



**Here below is a technical description on how to perform a complete cleaning and restoration of a PETROMAX 829 500CP.**

**Preface**

The description below is based on the work I did and the experiences I had during the restoration of a Petromax® lantern.

This step-by-step instruction may guide you through all the work perhaps necessary in order to get your lantern restored and back to work or perform better for future operation.

This instruction can similarly be used for a PETROMAX 828 (350 CP), 827 (250 CP) and GENIOL 830 (150 CP).

Although I'm providing this information for everyone to read and use, I can't assume any responsibility for the work, functionality or safety of your lantern and your work.

If you restore a lantern following these procedures it is your sole responsibility to take care of all necessary precautions in order to safely operate and enjoy your lantern.

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**Remark:**

The part no's. referred to in the following description are the standard part no's. given by Petromax. These can be used e.g. for identifying parts or ordering replacement parts.



Pic. 1: This is the candidate for restoration before disassembly.

## **1. Disassembly**

Start with the ventilator (#123). Loosen the knurled nuts on the frame (#121) until the ventilator can be lifted and removed. After this the inner hood (#117) can be taken out. Make sure the ceramic burner is not damaged when setting aside.

Now take the glass globe (#74) and the heat shield (if fitted) out. Remove the centre bottom screw (#14) which fixes the centre bottom plate to the font with a flat screwdriver. Next, take the centre bottom plate (#122) out and set the complete frame aside.

The font (#120) with the attached parts is left now.

The Rapid pre-heater (#226) is disassembled as follows: Open the pre-heater lever (#223), pull the flame tube (#220) off, unscrew the nozzle (#221) and the pre-heater nut (#222). The lever (#223) can now be removed. Finally unscrew the pre-heater body (#225) and put all parts aside.

To disassemble the generator, remove the nozzle (#115) with a 9mm wrench (or Petromax® wrench or adjustable wrench), then take the needle (#68) out with the special tool (see pic. 13).

Unscrew the gland nut of the gen's upper part (#152) using a proper wrench and lift the upper part off of the gen. rod (#104). Now unscrew the complete valve (#114) with a 10mm (or equivalent) wrench. One now can take the complete generator rod (#104) out. Unscrew the gen's lower part (#153) from the font (#120).

To complete the disassembly remove the complete pressure gauge set (#149). Remove the pump (#6) to get access to the pump check valve (#10). Take the valve out with a big, flat screwdriver or the special check valve tool (#57) depending on the type of valve.

Congratulations!

You are now done with disassembly.



Pic. 2: Lantern completely disassembled into parts.

## 2. Cleaning the parts

After the above procedure and a first inspection of the parts, I heated water in a bucket for washing and added some citric acid.

I prepared myself with protective gloves and goggles and started off with an old toothbrush as the best and cheapest tool to clean the small parts and folds, where it is difficult to get access to.

Most of the dirt and debris came off of the parts quite fast in the hot citric solution.

After I'd cleaned the font, frame, centre bottom plate and the ventilator I washed the parts again in water with dish detergent added in order to stop the chemical reaction of the citric acid.

The other parts like gen and pre-heater were specially cleaned in an ultrasonic bath with citric acid again. They came out very nice and clean.

However, the brass changed the color in the citric acid to a reddish tone because small particles of zinc are consumed in the bath and the copper shines up more. I polished those parts with fine steel wool and they now shine nicely in the original brass tone again.



**Pic. 3: The bucket with the main parts in citric acid**



**Pic. 4: Font, already partly cleaned**



**Pic. 5: The cleaned vent**

### **3. New seals for generator and pump check valve**

Usually the rubber seals in the generator foot valve (#196) and the pump check valve (#10) are dry and totally hardened. If one doesn't at least replace the pump check valve seal one can hardly operate the lantern safely because of kero leaking from the font into the pump body, thus flooding the body and also losing pressure.

