Running A Generator On Water

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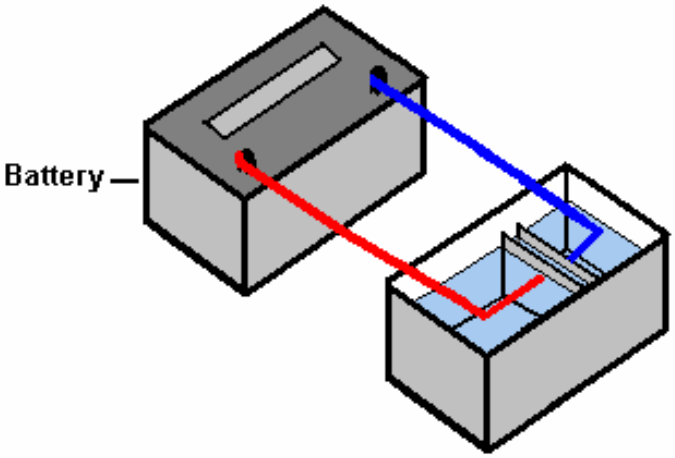
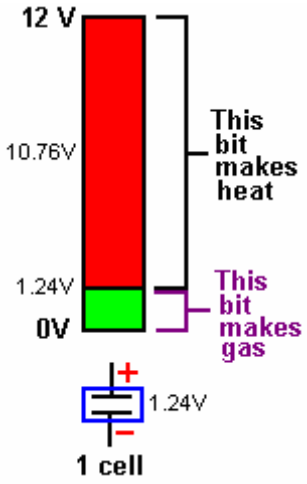
"HHO" IS A COMMON NAME GIVEN TO THE GAS MIXTURE PRODUCED DURING THE ELECTROLYSIS OF WATER. ELECTROLYSIS CAN BE ACCOMPLISHED BY PLACING TWO CONDUCTING ELECTRODES IN WATER AND APPLYING A SUITABLE VOLTAGE TO THOSE ELECTRODES :



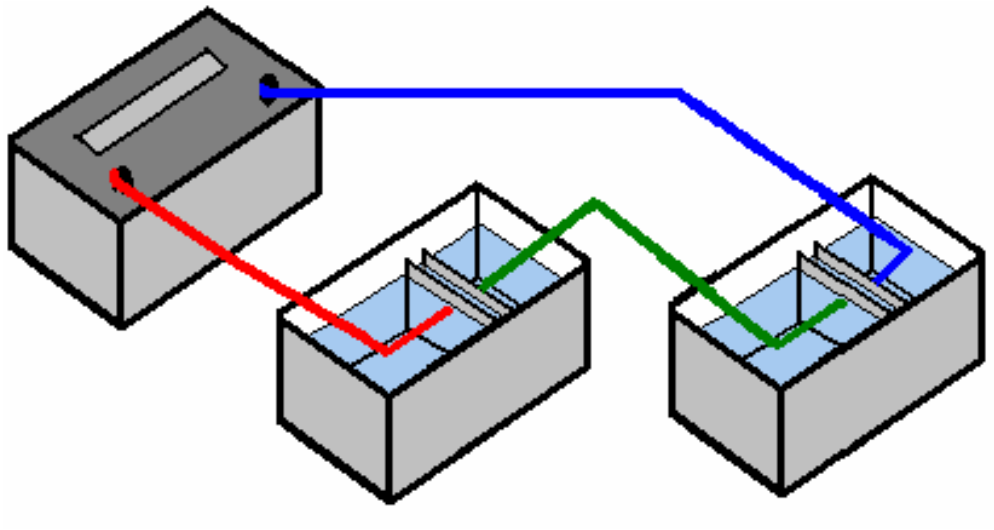
THE RESULT OF THIS IS BUBBLES OF GAS LEAVING THE LIQUID. THE VOLUME OF WATER DOES NOT APPEAR TO CHANGE MUCH BECAUSE ONE LITRE OF WATER PRODUCES AROUND 1750 LITRES OF GAS. MICHAEL FARADAY DID THIS AND DETERMINED HOW MUCH GAS WAS PRODUCED PER AMP OF CURRENT FLOWING BETWEEN THE ELECTRODES. "SCIENTISTS" ASSUME THAT FARADAY'S RESULTS ARE THE FINAL WORD ON THE SUBJECT. THEY AREN'T. BOB BOYCE OF AMERICA DOES NOT CONSIDER AN ELECTROLYSIS CELL READY FOR USE UNTIL IT EXCEEDS TWICE THE PERFORMANCE OF FARADAYS EXPERIMENTS.

WE HAVE A PROBLEM WITH THE ABOVE ARRANGEMENT. THE VOLTAGE WHICH PRODUCES GAS FROM WATER IS 1.24 VOLTS, AND SO, IF WE APPLY SAY, 12 VOLTS TO THE ELECTRODES, THEN THAT IS VERY INEFFICIENT :

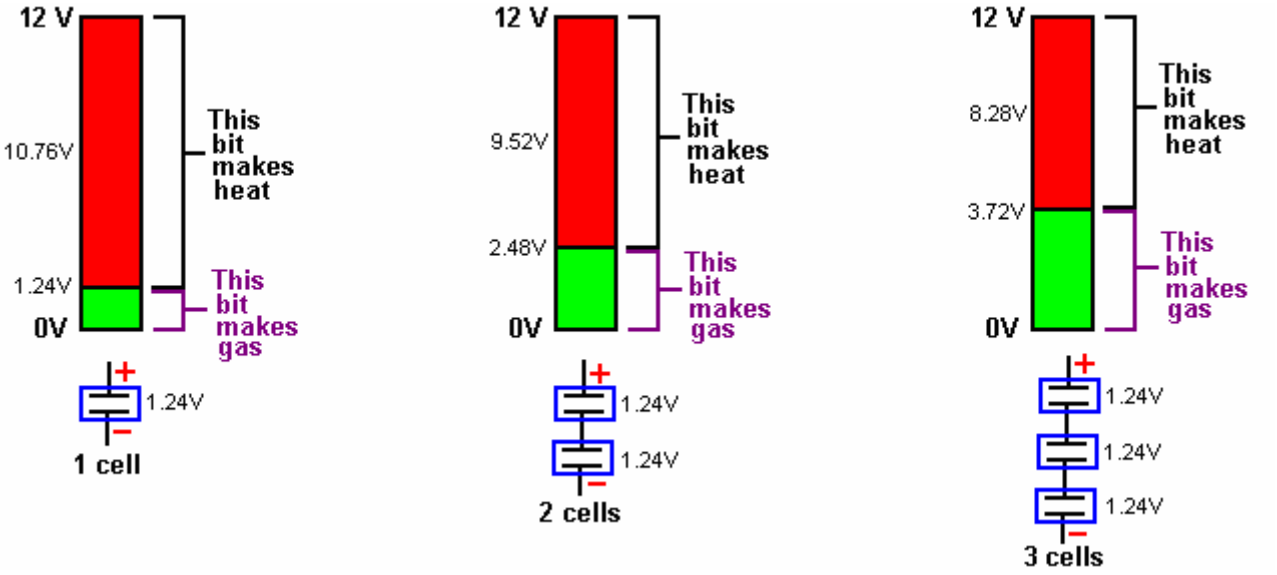


WITH 12 VOLTS APPLIED, 10.76 VOLTS DO NOT MAKE HHO GAS AND SO THE PROCESS IS ONLY ABOUT 10 PER CENT EFFICIENT AND 90 PER CENT OF THE POWER SUPPLIED ONLY HEATS THE WATER.

WE CAN IMPROVE ON THIS ARRANGEMENT BY USING TWO CELLS CONNECTED IN SERIES :



THIS DOUBLES THE AMOUNT OF GAS PRODUCED AND IT DOUBLES THE OVERALL PERFORMANCE OF THE SYSTEM.

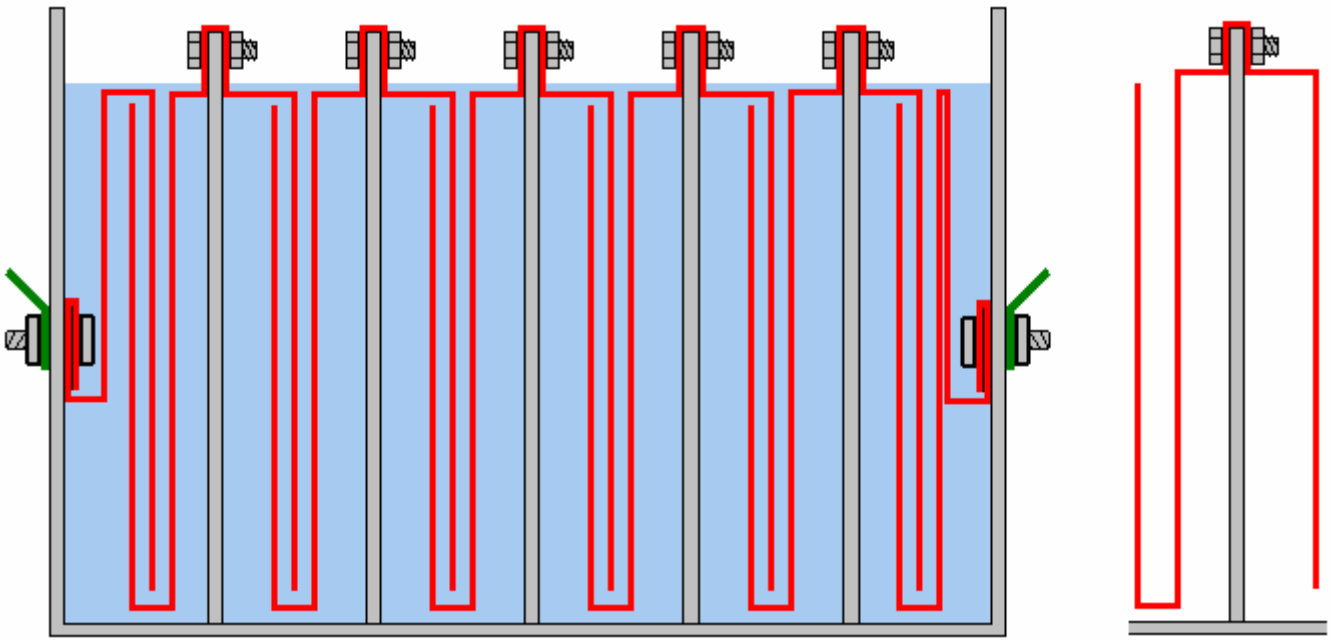


EXPERIENCE HAS SHOWN THAT USING SIX OR SEVEN PAIRS OF ELECTRODES WITH A VEHICLE'S ELECTRIC SYSTEM IS THE MOST EFFECTIVE COMBINATION.

HOWEVER, WATER DOES NOT EASILY BREAK DOWN INTO HHO GAS, AND SO USING A CATALYST IS AN IMPORTANT STEP FORWARD. THE TWO BEST KNOWN TRUE CATALYSTS ARE SODIUM HYDROXIDE (NaOH) AND POTASSIUM HYDROXIDE (KOH). THESE INCREASE THE CURRENT FLOW THROUGH THE WATER AND SO, INCREASES THE HHO GAS VOLUME PRODUCED. THE OPTIMUM SODIUM HYDROXIDE MIX IS 20% BY WEIGHT, AND FOR POTASSIUM HYDROXIDE 28% BY WEIGHT.

HOWEVER, THOSE CATALYSTS REACT WITH MANY ELECTRODE MATERIALS AND SO 316L-GRADE STAINLESS STEEL IS A GOOD CHOICE FOR THE ELECTRODE MATERIAL.

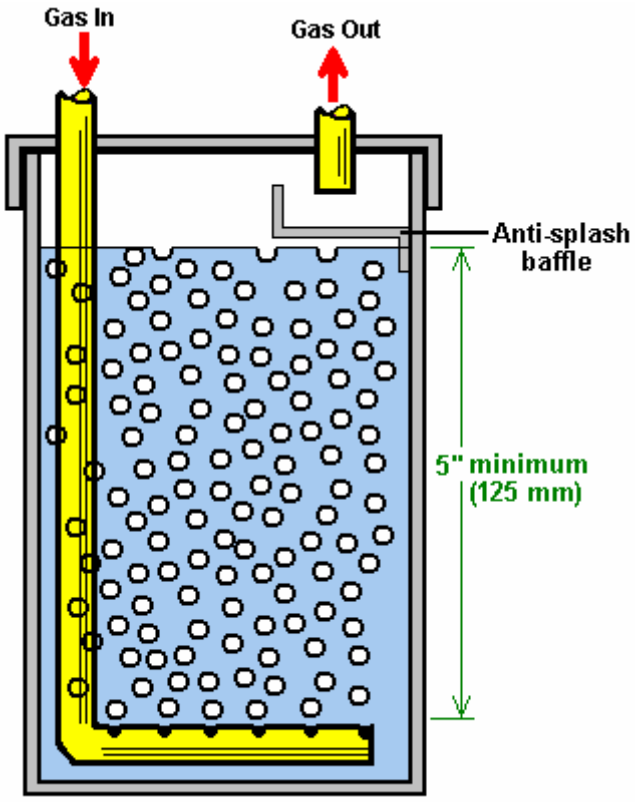
IT IS NOT REALISTIC TO USE THE ELECTRODE ARRANGEMENT SHOWN DUE TO ITS SHEER PHYSICAL SIZE. INSTEAD, ALL ELECTRODE PAIRS ARE PLACED INSIDE ONE CONTAINER, PERHAPS LIKE THIS :



ADDING HHO GAS TO THE AIR ENTERING A VEHICLE ENGINE IS HIGHLY BENEFICIAL AS IT PROMOTES THE FULL BURNING OF THE FUEL BEING USED AND THAT OFFSETS THE NEED FOR A CATALYTIC CONVERTER AS WELL AS INCREASING THE MILES PER GALLON BY ANYTHING FROM 20% TO 100% AND ONLY HALF OF ONE LITRE PER MINUTE OF HHO FLOW IS NEEDED FOR THAT.

