PPE MTE Presentation

Boiler Mountings and Accessories

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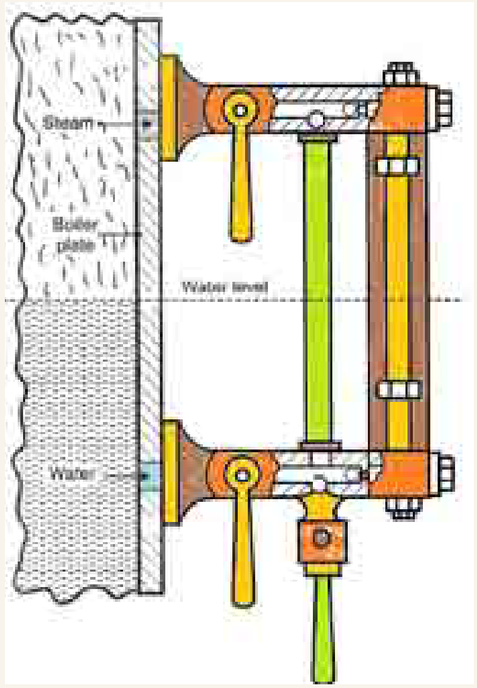
BOILER MOUNTINGS

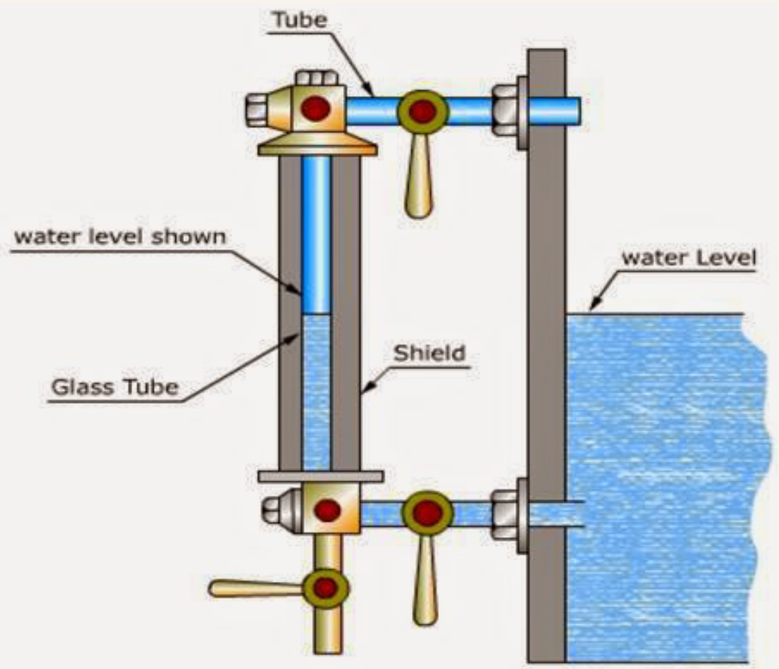