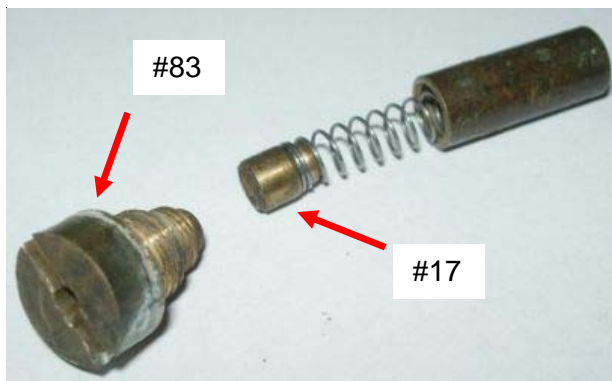
An old, hardened seal in the generator foot (#193) must in any case be replaced if one wants to pre-heat the lantern with the Rapid pre-heater later. If one only wants to pre-heat using the little alcohol cup (#35) then it is not mandatory but again highly recommended for safety reasons.

The complete pump check valve is shown in pic. 6. The rubber seal (#17) needs to be replaced. The lead washer (#83) should also be replaced. However, if it doesn't have too much deformation you can try to re-use it, but make sure it seals tightly and doesn't leak.

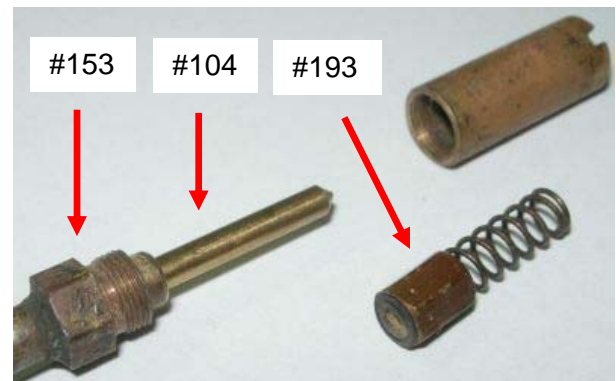
In case of any lead washer make sure you turn the parts only clockwise to keep the lead washer tight. Never turn counter-clockwise again!

The most common problems are caused by a defective / leaky generator foot valve. When the font is pressurized, the valve wheel points to the 'closed' position and one starts to pre-heat the gen with the Rapid pre-heater, then some fuel might rise in the gen and come out of the nozzle. This causes the lantern to catch fire with lots of smoke and soot. If that continues during the pre-heating time one has a perfect 'inferno'.

Pic. 7 shows sections of the gen's lower part (#153), the generator rod (#104) as well as the disassembled generator foot valve with the rubber seal (#193) and the valve spring (#194).



**Pic. 6: Pump check valve**



**Pic. 7: Generator foot valve**

Everything fine so far?

All parts clean, straightened-out, worn-out parts replaced and seals at hand to start re-assembling?

OK, fine! Then let's go for the next step.

#### **4. Re-assembly of Rapid pre-heater and generator (lower part)**

In general, re-assembly of the whole lantern is done in the reverse sequence compared to disassembly.

We'll start with the Rapid pre-heater.

First make sure the mesh (#187) at the lower end of the pick-up tube is clean. Otherwise replace (see pic. 41).

Also clean the tiny channels in the Rapid nozzle (centre hole for kero, 2 outer holes for air). This is very important to get the Rapid running properly (see also pic. 42).

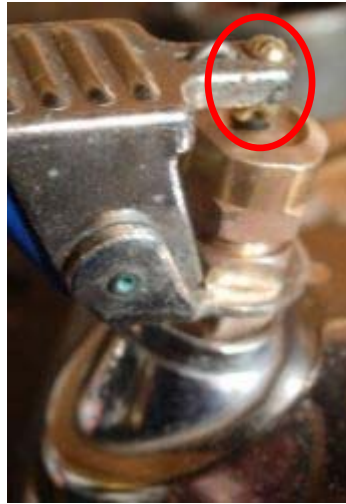
The pre-heater body (#225) along with a new lead washer (#90) will be mounted first (pic. 8). Screw the part in until it sits tight and is properly adjusted. Don't turn in reverse direction again in order to avoid the lead washer leaking.

Next, the lever (#223) is mounted onto the pre-heater body. The lever is to be secured with the nut (#222). Now the pre-heater nozzle (#221) must be screwed onto the pre-heater body. Then the flame pipe (#220) can be put onto the nozzle (One can also put the flame pipe on after assembly of the frame).

Most probably the rubber sealing part (#229, circled in pic. 9) has to be replaced as well as it is worn out or edges are damaged due to improper centering.