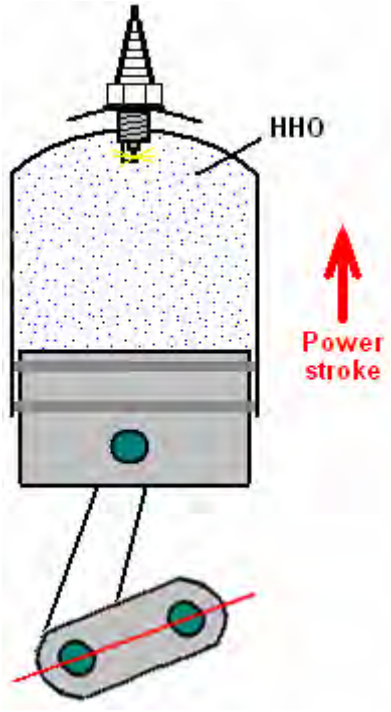
SOME PEOPLE ARE AFRAID OF HHO GAS AS THEY THINK THAT IT CAN EXPLODE. IT CAN'T. WATER EXPANDS SOME 1750 TIMES TO MAKE HHO GAS AND SO IF IT IGNITES AND RETURNS TO WATER, THEN IT WILL BE SOME 1750 TIMES SMALLER – THAT IS, IT IMPLODES. THAT CHANGE IN SIZE IS VERY FAST AND IT RELEASES A GOOD DEAL OF HEAT. A WORD OF WARNING : DO NOT IGNITE HHO GAS IN THE OPEN AIR AS THE BANG IS SO LOUD THAT YOU COULD DAMAGE YOUR HEARING AND BE DEAF FOR THE REST OF YOUR LIFE.

A VERY IMPORTANT DEVICE FOR WORKING WITH HHO IS THE BUBBLER :



THE IDEA IS TO HAVE A WATER BLOCK TO PREVENT ANY ACCIDENTAL IGNITION OF THE GAS FROM PASSING DOWNWARDS THROUGH THE WATER. A LARGE NUMBER OF SMALL BUBBLES IS HELPFUL.

THE FACT THAT HHO IMPLODES LEAVES US WITH TWO OPTIONS :



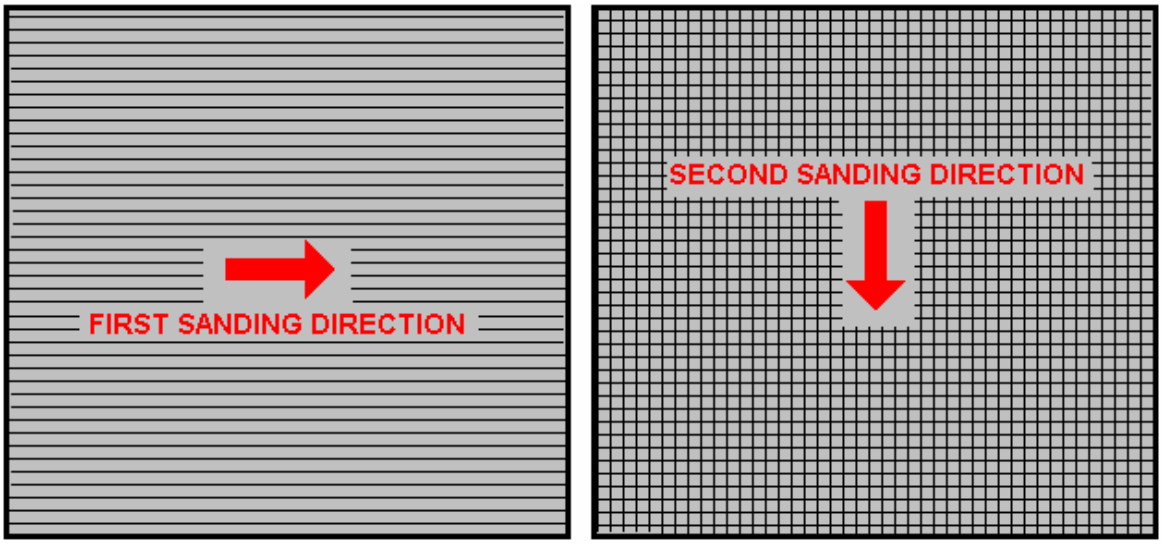
THE FIRST OPTION IS TO CHANGE THE SPARK TIMING DRASTICALLY AND MAKE THE IMPLOSION SUCK THE PISTON UPWARDS ON WHAT USED TO BE THE COMPRESSION STROKE. THIS IS NOT CONVENIENT ALTHOUGH IT HAS BEEN DONE SUCCESSFULLY IN SPITE OF THE VALVE OPERATION CHANGES NEEDED.

THE SECOND OPTION IS TO CHANGE THE IMPLOSION INTO AN EXPLOSION WHICH IS A GOOD DEAL EASIER THAN IT SOUNDS. THE TRICK IS TO USE THE HEAT OF THE IMPLOSION TO TURN WATER INTO STEAM AND THE FASTEST WAY TO DO THAT IS TO ADD COLD WATER MIST OR "FOG" TO THE INCOMING AIR. THAT RESULTS IN 'FLASH STEAM' WHICH PROVIDES A POSITIVE PRESSURE ON THE PISTONS JUST AS THE NORMAL FUEL WOULD DO. THIS MEANS THAT YOU CAN RUN A GENERATOR LIKE THIS ONE :

WITHOUT USING PETROL. THE EFFICIENCY OF DC ELECTROLYSIS FOR USE WITH A GENERATOR CAN BE IMPROVED QUITE READILY. THE FIRST STEP IS TO USE AN ELECTRONIC PULSING CIRCUIT INSTEAD OF JUST AN ORDINARY DC SUPPLY. THESE PULSING CIRCUITS ARE SOLD AS "DC MOTOR SPEED CONTROLLERS" AND CAN LOOK LIKE THIS :

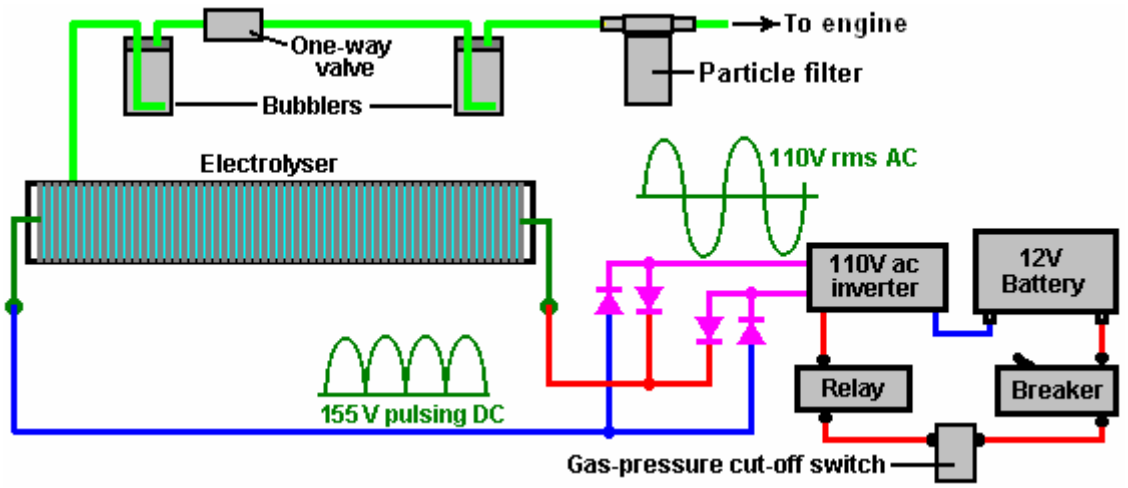
THE UNIT SHOWN HERE IS INTENDED TO PROVIDE UP TO 30 AMPS AND FANCIER UNITS ARE ALSO AVAILABLE.

BOB BOYCE IS THE MOST EXPERIENCED PERSON IN THE HHO FIELD AND HE STRESSES THE NECESSITY FOR CAREFUL ELECTRODE PREPARATION BEFORE USE. FOR THIS, THE 316L-GRADE STAINLESS STEEL ELECTRODE PLATES HAVE ALL TRACES OF OIL, GREASE OR OTHER CONTAMINANTS REMOVED FROM THEM AND ARE THEN SANDED WITH GRADE 80 SANDPAPER IN TWO DIRECTIONS WHICH ARE 90-DEGREES APART IN ORDER TO CREATE TINY PEAKS ON BOTH SURFACES OF EACH PLATE :



THEN, THE PLATES ARE WASHED WITH DISTILLED WATER AND ALL HAND CONTACT IS AVOIDED BY THE USE OF DISPOSABLE GLOVES. NEXT COMES THE 'CONDITIONING' PROCESS WHERE THE PLATES ARE INSERTED IN THE ELECTROLYSER AND CURRENT RUN THROUGH THE WHOLE SET OF PLATES FOR SEVERAL HOURS, USING A 20% SODIUM HYDROXIDE ELECTROLYTE. THE PLATES ARE THEN RINSED OFF AND THE PROCESS REPEATED UNTIL THE ELECTROLYSER PERFORMANCE IS AT LEAST DOUBLE THAT OF FARADAY. MORE PRECISE DETAILS FOR THIS PROCESS ARE GIVEN IN CHAPTER 10 OF www.free-energy-info.com/PJKbook.pdf WHICH IS A FREE DOWNLOAD.

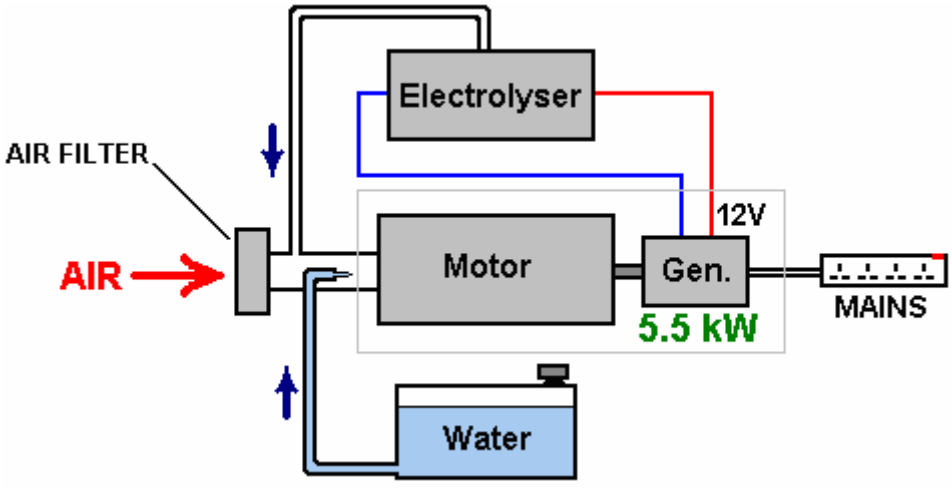
THE RATE OF GAS PRODUCTION CAN BE INCREASED BY INCREASING THE NUMBER OF PLATES IN THE ELECTROLYSER. BOB BOYCE CHOOSES TO DO IT THIS WAY :



AS BOB IS AMERICAN, HIS DC INVERTER PRODUCES A NOMINAL 110-VOLTS AC WHICH RECTIFIES TO ABOUT 155 VOLTS OF PULSING DC. THIS ALLOWS AN ELECTROLYSER WITH 100 SEPARATE CELLS IN IT, (CREATED BY 101 ELECTRODE PLATES) TO BE USED. BOB'S PREFERRED PLATE SIZE IS 6-INCHES SQUARE (150 mm SQUARE). THE DC EFFICIENCY OF EACH CELL IS APPROXIMATELY 216% THAT OF MICHAEL FARADAY.

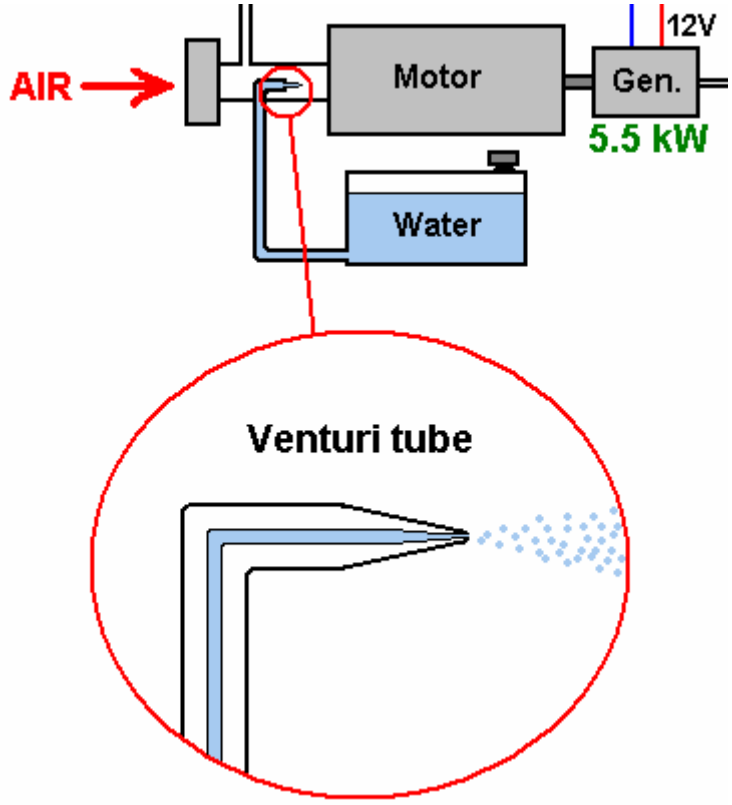
IT IS PERFECTLY POSSIBLE TO RUN AN ORDINARY, COMMERCIAL GENERATOR WITHOUT THE USE OF ANY CONVENTIONAL FUEL.

