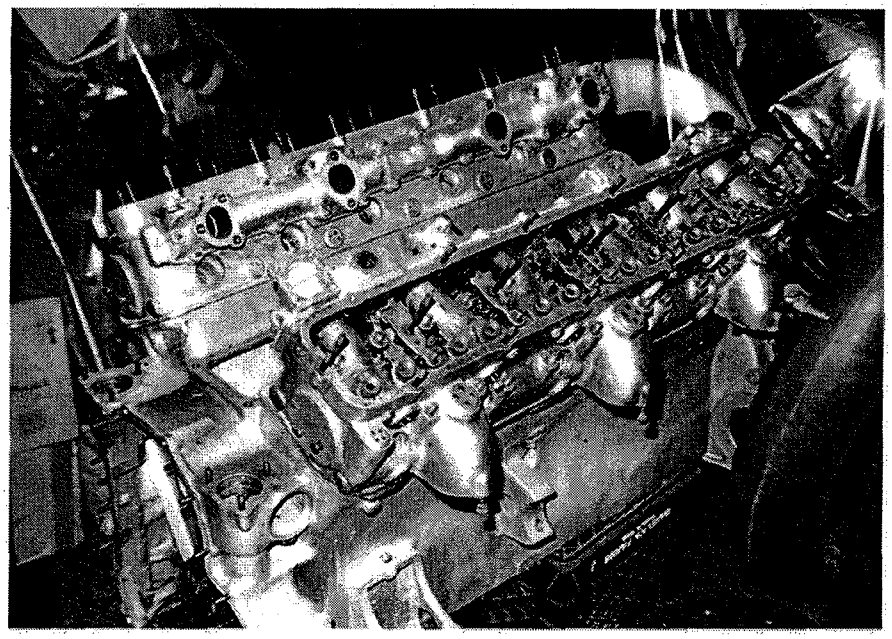
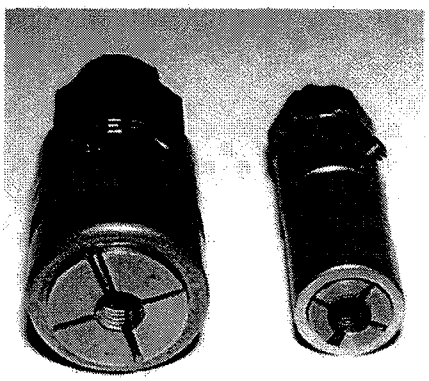


Not quite the same Phantom engine as in the text, but this PIII engine is similarly prone to stuck heads as steel studs and aluminum heads create electrolytic action that glues them solid.



The business end of the stud removers showing the collets made by the author. They grip studs without crimping or damaging them, even when only a fraction of an inch is reachable.

Removing a Stuck Aluminum Head

By HERBERT TOBIN, CT

I recently had to remove the aluminum cylinder head from my Phantom II, 281AJS. What I learned while doing this may be of interest to other club members.

Removing a head stuck into place by electrolytic corrosion can be a risky operation and there are several proven, safe and reliable ways to remove heads that have been used for years by top restorers and experts in the club. There are also a number of less-than-satisfactory methods that should not be attempted under any circumstance. Unlike these "creative" methods, the procedures outlined are proven safe and do not run any risk of damaging the head or block mating faces, the con rods or other key engine components. Regardless, use caution when undertaking the removal of a stuck head and contact the club technical advisors if you have doubts about how to proceed.

Though I have only used this method personally on my Phantom II, I am told that the method should be applicable to heads ranging from the late PI aluminum heads right through to the post-war Cloud/S six-cylinder engines.

The engine in 281AJS had last been apart for major engine work in 1963. In fact, I remember being in the middle of cleaning out the oil pan when I heard the news of President Kennedy's assassination. Since then, the head had not been off.

The car saw a lot of use when I first acquired it, but for the last 15 or 20 years it has been mostly inactive. There were periods during this time when the car would sit for years between being run.

I set out to remove the head by removing all of the usual manifolding, wire looms, rocker shafts, etc. The specific steps are all spelled out in the manuals and handbooks that I have obtained from RROC over the years. Everything went along smoothly.

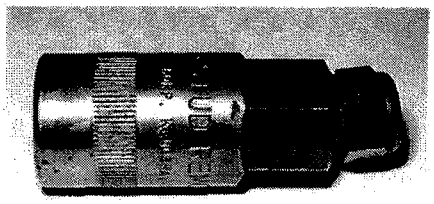
When I removed the head bolts, however, the head refused to budge. At first I tried lifting it from above by hand. This has always worked for me on this car and the many others I've worked on. Nothing moved.

