Paruzzi Magazine

Technical Publication for the classic Volkswagen

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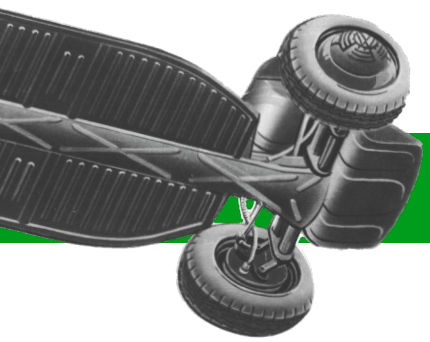

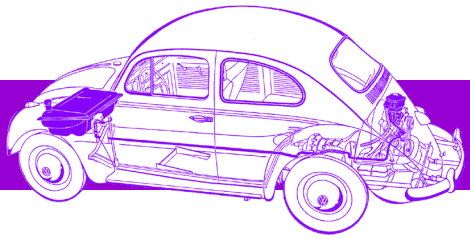

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#43 Buying a VW

Introduction

We discovered the VW 1200 (on the left side of the picture) in the previous edition, this is a Beetle that is very similar to the very first models such as the Split and the Oval. This time we look at a more "modern" version of the VW Beetle, the VW 1303. It was the 1303 model that was introduced to compete with brands such as Opel and Ford but also with the emerging Japanese brands Datsun and Toyota. VW introduced new technologies to its "outdated" sixties Beetle to be able to survive the first half of the seventies, waiting for their trend braking water-cooled Golf series. It all started with the 1302 and later on the 1303 (on the right side of the picture), the latter is the most developed model, it helped VW to reach their sales targets in the early seventies.

The parts that are the very similar to the VW 1200 wil not be discussed again, if you didn't read the first part of this article yet, read edition 14.

underneath the VW 1303

Many chassis parts of the 1303 explained on the following pages are also used on VW Beetles starting from January 1963 on. It is now time to jack up the car and start exploring the rear side of the Volkswagen 1303.

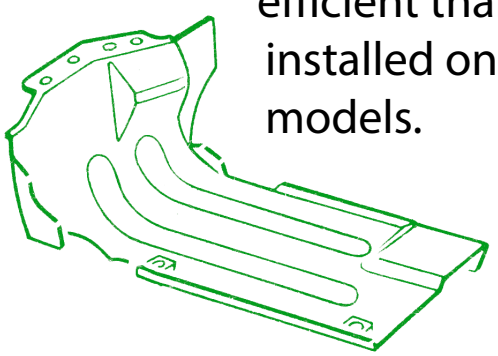
Below we show a picture of the VW 1200 from 1960 (left) and a 1303 Karmann Convertible (right). They look very similar for someone without experience in classic Volkswagens, except for the curved windscreen and bigger tail lights on the VW 1303.

Underneath the VW 1303 - the rear

As we said earlier, we will talk about the parts that are different from the VW 1200. The rear bumper, the bumper brackets, the fenders and the crankcase look pretty much the same , the same remarks should be taken into account as for the VW 1200.

Engine tin

The engine tin is different though, this is because the 1303 has a different heating system than the VW 1200. This type of heating was installed starting January 1967 on most Beetles and Ghia's. The engine tin (1), as shown on page 7, is much smaller and it doesn't cover the heat exchangers. This model of heat exchanger is much more efficient than the one installed on older models.



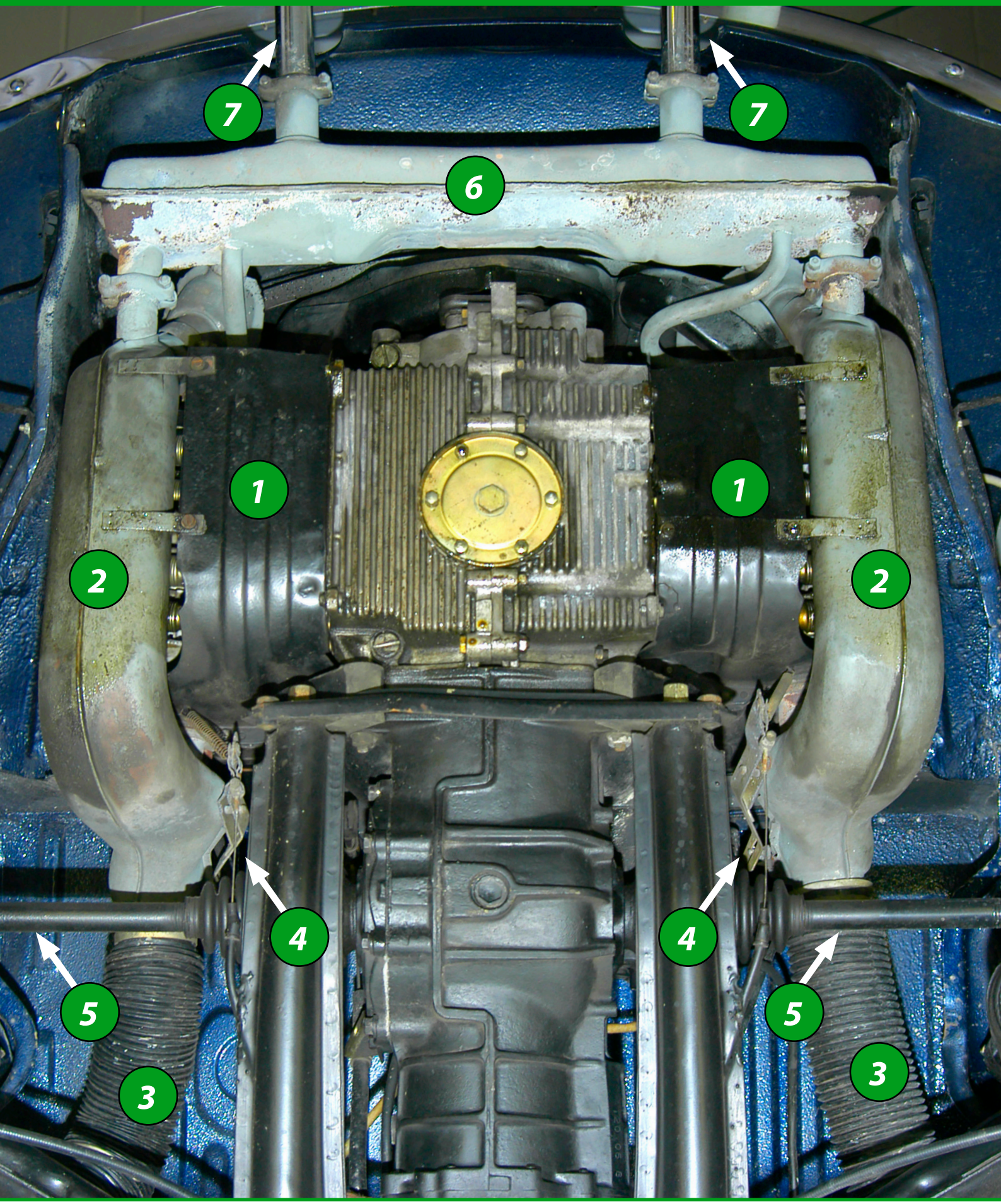
1

Heat exchangers

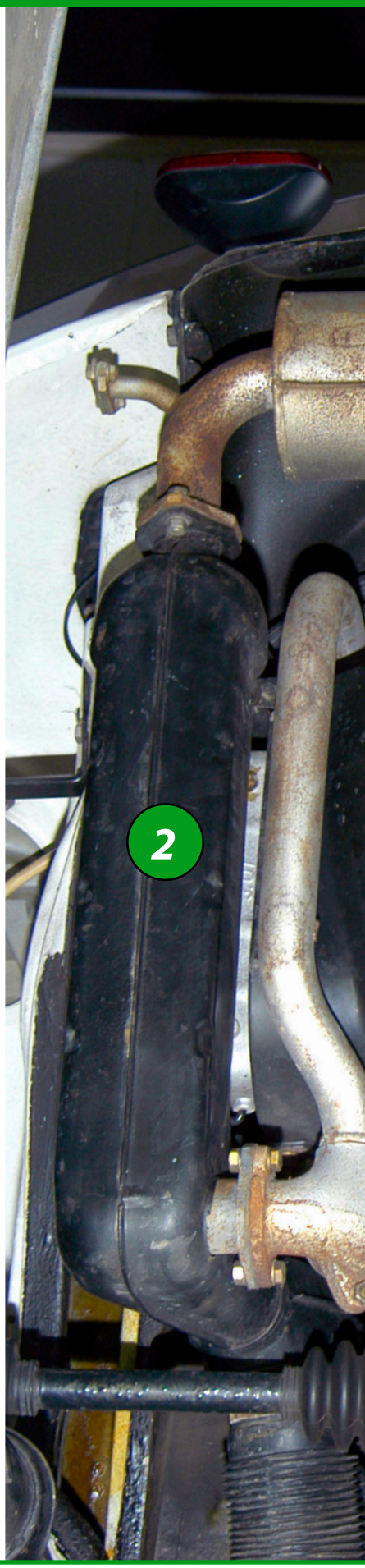
You will find two heat exchangers (2), one on each side of the engine. Two plastic heater hoses (3) transport the heated air into the Beetle interior. You can see the heater cables (4) on the picture on page 7, they connect the heating control mechanism to the heater levers in the car. Try to pull the cables, you should hear the heater flaps open en close. If the system is stuck, there is a problem with the heating system. If you want to learn more about the heating system of the air-cooled Volkswagen, go to edition 09.

If some parts of the engine tin are missing, you will need to replace them immediately. Check if there are leaks in the heat exchangers, if so, you'll need to replace them. Quality heat exchangers are expensive, so, take that into account in your budget.

underneath the VW 1303



We showed on page 7 the European version of the VW 1303 with type 1 1600 engine with single carburetor. On page 9 we show a USA 1303 with the export version of the type 1 engine, a 1600 injection. The heat exchangers (2) of this USA Beetle are more angular shaped. Under the fender on the right side of the picture you can see the additional emission control parts (8) that were added to meet the stringent gas emission standards of the USA in the early seventies.

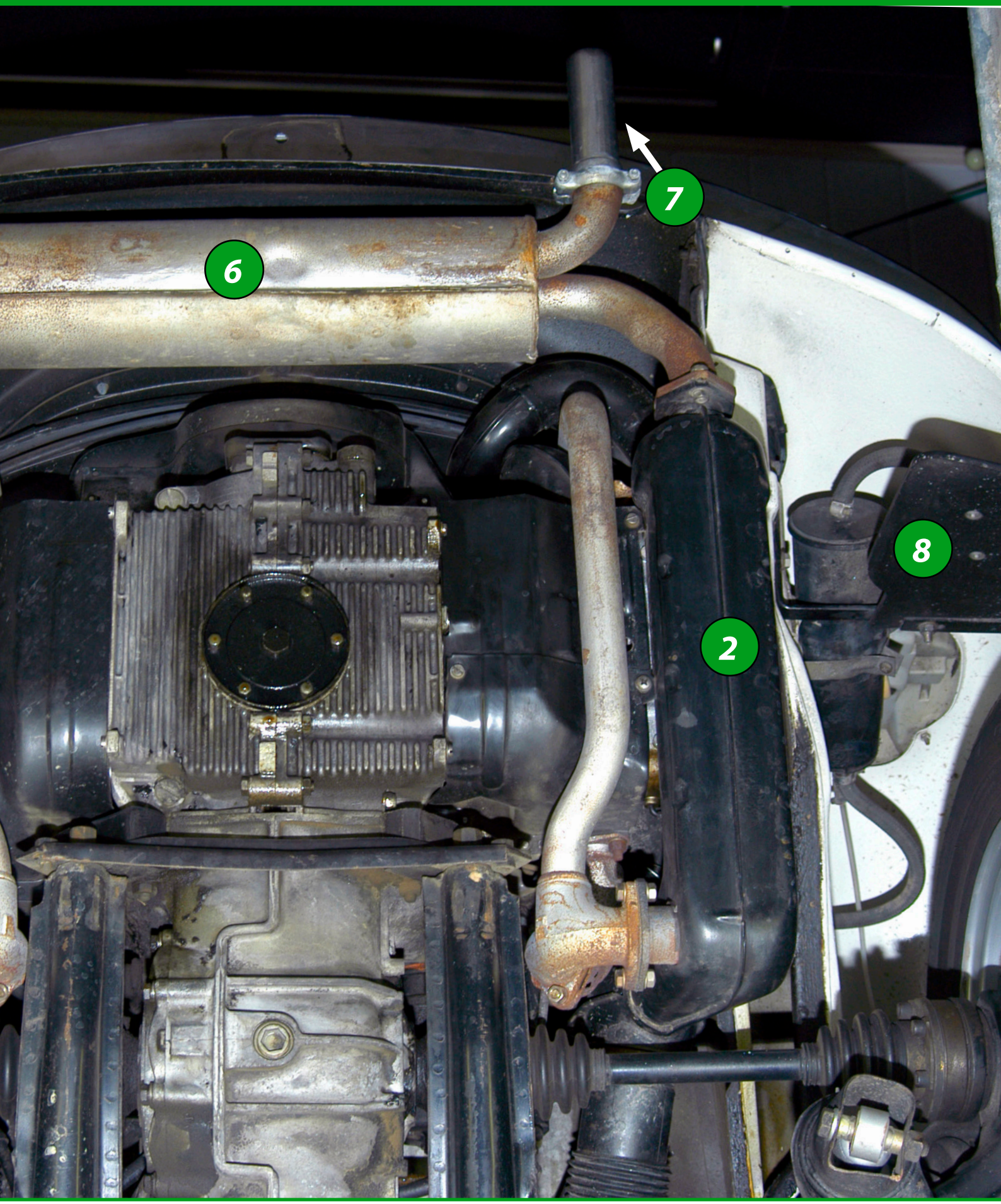


The exhaust

The exhaust (6) on the injection engine has only one tail pipe (7) while the carburetor engine on the European 1303 has two (refer to page 7). The rest of the USA Beetle is very similar to the European one or the VW 1200 we saw in edition 14.

The rear brakes, the suspension, the running boards, the body and chassis are also very similar to the VW 1200, take into account the same remarks as in edition 14. Some parts look a little different, the 1303 is indeed 15 years younger than the VW 1200 discussed in edition 14. The 1303 Beetles we show are convertible models from Karmann, they have additional reinforcement panels to compensate the lack of a roof. The panels are not shown on the pictures in this article.

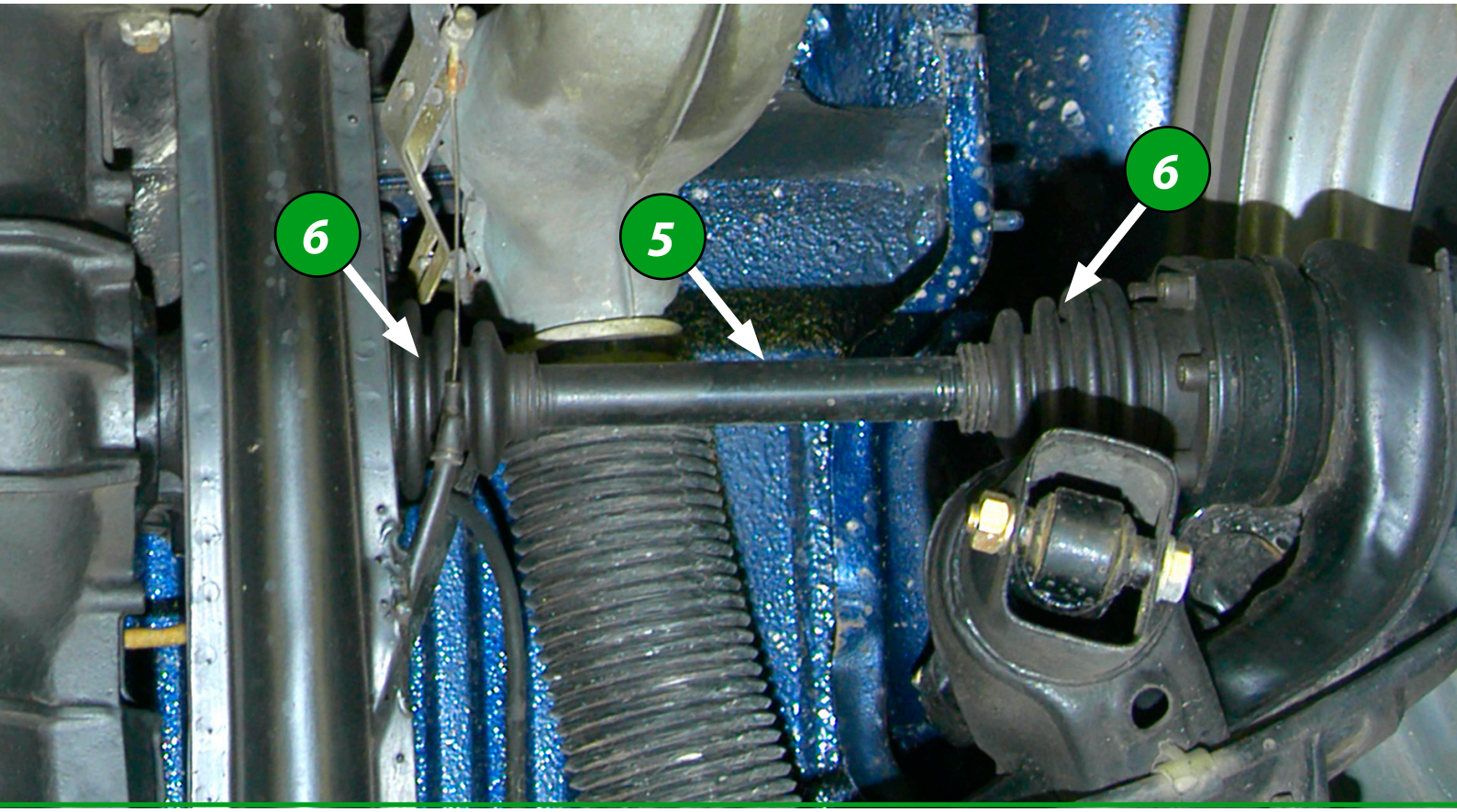
underneath the VW 1303



The gear box, the clutch, the throttle and the starter are very similar to the VW 1200, we won't elaborate on these topics again, if you want to know more about them we advise to read edition 14.