THE WAY THAT THIS IS DONE IS FAIRLY STRAIGHTFORWARD AND EASY TO UNDERSTAND :

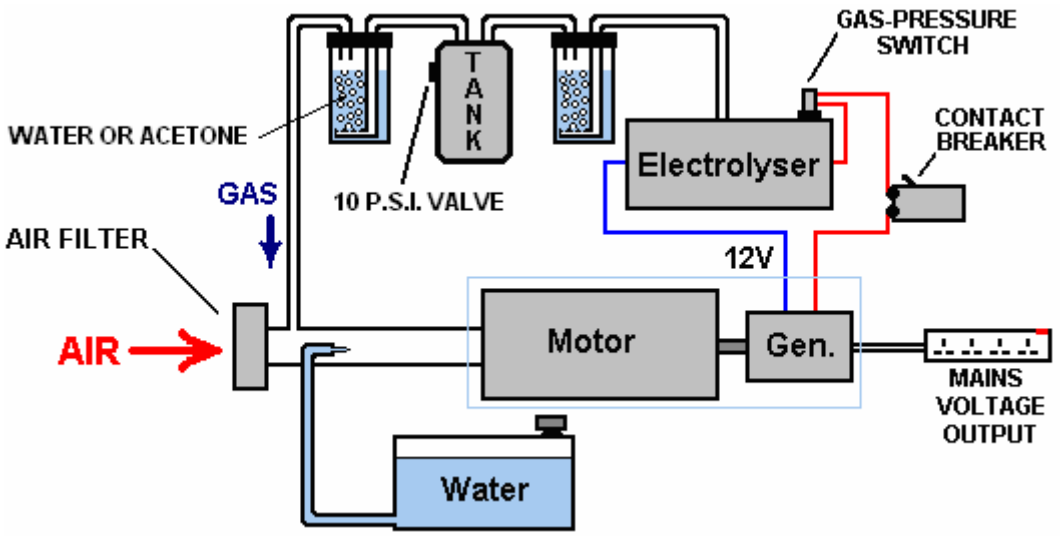


AS THE GENERATOR IS A GREAT SOURCE OF ELECTRICAL POWER, IT IS USED TO POWER THE ELECTROLYSER TO CREATE THE NECESSARY HHO GAS TO POWER THE MOTOR OF THE GENERATOR. THE ELECTROLYSER GAS IS FED INTO THE AIR STREAM ENTERING THE ENGINE AND AS HHO GAS IMPLODES, COLD WATER MIST IS ALSO FED INTO THE ENGINE.

THE COLD WATER MIST IS A STREAM OF TINY WATER DROPLETS WHICH CAN BE PRODUCED WITH A COMMERCIAL "POND FOGGER" FROM A PET SHOP OR A GARDEN CENTRE, OR JUST VERY SIMPLY WITH A VENTURI TUBE AS SHOWN HERE :

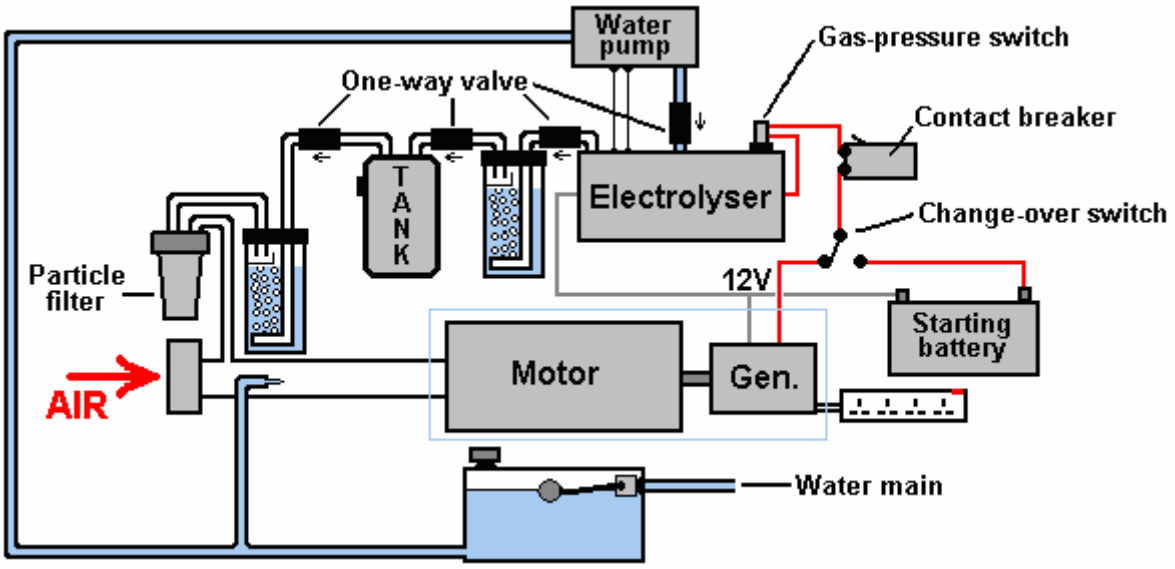


OBVIOUSLY, SOME SAFETY FEATURES ARE ADVISABLE AND WHILE THEY MAKE THE SYSTEM APPEAR TO BE MORE COMPLICATED, IT REALLY ISN'T :

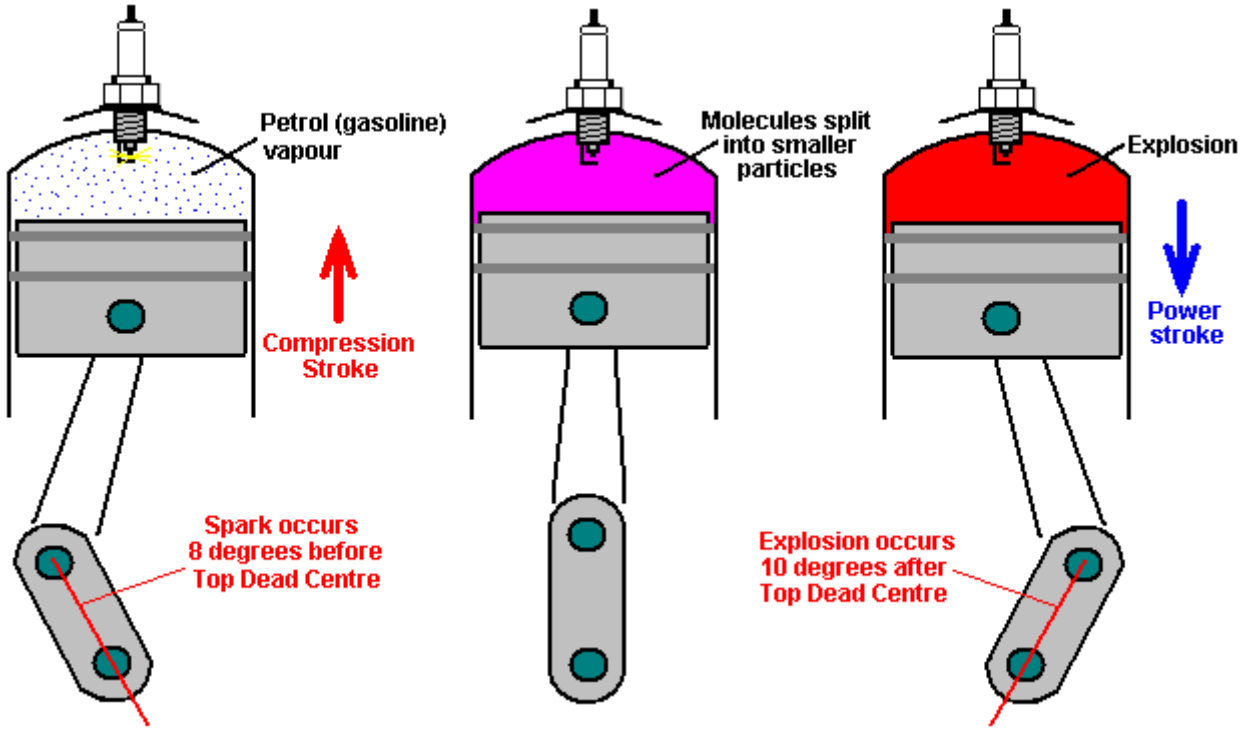


THE MAIN ADDITION IS TWO BUBBLERS BETWEEN THE ELECTROLYSER AND THE MOTOR OF THE GENERATOR. THESE ARE TO WASH OUT ANY SLIGHT TRACES OF ELECTROLYTE WHICH MAY HAVE CONTAMINATED THE HHO GAS GENERATED.

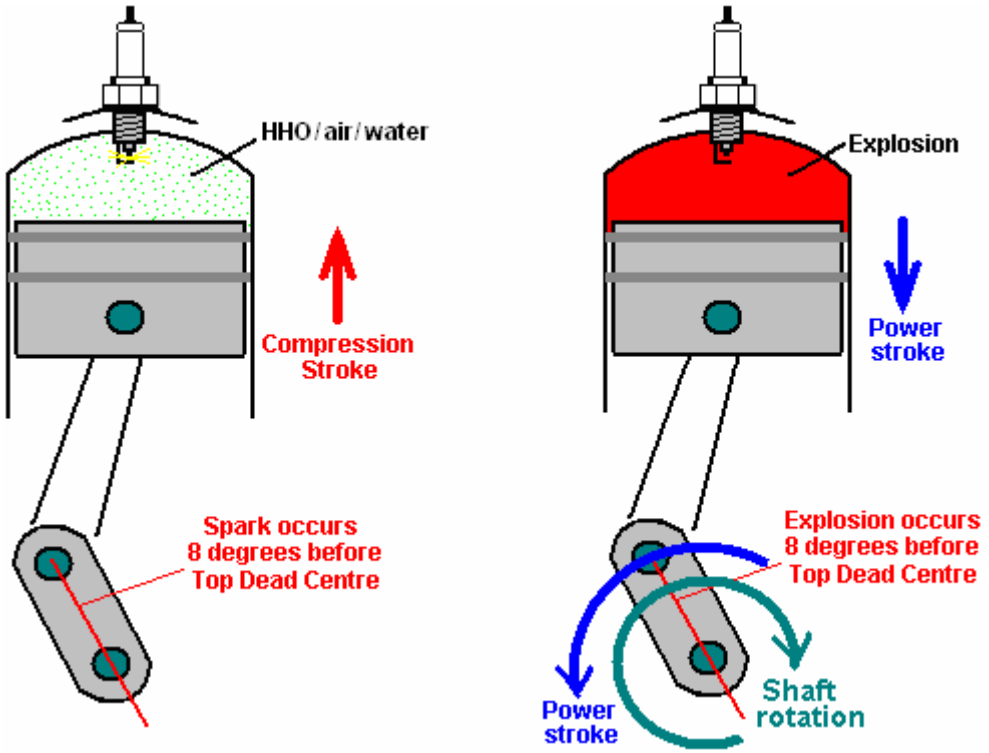
IT IS NORMAL FOR A SYSTEM LIKE THIS TO BE STATIONARY AND IF THAT IS THE CASE, THEN A LOCAL WATER SUPPLY CAN BE ATTACHED :



THE REASON FOR ALTERING THE TIMING OF THE SPARK IS THE SLIGHT DELAY BETWEEN THE SPARK AND THE COMBUSTION OF A PETROL / AIR MIX. THE COMBUSTION NEEDS TO HAPPEN A FEW DEGREES AFTER TOP DEAD CENTRE, WHEN THE PISTON IS STARTING ITS DOWNWARD MOVEMENT IN THE POWER STROKE. BECAUSE OF THE DELAY WHILE THE HYDROCARBON CHAIN IS BREAKING DOWN, A PETROL ENGINE SPARK OCCURS A FEW DEGREES BEFORE TOP DEAD CENTRE :

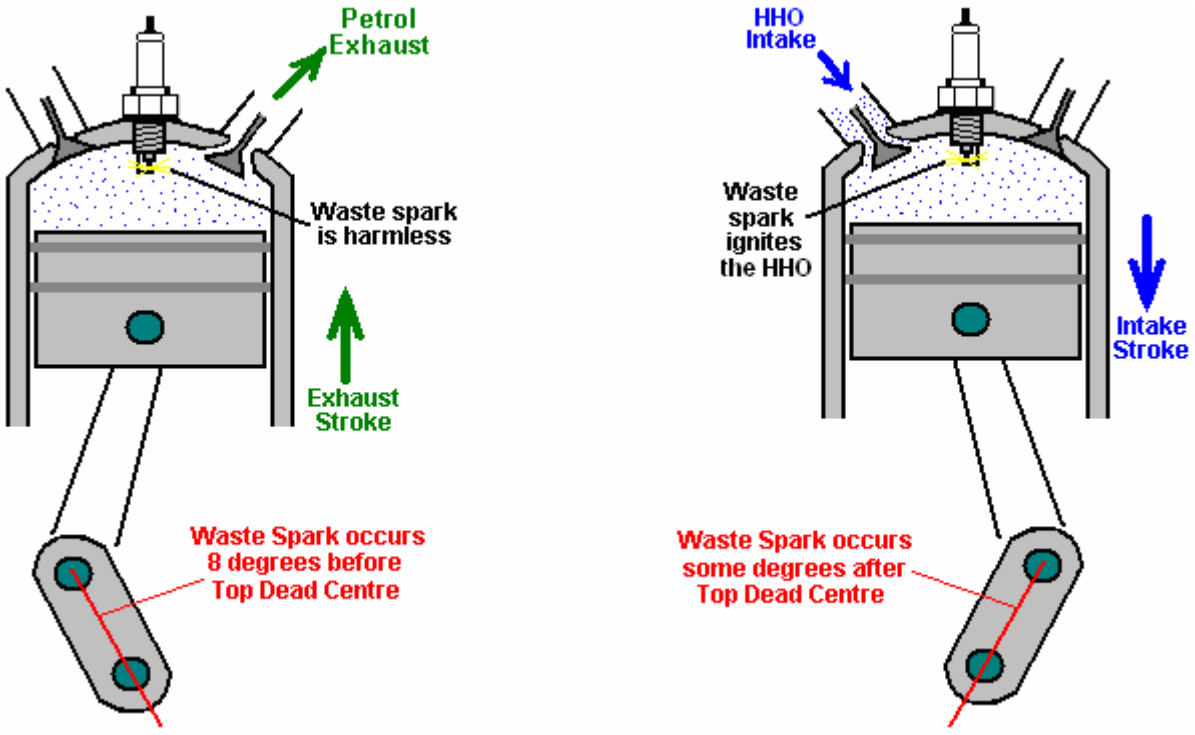


IF YOU JUST REPLACE THE PETROL VAPOUR WITH HHO GAS THEN THAT WOULD BE A MAJOR PROBLEM BECAUSE HHO IGNITES INSTANTLY AND THAT WOULD BE FAR TOO SOON BECAUSE OF THE WAY THAT THE GENERATOR IS MANUFACTURED FOR USE WITH PETROL :



USING JUST AN HHO-AIR-WATER MIX, THE COMBUSTION WOULD OCCUR BEFORE TOP DEAD CENTRE AND MIGHT WELL BREAK THE CONNECTING ROD WHICH MOVES THE PISTON, SO WE NEED TO DELAY THE SPARK BY ABOUT TEN DEGREES.