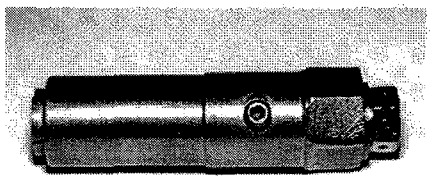
I tried applying gentle pressure with an hydraulic ram pushing up on the head where it is exposed between the front and rear cylinder blocks. Again nothing moved and this time it looked like there was a risk of doing serious damage to the head or crankcase.

Consulting back issues of *The Flying Lady*, I found that a sticking head is a common occurrence on aluminum heads. It results from electrolytic action that causes corrosion between the steel studs and the aluminum head and virtually welds the heads to the studs through a combination of rust and white aluminum oxide powder. The ways suggested for removing these stuck heads have consisted of specialized hole saws which are used to drill out a space between the studs and the head, along with hardwood wedges driven into the sides of the head gasket. In extreme cases it is suggested to drill out the studs completely.

After consulting with RROC member Bill Butler (Yankee Region), I was put in touch with one John O'Shea who had been through a similar problem, but on an L-head Packard. John said that he had tried the hole saws (see: FL83-3, p. 2716) but that the saws were continually breaking up. What had worked for him, he said, was to use a stud remover and break up the corrosion by rotating the studs. I decided to take his advice.

Snap-On makes a stud remover, which consists of a heavy tapered housing into which a collet is drawn. The collet is internally threaded to match the threads of the





Two stud removers, one commercial (above left) and one made by the author (above right).

Collet in place with the tool body removed for the photo.

stud. When the collet is drawn into the tapered housing it clamps down on the threaded part of the stud with great pressure, but the stud is not damaged because of the matching fit between the collet and stud threads.

This tool has two significant advantages over other types of stud removers for this application. First, it is meant to be attached to the threaded part of the stud. Since only the threaded part of the stud is exposed, this is no minor feature. Second, this stud removal tool does not depend on (rotational) wedging action to lock onto the stud. This allows you to rotate the stud both clockwise and counterclockwise to try and break up the corrosion. Also, this tool does not have teeth that cause damage to the studs as is the case with "gripping" tools.

Of course, this being a Rolls-Royce, things weren't quite that simple. These collets are readily available in a wide range of U.S. and metric sizes, but not in BSF or other British sizes. The studs on my car are $^{3}/_{8}$-20 BSF, definitely not a standard U.S. size.

Additionally, the collet housing measures about $1^{3}/_{8}$ inch in diameter. Of the two rows of studs that live under the valve cover, all but two have sufficient clearance to swing this large-diameter tool. However, the entire third row of studs, which is located outside of the valve cover, has less than an inch of clearance and would not accommodate the Snap-On tool.

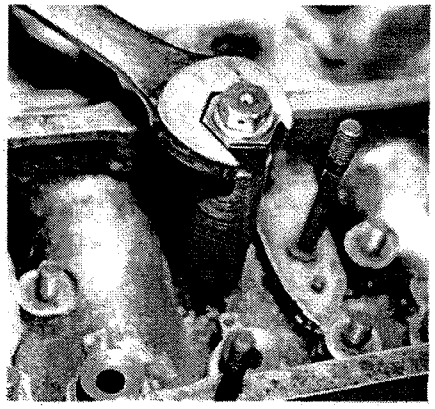
Since I wasn't sure that the stud remover technique would work, I decided that the first thing I should do was to make a special collet with the proper size British thread for the Snap-On tool and try it on the studs that had enough clearance.

These collets are very simple and straightforward devices. Everything but two features on them can be duplicated with the absolute minimum metal lathe. I used a little 6 inch Craftsman lathe that I have had even longer than my Rolls-Royce. The first non-lathe feature is a locating slot, which does not have to be very accurate and could be cut with a hand grinder. I used a milling attachment on my "toy" lathe. The second non-lathe feature is the set of longitudinal slots, which allow the collet to close. I cut these with a hacksaw.

There was another way that I might have made the special collet, but I was afraid that I might damage my treasured BSF tap. That would have been to buy a collet meant for a smaller size, i.e. $^{3}/_{8}$ or $^{5}/_{16}$ and drill it and tap it for the BSF size. I was afraid that the collet slots might damage my tap. Someone who knows more about it or who has a source of BSF taps might try this.

Armed with my new British-thread collet, I was ready to try freeing up some studs. The studs are rooted in the aluminum of the crankcase and pass freely through the cylinder blocks and through the head. It was apparent which studs were frozen and which were free. Some studs could be moved from side to side with very light hand pressure. Others would move very little or not at all. I assumed that the moveable studs were OK, the unmovable studs the sticky ones.