Transmission

The main difference between the old generation Volkswagens and the 1303 is how the power of the engine is transmitted the rear wheels. We explained in edition 14 on page 4 what the difference is between the old swing axle and the modern IRS transmission (5).



underneath the VW 1303

The VW 1303 has an IRS drive axle on both sides of the gear box. This type of axle hinges on both the wheel side and the gear box side. It is the IRS drive axles that will transmit the power of the engine to the rear wheels. The IRS transmission offers more comfort and an improved handling compared to the older swing axle technology. The IRS was introduced on most deluxe VW models to be more competitive in the late sixties.

We show the left hand side IRS drive axle on our VW 1303 on page 10. One side is attached to the gear box, the other side is attached to the rear wheel. Rotate the wheel, you will see the IRS drive axle rotate as well. This is not the case with the old swing axle, the swing axle rotates inside of a tube. These IRS drive axles should not show signs of grease, the CV boots should be completely dry.

Check if the rubber constant velocity boots (or CV boot) (6) are not cracked or damaged, there are two CV boots on both sides of the gear box. They should not leak grease, if they do, replace them as soon as possible. This is quite easy to do yourself by removing the IRS drive axles, it will take a day of work if you do this for the first time. New CV boots are not expensive.

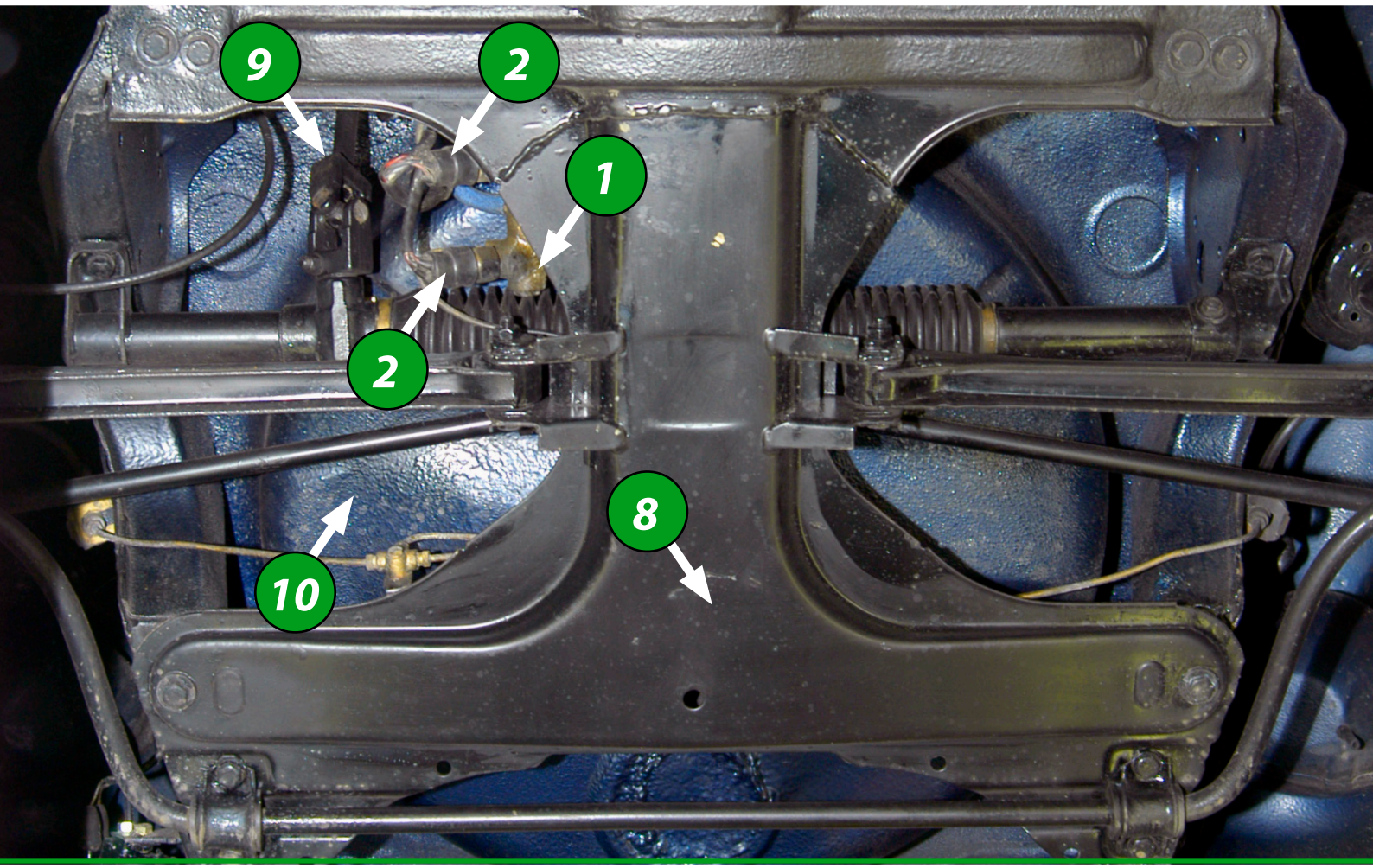
Below we show a new CV boot kit that includes a new CV boot, bolts, clamps and grease.

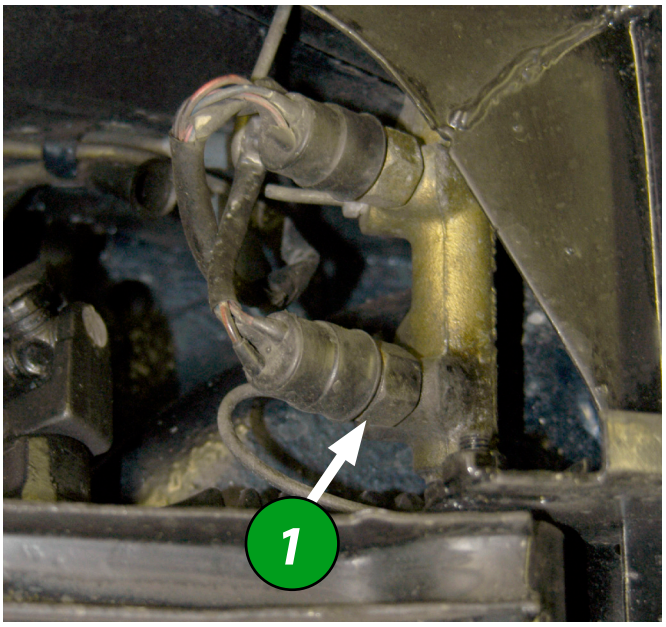
Underneath front

The front of the VW 1303 is very different to the VW 1200 we showed in the previous edition. The front of the 1303 is very similar to its predecessor the 1302. We will explain all the parts shown on the picture below.

Master brake cylinder

The master brake cylinder (1) is very visible, it was not the case on the VW 1200. We show the master brake cylinder as number 1 on the pictures. The 1303 has a dual brake circuit, each circuit will take care of two wheels. Check for brake fluid leaks, this fluid is very corrosive, if it is leaking for some time the damage to the chassis parts could be big!





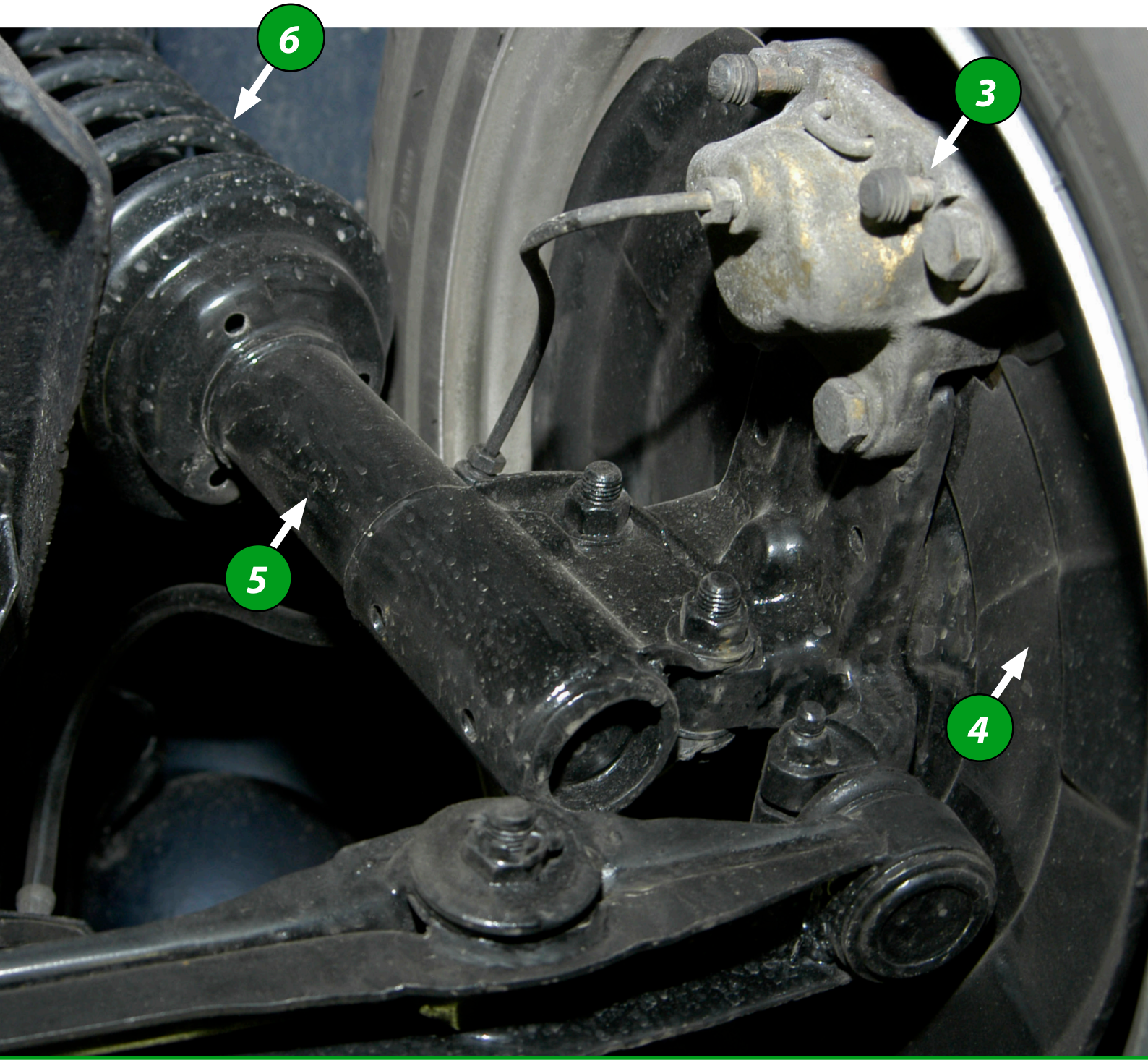
We show the master brake cylinder of the VW 1303 below. You can see the two connections for the brake lines, one line to activate the front wheels and one line for the rear wheels. The connection with the brake pedal rod is hidden under the rubber dust cap.

A dual brake circuit is of course safer than a single circuit, if one circuit fails you always have two wheels with brake power left. Two brake light switches (2) are installed on this type of master brake cylinder.

This is a brake light switch, you will need two switches on a dual master cylinder. These switches are delivered with the master brake cylinder in some cases, not always. Check all brake parts in our webstore for more details.

Front brakes

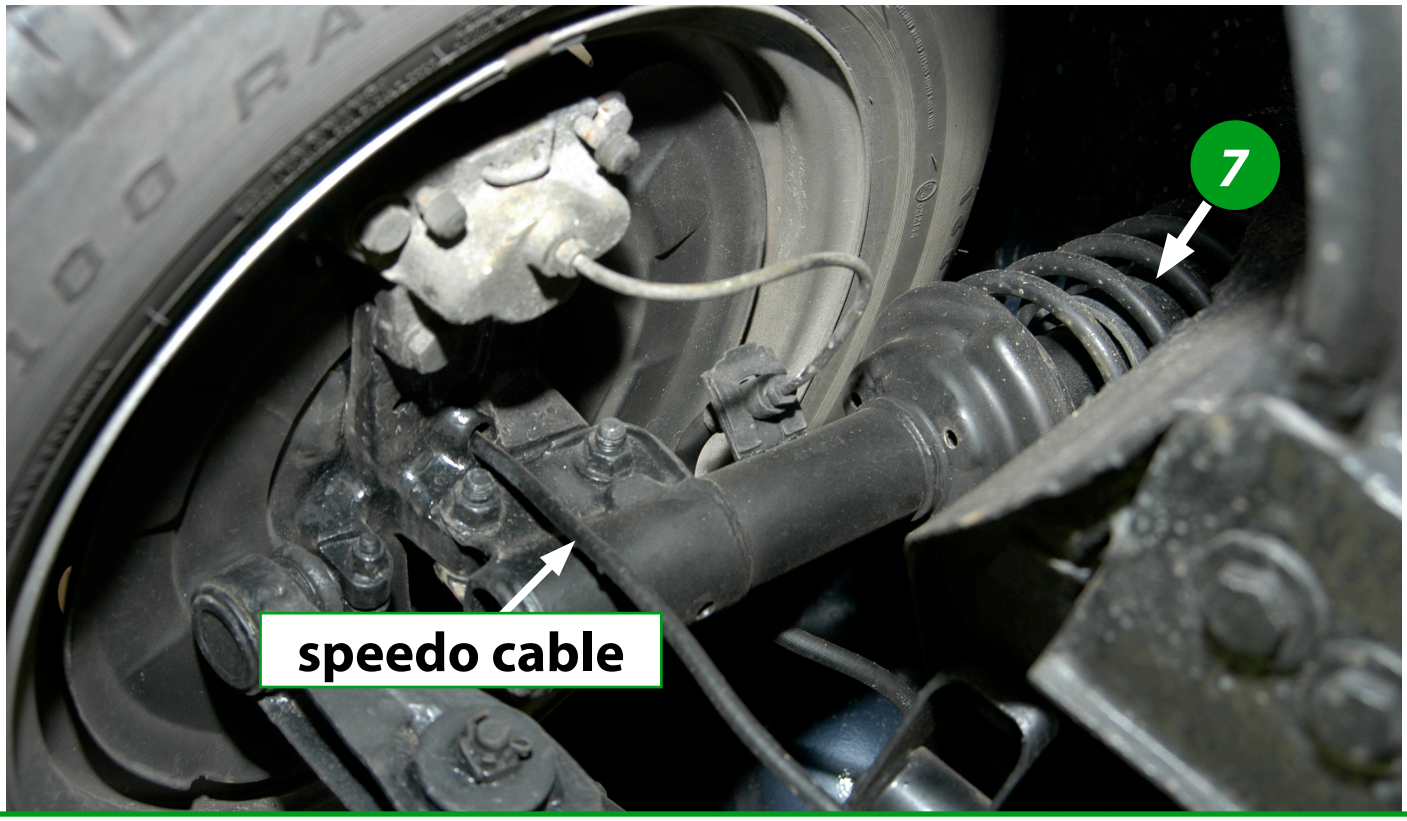
The front brakes are visible on the left and right hand side underneath the 1303, these are disc brakes versus drums on the VW 1200. We show the disc brake of the right hand side wheel, the brake caliper is shown as number 3.



Check the brake lines carefully for leaks, but also if the flexible brake lines are not cracked and if the metal brake lines are not corroded. Brake fluid leaks are very corrosive! Rotate the wheels now, they should moving without friction, but you will hear some abrasive sound coming from the brake pads, this is completely normal (it wasn't for the VW 1200 brake drums). Check the quality of the backing plates (4), these metal parts protect the discs against dust and water.

Speedo cable

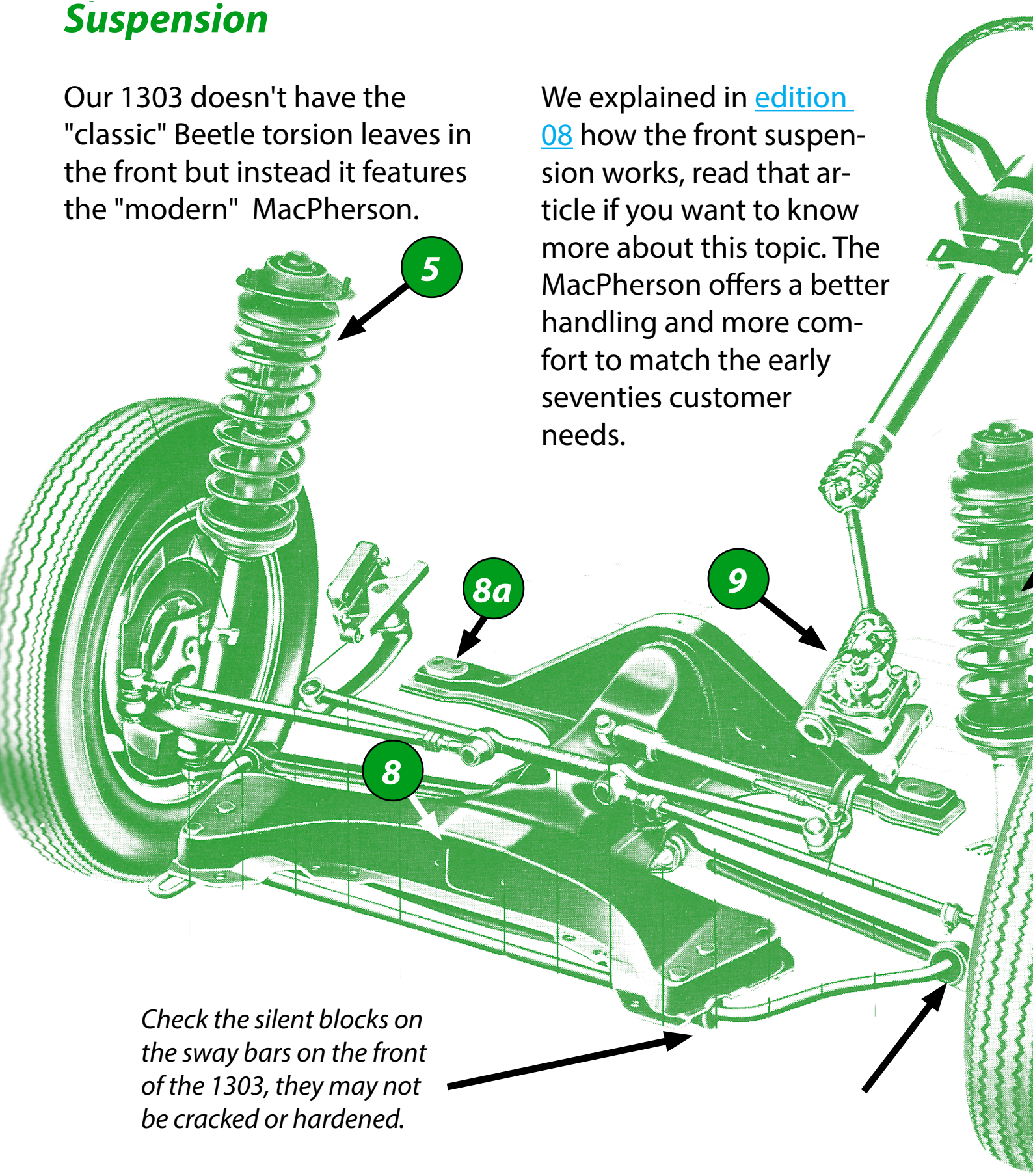
On the left wheel of the 1303 is the speedo cable. It connects to the speedo gauge in the dashboard just as in the VW 1200.