**Pic. 8: Pre-heater body**



**Pic. 9. Lever and nozzle**



**Pic.10: Completed**

Next is the re-assembly of generator (lower part).

First comes the gen's lower part (#152) and a lead washer (#90). The lead washer gets between the front and the lower part as shown in the picture.

It might be helpful to first screw in the gen without the lead washer to check the number of turns. Then put the washer on and screw in. Again, make sure you turn only clockwise until the gen is in the right position to avoid leakages from the lead washer later.

The opening for the valve w. the valve wheel (#114) should then exactly point to the front (outwards). Only then can one assemble the frame easily and correctly later.



**Pic. 11: Lower part of gen w. lead washer**

## 5. Adjustment of the gen's rod length, assembling of gen (upper part) and valve

In order to complete the re-installation of the generator, one now has to put the generator rod (#104) in place. The rod is to be inserted in the gen's body and turned in a way, that the receiver (#103) for the valve shaft (#105) can be seen through the gen's valve opening (pic. 12).

Now the valve shaft along with the hand wheel must be screwed in. In order to allow the little pin on the valve shaft to match the receiver (#103) one needs to push down the gen rod a little. If that was done properly, one can now move the rod up and down by turning the hand wheel.

Next the upper part of the gen (#152) is carefully slid over the gen rod. Tighten the gland nut of the upper part 'hand-tight' only for now.

Now take the thin gen needle (#68) and screw it into the gen rod, using the special tool (#119). See pic. 13. Finally insert the nozzle (#50) into the gen and tighten loosely.

Most important now is to check, how far the needle comes out of the gen' nozzle when the valve is closed (arrow on the hand wheel points 'up'). It's best if the needle comes out between 0.5 – 1mm. If it comes out considerably more or less, a re-adjustment is necessary. It shouldn't look like as shown in pic. 14.

If a re-adjustment is required, unscrew the gen's nozzle again, followed by the needle. Next the gen's upper part and the valve with hand wheel have to come out again.

The 2 halves of the generator rod need to be adjusted to a proper length so that the above mentioned measures (0.5-1mm) are reached. To achieve this, the little counter nut (#102) on the 'reception part' has to be loosened, the length adjusted and the nut pulled tight again (pic. 15 and 16).

When that step has been done successfully, all parts need to be re-assembled as described above. Now check all connections again and pull firmly tight in order to safely run the lantern and avoid leakages during later operation.

In the optimum case the needle looks out of the nozzle as shown in pic. 17.

If a proper result was not achieved in a first step, one unfortunately has to repeat the whole procedure until a convenient result is achieved.



Pic. 12: valve assembly



Pic. 13: needle mounting



Pic. 14: No proper adjustm.



**Pic. 15: Adjustment of rod's length**



**Pic. 16: Secure adjustment w. counter nut**



**Pic. 17: Proper adjustment**

## 6. Assembly of frame w. pre-heater cup

Now it's time to assemble the frame (#121).

Set the frame onto the font and adjust right. Put the centre bottom plate (#122) in the bottom of the frame and fix these parts using the centre bottom screw (#14). If the lantern isn't already fitted with an alcohol pre-heater cup (#35) this is the time to add one. Just put in on top of the centre bottom plate and screw all parts together. You now have the options to pre-heat using the Rapid pre-heater or make a softer start with alcohol.