TO LOWER MANUFACTURING COSTS, SPARK TIMING IS OFTEN TAKEN OFF THE OUTPUT SHAFT, PRODUCING A SPARK ON EVERY REVOLUTION INSTEAD OF EVERY SECOND REVOLUTION AS IS ACTUALLY NEEDED. THESE EXTRA "WASTE" SPARKS DON'T MATTER WITH PETROL AS THEY OCCUR DURING THE EXHAUST STROKE, BUT WITH HHO FUEL THEY DO MATTER VERY MUCH DUE TO THE DELAYED SPARK TIMING :

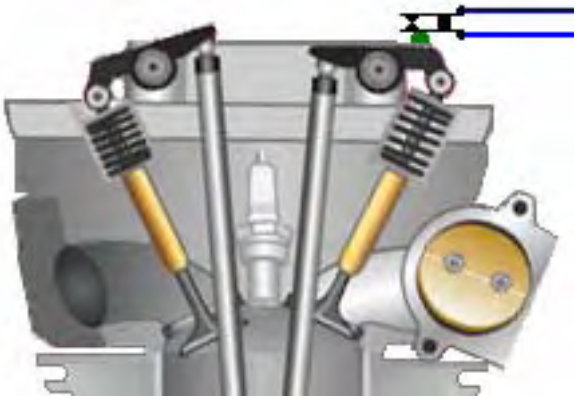


THIS LEAVES US WITH TWO ESSENTIAL ADJUSTMENTS – TIMING DELAY AND WASTE SPARK SUPPRESSION. THERE ARE VARIOUS WAYS THAT THIS CAN BE DONE BUT AS EACH ENGINE DESIGN IS DIFFERENT IT IS DIFFICULT TO COVER EVERY POSSIBILITY. HOWEVER, THERE IS A TECHNIQUE

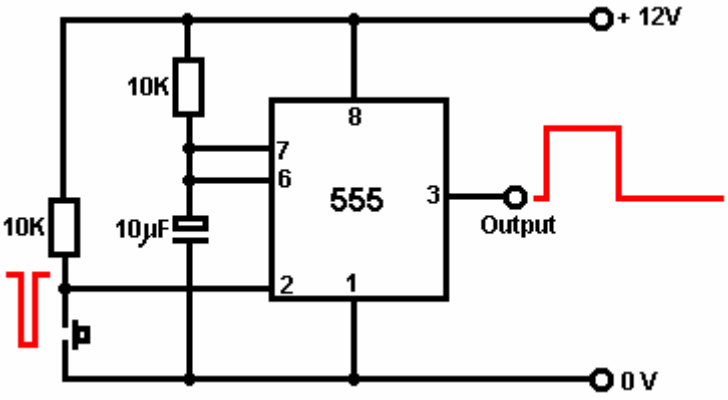
WHICH CAN BE USED WITH MANY ENGINES AND WHICH DEALS WITH BOTH ISSUES AT THE SAME TIME.

MOST GENERATOR ENGINES ARE FOUR STROKE ENGINES WITH INTAKE AND EXHAUST VALVES WHICH ARE PERHAPS SOMETHING LIKE THIS :

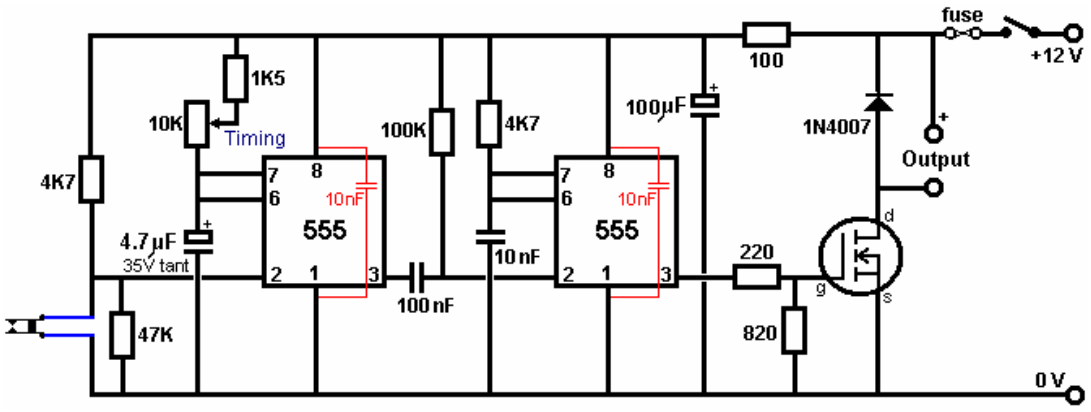
THE INTAKE VALVE (SHOWN ON THE RIGHT IN THIS ILLUSTRATION) IS PUSHED DOWN BY A CAM SHAFT, COMPRESSING THE SPRING AND OPENING THE INLET PORT. THIS ONLY TAKES PLACE EVERY SECOND REVOLUTION. IF A SWITCH IS MOUNTED SO THAT IT OPENS AND CLOSES WITH THE INTAKE VALVE (AND THE ORIGINAL SPARK TIMING WIRING REMOVED), THEN AN ADJUSTABLE ELECTRONIC CIRCUIT CAN SET THE CORRECT SPARK TIMING :



THE SORT OF DELAY CIRCUIT NEEDED IS CALLED A “MONOSTABLE” MULTIVIBRATOR :



WE CAN USE TWO OF THESE CIRCUITS, THE FIRST TO GIVE THE NEEDED DELAY AND THE SECOND TO GIVE A BRIEF PULSE TO THE IGNITION CIRCUIT TO GENERATE THE SPARK :



SELWYN HARRIS OF AUSTRALIA HAS KINDLY AGREED TO SHARE DETAILED INFORMATION ON HOW HE PERFORMS THE CONVERSION OF A STANDARD ELECTRICAL GENERATOR, AND HERE HE USES A GX4000i GENERATOR AS AN EXAMPLE. HIS CONVERSION DEALS WITH BOTH THE DELAYED SPARK AND THE WASTE SPARK :

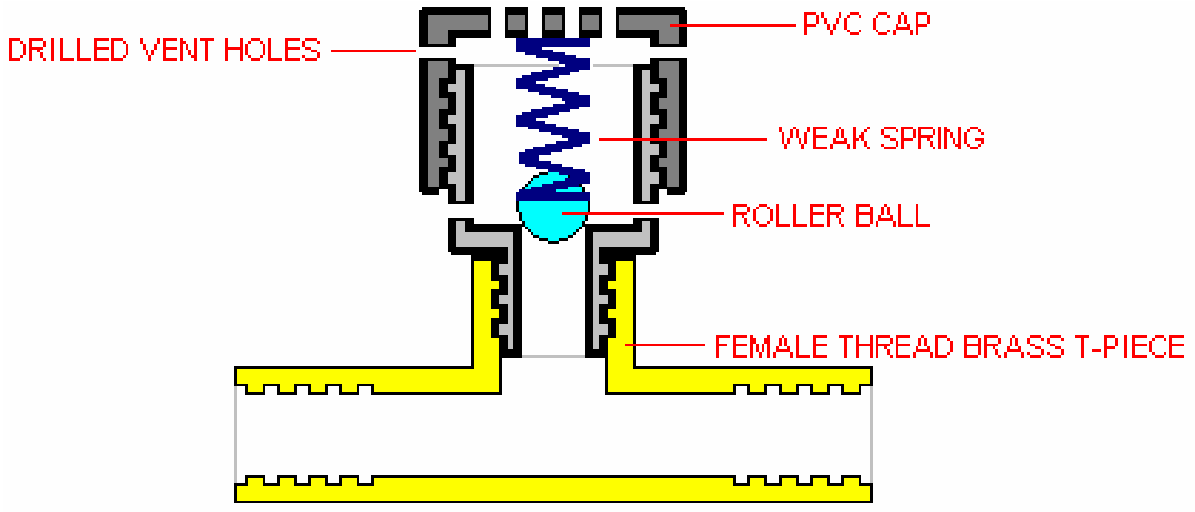
THE FIRST STEP OF THE CONVERSION IS TO REMOVE THE FUEL TANK WHICH IS HELD IN PLACE BY FOUR BOLTS, AND THAT GIVES ACCESS TO THE CARBURETTOR WHICH IS REMOVED AS IT WILL NOT BE USED :

THE NEXT STEP IS TO CONSTRUCT A PRESSURE-RELEASE VALVE. FOR THIS, PARTS ARE PURCHASED FROM THE LOCAL HARDWARE STORE. THE BRASS FITTINGS ARE A 12mm BARREL, A 12mm FEMALE T-FITTING AND A 12mm TO 9mm HOSE REDUCER AS SHOWN HERE :

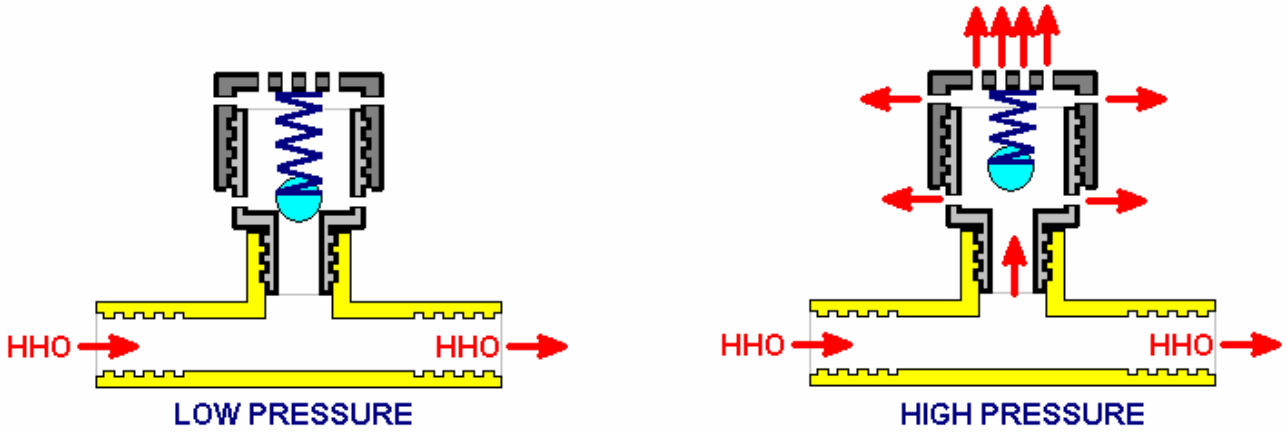
THE PVC PLASTIC FITTINGS ARE A HALF-INCH TO ONE AND A QUARTER INCH REDUCER AND A ONE AND A QUARTER INCH END CAP. ALSO NEEDED ARE THE ROLLER BALL FROM AN OLD COMPUTER MOUSE (3-D PRINT ONE IF NONE IS AVAILABLE) AND A FAIRLY WEAK COMPRESSION SPRING TO HOLD THE BALL IN PLACE DURING NORMAL OPERATION WHERE THE GAS PRESSURE IS LOW :

THE CAP IS DRILLED WITH HOLES AND THESE COMPONENTS ARE THEN ASSEMBLED TO PRODUCE A PRESSURE-RELEASE VALVE :