Suspension

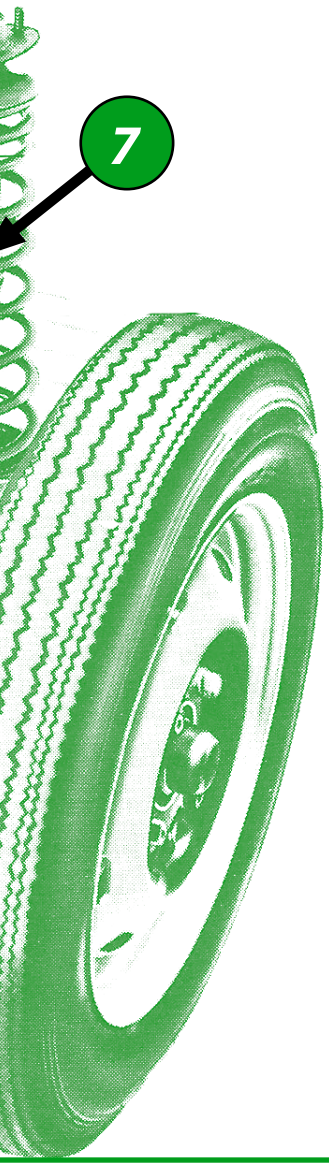
Our 1303 doesn't have the "classic" Beetle torsion leaves in the front but instead it features the "modern" MacPherson.

We explained in edition 08 how the front suspension works, read that article if you want to know more about this topic. The MacPherson offers a better handling and more comfort to match the early seventies customer needs.



Check the silent blocks on the sway bars on the front of the 1303, they may not be cracked or hardened.

We show the MacPherson parts on the pages 14 and 15 (5). It has a coil spring (6) with an shock absorber (7) inside. You can barely see the shock on page 15, that is why we added this drawing to make it more visual.

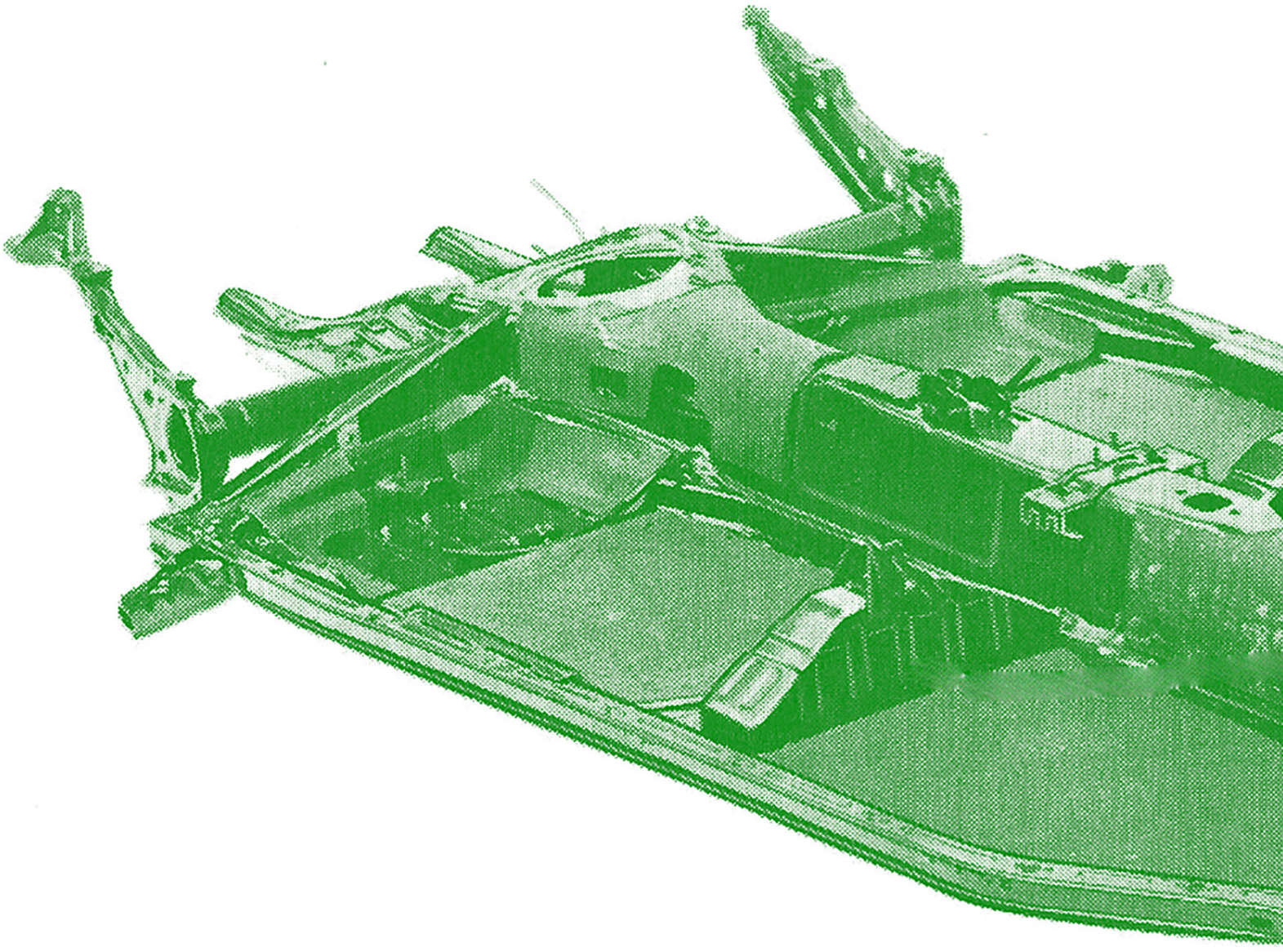


Check the MacPherson parts for signs of wear and rust. The shocks shouldn't leak oil (if they are oil filled shocks). Check also under the front hood if the MacPherson strut mounting bolts aren't corroded, if so, this could be an expensive repair.

Body and chassis

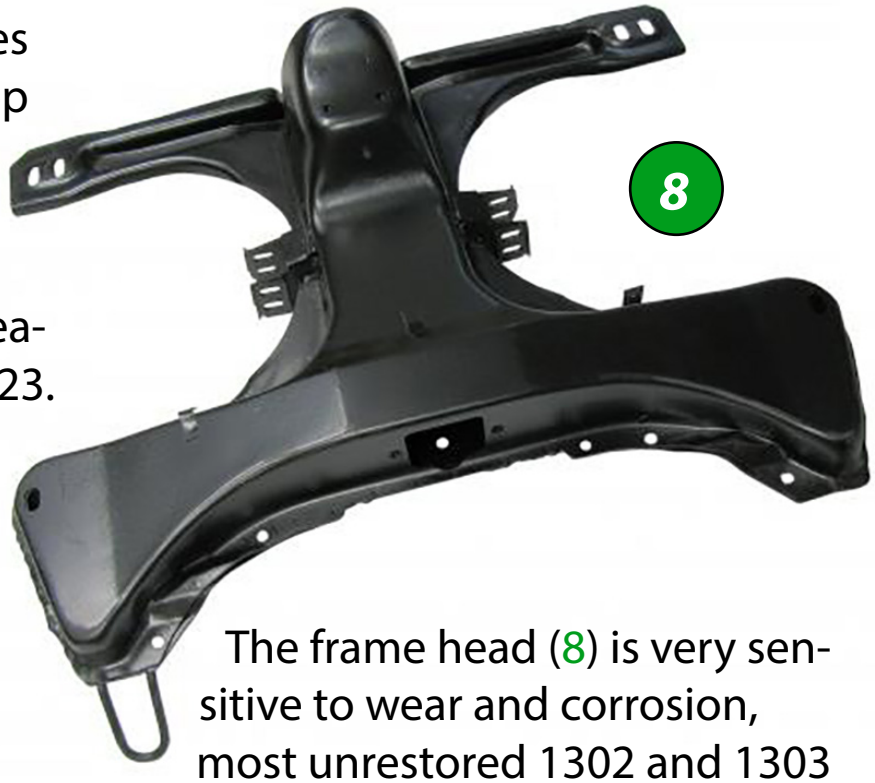
The frame head (8) is completely different from the "classic" design of the VW 1200. The introduction of the MacPherson strut suspension required a complete review of the frame head. Make sure it is solid and that there is no structural damage due to corrosion. Take your time, check the frame head bolts (8a) on both sides. If there is a lot of rust, the repair will be expensive.
A professional will be able to see if the front has damage caused by a collision.

#43 Buying a VW

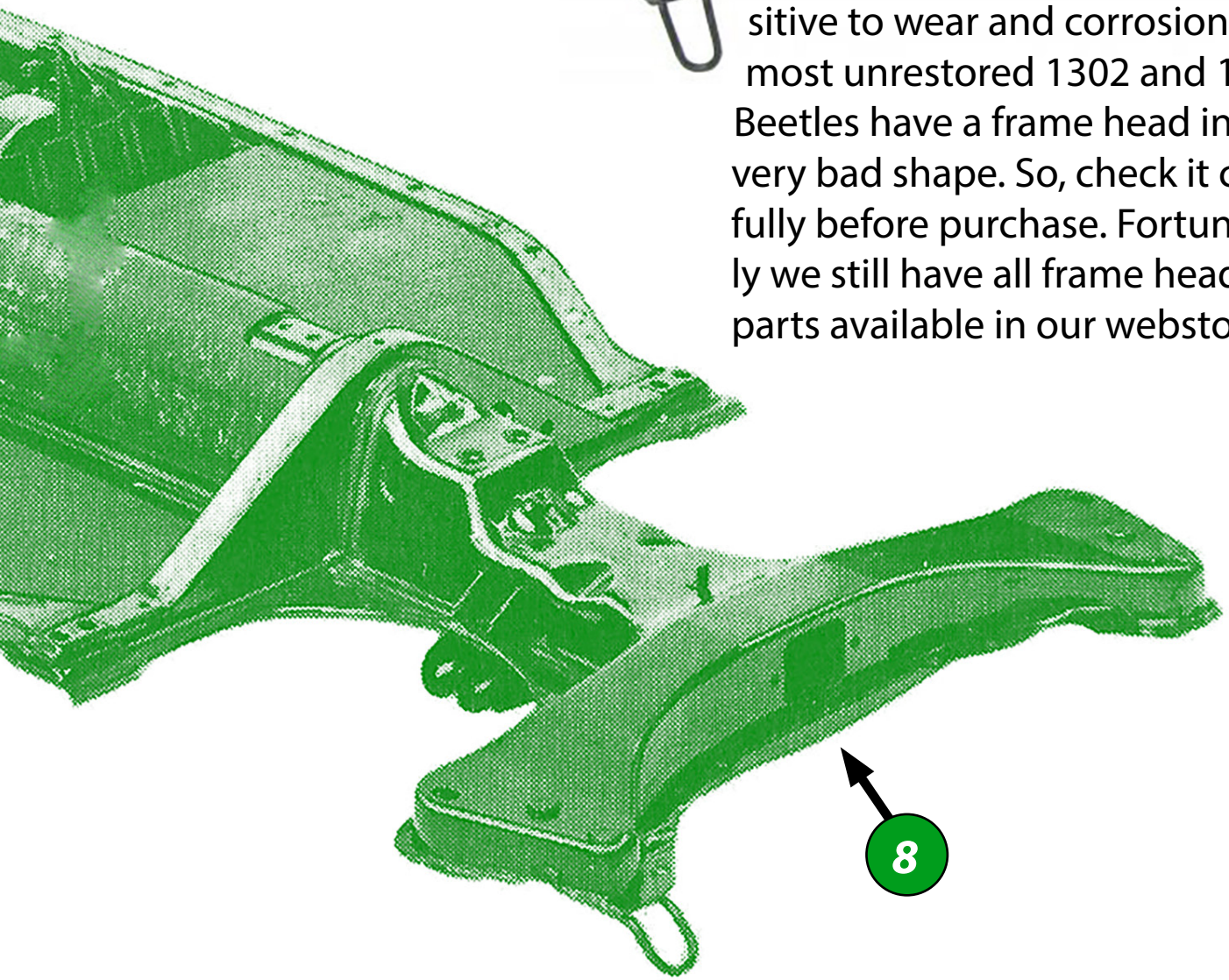


underneath the VW 1303

This beautiful drawing comes from a Volkswagen workshop manual, it shows how different the front part of the 1302 or 1303 chassis is compared to the VW 1200 featured in edition 14 on page 23. The rear is very similar on all VW Beetle models from the start of the production until 2003.



The frame head (8) is very sensitive to wear and corrosion, most unrestored 1302 and 1303 Beetles have a frame head in very bad shape. So, check it carefully before purchase. Fortunately we still have all frame head parts available in our webstore.

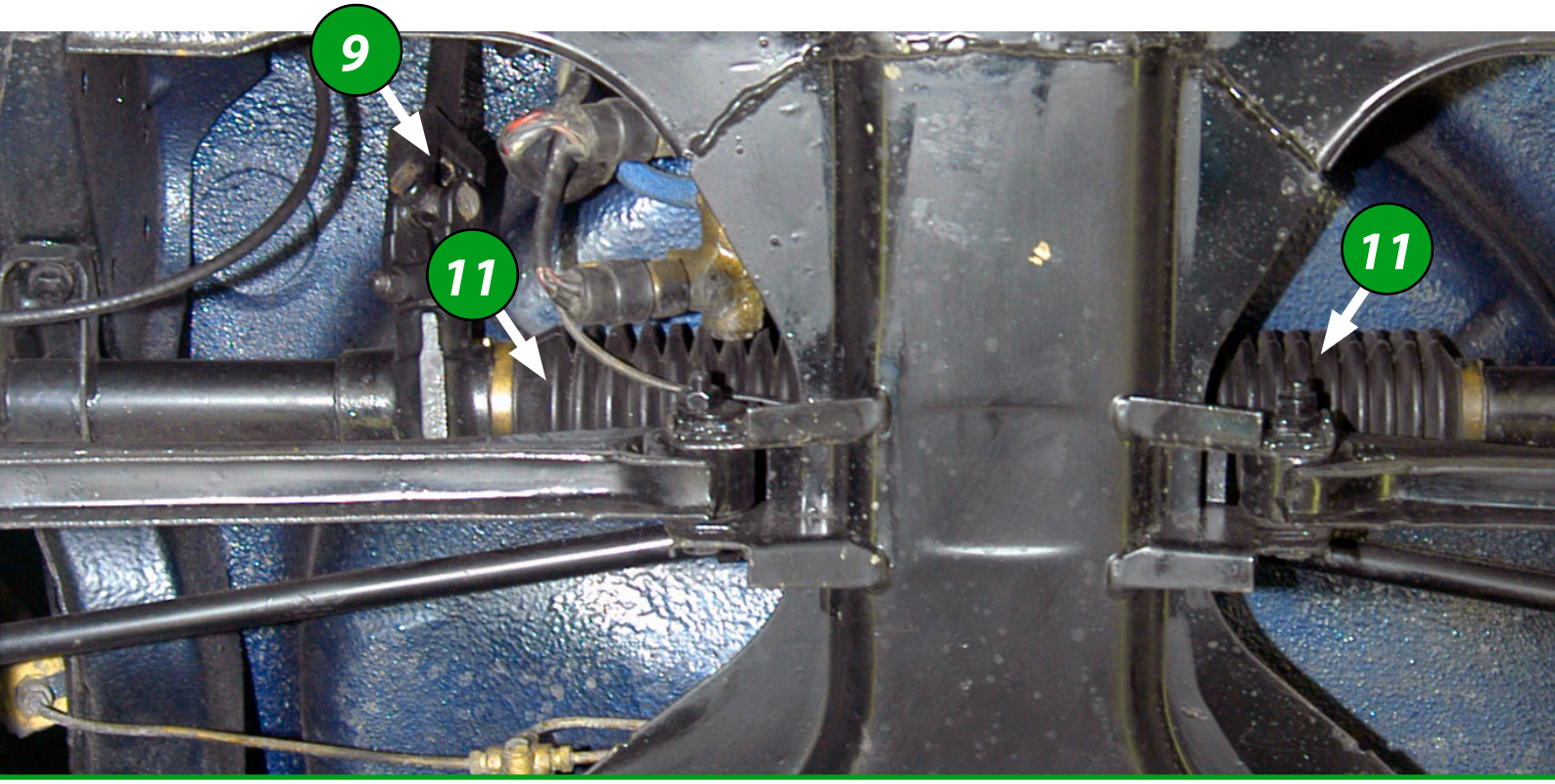


The 1303 doesn't have a spare wheel compartment like the one on the VW 1200, the spare wheel is located in the front trunk in a horizontal position. You can see the spare wheel location (10) on page 12. Check for corrosion or damage.

Steering box

The steering box (9, refer also to page 12) makes it possible to turn the wheels. The construction of the steering box on the 1303 is very different from the one on the VW 1200.

Ask a friend to turn the steering wheel inside the car, you will see how the steering box reacts to that (make sure the car is stable before doing that). Check for oil leaks around the steering box, this is an expensive replacement part. Check if the rubber boot (11) is still in good shape, it is not expensive to replace. We show on page 16 that the steering wheel inside the 1303 is not directly connected to the steering box, there is a U-joint in between to protect the driver in case of a frontal collision. This is an improvement compared to the older models.



