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REF: Tools & Fasteners

Stuck, Frozen and Broken Off Bolts

- Something that often comes up on these old bikes, due to age and due to previous owners' shenanigans, you quite often see many good reasons why hand tools and not hand guns should be licensed. ¹⁾
- There are three ways to unlock the bolt: chemical, thermal, and mechanical. You pretty much want to attempt the process of unsticking in that order, too. ²⁾
- The reason the bolt gets 'stuck' (more often than not) is corrosion expands - iron oxide can expand to be something like 17 times as thick as the base steel was. The oxidization (rust) effectively locks the bolt in place. ³⁾

Penetrating Oil

[Click Here](#) to see a list of penetrating oils in the Sportsterpedia.

- **Chemical attacks are not instantaneous events;** Pop would, when working a bolt on his Model A, often squirt the bolt once a day for two weeks, then give it a rap to try to loosen corrosion before walking it out conventionally. Sometimes it works, sometimes it doesn't. ⁴⁾
- **Even a good penetrating oil sometimes just needs time.** First, follow the label on your choice of oil. A rule of thumb is a 24 hour soak, followed by a few taps with a hammer or rubber mallet to set up some vibration in the threads to distribute oil and friction. This procedure can be duplicated as often as you feel comfortable with and it depends entirely on your time frame allowed. It's not possible to nail down a set day(s) or hour(s) as every situation and climate is different.

Heat

- Heat in this instance is applied to the bolt surroundings but not to the bolt. The idea is to thermally expand the hole that the bolt is in without expanding the bolt itself or weakening it's internal properties. ⁵⁾
- For exhaust nuts/studs etc, or removing exhaust pipes, run the engine and get it real hot, then try. ⁶⁾
- For bolts stuck in aluminum castings, take a propane torch with a wide heating tip, not the narrow soldering tip, or an electric heat gun and heat the aluminum up. Keep the heat source moving. The aluminum expands more than the steel bolt and loosens up the stickiness. A propane torch or heat gun used with movement will not warp aluminum. Just don't heat it more than about 210 degrees, which is when you can spit on it and the spit boils and sizzles. Oxy acetylene torch can melt aluminum so that is a no-no for me. ⁷⁾

- For stuck brake calipers etc, someone one here (XLFORUM) suggested and swears by boiling the caliper in a pot of water. Same effect, the aluminum expands. ⁸⁾

Wrenching

- Impact always works better than steady pressure. Jar the wrench or socket handle with the palm of your hand, rather than just pulling on it steady. ⁹⁾
- Take a flat nosed punch or drift and give the stuck bolt a few solid belts with a hammer, straight on. It pushes the bolt into the hole and lets it spring out, sometimes breaking the oxide layer holding it in place. Be careful not to damage the screwdriver slots or hex head in the bolt/screw. Brass drift helps for that. ¹⁰⁾
- Impact screw driver is the only thing to use on the gearcase and primary cover screws. You hit it with a hammer and twist it at the same time. A must have for any bike workshop. ¹¹⁾
- Right-angle screw drivers let you get more leverage to, or those screwdriver bits for your socket set. But impact driver works much better. ¹²⁾
- A six-sided hex wrench will grip a rounded off nut better than a 12-point socket or box wrench sometimes. ¹³⁾
- Use the right size wrench or screwdriver bit. Sometime you can put a Crescent wrench on a square shank screwdriver for more leverage. ¹⁴⁾
- ALWAYS use good quality tools. A Snap On or Craftsman wrench will grip a bolt better than a cheap Chinese wrench.
That is why professionals pay the extra money for good tools. Saves them money on repairing damage from cheap tools. ¹⁵⁾
- An air impact wrench is good for undoing stuff but never use it to tighten. It's too easy to over torque and strip the bolts. ¹⁶⁾
- Do not use an air impact wrench on the crankshaft mainshaft nuts etc, it can throw the crank assembly out of true, so they say. ¹⁷⁾
- Carefully weld a piece of metal onto a rounded or broken bolt head so you can grip it and turn it. ¹⁸⁾
- Go round the other side of the bolt and cut the nut off it using a grinder or hacksaw. ¹⁹⁾
- File two flats on a rounded bolt head so you can get the next size smaller wrench on there. ²⁰⁾
- A half inch breaker bar stuck into an 8 foot long piece of black pipe. It has never meet a nut or bolt it could not take off. I prefer this to the impact gun. ²¹⁾