These are the fittings, which are mounted on the boiler for its proper and safe functioning. The important boiler mounting from subject point of view includes:

1. Water level indicator
2. Pressure gauge
3. Safety valves
4. Stop valve
5. Blow off cock
6. Feed check valve
7. Fusible plug

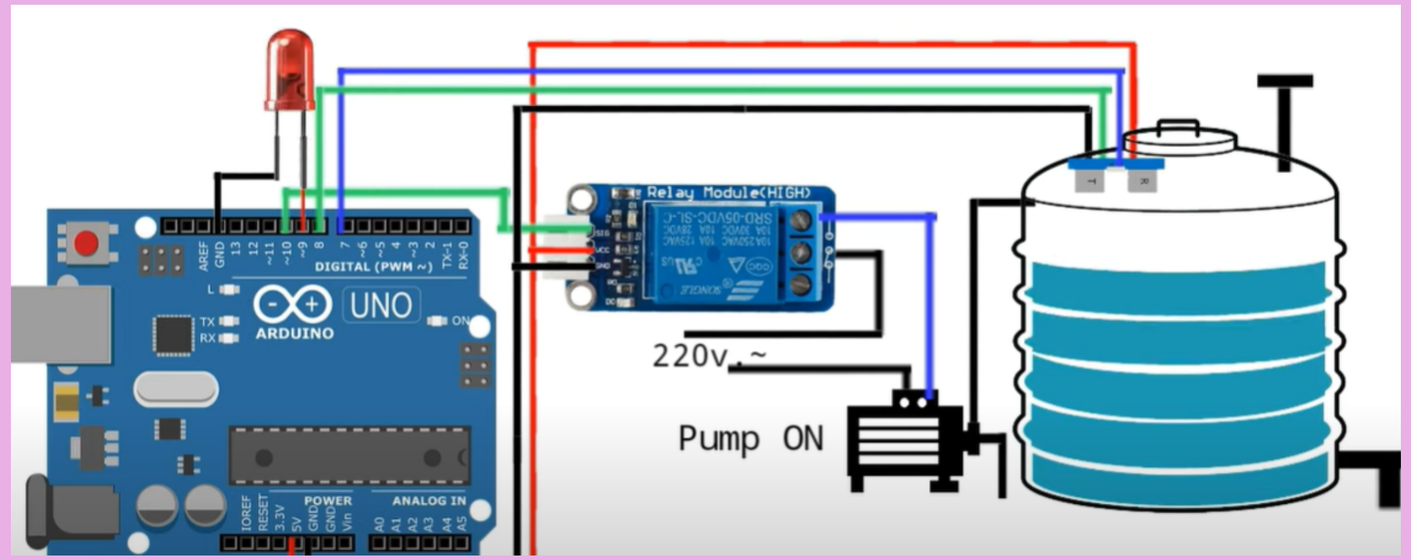
1. WATER LEVEL INDICATOR

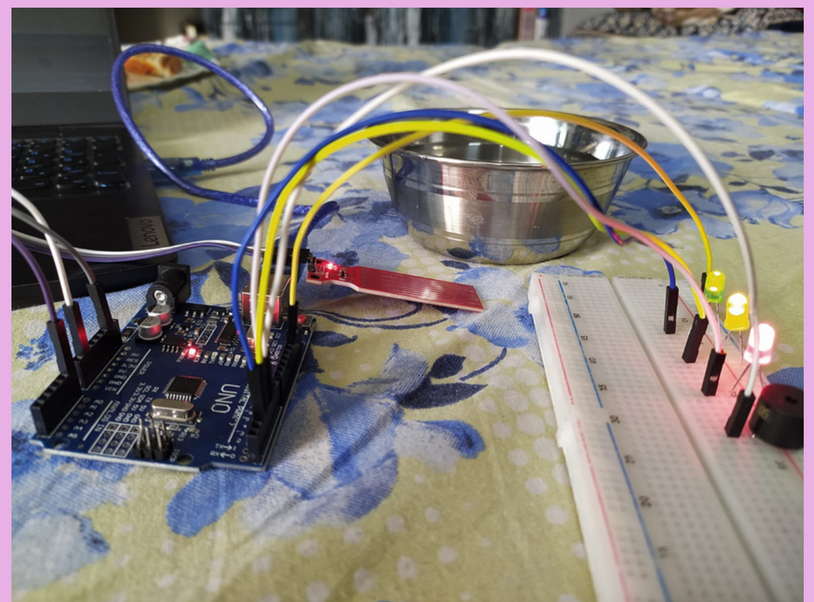
It is an important fitting, which indicates the water