**Pic. 18: Centre bottom plate, centre screw and pre-heater cup**



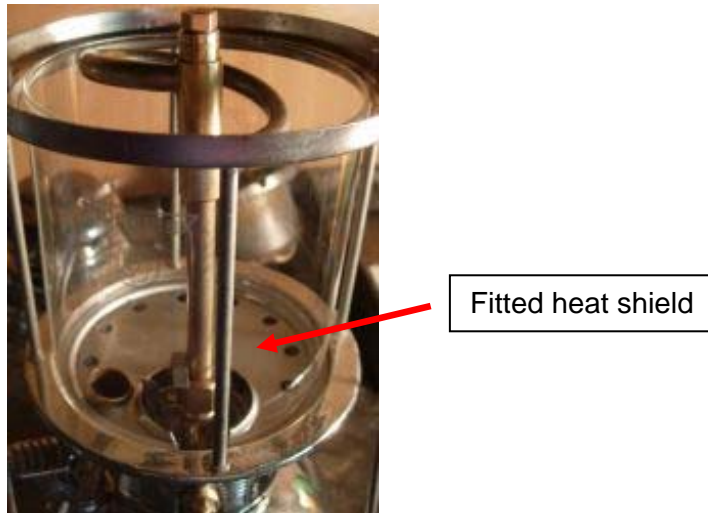
**Pic. 19: Completely assembled**



## 7. Putting heat shield and glass globe in place

Now the glass globe (#74) can be set in. Optionally one can also add a heat shield (# 126). This heat shield protects the front from heat radiating down from the mantle. However, it is still possible to pre-heat the gen using the alcohol pre-heater cup, if desired.

There are descriptions in old ads that one can run a lantern with fitted heat shield for some more time even if the mantle is broken. However, I can't recommend this as the glass globe is at risk. Replace a broken mantle as soon as you notice.



Pic. 20: Fitted heat shield and globe

## 8. Assembly of complete inner hood and fitting of mantle

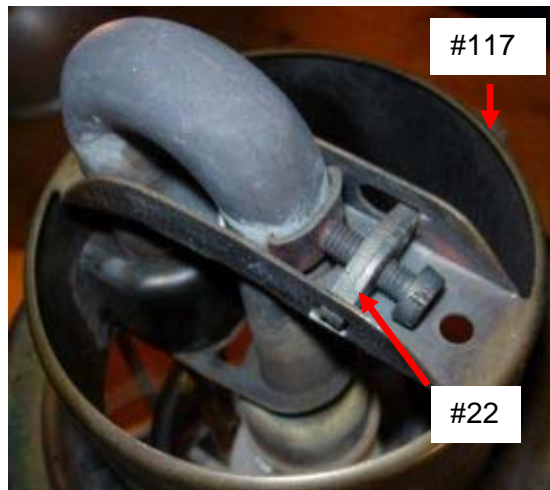
The complete inner hood consists of the following parts: The inner hood (#117) itself, mixing tube (#33), mixing chamber (#34) and the ceramic burner (#3). See pic. 21 and 22.

These three parts are adjusted and held in place by the clip (#20), screw (#21) and cross bar (#22).

The mantle is put on the ceramic burner above the lower rim and roughly fixed with one knot. Then the folds are distributed evenly, the knot is pulled tight and secured with a second knot. This ensures that the mantle will get an even form when burned. Now just cut the surplus strings off and you're prepared (pic. 23).



Pic. 21: Burner parts



Pic. 22: Fixation of mixing pipe



Pic. 23: Mantle on

## 9. Adjustment of mixing tube distance

The generation of best (kero-) gas / air mixture is ensured by the proper adjustment of the mixing tube distance. The inner hood must firmly sit on the frame before adjustment. The valve must be in the 'open' position (arrow pointing down) to avoid bending of the generator needle sticking out of the nozzle with the Petromax wrench (#66).

Loosen the screw (#21) a little with a flat screwdriver until the mixing tube can be moved up (see pic. 24). Now place the Petromax wrench vertically on top of the nozzle and slide it in the '500CP' position (pic. 25). Now lower the mixing chamber onto the wrench. Pull the screw (#21) securely tight, check the distance again and the proper distance is adjusted and fixed. The optimum value for a 500cP lantern is 14.2mm.



**Pic. 24: Inner hood details**



**Pic. 25: Adjusting the mixing tube distance**

Congratulations again!

By now all the preparation work is pretty much done.

Now fill the font with max. one liter of clean, white kerosene. This ensures that the necessary space is left in the font for pressurizing. If the font is overfilled one has to pump again within a very short time to maintain required pressure.

When done, screw the pressure gauge set (#149) tightly on. Make sure the rubber gauge seal (#11) is there and it's undamaged.



