



# Keep up **the pressure**

**Bob Knijnenburg** catalogues the radiator pressure caps used on Jaguar XKs

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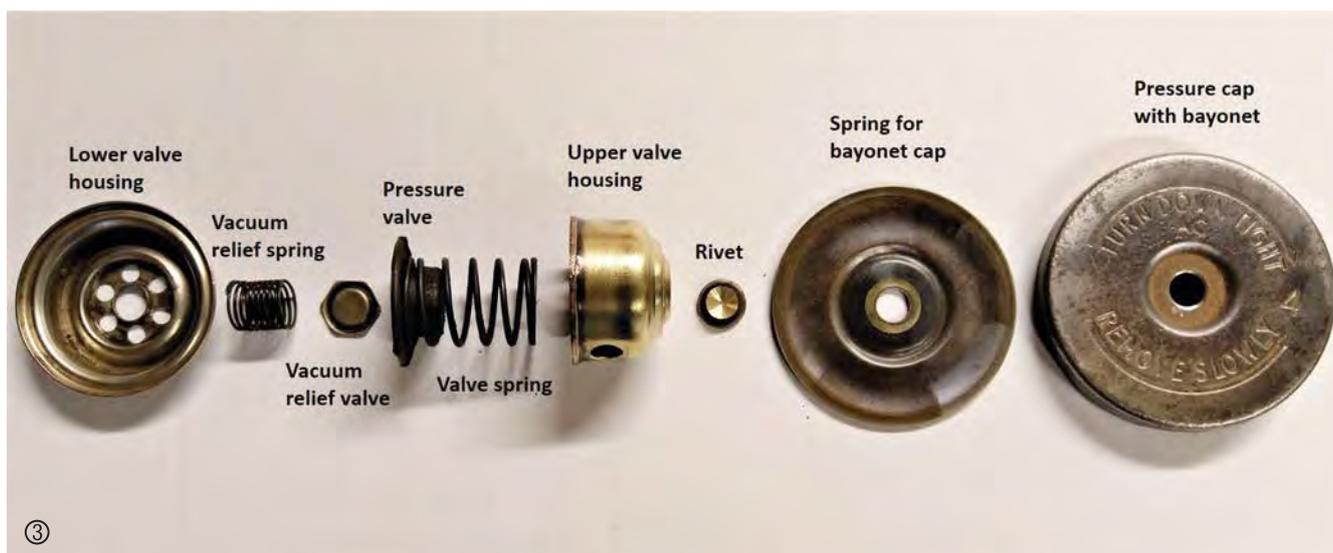
Perhaps radiator caps aren't the 'hottest' subject when discussing your Jaguar XK amongst friends. But that might change the moment your radiator starts losing coolant via the filler cap, so you really need the correct cap for your radiator to keep up the pressure.

You may (or may not) have seen that some early Jaguars with an XK engine had a different kind of radiator cap than the ones you normally find on many other cars from the Fifties. But then again, XKs are now close to 70 years old, so maybe someone replaced the standard cap somewhere in the past for an incorrect model. But once you take a closer look at this cap, you'll see there's also this strange fibre washer in the radiator neck, or a broken fibre washer, or – worst case – the fibre washer is completely missing and you cannot keep up the pressure. Time to read this story!

## **From atmospheric to pressurised systems**

In the 1930s and 1940s, most cars had a simple radiator cap on top of the radiator, using some kind of rubber washer to seal it. Cars ran at relatively low coolant temperatures and the





system operated basically at atmospheric pressure. Take a look at the pre-war SS and the first post-war Jaguar models with their beautiful chromed radiator grilles and radiator cap on top, which is basically a simple screw cap with a rubber washer to keep the coolant in the system (photo one).

Most of us know that the boiling point of water depends on the atmospheric pressure: on top of a mountain, water starts boiling at lower temperatures than it does at sea level. Conversely, by increasing the pressure the boiling point can be raised. It was in the early 1940s that the car industry started using pressurised cooling systems in order to raise the boiling temperature of the coolant.

Jaguar opted (at least initially) to raise the boiling temperature of the coolant from 100 to 107 degrees Celsius by increasing the pressure in the cooling system to 4psi. Please note that we've assumed here the use of plain water as a coolant, without the addition of any anti-freeze. Anti-freeze will further raise the boiling point. As an example, a 50:50 mixture of water and glycol will raise the boiling point from 100 to 106 degrees C at atmospheric pressure, and even higher if used in combination with a pressurised cooling system.

### Pressure cap development in WW2

Around 1939, various developments within the automotive industry led to the gradual introduction of pressurised cooling systems to further improve the reliability of engine cooling, especially under adverse conditions. The first pressurised radiator caps were probably used on the 1939 Cadillac La Salle models, which had radiators made by the Harrison Radiator Corporation of Lockport (NY).

The outbreak of the Second World war led to an increase of the number of military cars with a pressurised cooling system, one of the best-known examples being the famous WW2 Jeep, made by Ford as well as Willys. There are indications that Ford further developed this pressure cap (Ford GPW-8100-A) – assembly drawings show two different versions for different manufacturers: AC and Stant.

As availability of spare parts for these cars in wartime was essential, this radiator cap type was soon standardised within the US Army under type code R7, and manufactured by a number of US suppliers, such as the AC Spark Plug company, Dodge and Stant – the latter also supplying under the Ford label (photo two).



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**Closed and open types**

To understand the difference between these early and the later type of pressure caps, we need to provide some background information. Any radiator pressure cap has two functions:

1. To keep the pressure within the cooling system under a pre-determined value, using a first relief valve in the cap. For Jaguar XK engines up to the Sixties, this relief valve opens at 4psi.

