 1919, at the behest of his wife, Eleanora Thompson Brodie, who 'wished to live in the city of her birth', again according to the 1926 Buffalo Times profile.

The question of Brodie's own nationality status during the 1920s (and beyond) is unclear. The 1926 Buffalo Times piece says that he 'received his US citizenship in 1924'; and an application for US naturalisation by Eleanora Thompson Brodie was submitted to US

District Court for the Western District of New York, dated April 10th 1924. Was she applying on her husband's behalf? And is it possible that the application was, in fact, rejected? It seems that the US authorities might have felt that they had reasons for blocking Brodie's desire to become an American citizen, as we shall see.

By this time John Leopold Brodie had been domiciled at 806 West Ferry Street, Buffalo NY – an address that was to become familiar to readers of the town's local newspapers over the years that followed. It's possible that the property still stands.

'Mr. Brodie for a number of years has been one of Buffalo's most distinguished citizens,' the glowing Buffalo Times profile proclaims: he is a 'local genius' who 'invented many war devices', and the 'richest of all local war millionaires, and possibly the wealthiest man in the city'.

Other inventions the newspaper credited Brodie with included 'a chain steel visor attached under the tin hats and so arranged as to pull it down in front of the eyed for protection from shrapnel', a 'message-carrying rocket', 'smoke helmets and gas alarms' – 'most of which saw a great deal of active service in France'. Brodie is also said to have developed the "stop-and-go' traffic light'.

By the time this tribute appeared Mr and Mrs Brodie had become well-known to local newspaper readers, and it is these sporadic mentions from the publications' archives that provide the primary steers as to their activities during the latter half of the 1920s and into the 1930s. Mr and Mrs JL Brodie seem to have been quite active socially, and there are several mentions of parties, receptions and other society events. These were often hosted at their 'handsome yellow brick Colonial house with tall white pillars' at 806 West Ferry Street, as described in passing in the Social record of the Buffalo Courier in February 1926.

Brodie may have been relatively well-off financially, but that didn't deter him from trying to recover what he saw as unpaid monies arising from the fact that, since it entered the First World War, his helmet has also become standard issue to the US army – without a penny in royalties being paid to its creator.

A month later (March 4 1926) the Buffalo Evening News' front page headline 'Buffalonian sues US for $2,000,000' reported that Brodie had brought an action in the United States Court of Claims to recover the sum 'as damages for the manufacture and use of soldiers' helmets, which he claims were made by an infringement of patient rights he holds to the "Brodie helmet"'.

The story states that the US attorney Clifton W Edwards 'contends there was no infringement and that Brodie is a British subject' – again seemingly contradicting earlier claims that Brodie was formally US-naturalised.

We next catch sight of J. Leopold Brodie on the Buffalo Evening News dated November 30 1927. On its 'Full page of pictures from all over the world', squeezed in between a group portrait of a murder case jury and picture showing the blowing-up of an old bridge over the Susquehanna river at Conowingo, Maryland. The rather grim-faced inventor of the 'iron hats which our boys wore during the World War' is pictured arriving back in New York aboard the RMS Mauretania (the first Cunard Line liner of that name, launched in 1906); he was almost certainly returning from a trip to Europe.

The next mention of Brodie comes in a story in the Mount Vernon Daily Argus for September 2nd 1932. It seems that 'the inventor of the tin hat' was still trying to recover unpaid royalties from its Stateside deployment. In a story headed 'British present $2,000,000 bill for inventions', the story explain how the United States had been 'presented with a bill' for nearly $2m by British inventors claiming credit for the steel helmet, the six-inch trench mortar, a famous secret cypher, and a dozen other devices which helped win the war'. Brodie was demanding a more modest $134,487 in royalties from the United States 'representing six pence on each of the 1,537,000 steel helmets supplied by Britain to the A.E.F' (American Expeditionary Force) during the conflict.

Curiously, again, despite the earlier Buffalo Times assertion that Brodie had been a naturalised American citizen for nigh-on eight years, the Mount Vernon Daily Argus report refers to Brodie as 'a British subject now living in Buffalo'. Could it be possible that the US authorities were aware of the potential liabilities regarding outstanding royalty payments, and that this was a factor in processing Brodie's naturalisation, in that, as a US citizen he would have been in a better legal position to prosecute his claims?

In the next media mention of citizen Brodie we find he is again embroiled in an attempt to recover funds – but this time it's somebody trying to obtain payment from him. 'Helmet inventor sued – mortgage firm brings action against John L Brodie' is the headline above a report in the Buffalo Courier-Express for Thursday February 8th (1934). 'Trial of an action against John Leopold Brodie, inventor of the steel helmet worn by Allied troops in the World War, was started yesterday in supreme court... The action is being brought against Mr Brodie, as president of Murray Hills Apartments Inc., by the Nye Mortgage Corp., to recover $19,500 and interest for three years."

The details of this action are not altogether clear from this brief(ish) item that tries to cram-in what must have been many complex details. The mortgage corporation alleged that it was engaged by Brodie in December 1930, to negotiate a first mortgage loan of $650,000 at 3 per cent commission, on Brodie's home at 806 West Ferry Street, on the basis that it was to become the site of a proposed new-build apartment-house. The company contended that the Murray Hills Apartments Inc. refused to complete the transaction when the Prudential Insurance Company offered to negotiate the loan: 'The defence contends that the proposed

apartment house project was abandoned when it was found impossible to lease between 60 and 75 per cent of the apartments in advance of construction'. The judge and jury's decision was not delayed, for the next day's edition of the Buffalo Courier-Express reported that in a verdict awarded a judgement of $23,133 in favour of Nye Mortgage Group.

We know that Brodie was still alive and in business two years later, in 1938: he appears in a commercial directory listing in a publication called the American Import and Export Bulletin: he's still in Buffalo, by now having moved to Linwood Avenue in Buffalo – which is one of the close-by thoroughfares that intersects West Ferry Street. Whether Brodie had moved home from his former address, or had commercial premises on the latter location, is once more unclear.

...And that's the last evidence of the Brodie helmet's inventor that we have been able to uncover – so far.