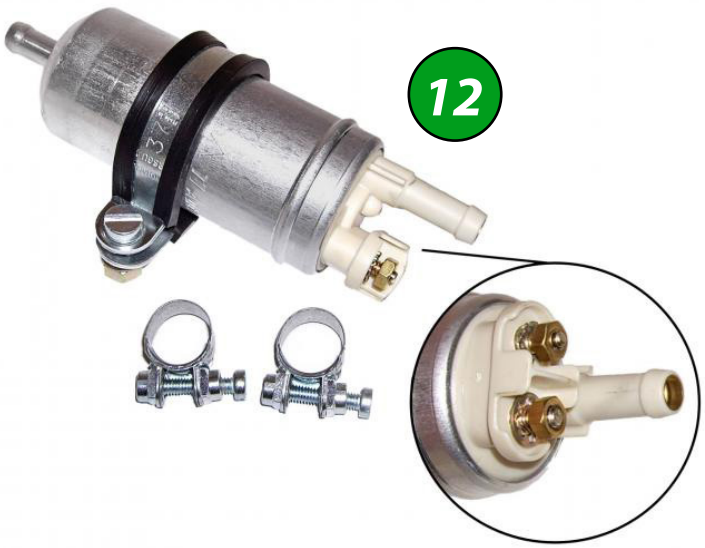
The rubber boot (11) will wear off easily, replace it to avoid oil leaks.

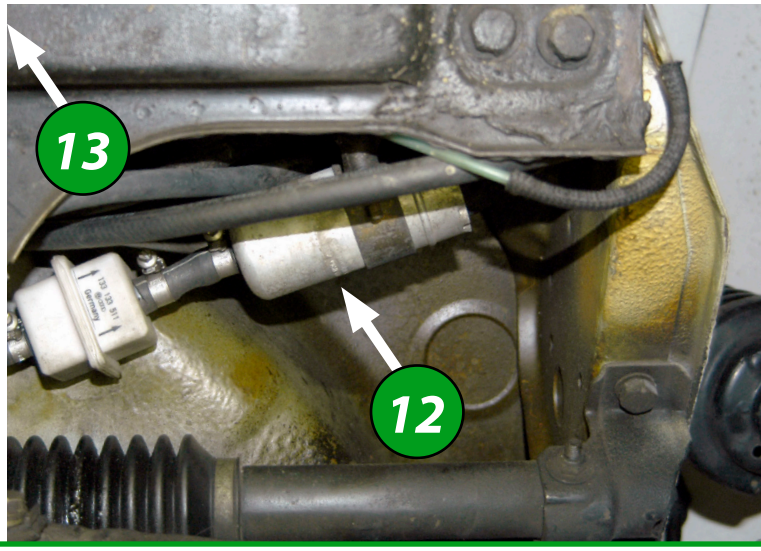
The steering box (9) on a 1303 is still available in our webstore.

Fuel tank

The fuel tank is not visible from underneath the 1303. It is safely hidden under the front hood, far away from dirt and bad weather.

We show below the USA 1303 with injection, this type of engine requires a constant fuel pressure in the fuel lines to feed the injectors. This is created by an electrical fuel pump (12), we also show the special fuel filter for this injection engine (13).



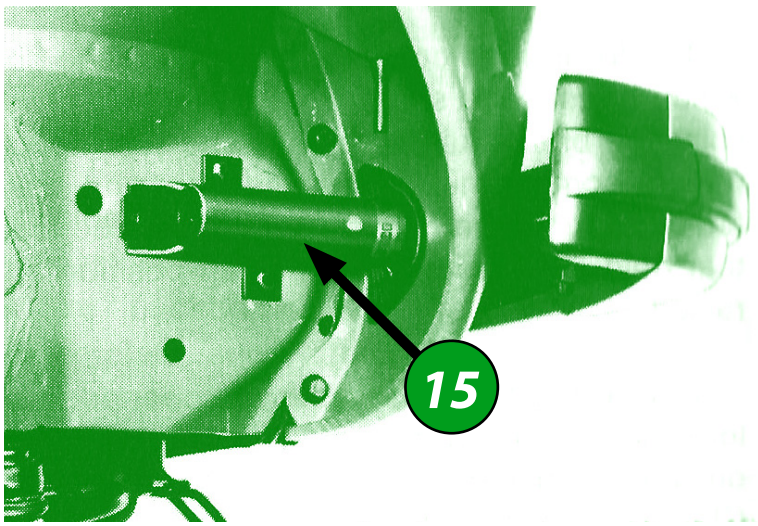


Front bumper

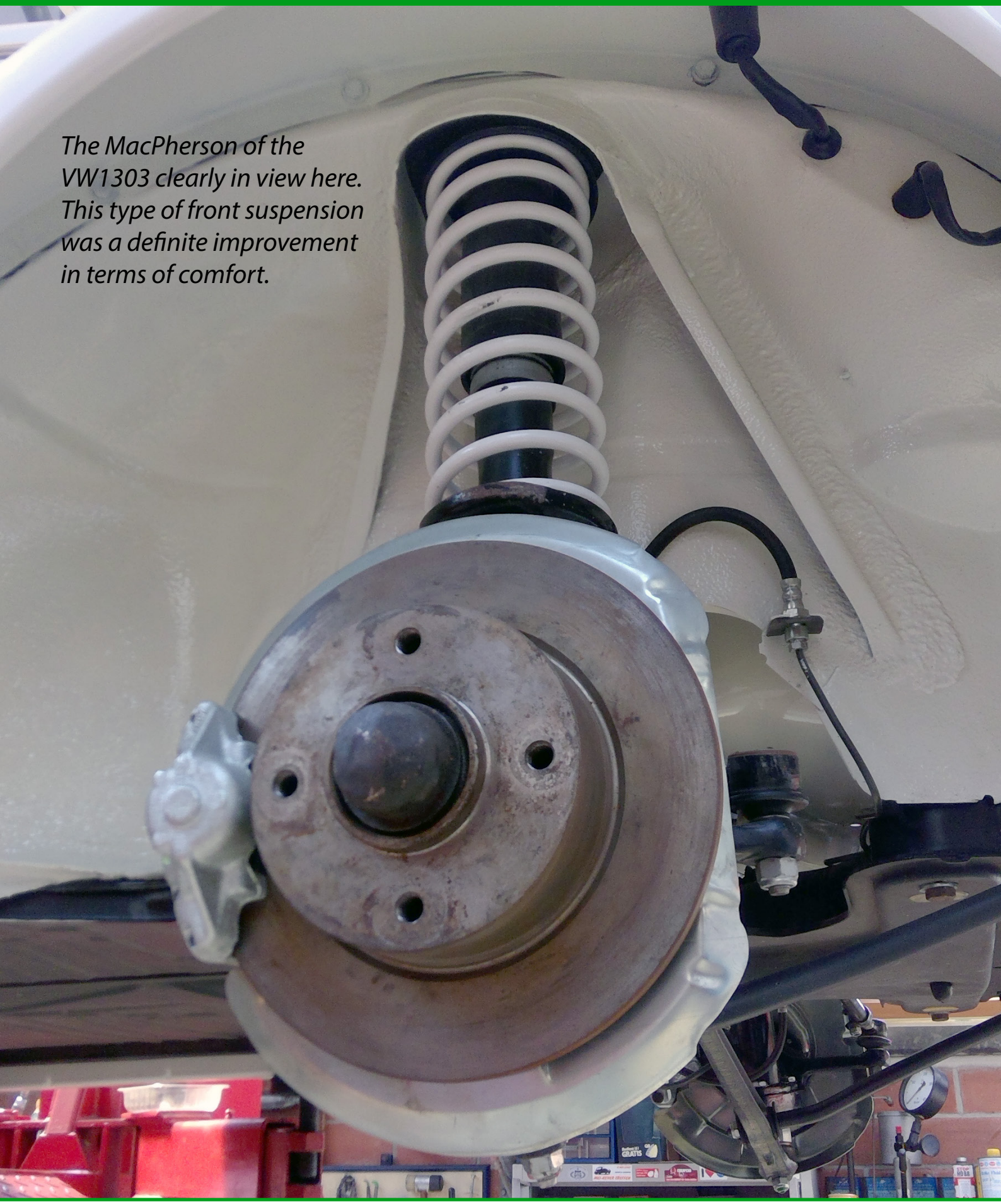
The front bumpers are not very different compared to the ones on the older VW 1200 model. They are more angular shaped, more robust, the USA bumpers are installed a little higher than the European bumpers to be compliant with the USA rules. We show the 1303 European front bumper on the picture below (14). The picture on the right shows the USA bumper with additional shock absorbers (15), the are able to absorb the impact of a frontal collision at low speed to avoid severe damage to the body.

Conclusion

We have studied the bottom of the VW 1200 and the VW 1303. We will continue exploring these two models from the top next time and explain what should added to your checklist when buying an air-cooled Volkswagen.



underneath the VW 1303



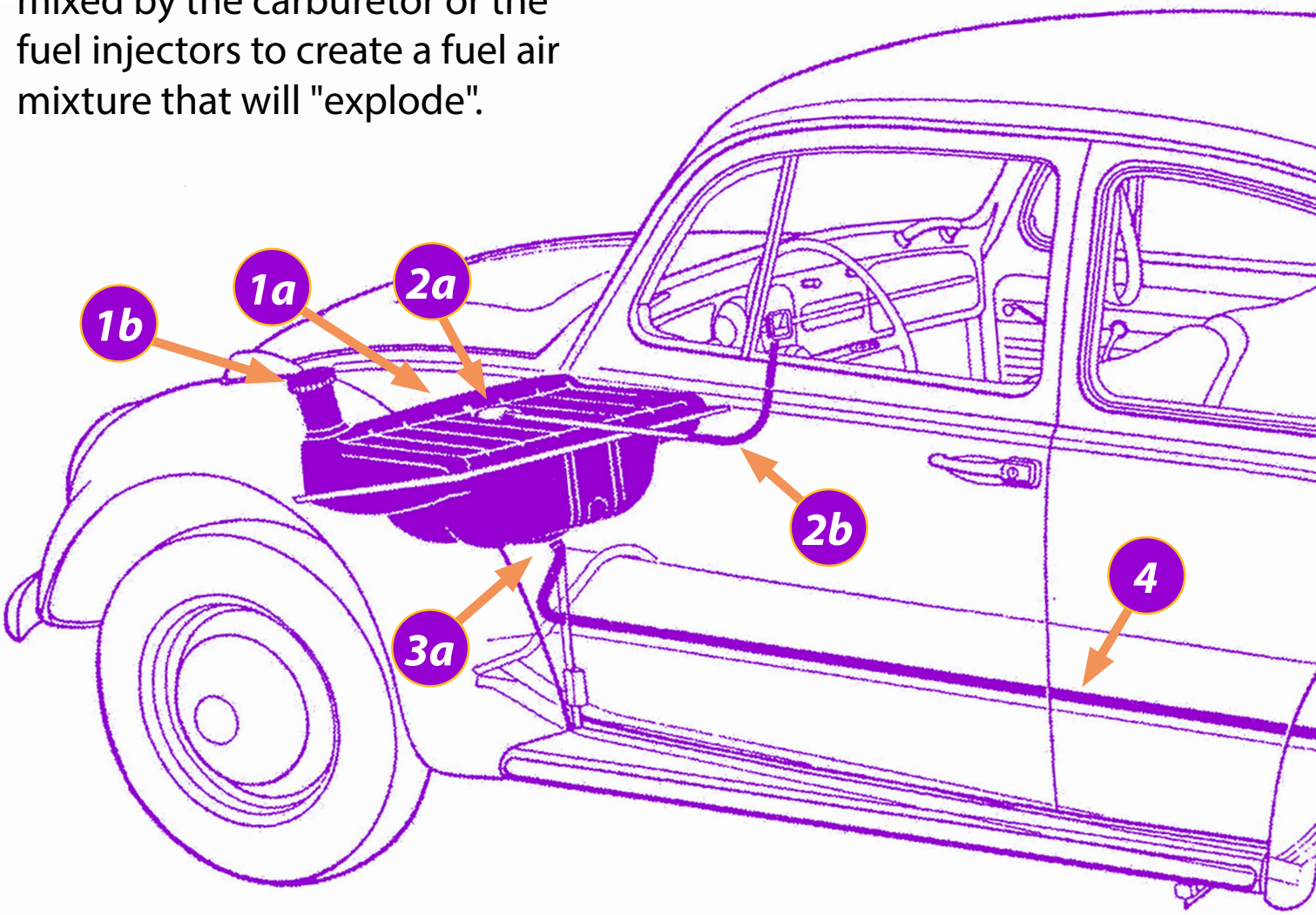
The MacPherson of the VW1303 clearly in view here. This type of front suspension was a definite improvement in terms of comfort.

#44 Carburetor

Introduction

The combustion engine (also called the otto engine) installed in our air-cooled Volkswagens runs on a mixture of air and fuel. Fresh air flows through the air cleaner to the carburetor or the fuel injectors. The air and fuel are mixed by the carburetor or the fuel injectors to create a fuel air mixture that will "explode".

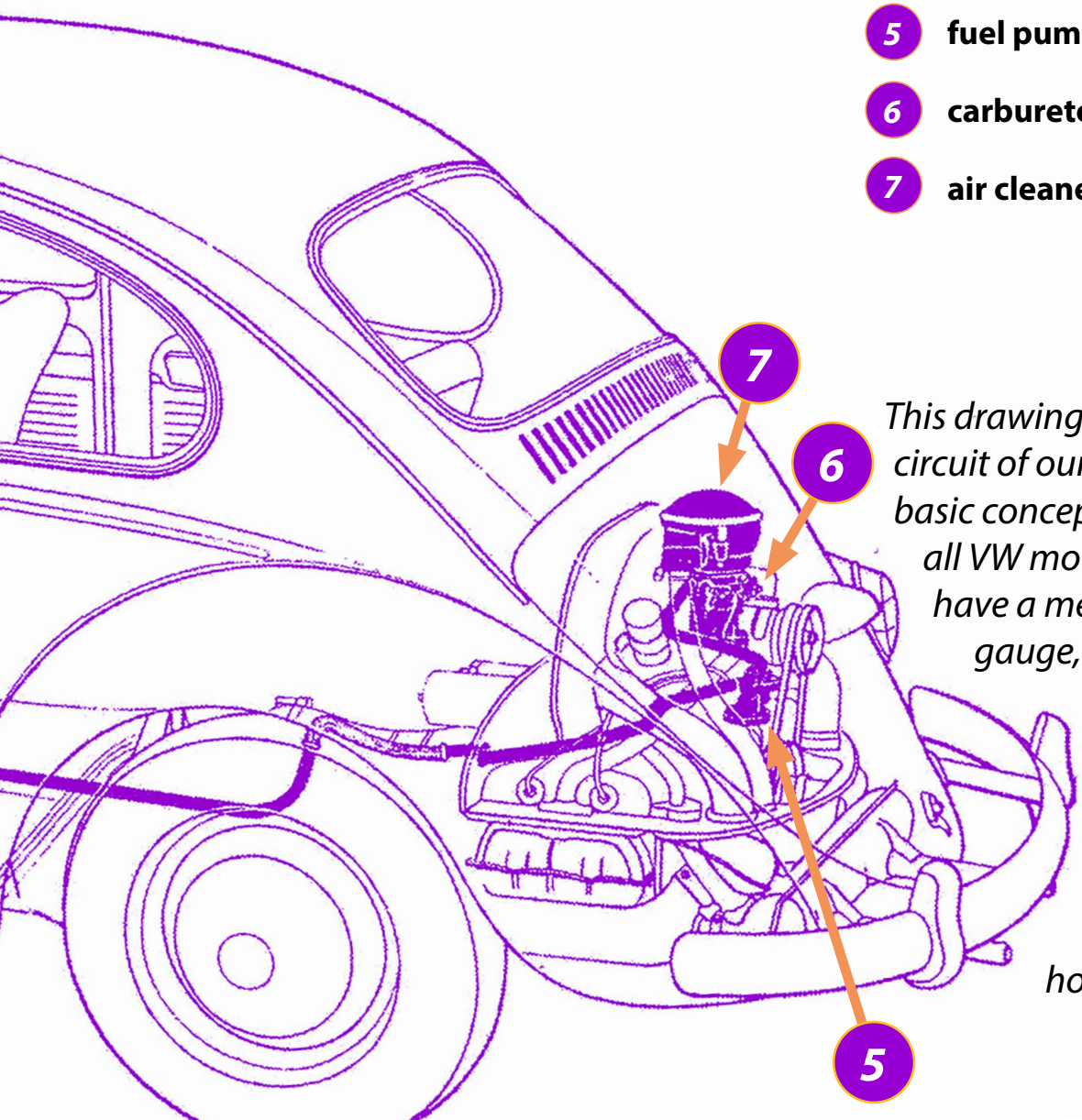
If you want to know more about this topic, we advise to read the article about the TDC in edition 06 of this technical series.



fuel circuit - concept

It is very important that the amount of air and fuel as well as the quality is controlled. The fuel circuit is not very well known by most VW owner, the result is a very poorly maintained fuel circuit on most old VW's.