Phillips head screws:

- Neat motorcyle Phillips head screw trick: If one is stubborn and wants to 'cam out' (screwdriver lifts out of the slots while attempting to turn the screw) you can sometimes restore the screw enough to get it out by flattening the head slightly with wrong end of a punch - or a machinist's round punch (flat face).
 - The idea is by flattening the head, the mushrooming effect 'closes' the slots, allowing a screwdriver or impact driver to get enough grip to back it out.
 - Be sure to use fresh Phillips tips. Just because it looks like a #3 Phillips head tip doesn't mean it still is one! Go to the store, buy a screwdriver with replaceable tips and a half dozen tips - and THROW OUT a tip when the edges become the least bit rounded. ²²⁾
- A 1/4 drive ratchet with a 1/4 six point socket will drive most any phillips head replaceable screw

point - especially those in tight places. Did the float bowl/idle jet swappie this past morning on the bike without taking the air cleaner off; if I'd used a conventional screwdriver, the angle would have caused the outboard screws to camout. I was able to keep the bit in the screw with one hand - and turn with the other. ²³⁾

- If you have a Phillips head that is camming out, put a little valve grinding compound on the tip of the screwdriver. It will give the screwdriver tip a lot of extra bite. ²⁴⁾
- Quite often, when a bolt or screw won't back out, I'll reverse the impact and give it a go that way. The next reverse impact usually pulls it out. It just wanted to be loosened by tightening ²⁵⁾

Brake Bleeder Bolts:

In a pinch and if the bleeder screw isn't leaking, you can try leaving it alone and bleeding at the banjo bolt instead.

[Click here](#) for Bleeder Screw Issues on the brake bleeding page in the Sportsterpedia.

Brake hose fitting:

- As to the brake hose going into the caliper, use only a proper brake hose wrench from the auto parts store. It is a six sided box end wrench with a slot in it so you can fit it over the metal tubing. Then jar the wrench to get the hose unscrewed. If you try to use an open end wrench on that pipe fitting, it will almost guaranteed just round off the flare nut hex. ²⁶⁾

Broken Bolts

So you have wrenched on that stubborn bolt long enough and hard enough that the damn head broke off, leaving the shank of the bolt stuck in the job. ²⁷⁾

- First step is most important: WALK AWAY. ²⁸⁾
 - The problem is not insurmountable, but it takes patience and a steady hand. ²⁹⁾
 - Do not attempt to deal with it when you are pissed off and or tired. Come back another day and start afresh. ³⁰⁾
 - Take a flat nosed drift and hammer and give that end of the broken bolt a few good taps to loosen it up. ³¹⁾
 - See if you can get it out with a screwdriver jammed against the broken end. Sometime you can get lucky and the release of tension when the bolt head comes off releases the bolt. I know this to be a fact but can't remember the last time it was actually that easy. ³²⁾
 - Take a small center punch and try to tap the bolt end around anticlockwise to see if it will move. If you can get it out a thread or two, vice grips will screw it the rest of the way out. Not often this one works too, but sometimes it does, specially with larger bolts where you can get some leverage on it by digging the punch in near the outer diameter. ³³⁾
 - Refer to the heat section above
 - If the bolt shank extends out of the hole far enough, a 12'-18" pipe wrench can be used to grab the bolt and remove it. Vise grip pliers always stand the chance of stripping around the bolt shank while reducing the metal around the body.