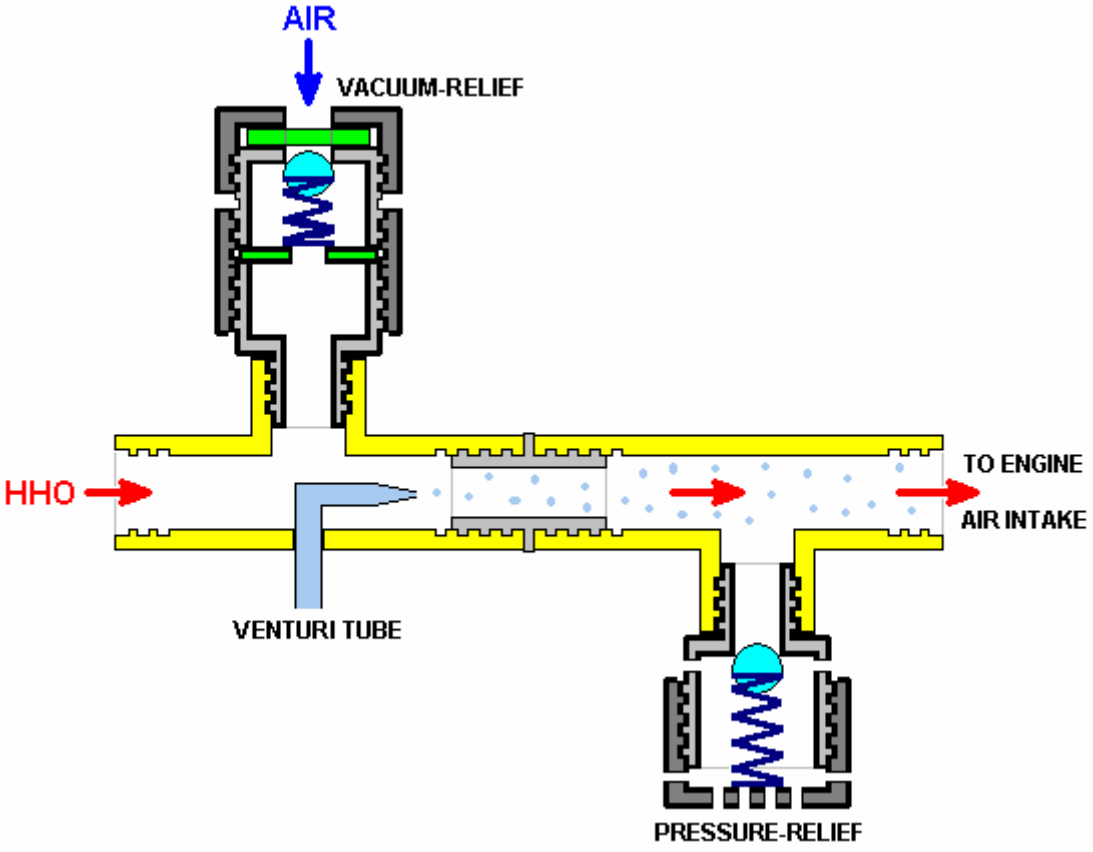
THE INSIDE OF THE FLASH ARRESTOR LOOKS LIKE THIS :



THE BALL IS HELD IN PLACE BY THE SPRING ALLOWING HHO TO FLOW PAST IT, BUT IF A SUDDEN INCREASE IN PRESSURE OCCURS THEN THE BALL IS FORCED UPWARDS, OPENING AN ESCAPE PATH THROUGH THE MANY HOLES DRILLED IN THE PLASTIC FITTINGS :

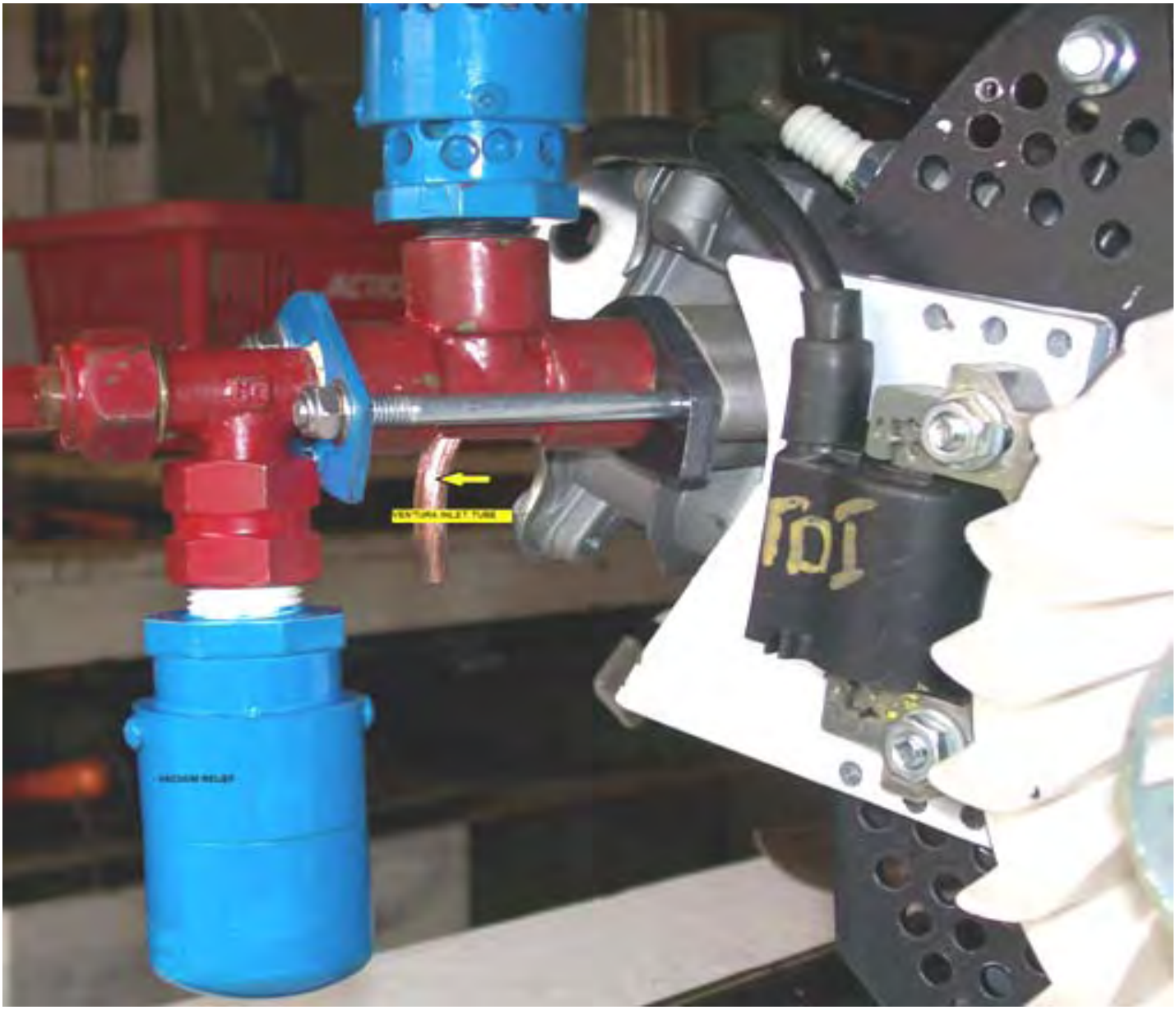


SELWYN ADDS AN ADDITIONAL SPRING-LOADED VALVE TO THE GENERATOR IN CASE THE ELECTROLYSER FAILS TO PRODUCE ENOUGH HHO GAS VOLUME. HE CALLS IT A "VACUUM RELIEF" VALVE BUT IT ACTUALLY OPERATES ON REDUCED PRESSURE RATHER THAN ON AN ACTUAL VACUUM. SELWYN USES A "HOGG" ELECTROLYSER (SHOWN IN CHAPTER 10) AND RECKONS THAT A HHO PRODUCTION RATE OF 4.5 TO 5 LITRES PER MINUTE IS SUFFICIENT TO RUN THE GENERATOR PROPERLY :

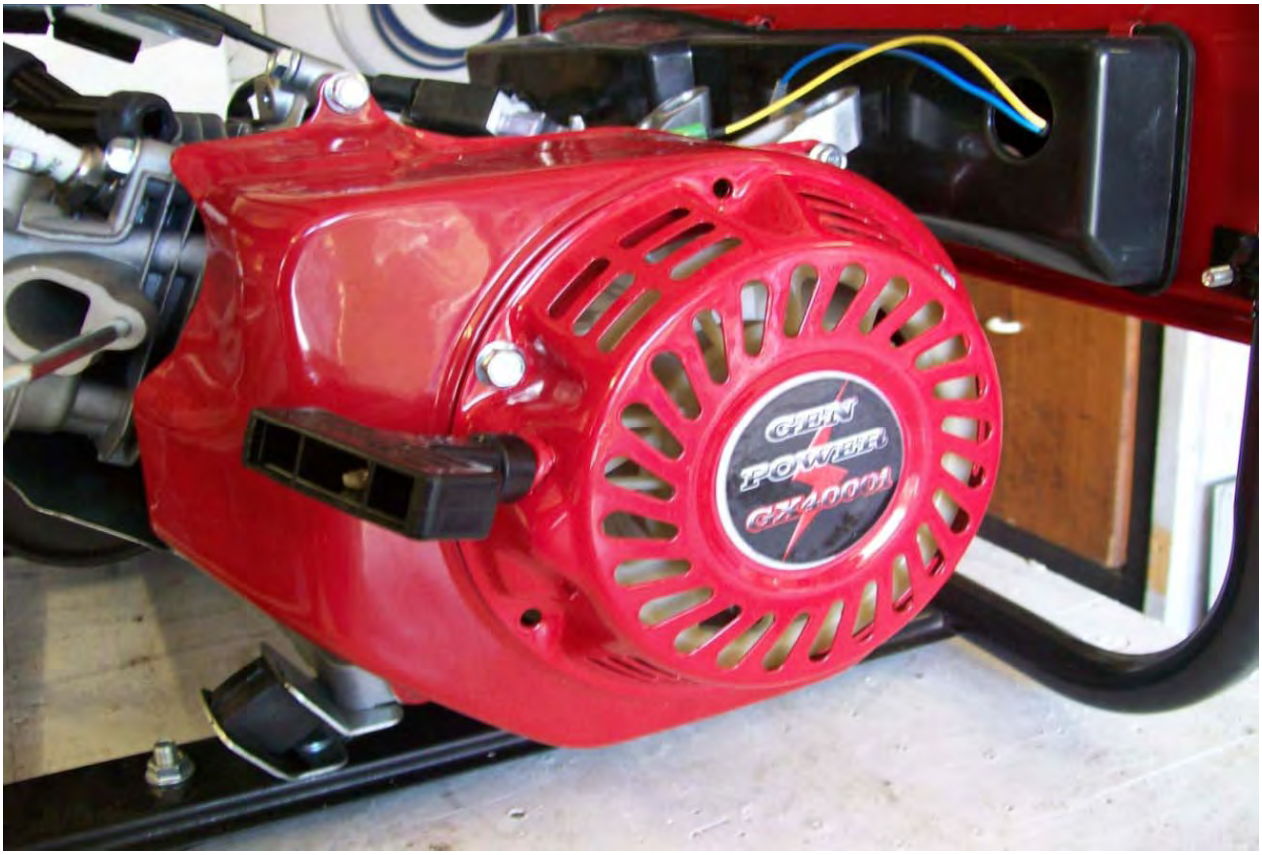


NEXT, A PIECE OF 6mm THICK ALUMINIUM PLATE IS CUT AND SHAPED TO BE THE SAME SIZE AND SHAPE AS THE CARBURETTOR GASKET (WHICH IS NOT SYMMETRICAL) :

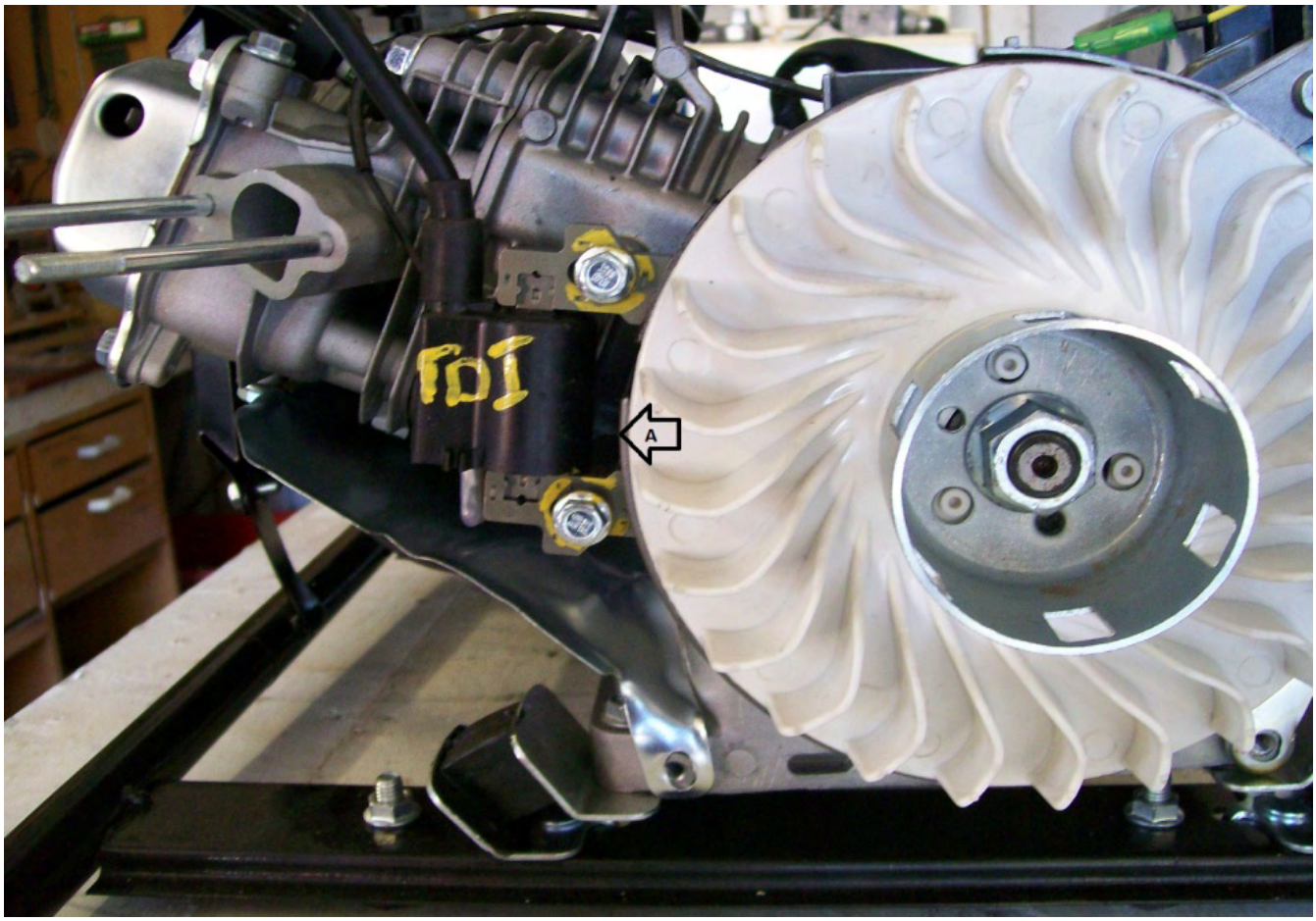
THE PIPES, BACKING PLATE, PRESSURE-RELIEF, VACUUM RELIEF, GASKETS, NUTS AND BOLTS ARE THEN ASSEMBLED AS SHOWN HERE – THE PAINT CONCEALS THE DIFFERENT MATERIALS BEING USED. AT THIS POINT, AN ELECTROLYSER ABLE TO PRODUCE AT LEAST 4.5 LPM OF HHO IS CONNECTED TO THE INTAKE.