I first connected the tool to one of the moveable studs. I wanted to get an idea of how much rotation I should expect to feel in a stud which was properly anchored, but otherwise free to move. I figured that if I could get that same amount of rotation from the frozen studs, they too would be free. Much to my surprise, when applying counterclockwise pressure to the first free stud, the stud came free of its anchor in the crankcase.

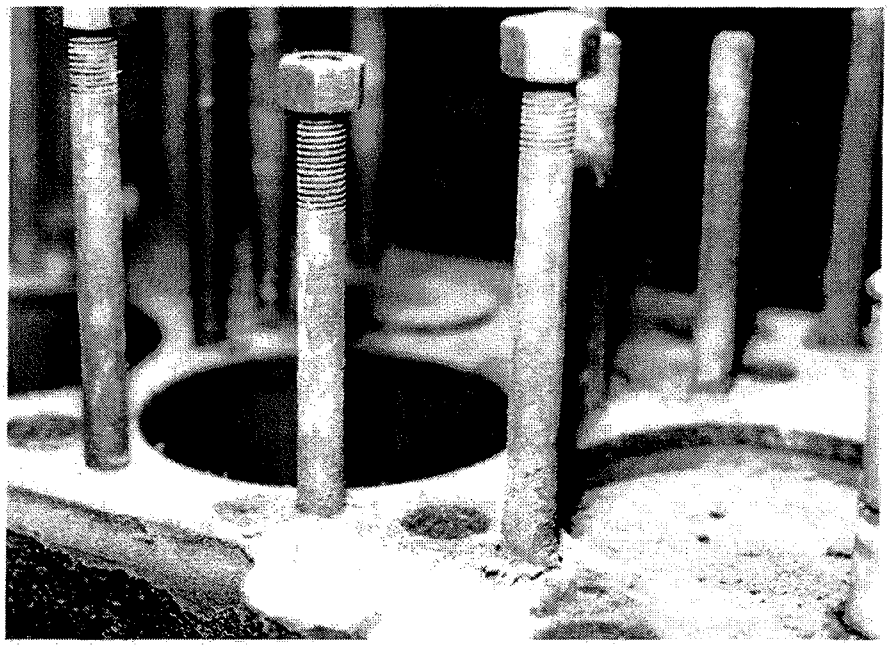


Tool in place on a PIII head. Wiggling back and forth with the wrench may free most recalcitrant studs.

Applying the tool to the unmovable studs, the results were not all that different. With not very much back and forth rotation the studs became nearly as moveable as the 'good' ones. About the same pressure removed these studs from the crankcase.

Since the special collet in the standard housing was such an apparent success, I decided to make another smaller collet and the smallest possible collet housing that, together, would handle a $^{3}/_{8}$-20 stud. The plan was to use this home-made tool on the studs that could not be reached with the larger commercially purchased tool.

I first made the collet. This was similar to the full size one but with these differences: I reduced the size of the thread on the pulling



Sweet success! This B-series engine had a badly stuck head, taking several days to remove. The rust on the studs is very apparent, but can often be broken up with the use of these tools.

end of the collet from 5/8 to 3/8 (fine thread). This allowed me to reduce the diameter of the straight part of the collet to just over 1/2 inch. The full size collet uses a taper of 7 degrees. I reduced this angle to 5 degrees so that the length of the tapered part would be longer. Since I was going for the minimum outside diameter, this would spread the load over a greater area and allow a thinner wall on the housing.

The housing started from a one-inch cylinder. I drilled it most of the way through, just big enough for the collet to be inserted. A 3/8 hole at the end allowed a pulling screw to enter the collet and a 5-degree tapered opening at the other end matched the taper of the collet. I decided to omit the positioning pin as there is no tendency for the tool to rotate.

When I reduced the outer diameter of the tool/housing to 7/8 inch I found that the tool would fit over most of the studs with limited clearance. I also found that it would work!

I used this home-made tool to loosen all the studs that it would fit, and then carefully reduced the diameter of the tool one more time to fit over the last remaining studs. The object was to avoid reducing the size, and therefore the strength, of the tool until as late in the sequence as possible.

With the corrosion bond between the head and the studs broken, the head was then free enough to be removed by hand.

An important detail, which I have not mentioned yet, is that when I reassembled this engine in 1963, I had used liberal amounts of Never-Seeze graphite compound on all the threads. It might not have been quite as easy to remove the studs if this had not been done. Since these cars will hopefully be around for many years to come, it certainly looks like a good idea to use Never-Seeze or an equivalent on anything that you decide to take apart. Your descendants might well thank you for it.