level inside the boiler to an observer. It is a safety device, upon which the correct working of the boiler depends. This fitting may be seen in front of the boiler, and are generally two in number. A water level indicator, mostly employed in the steam boiler consists of three cocks and a glass tube. Steam cock keeps the glass tube in connection with the steam space. Water cock puts the glass tube in connection with the water in the boiler. Drain cock C3 is used at frequent intervals to ascertain that steam and water cocks are clear

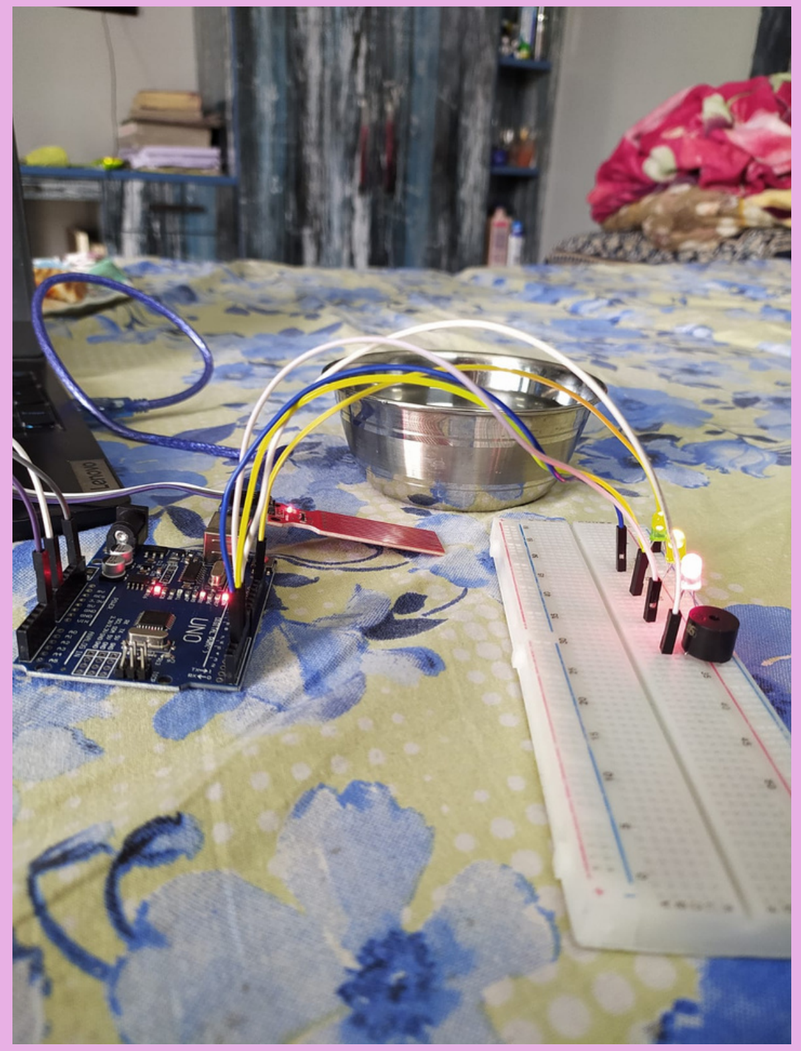




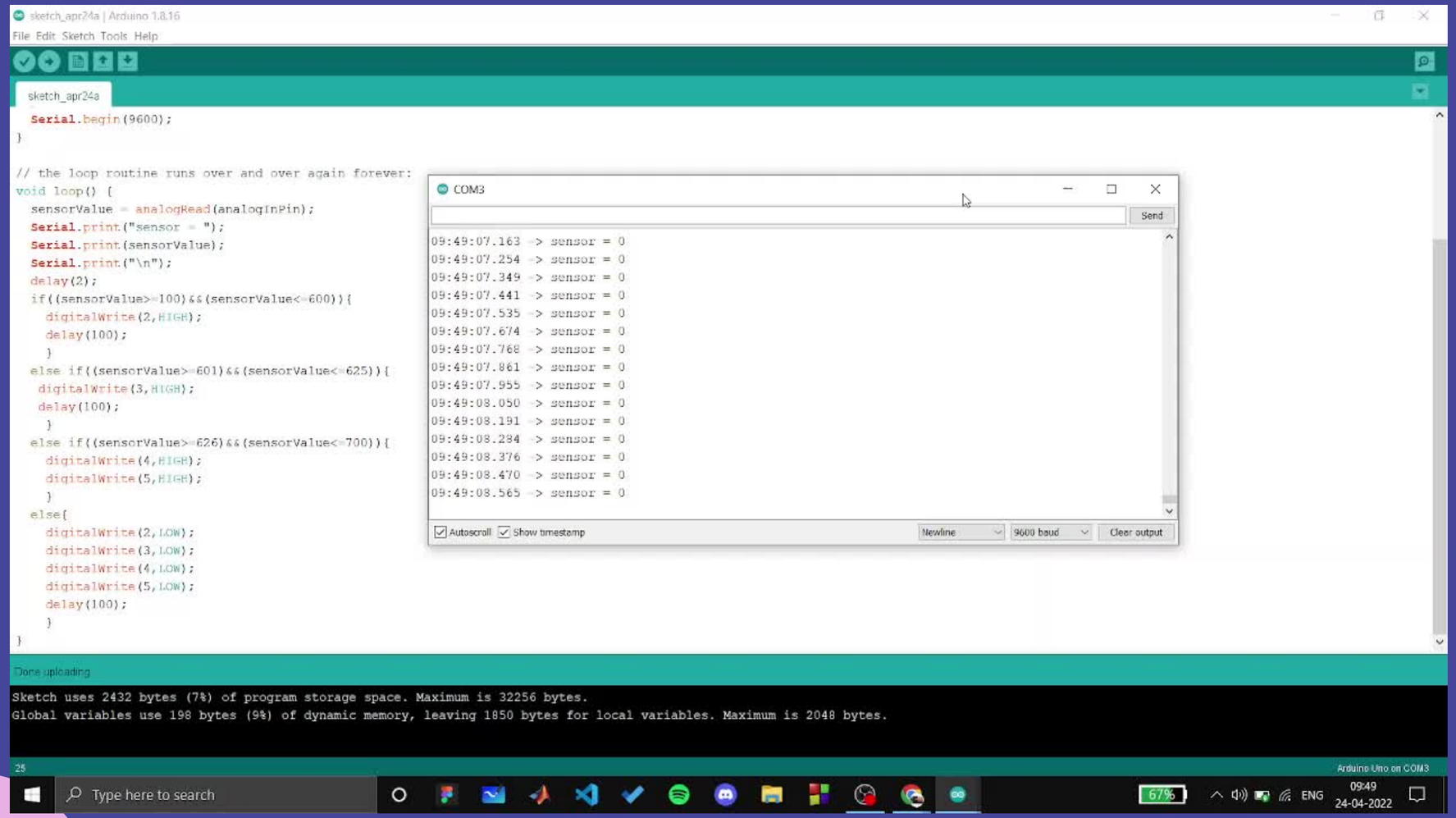
ARDUINO BASED WORKING MODEL:
WATER LEVEL INDICATOR
(PROTOTYPE -1) :WATER SENSOR

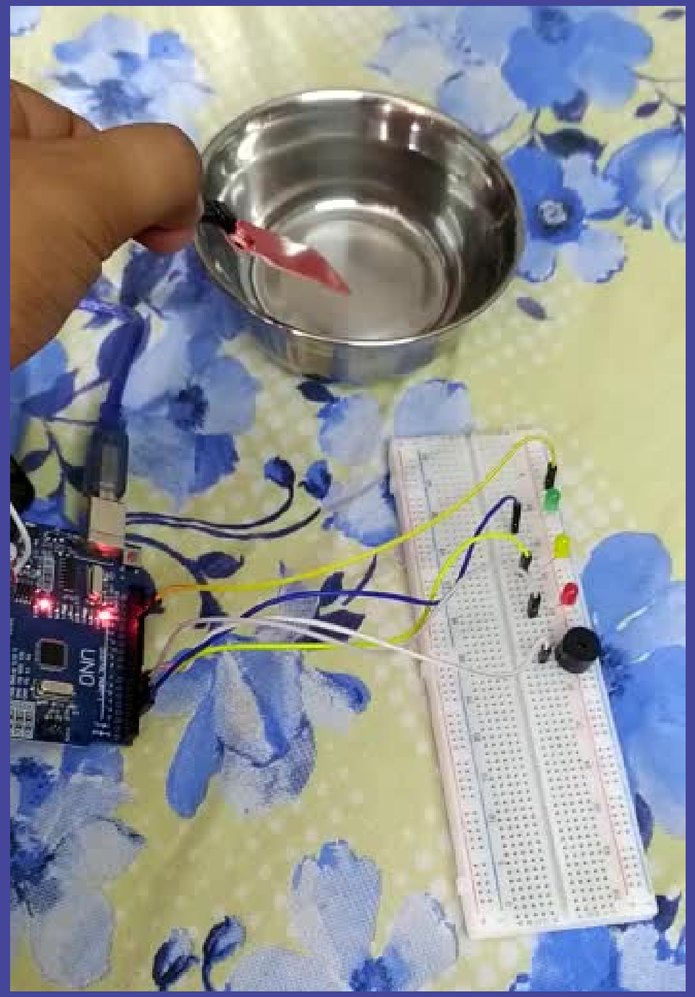






VIDEO OF A WORKING MODEL OF WATER LEVEL INDICATOR (PROTOTYPE -1)





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