THE MANUAL PULL-START AND THE GENERATOR COVER ARE NOW REMOVED. IT IS ONLY NECESSARY TO UNDO FOUR OF THE BOLTS IN ORDER TO TAKE THE COVER OFF :

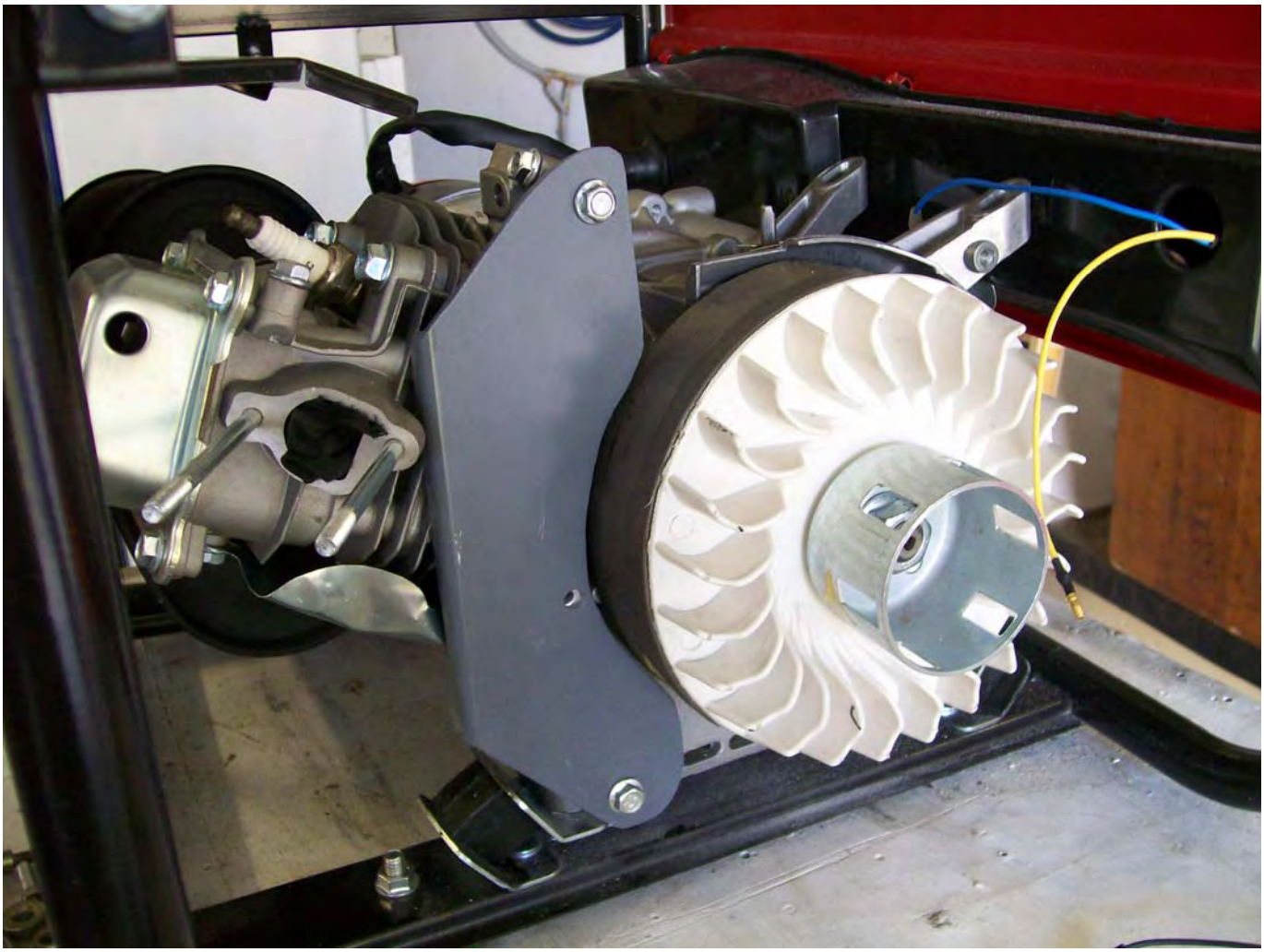


THIS IS THE ENGINE WITH THE PULL-START AND THE BLOWER COVER REMOVED :



AT “A” YOU CAN SEE THE MAGNETIC PULSE TYPE TRANSISTOR DISCHARGE IGNITION (“TDI”) PICK UP BOLTED IN PLACE IN ITS ORIGINAL 8-DEGREES BEFORE TOP DEAD CENTRE POSITION. THIS NEEDS TO BE REMOVED AND AN ALUMINIUM PLATE INSERTED TO ALLOW THE TDI TO BE MOUNTED IN ITS NEW POSITION. BECAUSE OF THE NEW FUEL, IT IS NECESSARY TO RETARD THE SPARK. TO MODIFY THE IGNITION TO TOP DEAD CENTRE.

THIS IS SELWYN'S 2mm THICK ALUMINIUM ADAPTOR PLATE READY FOR THE TIMING CHANGE :



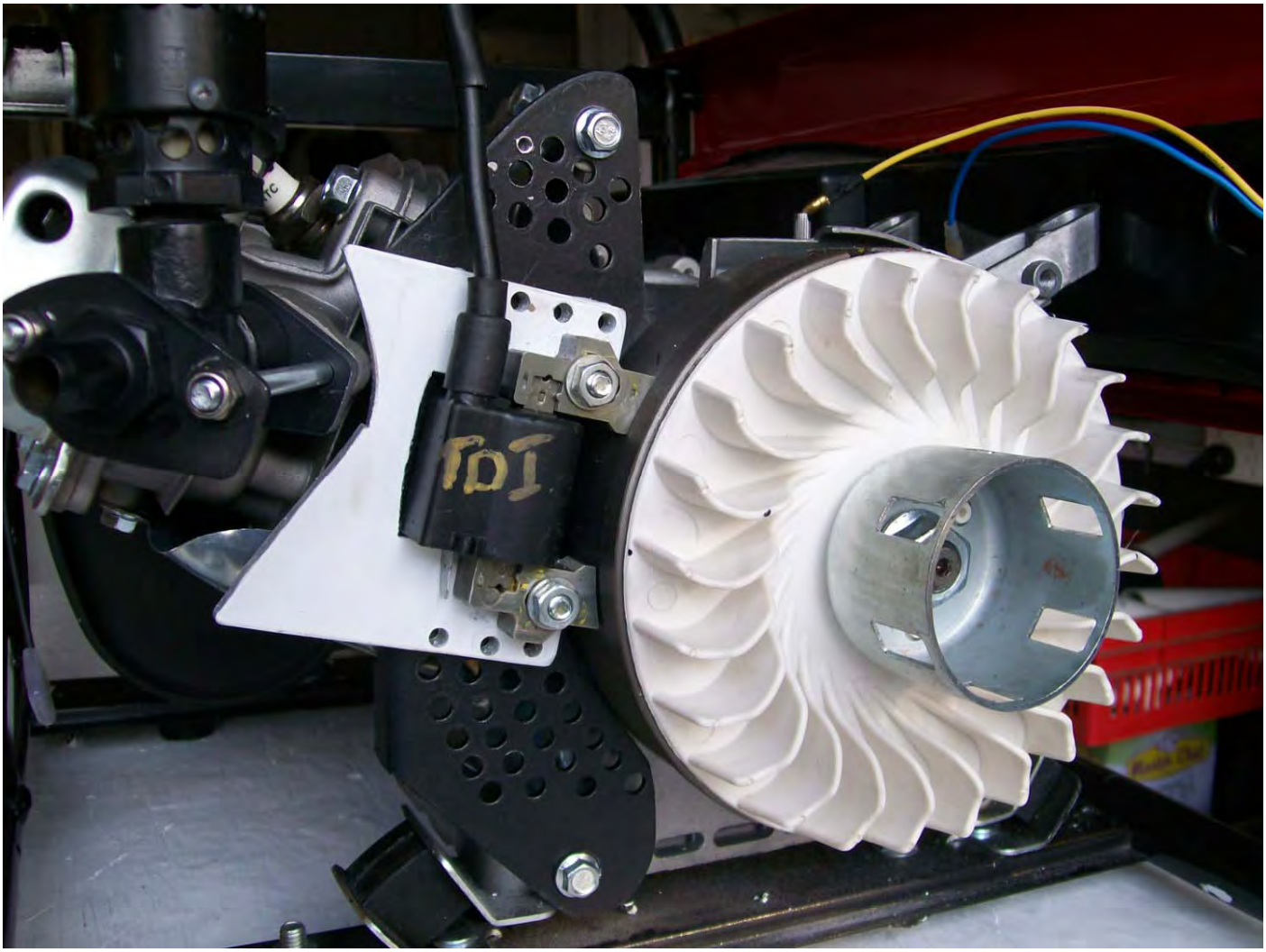
IN THIS PICTURE, THE FUEL INTAKE PORT OPENING IS OBSCURED BECAUSE IT HAS BEEN TEMPORARILY BLOCKED OFF DURING THE CONSTRUCTION.

THE TOOLS REQUIRED FOR CONSTRUCTING THESE COMPONENTS ARE A DRILL PRESS AND A JIG SAW FITTED WITH A METAL-CUTTING BLADE. SELWYN USED THIS TIMING ALTERATION METHOD ON HIS OWN SMALLER GENERATOR WHICH HAS RUN TROUBLE-FREE FOR A YEAR. THE OBJECTIVE IS TO DELAY THE IGNITION SPARK FROM 9 DEGREES BEFORE TOP DEAD CENTRE TO EITHER TOP DEAD CENTRE OR ONE DEGREE AFTER TOP DEAD CENTRE. THIS ALLOWS FOR A GOOD SPARK ON THE COMPRESSION STROKE AND WHEN THE WASTE SPARK OCCURS, THE INLET VALVE HAS NOT YET OPENED AND SO THERE IS NO HHO IN THE IGNITION AREA. THAT IS TO SAY, THE EXHAUST VALVE HAS JUST CLOSED AND THE INLET VALVE HAS NOT YET OPENED. THIS RESULTS IN A GOOD COMPRESSION STROKE FOR THE HHO AND DOES NOT TRY TO SEND THE PISTON BACKWARDS DUE TO PREMATURE IGNITION OF THE GAS MIX. THE PICTURE ABOVE SHOWS THE ALUMINIUM PLATE MOUNTED AND READY TO ACCEPT THE PICK-UP. THIS PLATE NEEDS TO HAVE AIR HOLES DRILLED IN IT IN ORDER TO ALLOW COOLING AIR TO FLOW OVER THE ENGINE FINS BEHIND IT.

THE TDI ADAPTOR PLATE LOOKS LIKE THIS :

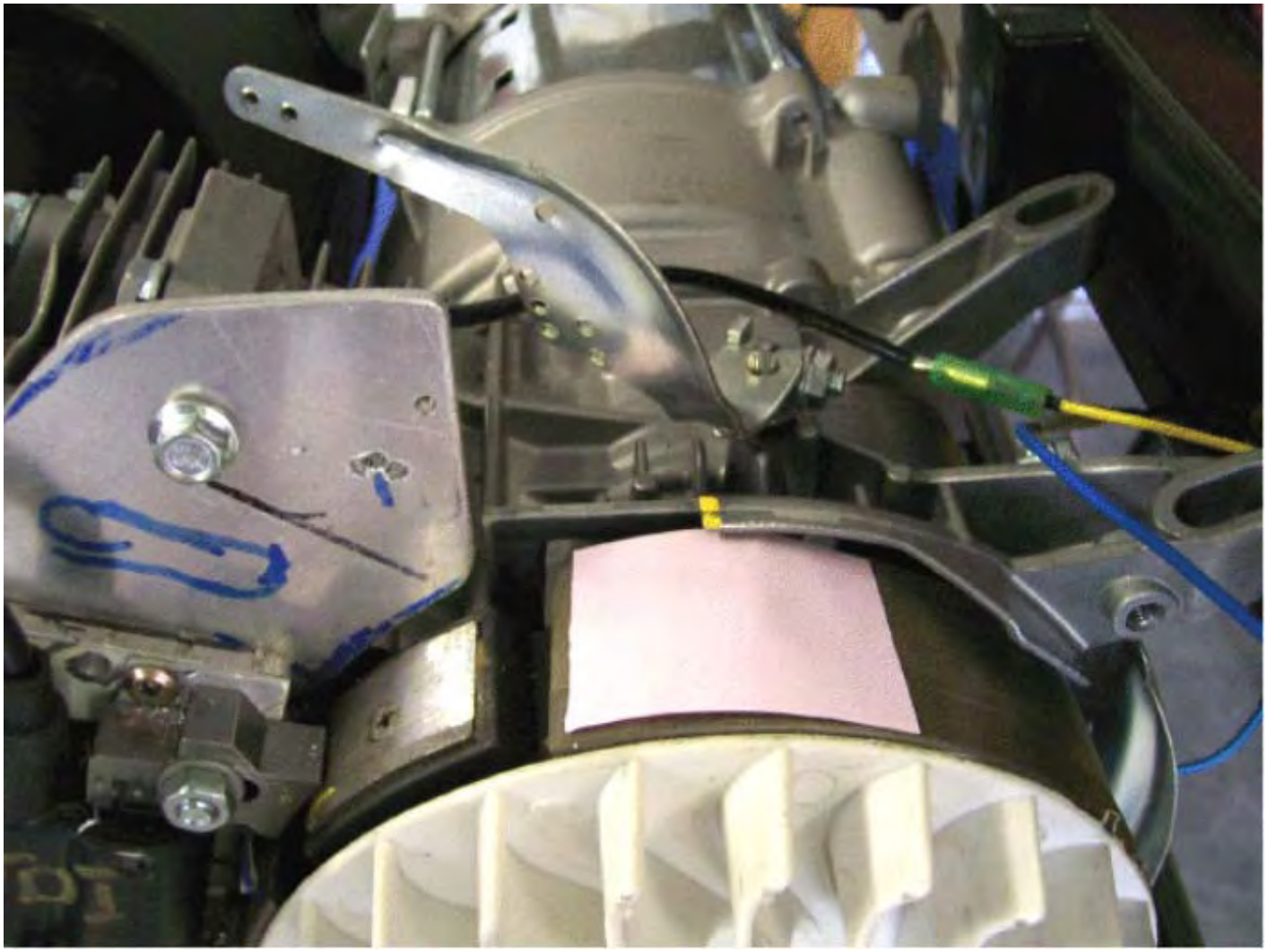
AND AS SHOWN BELOW, THE SUPPORT PLATE IS DRILLED WITH THE VENTILATION HOLES. IN THIS PHOTOGRAPH THE ADAPTOR PLATE IS JUST RESTING ON THE SUPPORT PLATE. LATER, WHEN THE