Drilling Out Broken Bolts

OK, so the SOB won't shift or budge. Time for some very careful skilled artisanship. You don't want to drill into the threads in the hole. ³⁴⁾

- First step is to tape off area around the bolt and cover any parts susceptible to debris and flying metal. ³⁵⁾
 - Find or create a flat plane near center of the bolt using a small file or grazing across it with a Dremil tool with a metal cutting blade attached. ³⁶⁾
 - Use a center punch to make a mark right in the center of the bolt shank. A fat punch with a wide point works better than a narrow pointed punch because you can see the outer edge of the punch lining up with the outside of the bolt on say a 1/4 or 5/16 bolt, the most common bike sizes. ³⁷⁾
 - Then you have to drill slowly and carefully down the center, getting a buddy to look on from the side and eyeball you are keeping the drill square to the job. ³⁸⁾
 - Use a drill bit plenty smaller than the bolt and then you can open the hole up with progressively larger bits. ³⁹⁾
 - As you drill it out, tension in the bolt is released, loosening the threads. So you might be able to stick the square tang of a file in there and turn the remaining shell out of the threads or you can use a thread extractor or Easy-Out to back out the remaining shank. ⁴⁰⁾
- Stud Extractor and Easy-Out is a small, square tapered or spiral tapered tool kind of like a tap, that you screw, left hand threaded, into the hole, in the bolt and then CAREFULLY use it to screw the drilled bolt shank out. WARNING: Small spiral Ezyout tools don't take much force to break. Then you have a hardened tool steel tip embedded in your job. You cant drill it. It is harder than a drill bit. If you can't get that out, a machine shop will have to use a electro discharge machine to burn it out. Expensive and messy. Be very careful. ⁴¹⁾
- Use a Snap-On style stud extractor. That is a small round plug with kind of teeth on it. You drill a SPECIFIC sized hole (in the tool instructions) then hammer the tool into the hole and use it to hook up your ratchet handle and screw it out. ⁴²⁾
- Left handed drill bits (no, that is not a joke). You can buy them at engineering shops and machine oriented sales companies. Get one just smaller than the root diamter of the bolt - ie, it will fit through a nut that same thread size with just a bit of slack to spare. You run your pistol drill backwards and drill out the bolt or stud as above. As the drill turns in the "undo" direction, it tends to screw the bolt out of the hole as it goes, and the hole relieves tension on the bolt so it loosens up and screws out. ⁴³⁾
- If you are working on a small part you can turn over and drill out from the back side, a normal drill bit will have the same effect. It can grab that bolt as it goes and turn it in the undo direction. ⁴⁴⁾
- Ideally of course, setting the job up in a drill press is always better than wobbling around with a pistol drill. But an Ironhead motor or frame is not always that portable. ⁴⁵⁾
- When drilling out a bolt, get the correct replacement in hand first, so you know how deep it is, and you can mark your bit at the same depth. ⁴⁶⁾
- Inspect all the threads on bolts and threaded holes to make sure they are clean of all debris, gasket material, rust and oil.
- Chasing threads simply means running a tap/ die back through the threads to insure they are all straight and clean which helps you achieve proper torque values when installing the bolts. Be cautious to match up to the existing threads your working on. If metal starts being cut while running down a tap/ die that's a good sign either your not locked into the threads or that you have

some warped or damaged threads.

- Wire wheels on a bench grinder works great for cleaning bolts. ⁴⁷⁾
- Soaking bolts and fasteners in gas or solvent will help to break loose old gasket material, oil and grime.
- Threads can also be cleaned with an old toothbrush and some solvent or gas or just simply sprayed down with your brand of brake cleaner.

Left hand drill bit for broken bolt removal. ⁴⁸⁾



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Larry Jaques <https://groups.google.com/forum/#!topic/rec.crafts.metalworking/BFVDZjOSOG>

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