- 1a **fuel tank**
- 1b **fuel filler neck**
- 2a **sender fuel gauge**
- 2b **fuel gauge cable**
- 3a **fuel filter**
- 4 **fuel line**
- 5 **fuel pump**
- 6 **carburetor**
- 7 **air cleaner**



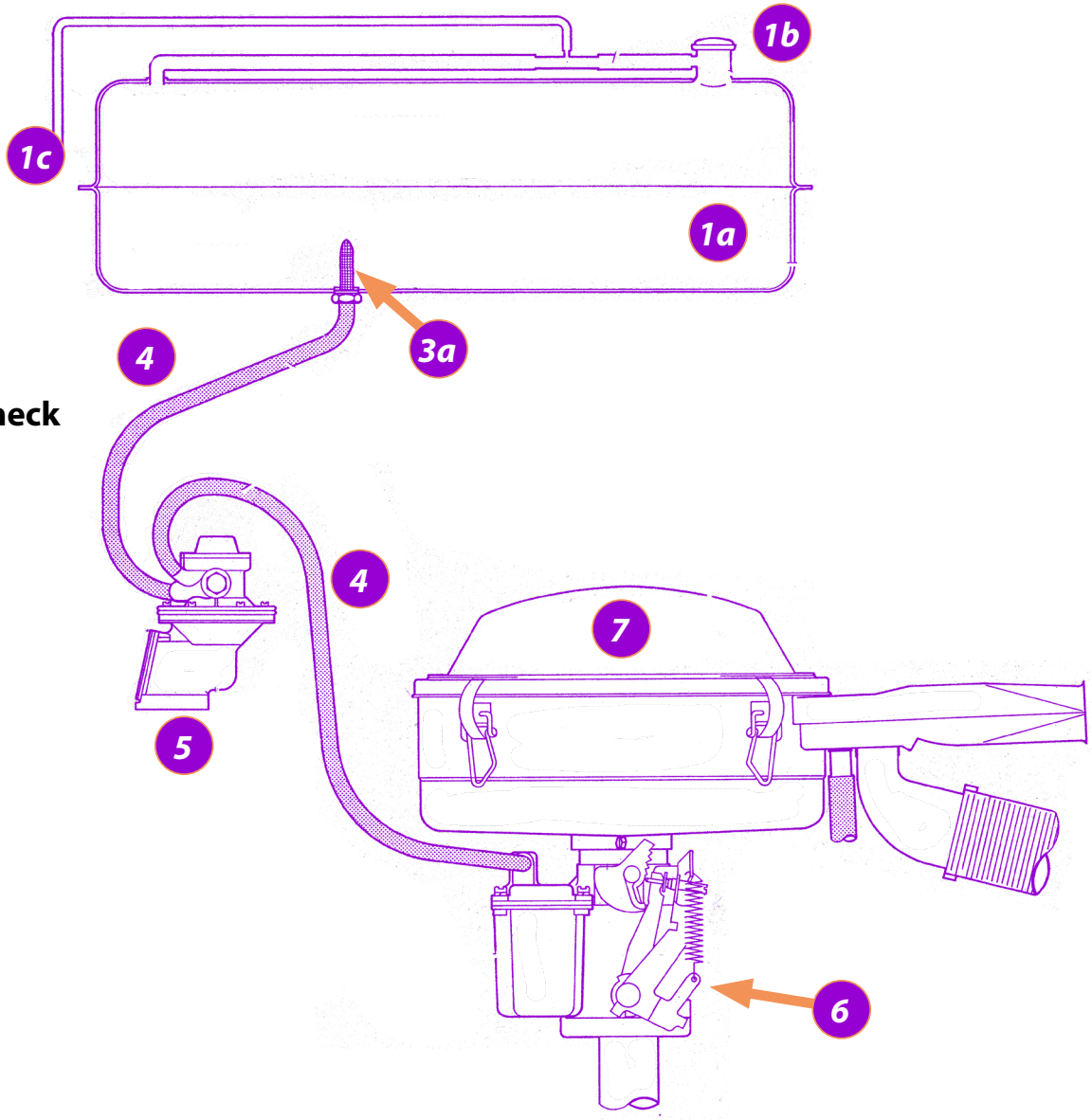
This drawing shows the fuel circuit of our VW 1200. The basic concept is the same for all VW models. Older cars have a mechanical fuel gauge, while younger models have an electrical gauge. This Beetle still has the fuel filler neck located under the front hood.

#44 Carburetor

To many times I've seen VW owners blaming the carburetor for a poorly running engine while the real parts to blame are upstream towards the fuel tank. Why is that? Most fuel circuit parts are hidden under the car, only the carburetor is visible and on some models the fuel pump.

If you don't see some parts I guess people think they are doing just fine?

We will discover all parts that contribute to the fuel circuit of your air-cooled Volkswagen. We will go more into details in the following editions.



- 1a **fuel tank**
- 1b **fuel filling neck**
- 1c **breather**
- 3a **fuel filter**
- 4 **fuel line**
- 5 **fuel pump**
- 6 **carburetor**
- 7 **air cleaner**

Fuel circuit components

The fuel circuit components have been updated and improved over the years depending on the availability of new technology. Some parts may look different on your VW, but the concept is always the same. We will discuss all fuel circuit parts now.

The fuel tank

It all starts with the fuel tank (1a) that stores and delivers the fuel to the carburetor. It is installed in the front of the car on most air-cooled Volkswagen (refer to the picture on page 24). The exception is the VW Bus, the fuel tank is installed in the back, in front of the engine.

We show a concept drawing of the fuel circuit on page 26, it comes from an old school book and shows how most cars fuel circuits are built. The parts will be mechanical on older cars or electrical on newer cars, but the principle is always the same.

The fuel filler neck (1b) is integrated in the body of the car on younger VW models, the Vintage VW's have a fuel filler neck located under the front hood. The fuel cap uses a cork seal or a rubber seal to avoid fuel leaks.

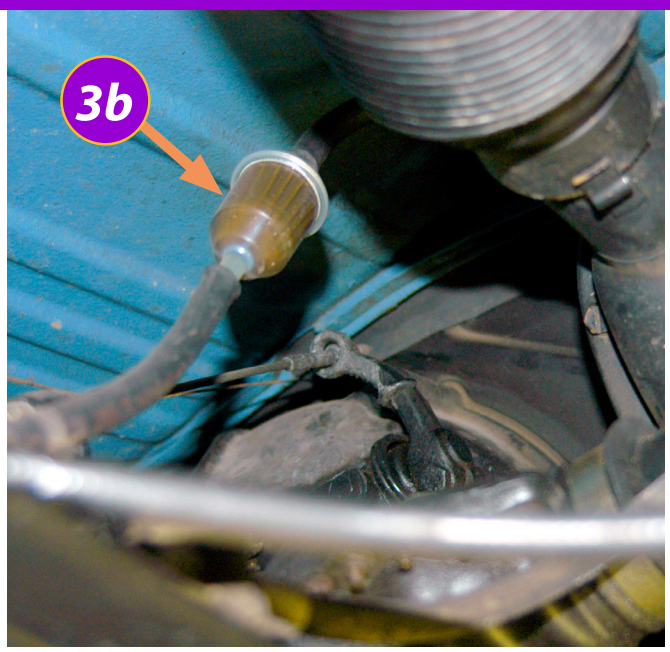
When the fuel level goes down, air should be able to flow into the fuel tank to avoid implosion. That is the reason why fuel tanks have a breather line (1c), to allow air to flow in and fuel vapors to flow out. This breather line is forgotten by most VW owners during maintenance. If it is not installed, fuel vapors will escape and enter the car interior. If it is clogged, the fuel will not flow to the fuel pump as it should and your engine will not run well.

#44 Carburetor

Fuel filter

The carburetor needs clean fuel, that is why fuel filters are included in the fuel circuit of your air-cooled Volkswagen.

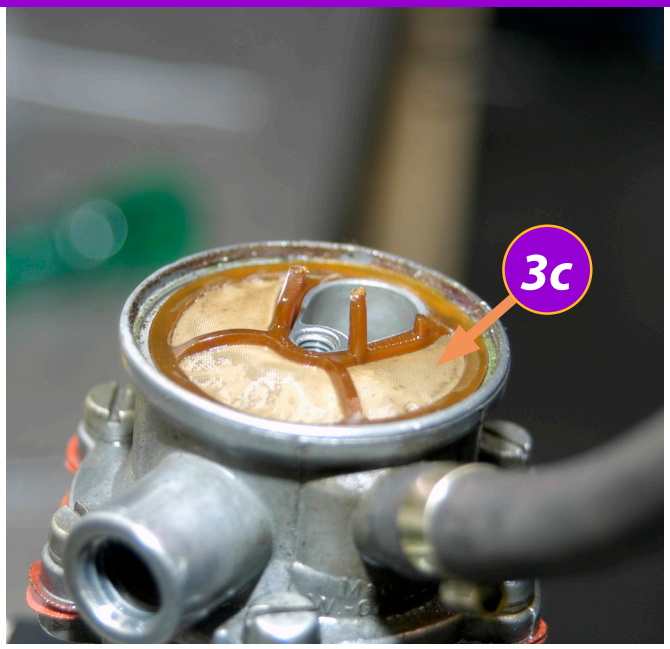
The first fuel filter is the one installed at the bottom of the fuel tank (3a), where the fuel is leaving the tank to flow through the fuel line towards the fuel pump. It is very well hidden, most owners have no idea there is a filter there that needs maintenance. This filter was shown on page 26 in the conceptual drawing. If this fuel filter is clogged, the fuel flow to the fuel pump will be dramatically reduced.



Some cars will also have an extra fuel filter (3b), it is most of the time installed underneath the car as shown in the picture above (3b) and on the drawing on page 29 (3b). Check if this filter is not clogged and if it is correctly installed, most fuel filters have an input and output.

The input and output are indicated with a painted arrow on this fuel filter.

fuel circuit - concept

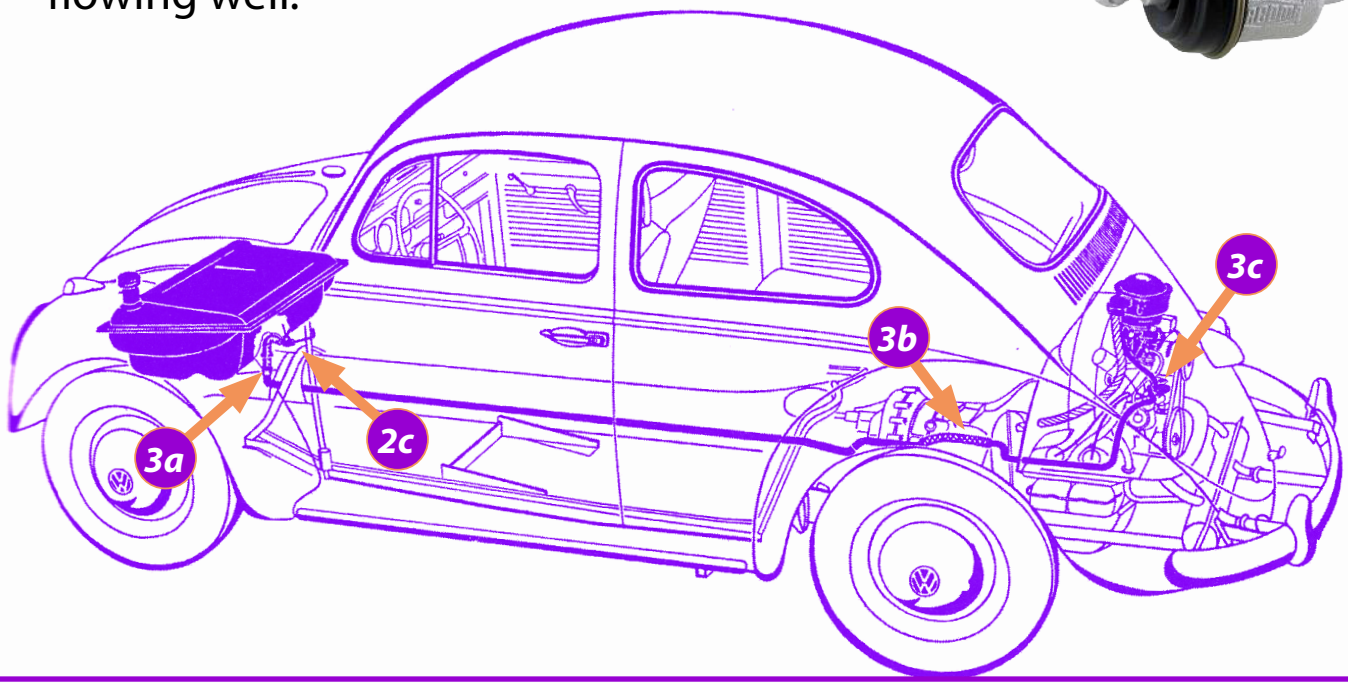


The fuel will also be filtered in the fuel pump. There is an extra filter built into the pump (3c) as shown on the picture above.

All fuel filters installed should be cleaned on a regular basis. The fuel pump and carburetor could malfunction if the fuel is not flowing well.

Fuel gauge

The Volkswagen Beetle on page 24 is a deluxe edition with mechanical fuel gauge installed in the dashboard. These older VW Beetles used a cable (2b) that connects the sender in the fuel tank (2a) to the dashboard gauge. The younger VW's use an electrical fuel gauge. The model on the drawing below doesn't have a fuel gauge but a fuel valve that includes a reserve position (2d).



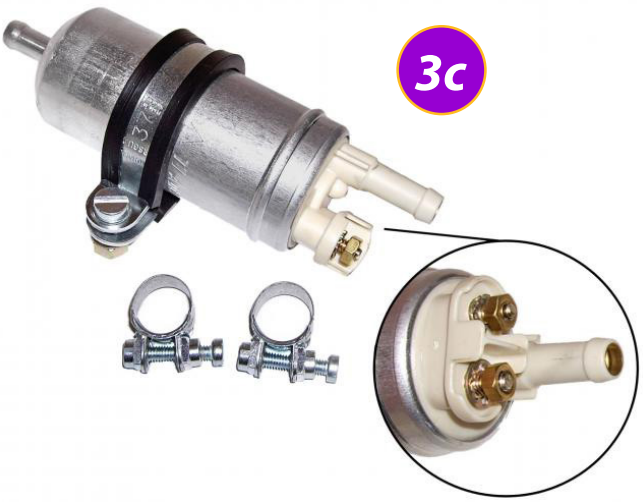
#44 Carburetor

The fuel pump

The fuel pump (3c) sucks fuel from the fuel tank en pushes it into the float bowl of the carburetor (6). Most air-cooled Volkswagen have a mechanical fuel pump installed driven by the crankshaft. Injection engines use an electrical fuel pump.

mechanical fuel pump

electrical fuel pump



The carburetor

The carburetor (6) sucks the fuel from its float bowl (delivered by the fuel pump) and air from the air cleaner (7). It works differently when you have an electrical fuel pump, the fuel is pushed under pressure through the fuel line to the carburetor or fuel injectors.

The fuel lines

The fuel lines (4) need to be in perfect shape, they shouldn't be cracked or hardened (or corroded for metal fuel lines). If you have any doubt, replace them. The fuel is under pressure in injection engine fuel lines, bad fuel line will generate fuel leaks much faster than in carburetor engines and the fuel pressure will go down which will have a bad influence on your engine performance.

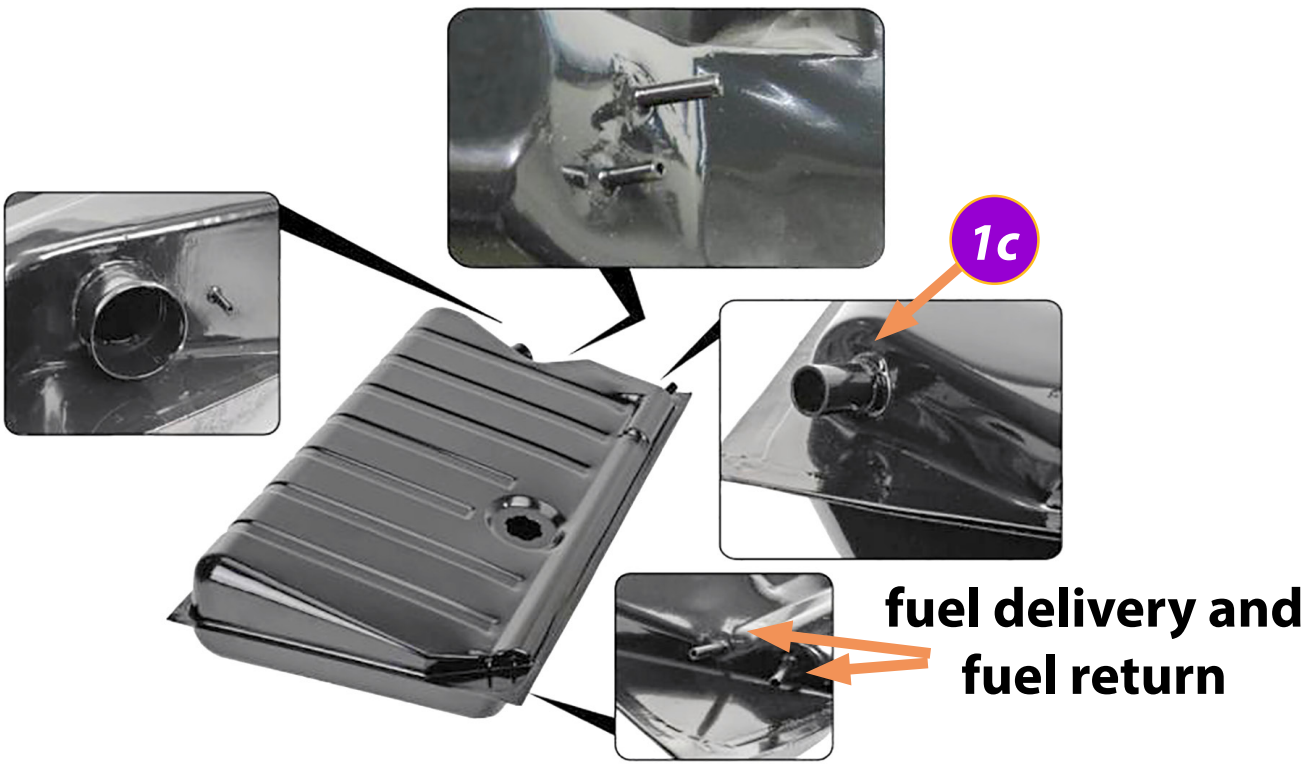
fuel circuit - concept

Fuel return line

All engines need a fuel line that goes from the fuel tank to the fuel pump. Injection engines also need a fuel return line to send the surplus of fuel back to the fuel tank. These engines don't have a float bowl to store fuel (buffer) in the carburetor. We show such a fuel tank below that has two tubes in the fuel tank, one goes to the fuel pump and the other is the return line. The breather line (1c) is also shown.

Conclusions

This was a short overview of all components necessary to transport and store fuel to power the engine. We will explain how all parts work in following editions of this technical series. It is of the utmost importance to understand how each and every component works to be able to diagnose your engine. Don't be too fast in drawing conclusions about what's going wrong with your engine, but first check all parts of the fuel circuit, they are crucial to your engine.