**Pic. 26: Fill up with clean kero**

## 10. Burning the mantle

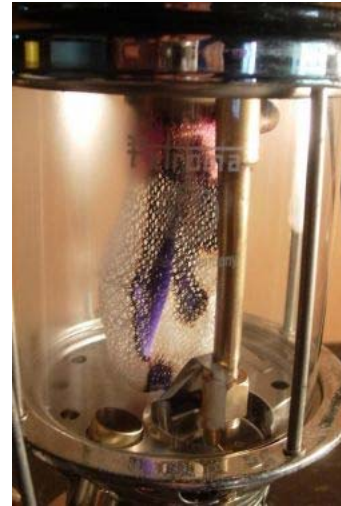
The lantern is now prepared. Now open (!) the pressure relieve screw of the pressure gauge. It's advisable to burn the mantle outdoors as it generates strong fumes and odor. Fill the pre-heater cup with alcohol (Ethanol) and light. The mantle starts to burn or glow until completely burned white. Only now it's ready to use. If it doesn't burn completely put some more alcohol in the cup and continue.

Burning the mantle with the Rapid (in case of non-existing alcohol cup) is different. Here the valve and the pressure relieve screw on the pressure gauge must be closed. Pump the font up to a lower pressure, just enough to get the Rapid to burn. Now open the Rapid with the lever and light the gas stream with a lighter or small gas burner. Let the mantle burn until completely white.

A properly burned mantle should look as seen in pic. 31 below. After burning let the mantle set and cool down some time before lighting the lantern.



**Pic. 27: Filling alcohol in the cup w. bottle**



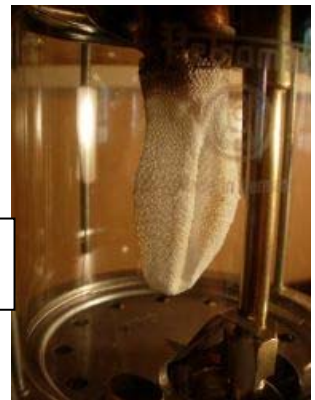
**Pic. 28: Burning the mantle**



**Pic. 29: Pump up to suitable pressure**



**Pic. 30: Ignite**



**Pic. 31: Nicely burned**

## 11. Pre-heating lantern w. Rapid / pre-heater cup

Pre-heating the generator before lighting the lantern can be done in two ways:

- 1) w. Rapid pre-heater using kero from the font, or
- 2) w. pre-heater cup and alcohol.

For pre-heating with the Rapid one has to pressurize the font first. Close the valve (arrow 'up') and the pressure relieve screw on the pressure gauge (#149). Pump up until the pressure is between 1 ... 1.5 bar. Usually the Rapid pre-heater works best in that range.

Now open the Rapid lever and immediately light the kero / air mixture (see pic. 30). Sometimes the pressure from the nozzle blows the Rapid out by itself. Then try again with some higher or lower pressure.

When the Rapid is firing (pic. 32; don't be afraid, it's quite noisy), constantly watch the pressure and keep slowly pumping to maintain a suitable pressure level in the font.

Pre-heat for abt. 60-90 seconds and make sure the flame reaches the upper part of the gen and the connections to the generator loop (pic. 33).

Now slowly open the valve. As soon as the mantle starts to form and to give a bright light (pic. 34), flip the Rapid lever down.

Check that the little rubber seal securely tightens the pre-heater nozzle (pic. 9).

Let the lantern run with lower pressure for a short time, watch the lantern behaviour (tightness etc.) and check, if the mantle is not damaged. Use welder's goggles or dark glass (pic. 35).

Pre-heating with alcohol takes more time but is a 'softer' start and is more gentle to the mantle.

In this case the valve and pressure release screw might be kept open. The pre-heater cup must be filled with alcohol and lit. If the burning time is considerably less than mentioned above, the gen is most probably not hot enough and a second fill is required.

Before the alcohol is fully burned, close the pressure release screw on the pressure gauge and start pumping to a suitable pressure. Slowly open the valve and let the rest of the burning alcohol light the lantern.

Let the lantern run with lower pressure again and watch proper operation before adding pressure up to the red mark on the pressure gauge.



**Pic. 32: Rapid firing**   **Pic. 33: ...to gen's top**   **Pic. 34: Burning ok**   **Pic. 35: Check mantle**

## 12. Adjustment of mixing tube paddle

Put the ventilator on if not already done and make sure, the little screw in the mixing tube can be seen from outside. Otherwise turn the vent horizontally by 180 degrees.