TDC TIMING POSITION IS ESTABLISHED, THE ADAPTOR PLATE WILL BE BOLTED TO IT USING THE THREE HOLES TOP AND BOTTOM ON THE WHITE PLATE. THIS LOCKS THE TIMING TO THAT SETTING AND THE TIMING IS NEVER CHANGED. IN 2010, WHEN ADAPTING A PREVIOUS GENERATOR, AN EXPERIENCED MECHANIC WAS ASKED TO ESTABLISH THE TDI PLATE POSITION AND HE CHARGED SIXTY AUSTRALIAN DOLLARS FOR DOING THAT.



FINALLY, THE COVERS AND THE STARTER HANDLE NEED TO BE BOLTED BACK IN PLACE. INSTEAD OF PAYING SOMEBODY ELSE TO SET THE NEW SPARK TIMING, IT IS PERFECTLY POSSIBLE TO DO THAT YOURSELF. ONE EFFECTIVE METHOD IS AS FOLLOWS :

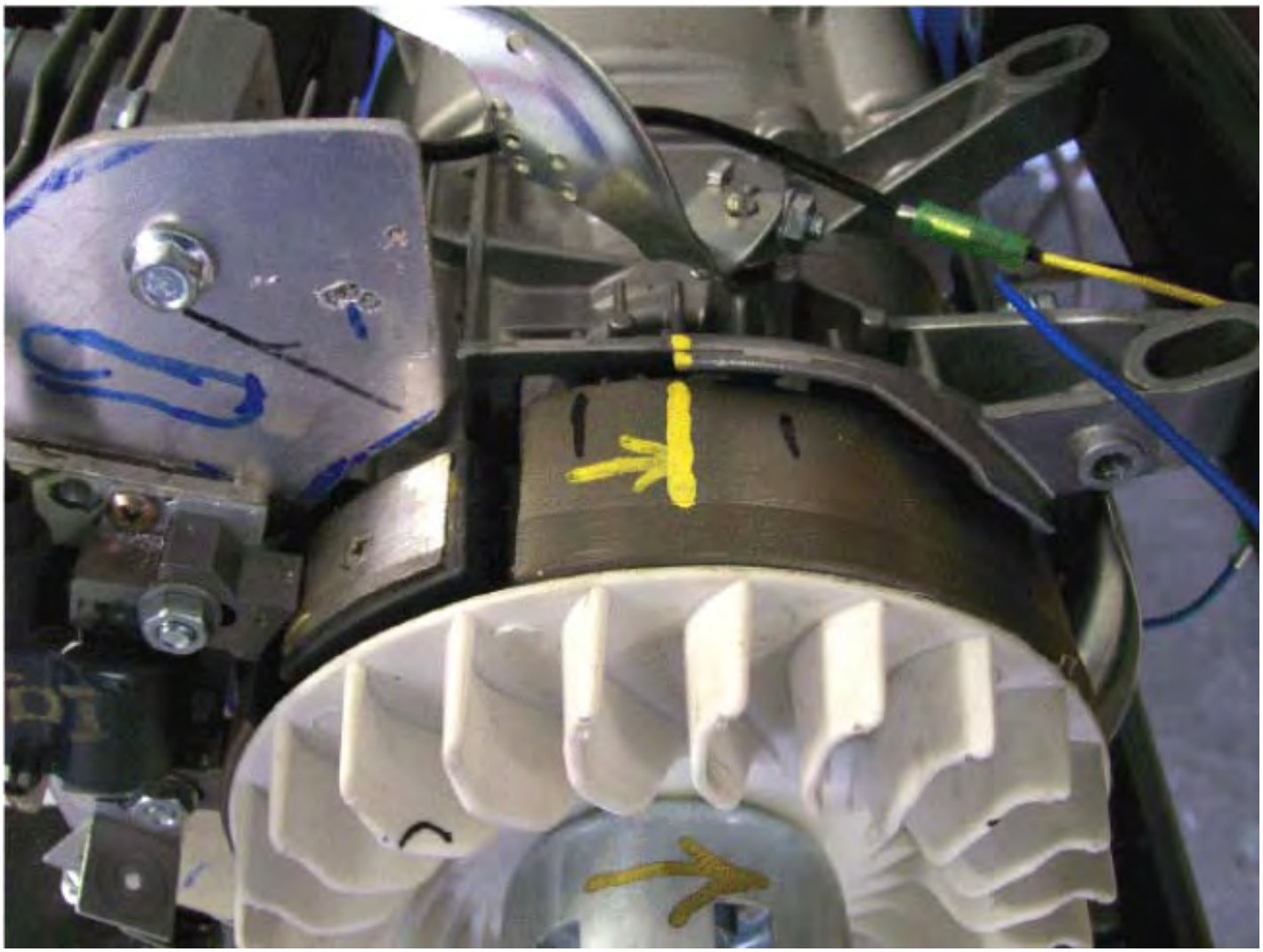
1. MARK THE CASING OF THE ENGINE IN A CONVENIENT LOCATION AS SHOWN IN YELLOW IN THIS PHOTOGRAPH :



2. **REMOVE THE SPARK PLUG AND INSERT A LONG SCREWDRIVER UNTIL THE TOP OF THE PISTON IS FELT. MANUALLY ROTATE THE ENGINE (CLOCKWISE FOR THIS GENERATOR AS CAN BE SEEN FROM THE CURVED FAN PIECES ON THE FLYWHEEL) UNTIL THE SCREWDRIVER IS NO LONGER PUSHED UPWARDS. IT MAY TAKE MORE THAN ONE ROTATION TO FIND THIS POINT ACCURATELY. WHEN THAT POINT IS FOUND, MARK THE FLYWHEEL DIRECTLY IN LINE WITH THE CASING MARK WHICH YOU JUST MADE. THIS MARKING NEEDS TO BE VERY ACCURATE.**

3. **CONTINUE ROTATING THE FLYWHEEL VERY SLOWLY UNTIL THE SCREWDRIVER STARTS TO GO DOWN AGAIN, AND MARK THAT POINT ON THE FLYWHEEL. AGAIN, THIS MARKING ALSO NEEDS TO BE VERY ACCURATE.**

4. **MEASURE THE DISTANCE ALONG THE FLYWHEEL BETWEEN THE TWO FLYWHEEL MARKS WHICH YOU HAVE JUST MADE AND THEN MAKE A LARGER MARK ON THE FLYWHEEL EXACTLY HALF WAY BETWEEN YOUR TWO MARKS. IF ACCURATELY DONE, THIS NEW POINT IS WHERE THE FLYWHEEL IS WHEN THE PISTON IS EXACTLY AT TOP DEAD CENTRE, WHICH IS WHERE WE WANT THE SPARK TO OCCUR. THIS MARKING ON SELWYN'S FLYWHEEL IS LIKE THIS:**



5. **NEXT COMES A BIT OF ARITHMETIC. THE DIAMETER OF THE FLYWHEEL IS 180mm WHICH MEANS THAT ITS CIRCUMFERENCE IS 3.14159 x 180 = 565.5mm AND AS THERE ARE 360 DEGREES IN EACH ROTATION OF THE FLYWHEEL, THEN THE OUTSIDE EDGE OF THE FLYWHEEL WILL MOVE 1.57mm FOR EACH OF THOSE DEGREES.**

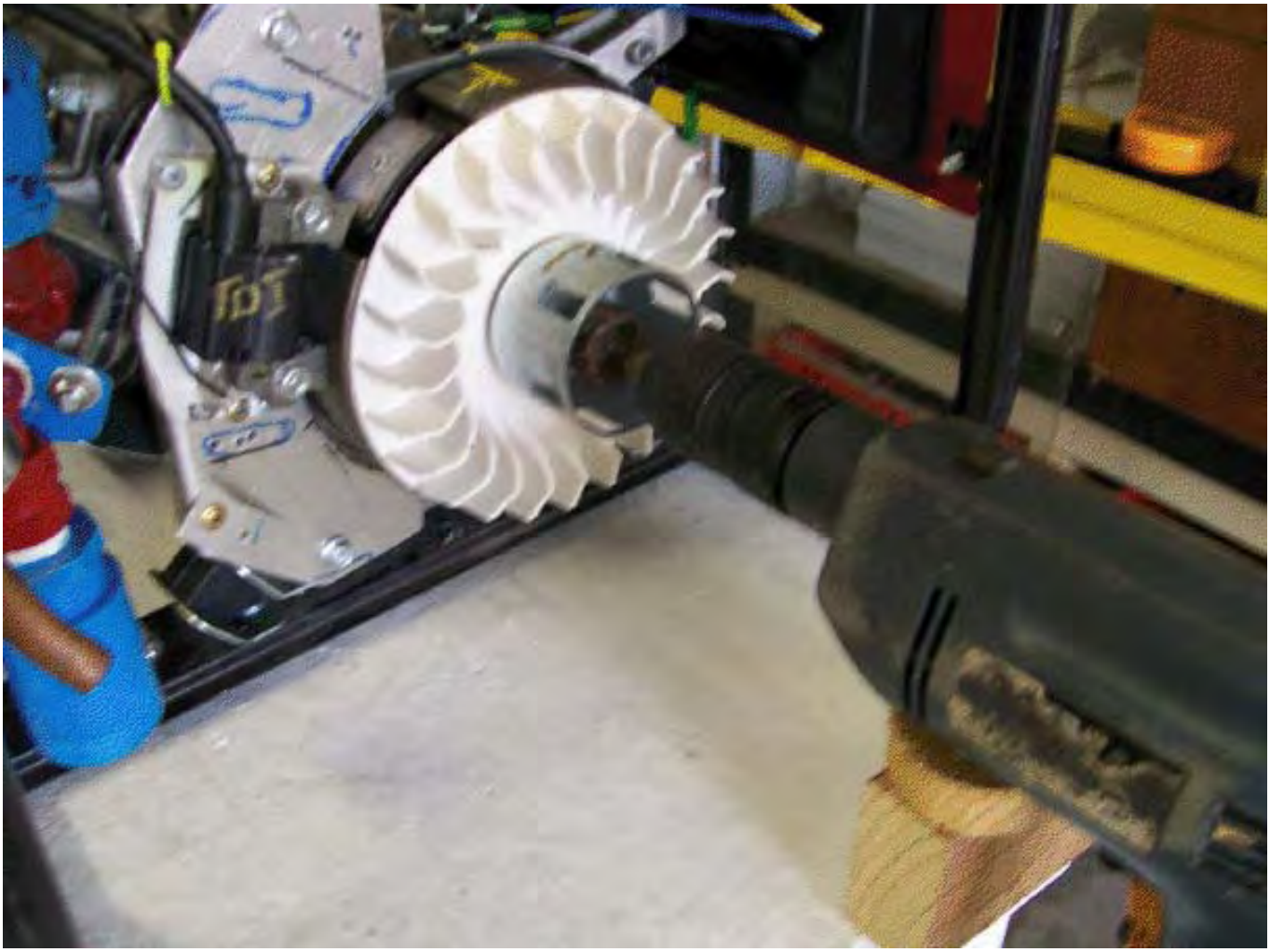
   THE ENGINE SPECIFICATION STATES THAT THE SPARK TIMING IS 8 DEGREES BEFORE TOP DEAD CENTRE AND WE WANT THE SPARK TO OCCUR EXACTLY AT TDC, WHICH MEANS THAT WANT AN EXTRA 8 x 1.57 = 12.5mm OF THE FLYWHEEL CIRCUMFERENCE TO HAVE PASSED BY BEFORE THE SPARK OCCURS.