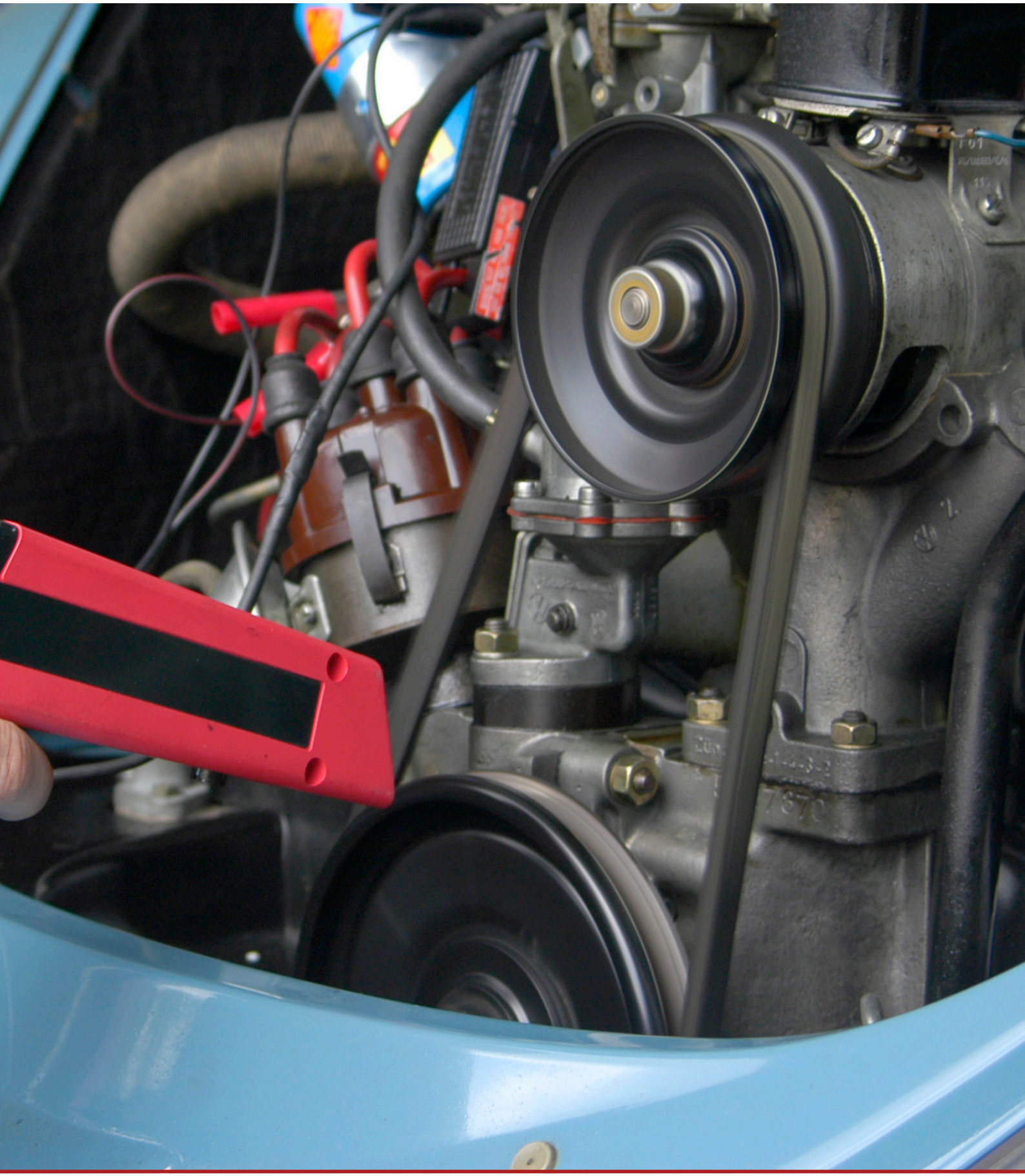


Introduction

We talked about the ignition timing in the previous edition and how to set the ignition timing using a simple light bulb; the so called static method. Read all about it in edition 14. We explained how to find the timing advance value for your engine type, we also explained how to find the Top Dead Center (TDC) and clarified the difference between the static and the dynamic method.

In this issue, we will set the ignition timing with the engine running, the so called **dynamic method**. VW advises this method in its workshop manuals for all air-cooled VW engines starting August 1970. The static method with the light bulb is from August 1970 on only used as (provisional) basic setting before doing the dynamic method with strobe timing light.

ignition timing - dynamic



Strobe light

Measuring **dynamically** is more accurate, it also allows to check if the advance mechanism works fine (refer to edition 10 to know more about how the advance mechanism works).

The ignition timing has to be set to 32° advance at high rev on engines such as the type 4 1700 and not at idle (refer to edition 14). You can't set the timing statically for these engines, the only option is to use a strobe light.

ignition timing - dynamic

So, you need a strobe timing light to measure the ignition timing dynamically. There are different types of strobe lights available on the market. Most models offer more than one function, they can measure the voltage, the Dwell value and the ignition timing. We show a professional multifunction strobe on page 34, it can be used for 2 cylinder, 4 cylinder, 6 cylinder and 8 cylinder engines. Some also measure the exhaust CO emission.

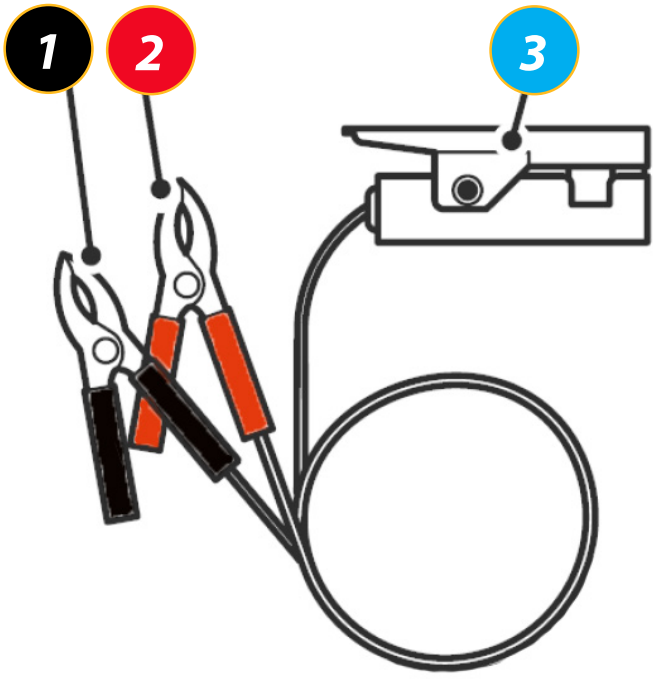
You can buy a strobe light for less than 100€, a professional strobe like the one on page 34 will be much more expensive of course, but you don't really need one like that for a standard type 1 engine, one like we show below is just enough. You can buy a low budget strobe timing light in our webstore.

We have already given an introduction on how this strobe works in edition 13.

You can buy a simple strobe light like this one in our webstore.

Powering the strobe

To measure the Dwell (refer to edition 13) you need to connect the negative and positive clamps of the strobe timing light to the battery and also the green cable to clamp 1 on the coil. The latter is not necessary when measuring the ignition timing. Our budget strobe can only measure the ignition timing, so it only has two power clamps and one inductive clamp.



1 negative clamp (chassis)

2 positive clamp / 12 volts

3 inductive clamp

The negative (black clamp) and the positive clamp (red clamp) are necessary to power the strobe light. Some work on batteries, so no need to connect to the car battery. If your VW has a 6 volts battery, you will need to find an external power source like a 12 volts car battery.

Inductive clamp

What is this inductive clamp? What you want to measure is when the spark plug of cylinder 1 will fire. Why you need to use cylinder 1 is explained in edition 14. When the breaker points open, the primary circuit of the coil will be interrupted, this will generate a high voltage in the secondary circuit. Read all about the ignition principle in edition 10.

ignition timing - dynamic

It is that high voltage that will fire the spark plugs, at that very moment a strong current will flow through the spark plug cables. It is the exact moment that strong current happens (ignition time) that you want to measure to know when cylinder 1 is firing. The ignition timing is set before or after Top Dead Center (TDC).

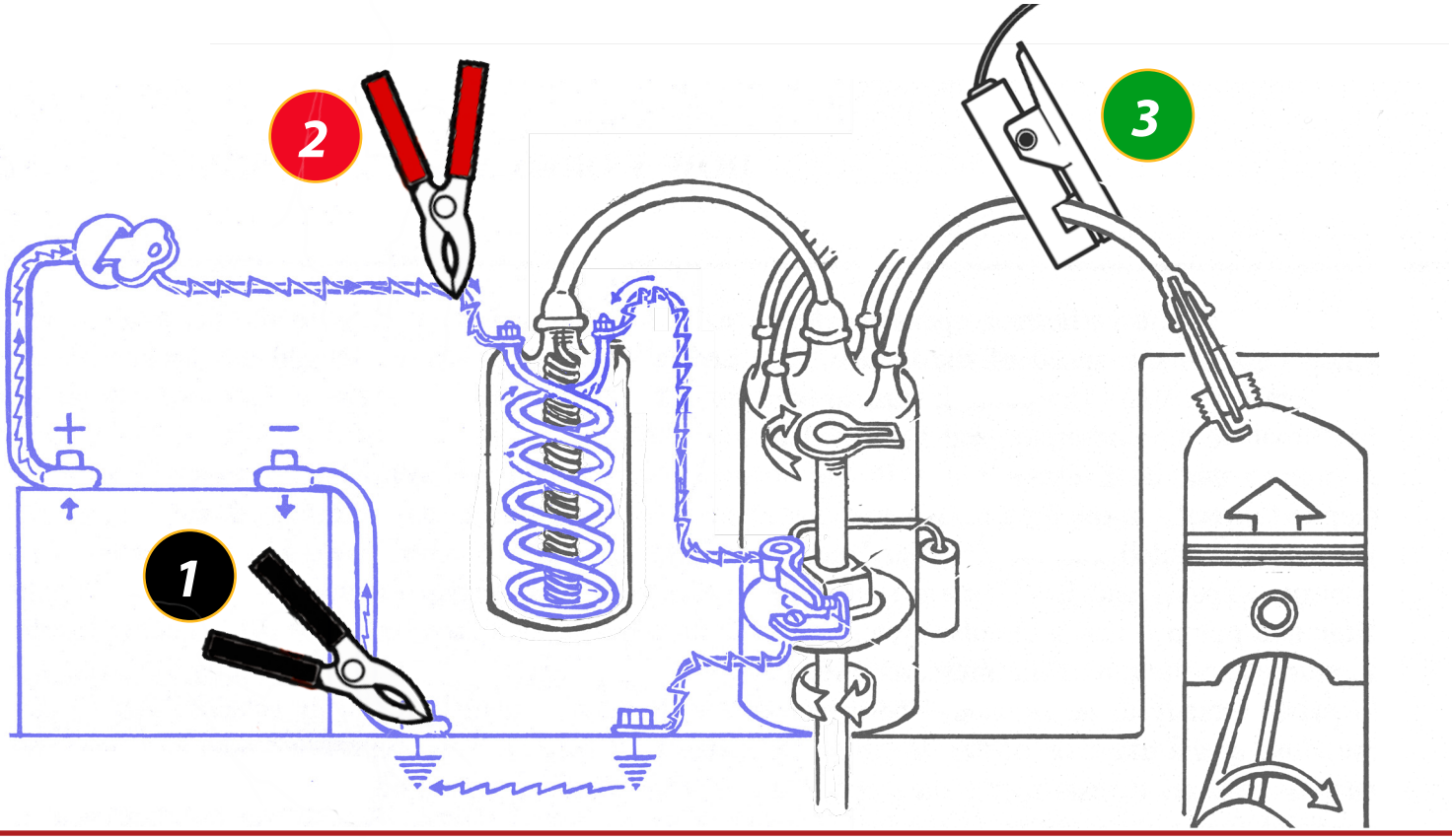
You are maybe used to measure a current through an electrical conductor by breaking the circuit open and insert an ammeter (an instrument to measure current in ampère) in series (in-line) with the circuit so that all current is flowing through the ammeter. But when measuring strong electrical currents it can be hazardous, using a inductive ammeter is a much safer and quicker solution. We show such an instrument from Fluke® on the left, it works just the same way as the inductive clamp on the strobe timing light.

When the spark plug in cylinder 1 is fired, a strong current will flow through the spark plug wire and create a magnetic field. The induction clamp of the strobe will detect that and activate the strobe light. A light flash will be visible for a short while. The flashes will help you to read the ignition timing marks on the crankshaft pulley.

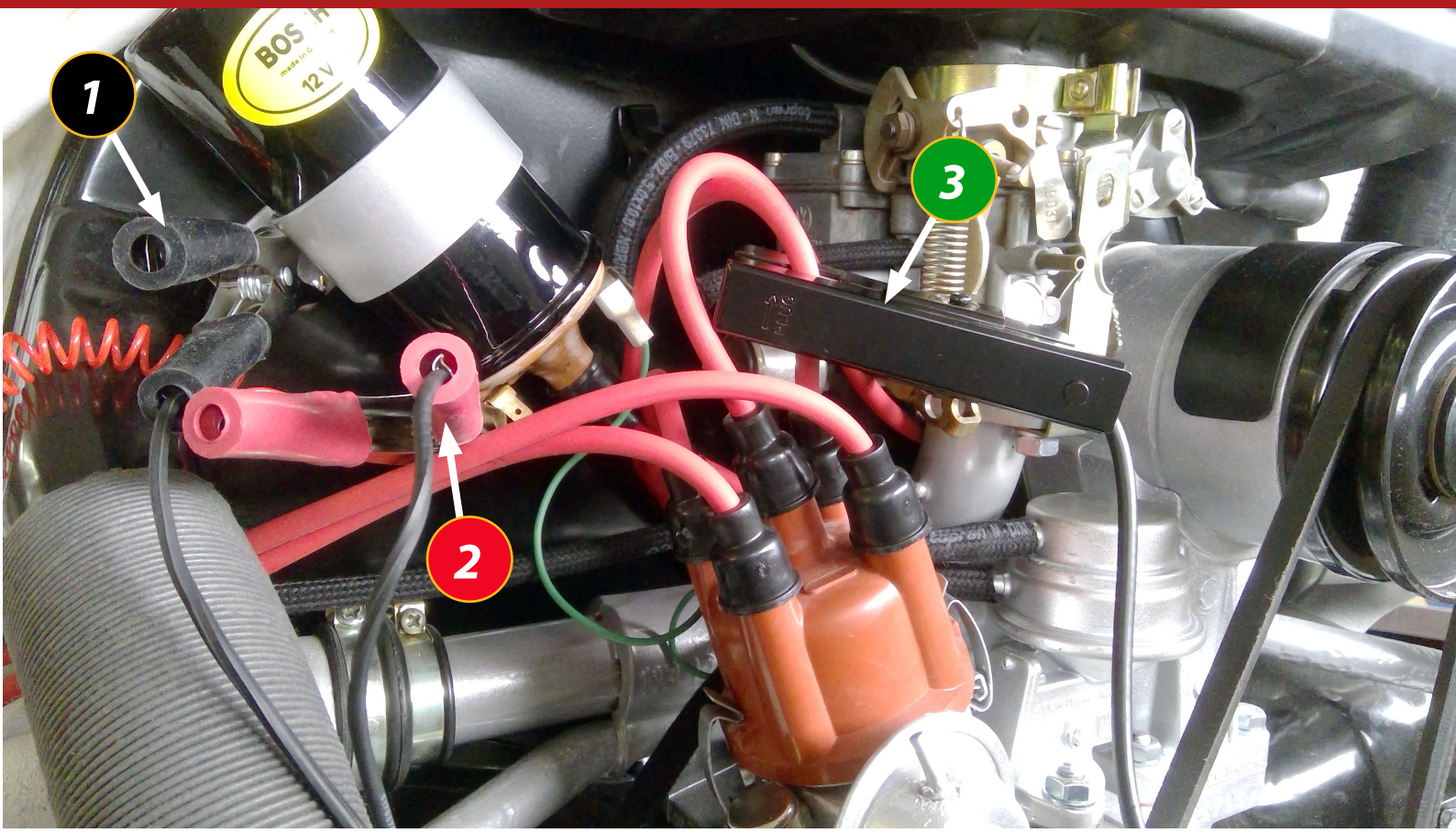
Connecting the strobe timing light

Before you start measuring the ignition timing dynamically, you have to make sure that your engine is well maintained. We explained in edition 13 which parts have to be checked before setting the ignition timing.
Read the manual of your strobe timing light carefully before you continue reading.

Connect the negative clamp of your strobe to the chassis of your VW, we use the bolt that holds the ignition coil (1) bracket for that. Connect the positive clamp to the 12 volts voltage of your VW, we use clamp 15 of the coil (2) for that. Install the induction clamp (3) on the spark plug wire of cylinder 1.