Now, only the final tuning is left. This is done using the mixing tube 'paddle' inside of the mixing tube (#33). Now turn the screw with a flat screwdriver forward and backward until the lantern gives the brightest light (pic. 36).



**Pic. 36: Adjusting the mixing tube 'paddle'**

That's it folks!



**Pic. 37: Voila, the perfect result ! ☺**

### 13. Put out lantern

To put the lantern out, simply close the valve. If the generator foot valve was properly maintained and is tight, the lantern should stop delivering fuel, vaporize the remaining fuel in the gen and go out almost immediately.

The pressure can be kept in the font if one wants to resume operation very soon. However the lantern should be checked for leakages or dripping frequently.

If it's not going to be used in the very near future it's best to put it out by just fully opening the pressure relieve screw on the pressure gauge. The lantern will dim and go out within a few seconds.

Let the lantern cool down, close the main valve, screw the release screw tight again and store away.

### 14. Generator details

Here below some detail pictures of the generator parts:



**Pic. 38: Complete generator with rod, foot valve, main valve and nozzle with needle**



**Pic. 39: Upper part of gen with nozzle and needle**



**Pic. 40: Lower part of gen w. gen rod foot valve body, spring and seal**

## 15. Rapid pre-heater details

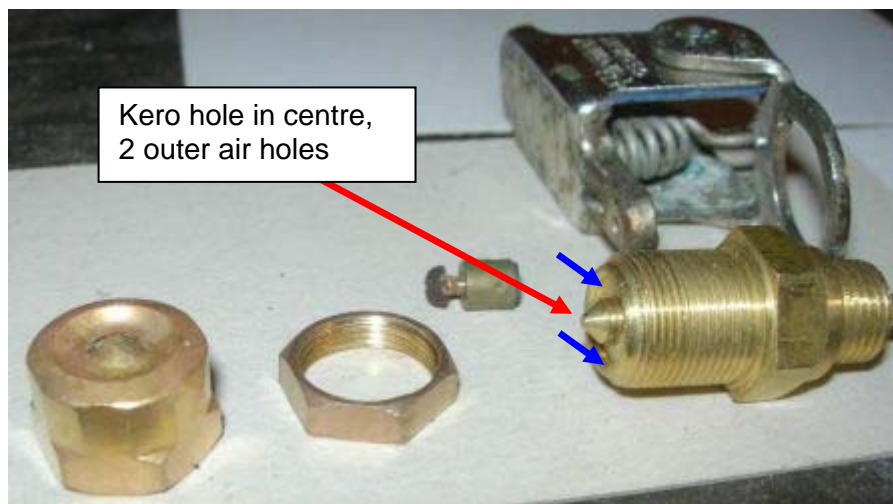
Some more pictures of the Rapid torch pre-heater:



Pic. 41: Fully assembled Rapid



Pic. 42: Disassembled



Pic. 43: Rapid details

**16. Valve, valve shaft details**



**Pic. 44:** The valve completely disassembled



**Pic. 46:** Completely assembled



**Pic. 45:** A new graphite packing (#108) fitted



**Pic. 47:** Valve wheel in 'open' position



**Pic. 48:** Valve wheel in 'closed' position



## 17. Check valve details



**Pic. 49:** Pump check valve disassembled



**Pic. 50:** View into the pump body



**Pic. 51:** Pump, pump body and pump check valve

## 18. Identification of age

The manufacturing date, for some lanterns, can be found according to the four-digit no. on the bottom of the fount. However, as far as we know today this is valid only for lanterns made in the 1960's.

My lantern bears the no. 4385.

The first two digits refer to the week the lantern was made. Here it means week 43.

The number 8 refers to the year: 8 means 1968.

The 5 refers to the day in the week: 5<sup>th</sup> day means Friday.

From this it seems the lantern was made Friday, Oct.25<sup>th</sup> 1968.

This way of identification is valid only for the 'civil' Petromax lanterns. Lanterns made for the army (with the dull grey surface) don't carry such numbers.

Newer lanterns also have certain numbering but there is no valid and proven interpretation up to now.



**Pic. 52: The number on the bottom of the fount**

### **That was it!**

My way and my experience during restoration of a Petromax lantern.  
Enjoy and run your lantern safely.

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