2. To relieve any vacuum in the radiator (eg, after the engine has cooled down) via a second valve in the cap that opens at ½ to 1psi vacuum.

There were two different radiator pressure cap types in the Fifties: the 'closed' and 'open' type. The closed type had been generally applied from the early Forties onwards, whereas the open type arrived in the mid-Fifties. The closed-type radiator pressure cap has an internal construction that is different from what we still see today (the open type) with a large pressure release spring, clearly visible when removing the cap.



The closed-type radiator cap has a valve housing that contains both the over- and under-pressure relief valves. When the bayonet cap is screwed down on the radiator neck, this valve housing is firmly pressed against a fibre washer at the bottom of the radiator neck, which seals the cooling system. So this separate fibre washer is not a part of the cap but is often held in place by a number of 'dimples' positioned at the circumference of the radiator neck to prevent the fibre washer getting lost.

The exploded view of a mid-1950s AC RB-5 pressure cap of the closed type (photo three) shows the various components that we'll discuss in detail. The brass lower valve housing (far left), which together with the upper valve housing (centre) holds the two valves. The main valve is the pressure valve, which has a rubber sealing ring and is pressed against the lower valve housing using a stronger valve spring (in our case opening at 4psi over-pressure).

Within the pressure valve is a cavity that holds the vacuum relief valve and vacuum relief spring to prevent under-pressure in the radiator after cooling down; this valve will open at 1/2 to 1psi vacuum. Note that the two valves and springs operate in opposite directions. The two valve housing parts are permanently joined via mechanical deformation, at five positions. The complete valve housing is attached to the galvanised steel pressure cap with bayonet using a brass rivet, with a phosphor bronze spring disc sandwiched

9 *Almost every British Commercial vehicle on the road is factory-fitted with one or more .*

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between. The latter allows the bayonet to function and secures a tight seal between valve body and fibre ring (photos four and five).

As mentioned above, there were at least three manufacturers during wartime – plus two other companies joining them after WW2 (Evrseal and Dorman) – that supplied this type of closed radiator pressure cap. Although they were interchangeable, there were some differences in



construction, as shown in photos six, seven and eight.

Please note that Jeep radiators have a so-called ‘B size’ filler neck with a 2¼in (57mm) inner diameter, whereas the separate fibre washer has a 2½in (54mm) outer diameter. The cap itself has an outer diameter of just over 2¾in (70mm).

### AC Sphinx Spark Plug Company

The AC Spark Plug Company of Flint, Michigan, was a forerunner in the area of radiator pressure caps, and via its affiliate in the UK (the AC Sphinx Spark Plug Company), Jaguar became aware of these caps.

In about 1902, the Sphinx Manufacturing company started the production of spark plugs at Bradford Street in Birmingham (UK). In the early 1920s, the company was taken over by the (US) AC Spark Plug company. The new company was named AC Sphinx Spark Plug company – from 1927 onwards, it was a division of General Motors UK – and had manufacturing premises at Watling Street, Dunstable. The company manufactured all kinds of other

parts for the automotive industry, and after WW2 it was renamed AC-Delco, a division of General Motors, and any reference to the former Sphinx Manufacturing company disappeared (photos nine and 10).

### Closed-type pressure caps on Jaguars

Before the arrival of Jaguar’s XK DOHC engine in 1948, all Jaguar OHV engines had a non-pressurised cooling system with the aforementioned cap type, often combined with the famous ‘leaping cat’ as an ornament.

The XK 120 OTS was the first car to use a radiator pressure cap made by AC Sphinx Spark Plug company of Dunstable. There must have been an exchange of information regarding new radiator cap developments between the US AC division and the British AC branch, because there is a distinct similarity between the radiator caps produced by the two companies, but they are not identical. Yet Jaguar only used radiator caps manufactured by AC in Dunstable!

Most US radiator cap types refer to an R code – so, the Jeep radiator cap is coded R7 in the US. AC, however, as the dominant player in the UK, set the codes for radiator caps in the British market. The closed-type radiator cap was coded RB-5 by AC (with article number 850573), probably assigned around 1948. Note that the original Jeep cap made by AC USA had an earlier article number, 850091, which may well have been assigned in 1941. Though the commercial AC type coding was different both sides of the Atlantic, the article coding system seems similar.

OEM supplies from AC to Jaguar always consisted of plain stamped cadmium-plated caps with, in addition to the brand name AC, the text ‘TURN DOWN TIGHT’ and ‘REMOVE SLOWLY’, both with arrows indicating the correct direction to turn. The oldest UK-manufactured versions we’ve seen to date had a large letter ‘B’ at the left side and the figure ‘4’ for the pressure in psi stamped at the right side, on one horizontal line through the centre (photo 11). On later RB-5 versions, probably from 1958 onwards, the figure ‘4’ – now in a smaller font – had been turned 90 degrees (photo 12). These caps have the later AC part number 850709.

AC pressure caps manufactured in the USA can be immediately recognised by the fact that they always had the patent numbers stamped above the text ‘REMOVE SLOWLY’. The letter B is not used on these and the pressure (‘4’) is stamped in a smaller size font.

The large ‘B’ stamped on the cap we referred to is most likely a date code that AC (UK) introduced in the late 1940s, whereby the B indicates a certain year/quarter/month. Confusion may arise because the letter ‘B’ is also a US type indication for the type of radiator neck, as mentioned earlier, and it stands for a ‘shallow-neck’ type with a depth of ¾in (19mm). But we observed that the letter B was later followed by other letters, meaning this letter isn’t a radiator neck indication and the ‘B’ must therefore be a date code. 🐎

*Part two next month*