At the very least, though, even if the studs had not come free from their base in the crankcase, the torsional rotation of the studs would probably have been enough to break the corrosion bond between the head and studs. This would free the head to a point where the head could have been removed with reasonable force.

Overall, I recommend this technique for prewar cars from Aluminum-head Phantom I right through to the early postwar 6-cylinders B-Series engines that are notorious for stuck aluminum heads.

Of note, I will make the collets available to other members with the requirement that they pay the insured shipping both ways and provide a substantial security deposit. A firstborn child or a pre-1914 Ghost would suffice. Anyone can purchase the stud removal tool by contacting their local Snap-On representative.

MINUTES OF THE RROC 1999 ANNUAL BUSINESS MEETING

The Board of Directors of the Rolls-Royce Owners' Club Inc. met by published pre-announcement at The Atlanta Airport Hilton, 1301 Virginia Ave., Atlanta, GA, on 1/30/1999.

The Officers and Directors had submitted written reports to Club HQ prior to the Meeting. Each of these reports had been previously received by all Board Members and are on file at Club HQ. The reports are not appended to these minutes. All motions were properly made and seconded. Some business was carried out without a motion, but by consensus; expenditure of money was not involved in such action. Votes were either unanimous or overwhelmingly in favor of or against a motion.

President Gil Frederick called the meeting to order at 1:20 PM and read a letter from Steve Antine, VP Awards, explaining that his health precluded him from completing his term of office and asking that B.J. Jefferson Jr. be appointed as his replacement. The President explained that this would require board approval which he then asked for and received.

Sect'y Clive Edmonds asked for approval of the minutes of the previous meeting, held in Rhode Island. A motion was made and the minutes accepted without discussion.

Treasurer Ed Gehringer presented and discussed his report and asked for approval. Passed without discussion or dissent.

Executive Director Tim Younes discussed his report, noting that we had undergone an IRS audit and passed with no problems. Motion to accept made and passed unanimously.

VP Activities Carl Peterson next discussed several upcoming events with the help of the hosting members.

Dennis Hill discussed his meet, to be held with the support of the Modern Car Society, in South Dakota, around Mount Rushmore, October 3–8.

B.J. Jefferson discussed the resurrection of the Inter-regional Meet concept, to be held shortly before the Annual Meet in Dana Point, but on the opposite side of the continent, in Springfield, MA, July 28–31.

VP Pub. Thea Armstrong next presented her report, noting that the National Meet issue of *The Flying Lady*, produced by Robin James, would be mailed at the end of February. Future issues would be produced by the new Publication Team now in place. Rob Rosenbaum would spearhead the *FL on CD* project. Report accepted unanimously.

President Gil Frederick next addressed the meeting on the subject of the confidentiality of Board Reports. He expressed disappointment that material had been forwarded to him from the attorneys acting for the dissident group, and bearing Jim Armstrong's fax number. He reported that he had written 2 letters to Jim Armstrong on the subject but had not received a reply. Mr. Armstrong's response was that he was only trying to bring a healing to the situation. The President's Report was accepted unanimously.

Dr. Bob Sessions next asked to be recognized and addressed the meeting, giving an introduction and update on Ken Karger's illness.

Board Reports which required no board action were next addressed.

Bob Jefferson Jr. addressed the meeting (in place of S. Antine) on the subject of a Merit Award to be presented by VP Tech to recognize exceptional hands-on work by an individual, but not to supplant the Guerrero Trophy.

Adrian West started to speak on the type of award, suggesting a lapel pin. At this point President Gil Frederick collapsed and was immediately assisted by Drs. Sessions, Ward and Armstrong. The room was cleared to give the medical people space.

After Gil Frederick was stabilized and taken to hospital by ambulance, the meeting was briefly reconvened.

Dr. Fred Ward gave a brief update of the President's condition.

Executive VP Carl Peterson, acting as President *pro tem*, called the meeting to order and asked for a 20 minute recess to allow the Executive Committee to have a brief meeting and recommend a course of action for the balance of the day's agenda. Motion carried.

Following the recess, the meeting was called to order by Carl Peterson. He explained that there were four items on the agenda that needed action at this meeting and after those items were considered, he would ask for an adjournment to a time uncertain. He then asked to "Suspend the Rules Temporary" to consider those four items. Motion was carried.

He then thanked the outgoing officers for their contribution to the Club.

He then welcomed the incoming officers to the board, who then took office.

He then asked for:

- board approval for the newly elected regional affiliate officers;
- requested changes in bank signatory authority for Tours;
- approval for supplemental budget requests, primarily for TFL.

The Board, in each case, voted unanimously to accept the motions.

He then called for an adjournment of this Annual Meeting to a time "at the call of the chair." Motion seconded and carried. Adjourned at 2:35 PM.