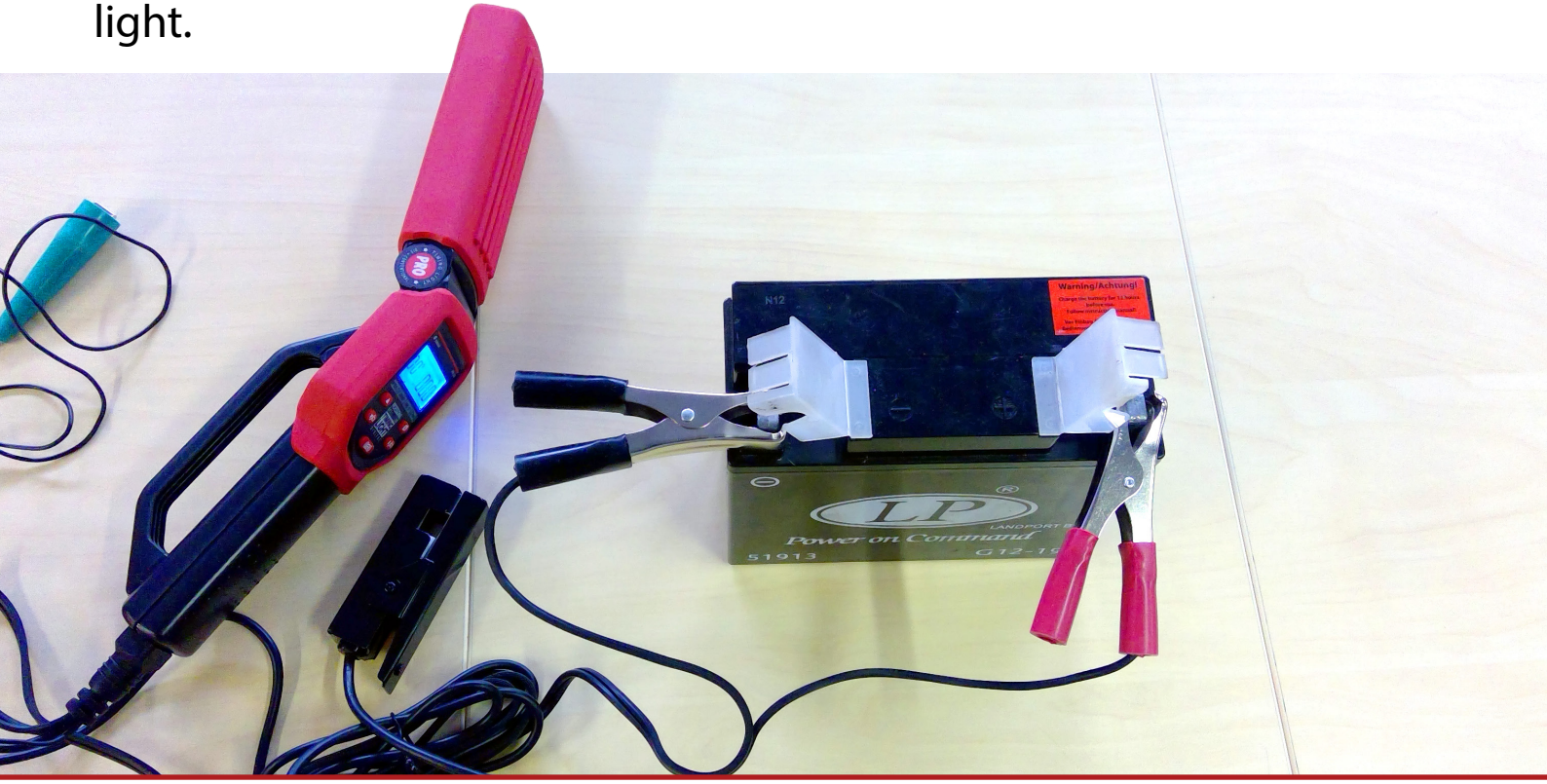


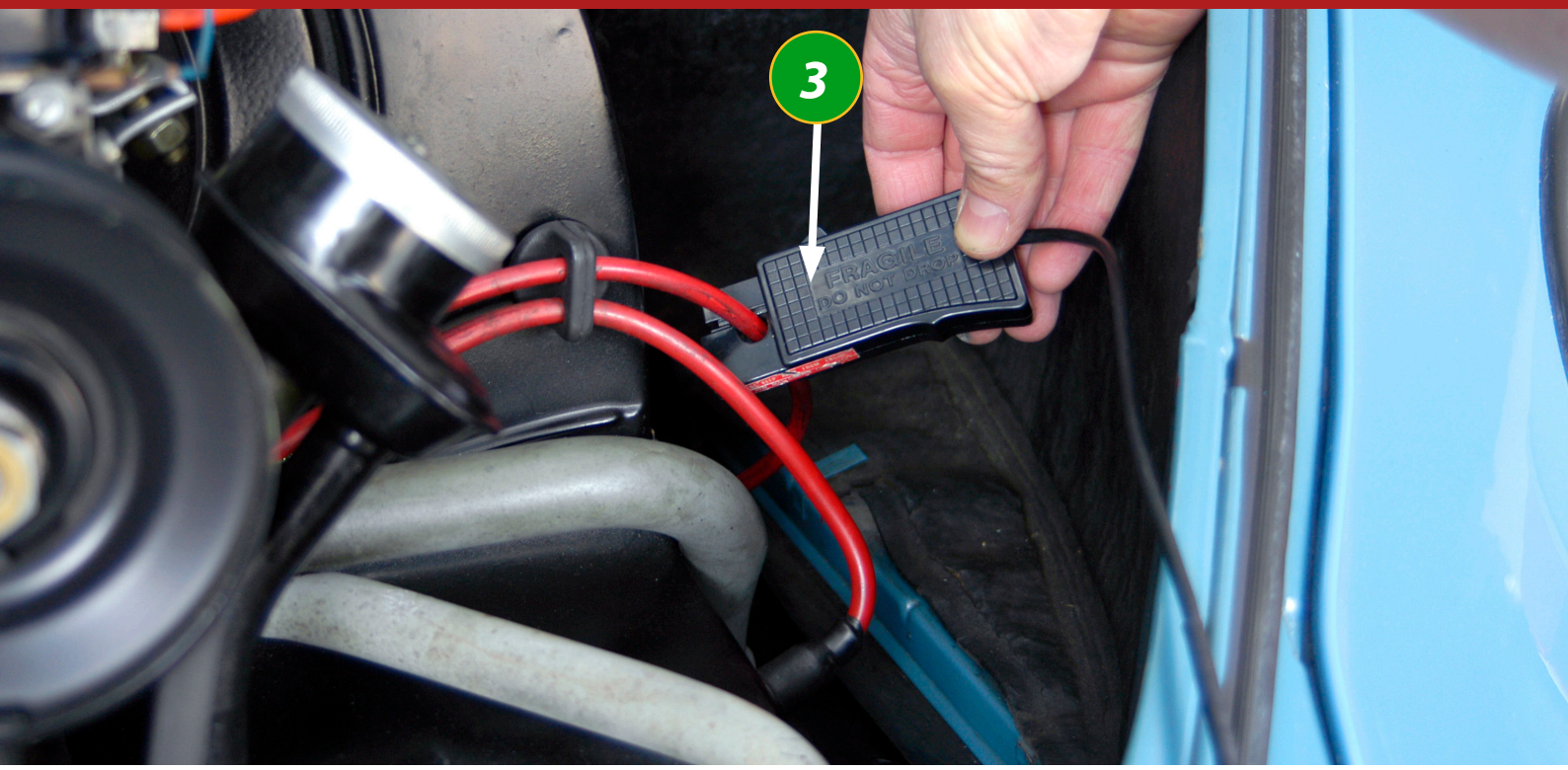
ignition timing - dynamic



If you have a 6 volts circuit on your VW, you will have to find an external source for your strobe light.

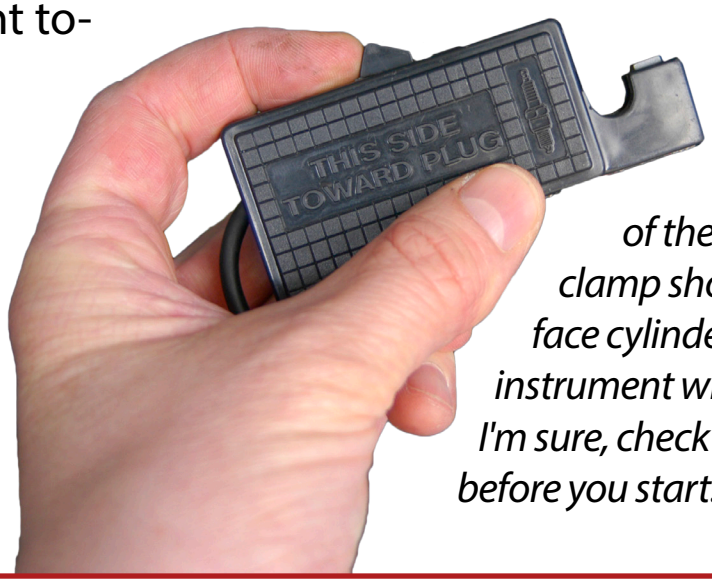
We show how we used a small 12 volts battery to power the strobe below.





The induction clamp is now installed on the spark plug cable of cylinder 1 as showed on the picture above (why cylinder 1? we explained that in edition 14). The induction clamp should be installed as indicated in your manual, most clamps have a sign printed or painted to show which side should point towards the spark plug.

Our induction clamp says: "**THIS SIDE TOWARDS PLUG**". The induction clamp on the picture on the top of the page is correctly installed, the text visible says: FRAGILE DO NOT DROP. The other side of the clamp that needs to face the spark plug is shown below.



This side of the induction clamp should face cylinder 1. Your instrument will be different I'm sure, check your manual before you start.

Preparations

Before you start, you will need to check the following items.

Operating temperature

Drive for a while so that your engine is at **operating temperature**, the engine oil temperature should read between 30°C and 70°C.

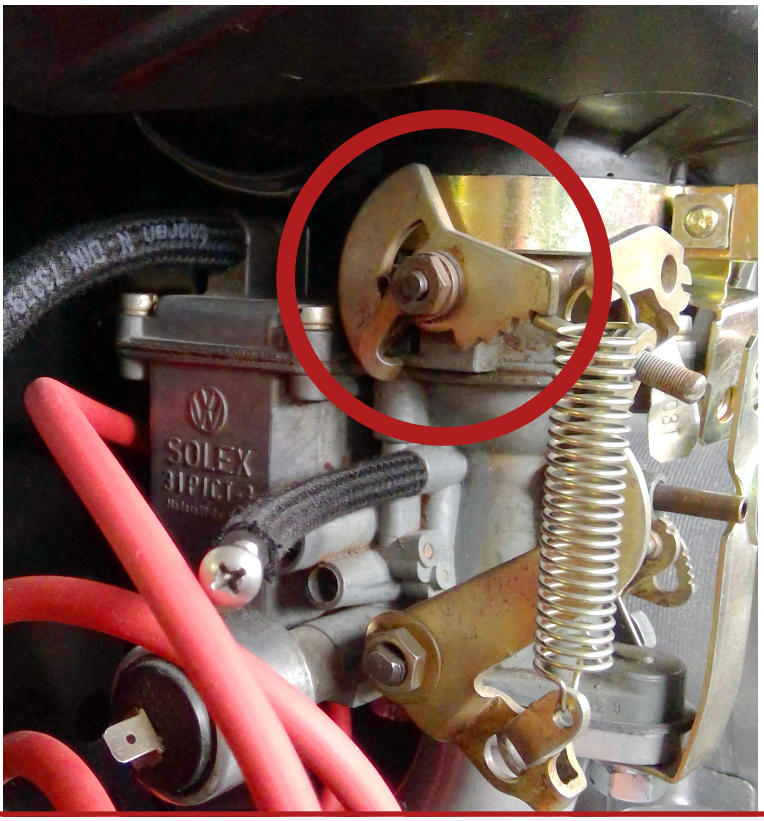
The pictures below show the carburetor choke. On the left is the choke position when the engine is cold (choke is active), on the right the choke is deactivated (engine is hot).

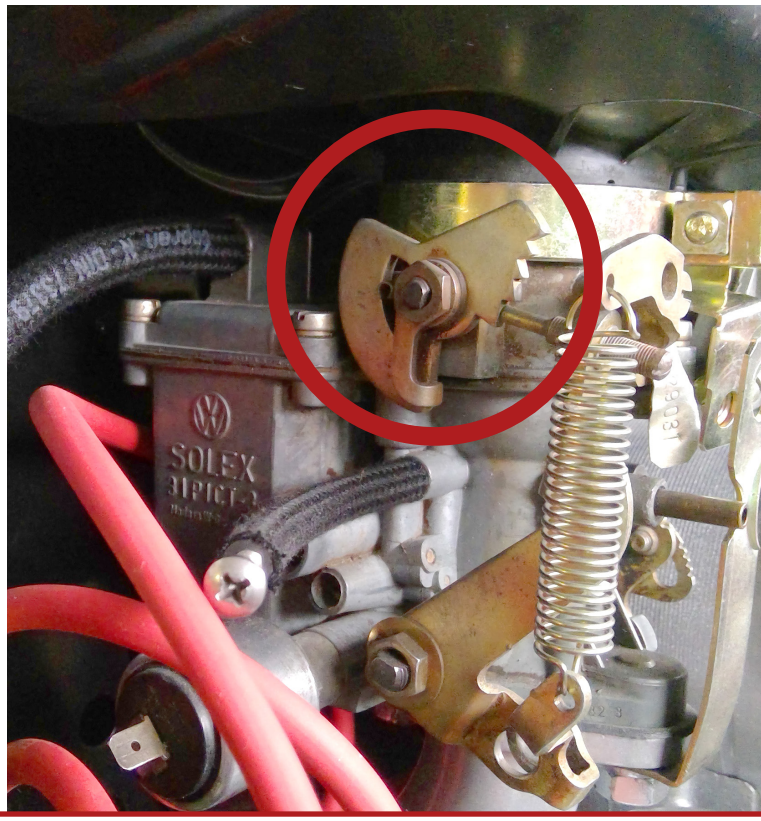
Throttle cable

Make sure the **throttle cable** is not pulling the throttle lever of the carburetor at idle, this could give a false reading. Disconnect the throttle cable if you want to be sure that it doesn't influence the readings.

Electrical choke

The **choke** should not be active during the measurement of the ignition timing. The choke should be in the position as we show in the picture on the right.

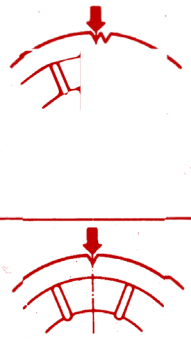




Vacuüm connection

The ignition timing table will tell you if you need to disconnect the vacuum advance hose on the carburetor or not (only for distributors with vacuum advance). This will depend on the distributor type installed. It is difficult to rely only on the tables with engine numbers, most engines have a different distributor installed than original. You will need to do some investigation before you start setting your ignition timing.

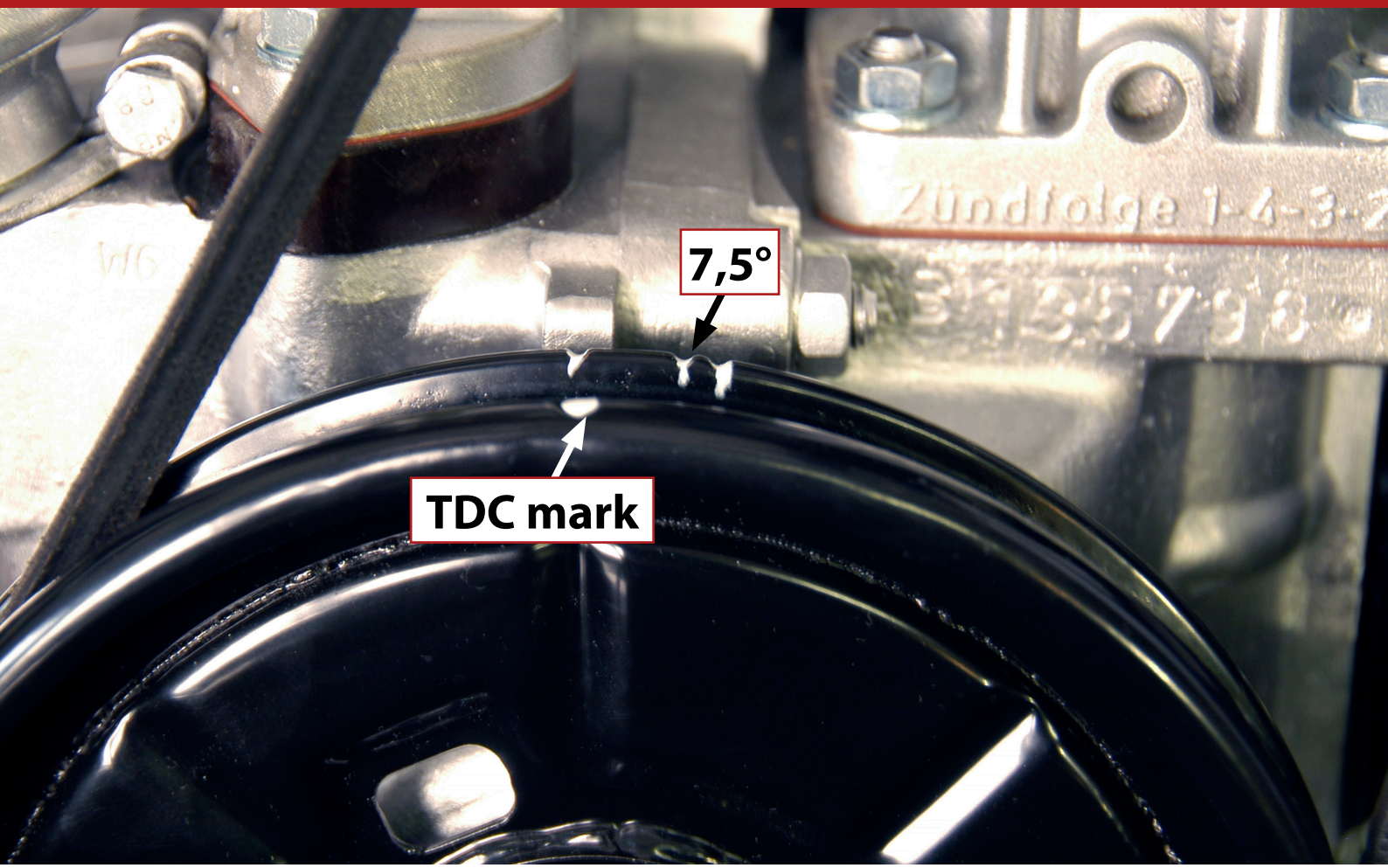
1/1300	F 0 000 001–F 2 140 820	7,5° before TDC	850 ± 50	vacuum detached
1/1300	AB 000 001–AB 313 344	7,5° after TDC	850 ± 50	vacuum attached
1/1300 1/1300	AB 313 345–AB 999 999 AR 000 001–	7,5° before TDC	850 ± 50	vacuum detached



The serial number of our test engine is AB135796. The tables in the official Volkswagen workshop manual tells me that the ignition timing should be set to 5° after the BDP with vacuum hose installed. This would be true if the original distributor with two vacuum hoses is still installed, it's not the case.

A double vacuum was used on some engines to limit the gas emissions. The first vacuum connection is used to regulate the ignition timing and the second one is used to advance the ignition time at idle.