6. **TO ACHIEVE THIS DELAY IN THE SPARK TIMING, THE TDI NEEDS TO BE MOVED 12.5mm IN THE DIRECTION IN WHICH THE FLYWHEEL ROTATES. YOU WILL NOTICE THAT FOR THIS MAJOR TIMING CHANGE THE TDI ONLY NEEDS TO BE MOVED JUST HALF AN INCH.**

7. **WHEN THE TDI ADJUSTMENT HAS BEEN MADE, THE TIMING CAN BE CHECKED USING AN AUTOMOTIVE TIMING LIGHT CONNECTED TO THE SPARK PLUG LEAD. THE ENGINE CAN BE SPUN USING AN ELECTRIC DRILL. AS THE FLYWHEEL IS SPINNING FAST AND THE FLASH OF LIGHT FROM THE TIMING LIGHT IS VERY SHORT, IT MAKES THE FLYWHEEL MARK APPEAR TO BE STATIONARY IN SPITE OF THE FACT THAT IT IS PASSING BY VERY RAPIDLY. IF THE TDI ADJUSTMENT IS CORRECT, THEN THE CENTRAL MARK MADE ON THE FLYWHEEL WILL APPEAR TO BE STATIONARY AND EXACTLY ALIGNED WITH THE MARK MADE ON THE CASING.**

   THIS IS EXACTLY WHAT HAPPENED WHEN SELWYN'S MOTOR HAD ITS TIMING ADJUSTED, BUT THE IMPORTANT FACTOR IS TO HAVE THE SPARK CLOSE TO THE TOP DEAD CENTRE POINT TO MAKE SURE THAT THE INLET VALVE IS FULLY CLOSED BEFORE THE SPARK OCCURS. TWO DEGREES AFTER TOP DEAD CENTRE IS A POPULAR POINT FOR THE SPARK WITH MANY OF THE EXISTING GENERATOR CONVERSIONS WHICH I HAVE BEEN TOLD ABOUT, POSSIBLY TO REDUCE THE LOADING ON THE PISTON'S CONNECTING ROD.

HERE IS A PHOTOGRAPH OF SELWYN'S LATEST GENERATOR CONVERSION HAVING ITS NEW SPARK TIMING CHECKED OUT :



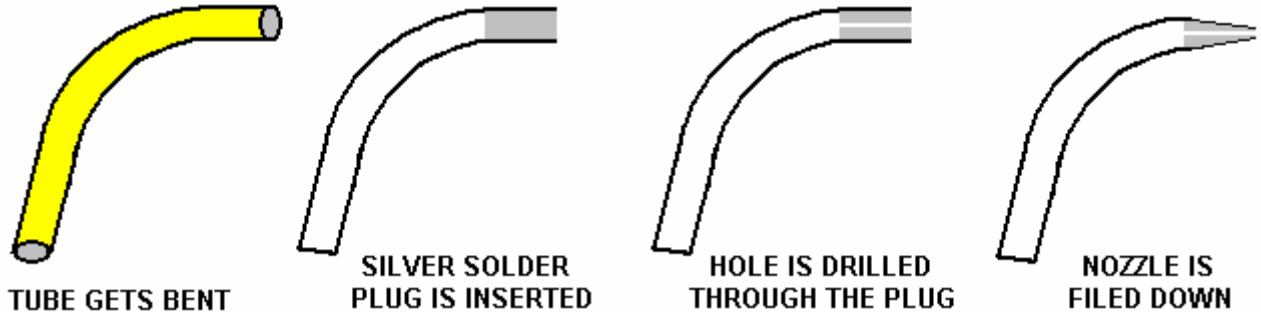
8. MOST SMALL PETROL ENGINES HAVE THE SPARK TIMING SET BETWEEN 8 DEGREES AND 10 DEGREES BEFORE TOP DEAD CENTRE. IF IT HAPPENS THAT YOU DO NOT KNOW WHAT THE TIMING OF YOUR PARTICULAR GENERATOR IS, THEN COMPLETE THE FLYWHEEL MARKING PROCEDURE OF STEP 4 ABOVE, BUT MAKE THREE ADDITIONAL MARKS ON EACH SIDE OF THE TDC MARK. SPACE THOSE MARKS 1.57mm APART AS THEY WILL THEN MAKE A SCALE WHICH SHOWS EACH DEGREE FROM 3 DEGREES BEFORE TDC TO 3 DEGREES AFTER TDC. WHEN THE TIMING LIGHT IS USED, IT THEN SHOWS EXACTLY WHERE THE SPARK OCCURS AND IF THE ENGINE HAD AN ORIGINAL SPARK TIMING WHICH WAS NOT 8 DEGREES BEFORE TDC, THEN THE SCALE SHOWS IMMEDIATELY HOW MUCH FURTHER THE TDI NEEDS TO BE MOVED TO SET THE SPARK EXACTLY WHERE YOU WANT IT TO OCCUR.

GETTING THE FINE DROPLETS OF WATER INTO THE ENGINE CAN BE DONE WITH A VENTURI TUBE. YOU MAY NOT HAVE NOTICED IT, BUT THIS METHOD HAS BEEN USED EXTENSIVELY IN PERFUME SPRAYS AND IS VERY EFFECTIVE. THIS IS HOW SELWYN CONSTRUCTS A VENTURI TUBE :

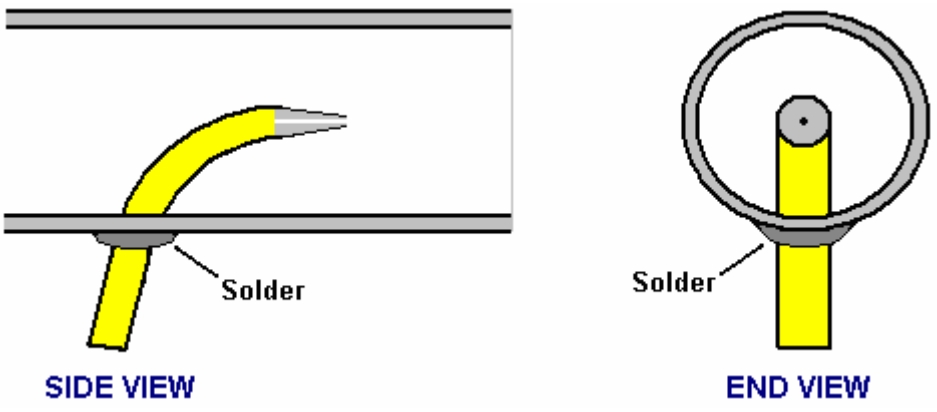
A SHORT LENGTH OF 5mm OR 6mm DIAMETER COPPER TUBING IS USED. THIS IS GENERALLY AVAILABLE AS CENTRAL HEATING SUPPLIES AND IF THERE IS ANY DIFFICULTY IN GETTING SOME, THEN YOUR LOCAL GARAGE CAN PROBABLY DIRECT YOU TO A SUPPLIER (IF THEY DON'T JUST GIVE YOU THE FEW INCHES WHICH YOU NEED, FROM THEIR OWN STOCK).

THE COPPER PIPE IS THEN HEATED WITH A PLUMBER'S GAS TORCH AND BENT VERY SLOWLY AND CAREFULLY TO THE SHAPE SHOWN ABOVE. SOME PEOPLE FIND IT HELPFUL TO INSERT A LENGTH OF SUITABLE FLEXIBLE MATERIAL, (SUCH AS THE COILED STEEL SPRING MATERIAL USED TO SUPPORT NET CURTAINS), BEFORE STARTING THE BENDING AS THAT HELPS TO KEEP THE COPPER PIPE FROM KINKING WHEN BEING BENT.

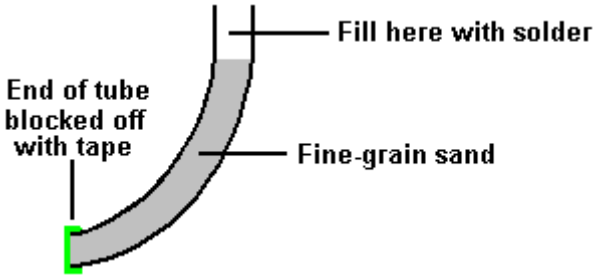
NEXT, THE END OF THE COPPER PIPE WHICH WILL FORM THE NOZZLE, IS FILLED WITH SILVER SOLDER AND THE END FILED FLAT. THEN, A SMALL DIAMETER HOLE IS DRILLED THROUGH THAT SILVER SOLDER PLUG – THE SMALLEST POSSIBLE DRILL BIT SHOULD BE USED FOR THIS, ALTHOUGH THE HOLE MAY NEED TO BE ENLARGED SLIGHTLY DEPENDING ON WHAT THE ENGINE REQUIRES (WHICH IS FOUND OUT BY SUCCESSIVE TRIALS). FINALLY, THE NOZZLE IS FILED DOWN TO MAKE A POINTED TIP :



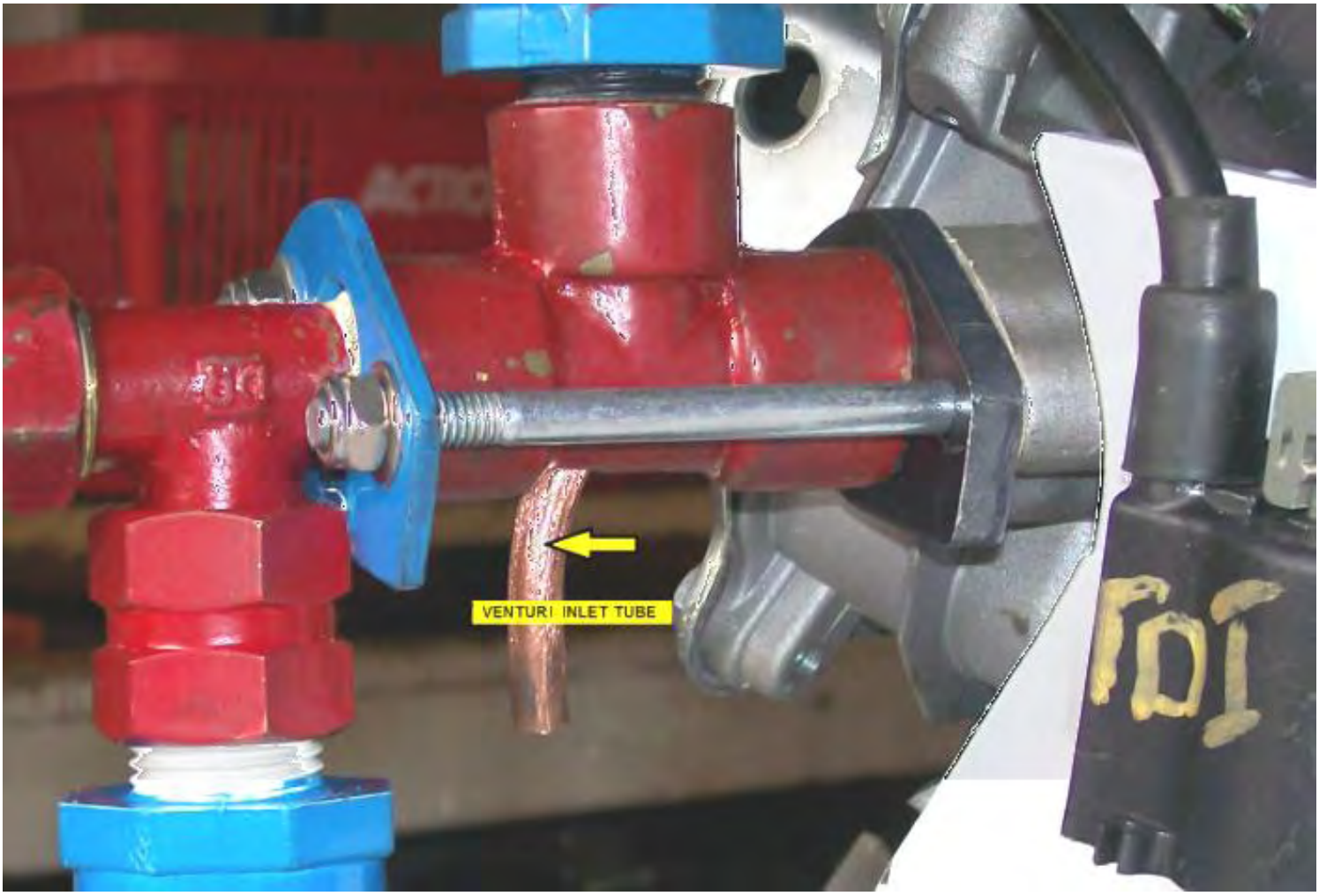
THIS VENTURI TUBE IS TO BE INSERTED INTO THE LAST BRASS FITTING BEFORE THE ENGINE, SO A 6mm DIAMETER HOLE IS DRILLED THROUGH THE BRASS AND THEN THE DRILL IS REMOVED VERY SLOWLY AT A SLIGHT ANGLE – THE ANGLE OF DRAG IS ALONG THE AXIS OF THE BRASS FITTING. THE COPPER VENTURI TUBE IS INSERTED THROUGH THE HOLE AND POSITIONED SO THAT THE VENTURI HOLE IS EXACTLY ON THE CENTRAL AXIS OF THE BRASS FITTING AND THEN SOLDERED IN PLACE.



THE WAY THAT THE SILVER SOLDER PLUG IS MADE IS TO BLOCK THE END OF THE TUBE AND FILL THE TUBE WITH FINE GRAIN SAND BEFORE APPLYING THE SOLDER :



AFTERWARDS, THE SAND CAN BE TAPPED OUT AND A PIPE CLEANER USED TO MAKE SURE THAT EVERY GRAIN OF SAND HAS BEEN REMOVED. THE INSTALLED VENTURI TUBE CAN BE SEEN HERE :



THE GENERATOR SHOULD RUN WELL WITH 5 LITRES PER MINUTE OF HHO (PLUS AIR AND WATER DROPLETS). A CAR BATTERY IS USED TO GENERATE THE HHO TO GET THE SYSTEM STARTED.

NOTES : http://www.free-energy-info.com/Generator.pdf

VIDEO : https://www.youtube.com/watch?v=jjiqUWKrALE