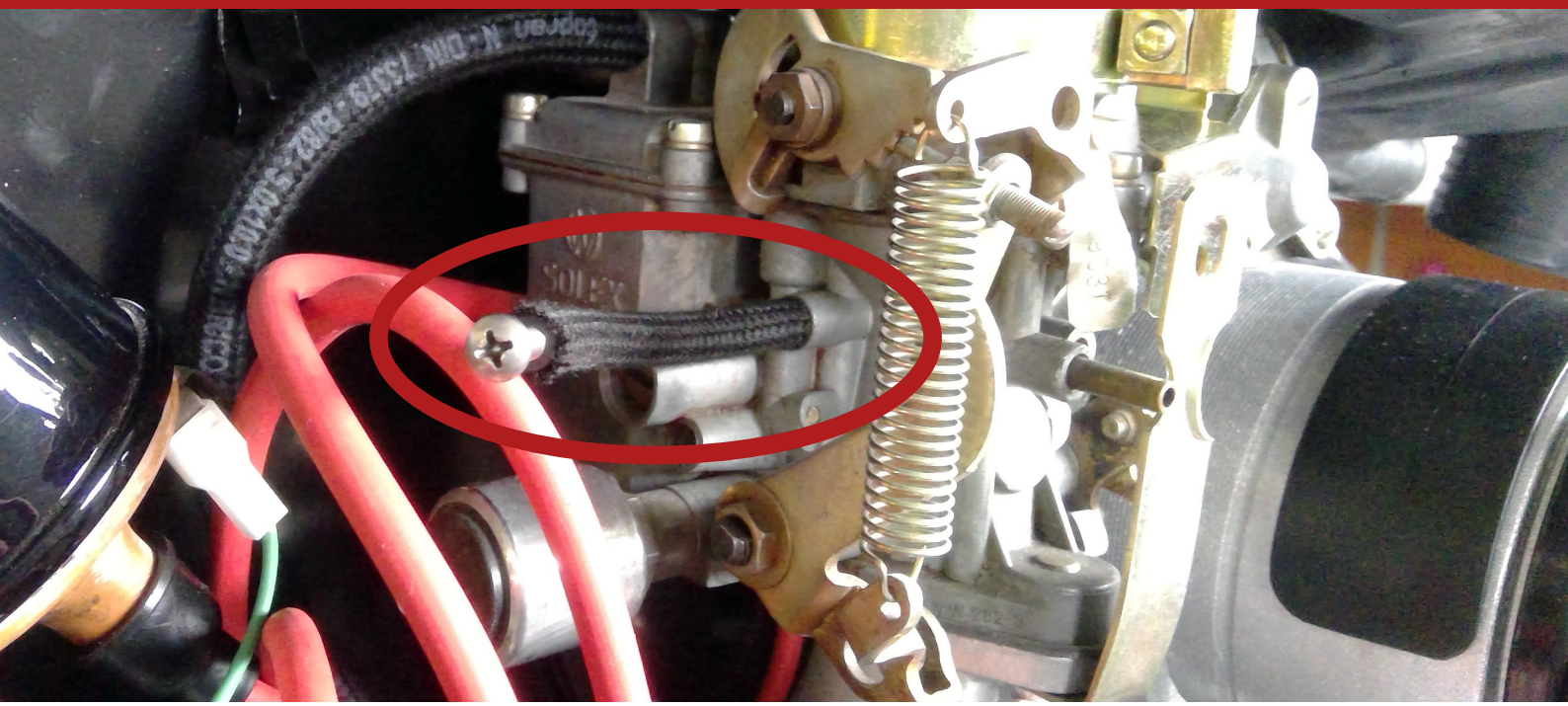
ignition timing - dynamic



The distributor and the crankshaft pulley on our AB engine are not original. The distributor has only one vacuum hose, so we need to set the ignition timing at 7,5° before the TDC (ignition advance) and not 5° after TDC as mentioned in the workshop manual. Ask a VW professional for advice if you are not sure about the ignition timing value.

If you have read the previous edition from page 34 on, you will have a mark painted on your crankshaft pulley to show the ignition timing setting. So, for our type 1 engine it should be 7,5° before TDC at idle.

#45 Electrical



The vacuum hose has to be disconnected on some engines with vacuum advance (refer to the original Volkswagen workshop manual: Bentley series). We show a partial table on page 42.

After removing the vacuum hose on the carburetor, you need to close it before starting the engine. This vacuum tube is directly connected to the manifold, this is where the fuel mixture is created. If more ambient air is entering the manifold through the vacuum tube, the fuel mixture will become very lean.

A lean mixture is very bad for the cylinder heads, the engine will get very hot and wear out or fail. A lean mixture will also influence the engine settings and it will be impossible to set the ignition timing or idle speed properly.

So, if needed, close the vacuum tube on the carburetor with a hose and a parker screw as shown on the picture above.

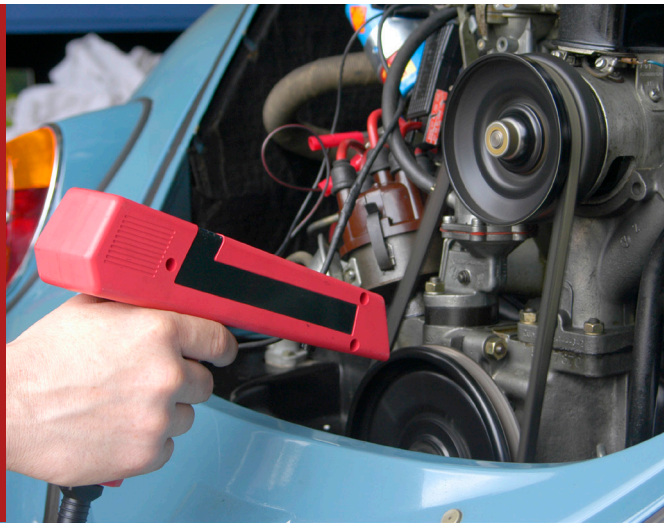
Measuring the ignition timing

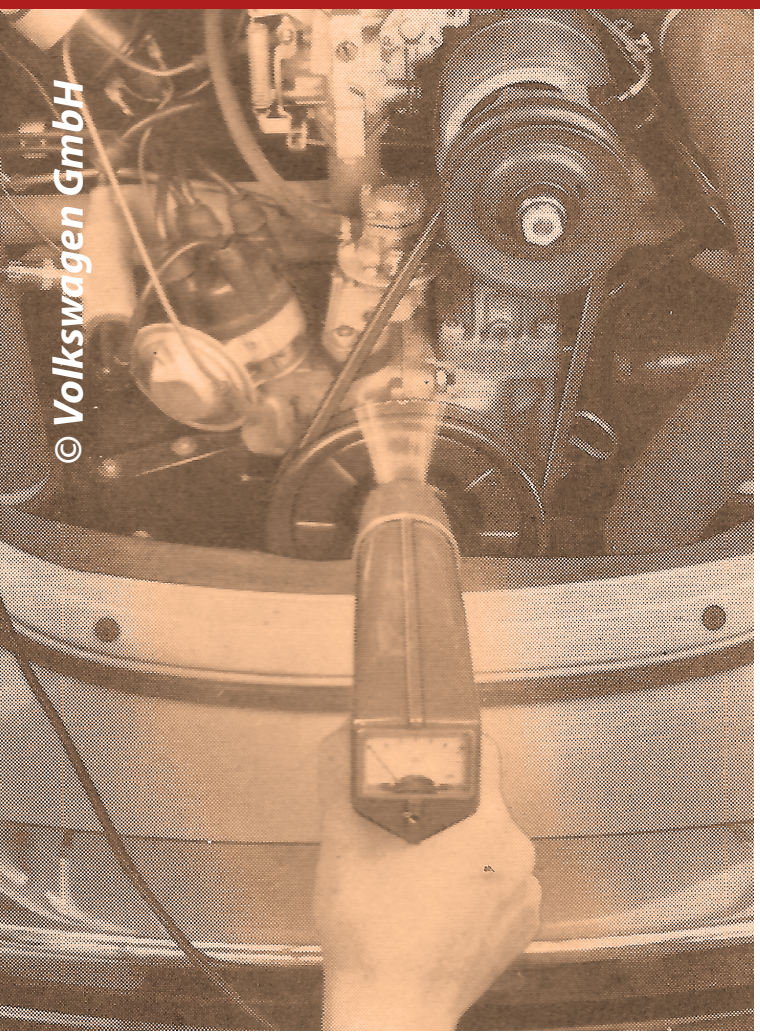
Now, the strobe timing light is connected, the engine is running at operating temperature, it is time to set the ignition timing.

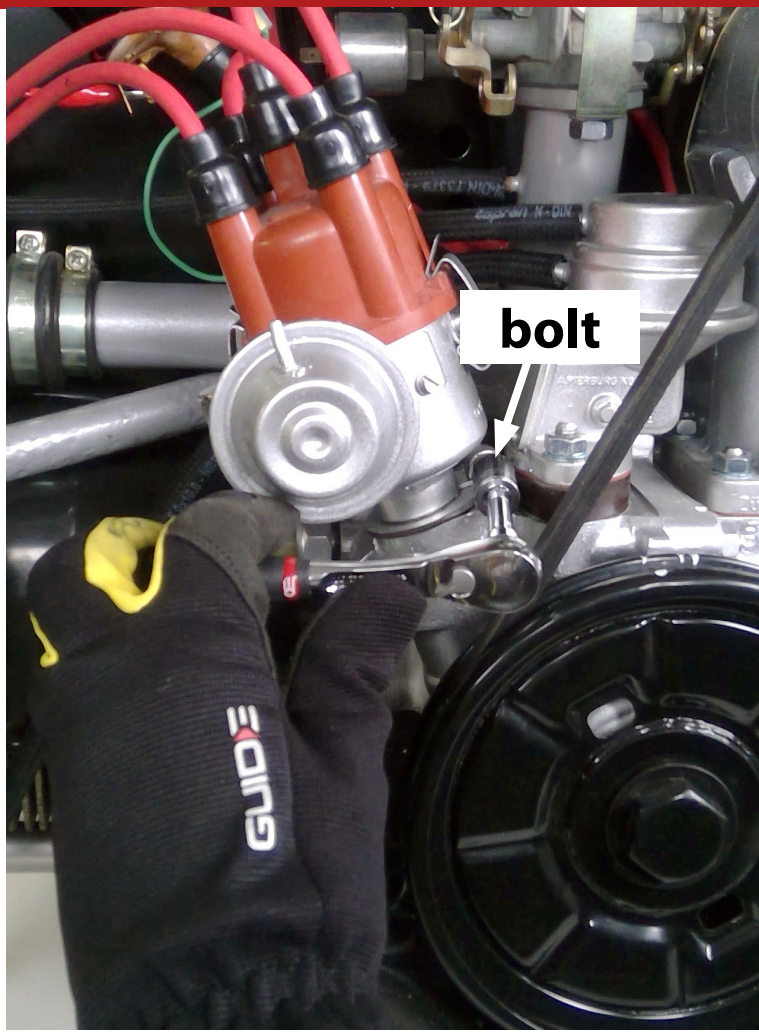
The engine runs smoothly at 850 rpm +/-50 (recommended idle speed for my type 1 AB engine). Point the strobe light towards the ignition timing mark on the crankshaft pulley. Make sure the engine doesn't face the sun or else you won't be able to read the ignition time correctly. The strobe light will flash, so it will seem that the engine is not running. The engine is running, don't ever forget that!!!

How do you know if the ignition timing is set correctly? You have probably set the ignition timing statically before as we explained in edition 14. If the ignition timing mark (7,5° advance for our AB engine) is in line with the centre of the crankcase, than the ignition timing is set correctly. If not, you need to rotate the distributor like we explained in edition 14 on page 47. The main difference with the static way to measure the ignition timing is that the engine is running now.

Warning! When the strobe timing light is flashing at the same pace as the ignition of cylinder 1, the crankshaft pulley and the alternator/dynamo pulley will seem to be standing still. This is an optical illusion. Watch for the rotating pulley belt while you are using the strobe light to set the ignition timing.





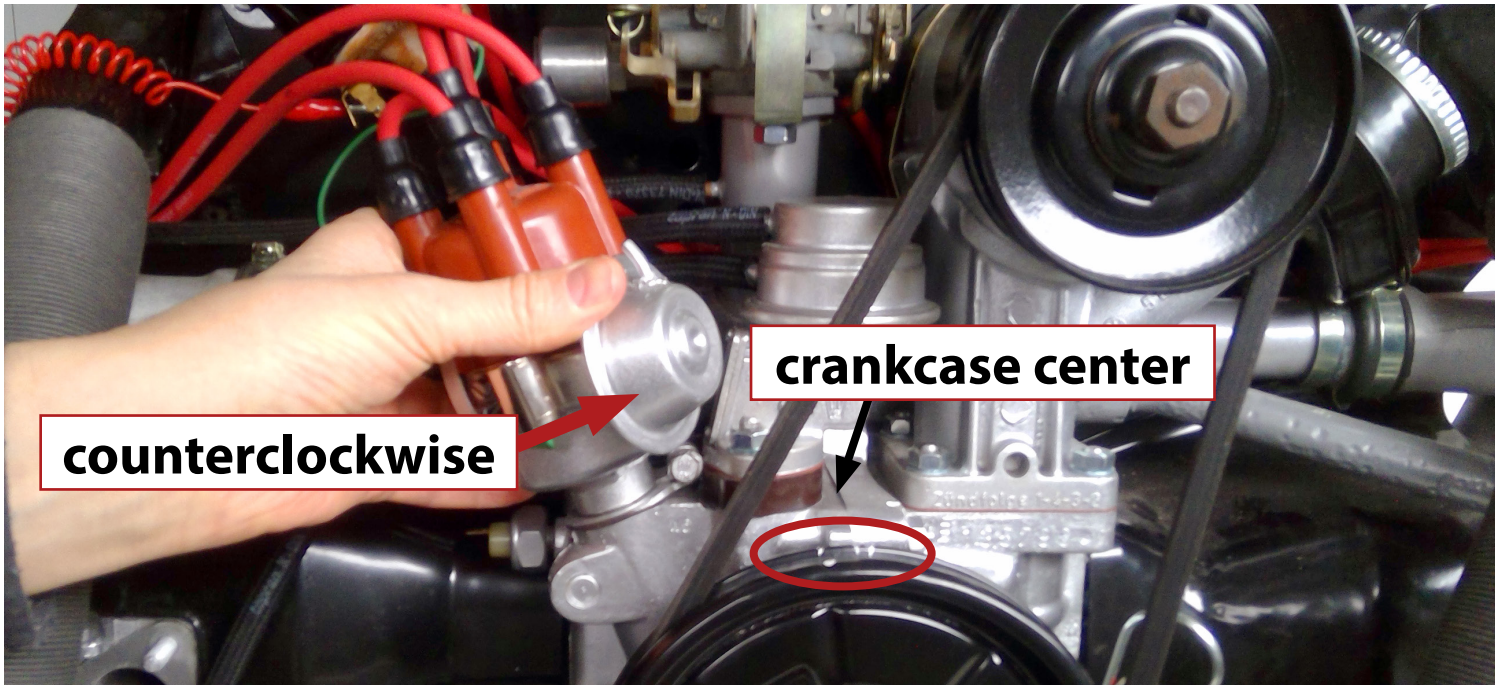


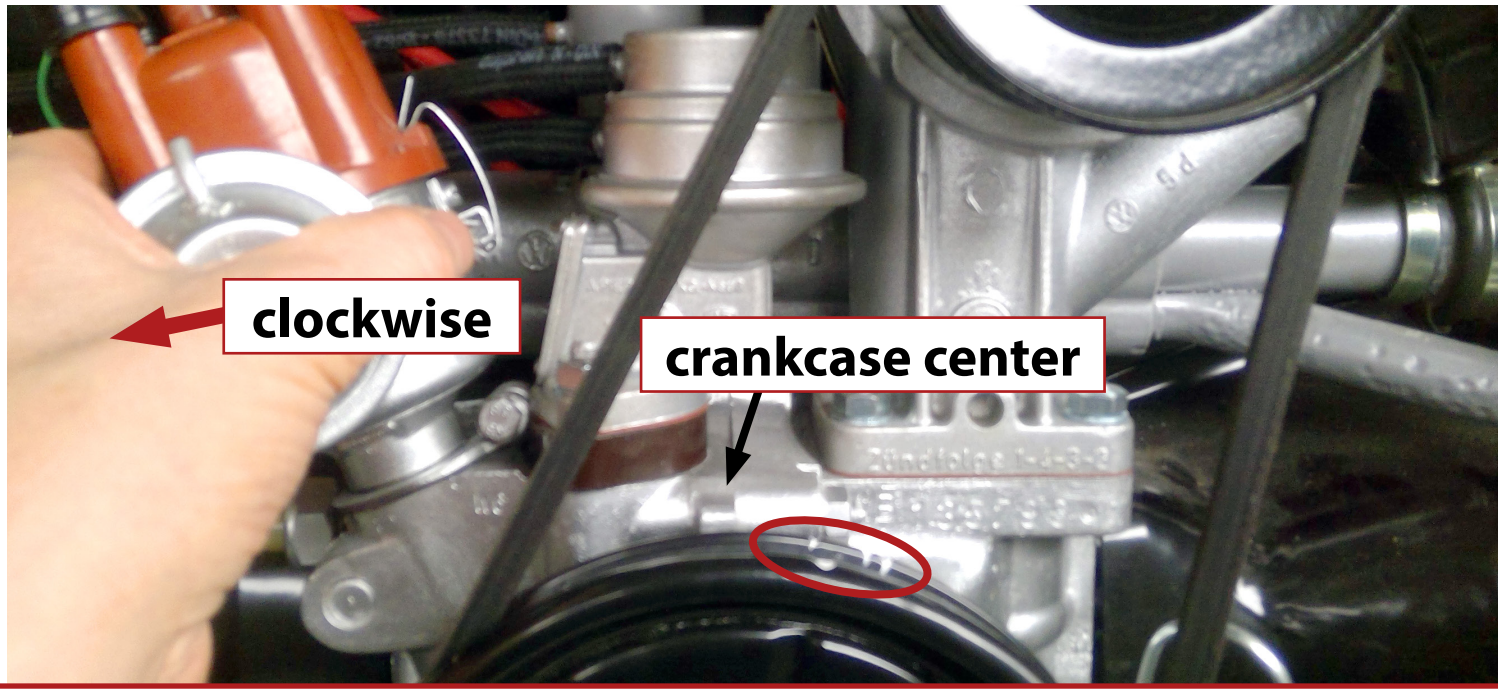
We show on the picture above (sourced from an old VW workshop manual) how to position the strobe light. The 7,5° mark on the crankshaft pulley should be in line with the center of the crankcase, where both crankcase halves meet. If not, you will need to rotate the distributor clockwise or counterclockwise to tune the ignition timing.

Loosen the distributor bolt a little so that the distributor can rotate freely (photo above). Rotate the distributor clockwise or counterclockwise, you will see that the 7,5° (can be a different value for your engine) mark moves to the right or to the left. Once the 7,5° mark is in line with the center of the crankcase, secure the distributor bolt and you are ready to go.

ignition timing - dynamic

Below we show a simulation of what happens when you rotate the distributor.
If you rotate the distributor counterclockwise, the breaker points will open sooner, the 7,5° mark seems to move to the left with the strobe flashing (optical illusion of course).
If you rotate the distributor clockwise, the breaker points will open later, the 7,5° mark seems to move to the right with the strobe flashing (optical illusion of course).





The distributor is now positioned so that the ignition timing mark is in line with the crankcase center when flashing the strobe with running engine, you can turn the engine off and secure the distributor bolt if you didn't do so yet.

You can also check if the advance mechanism is working fine. We have explained this briefly in edition 11. We will come back on that topic in a following edition of this technical series.

Conclusions

All the information published until now in this technical series about the ignition should help you to diagnose and to tune your classic Volkswagen engine.

It is possible that the ignition still doesn't work properly because the distributor is faulty or another part of the ignition circuit such as the coil is failing (read edition 08), or the condenser.

We will discuss more ignition parts in following editions of the Paruzzi Magazine.

ignition timing - dynamic

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