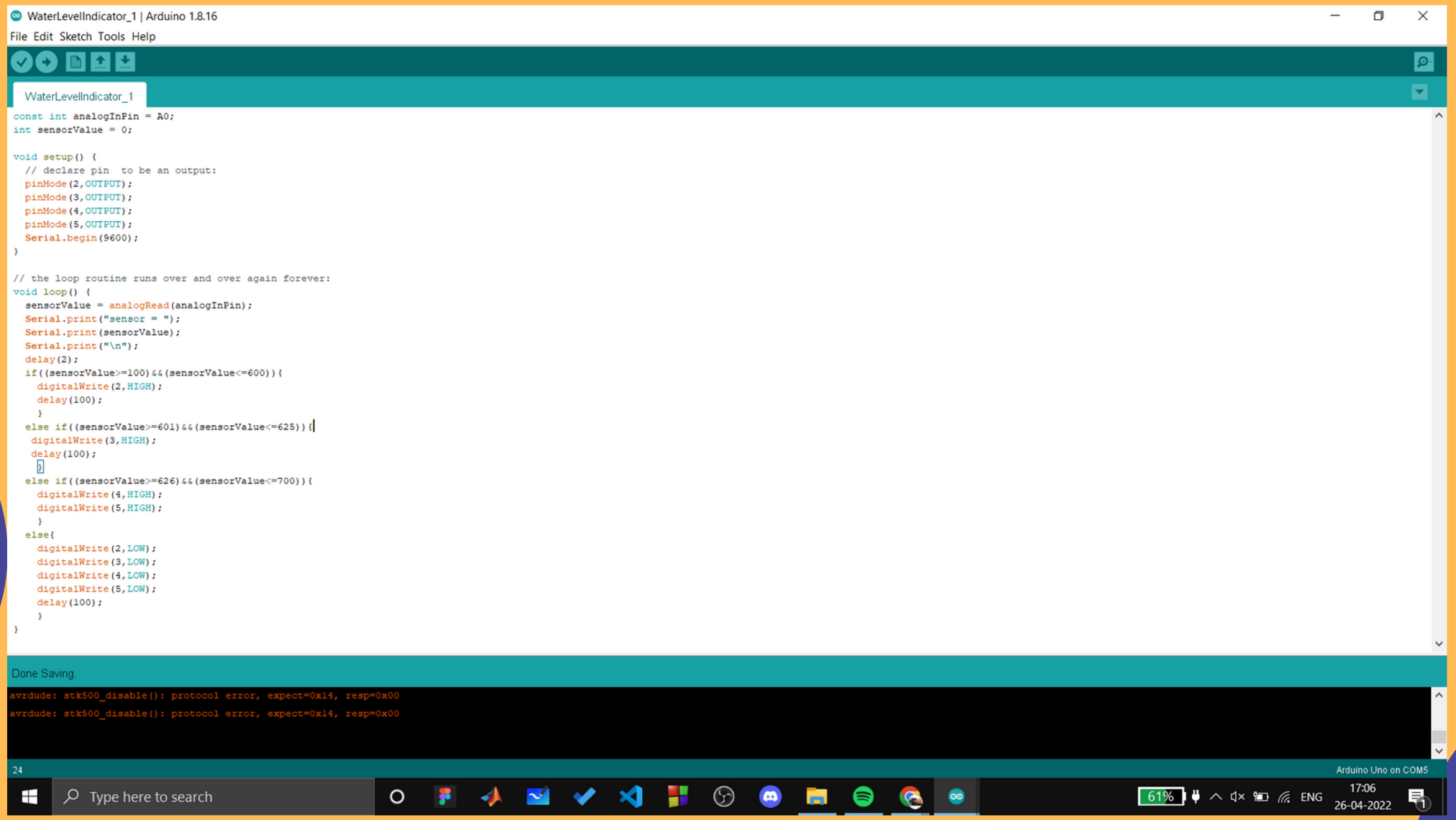
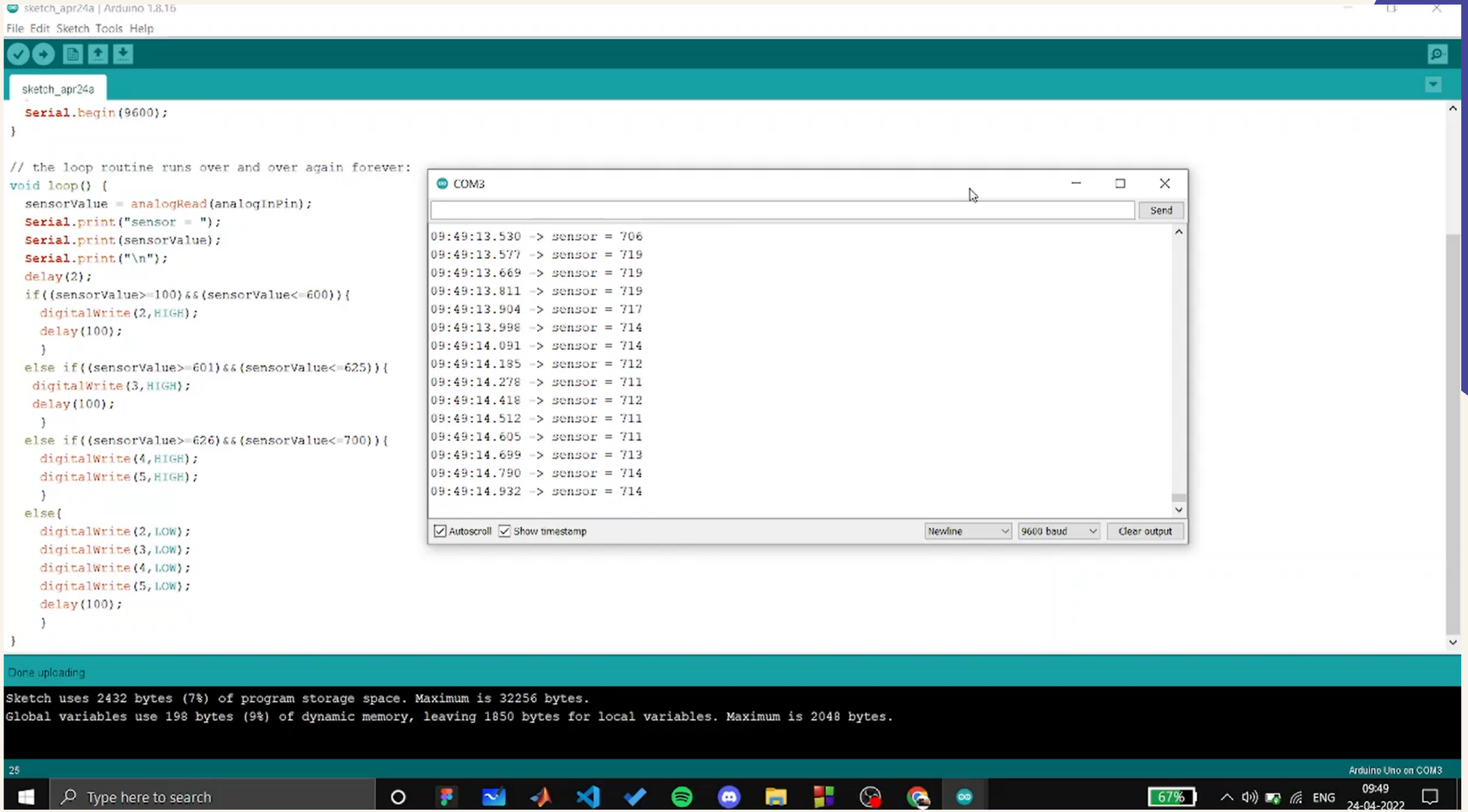
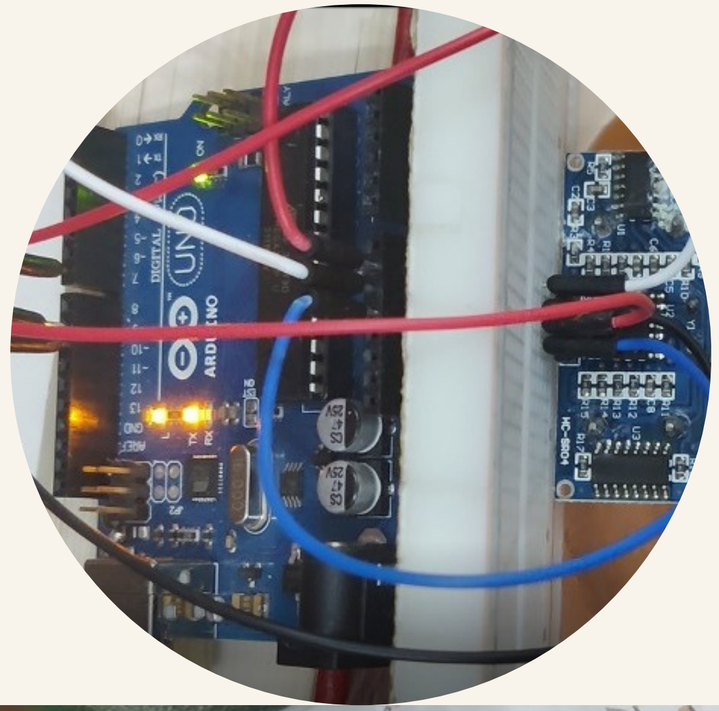
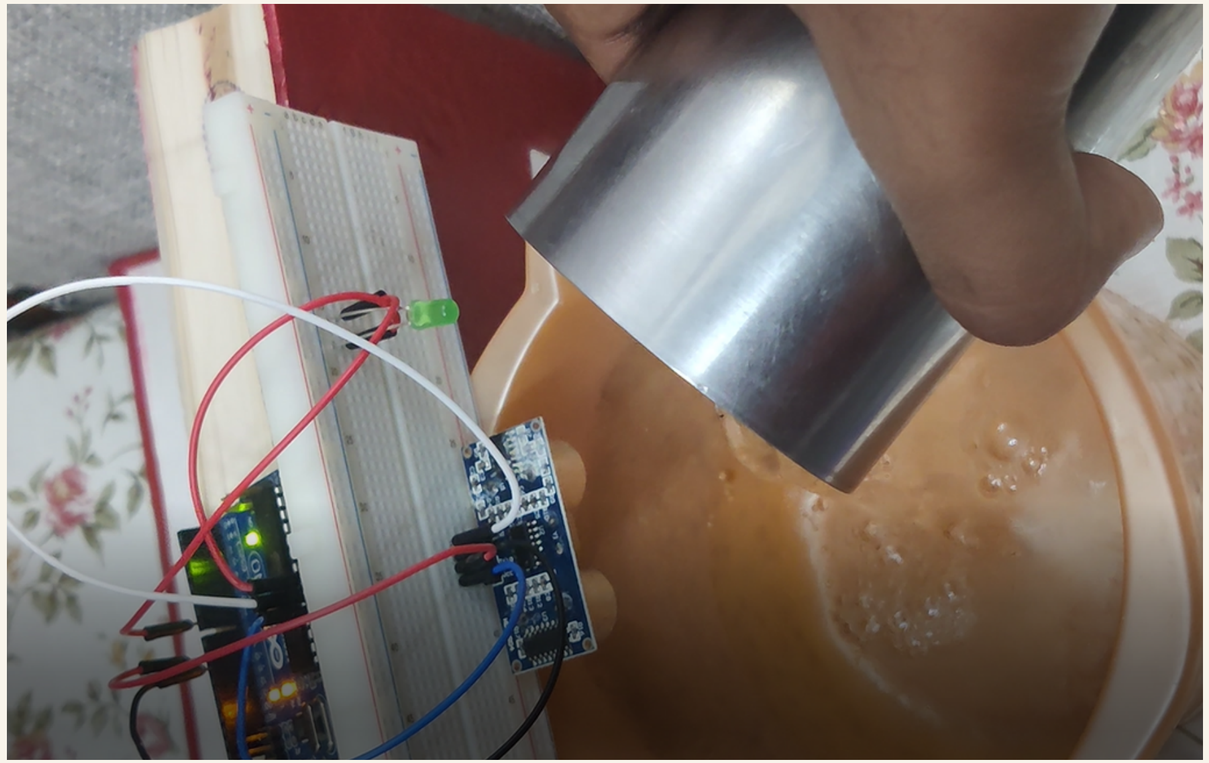


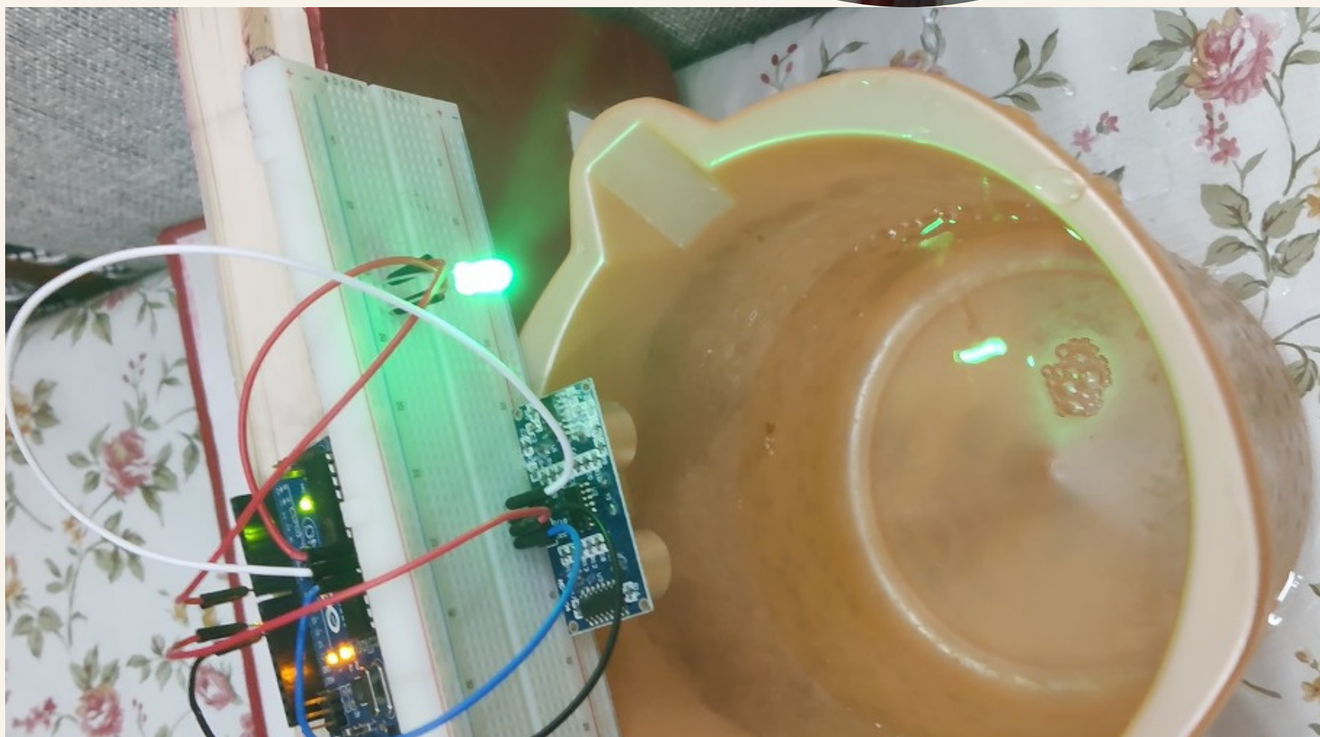
Arduino Output



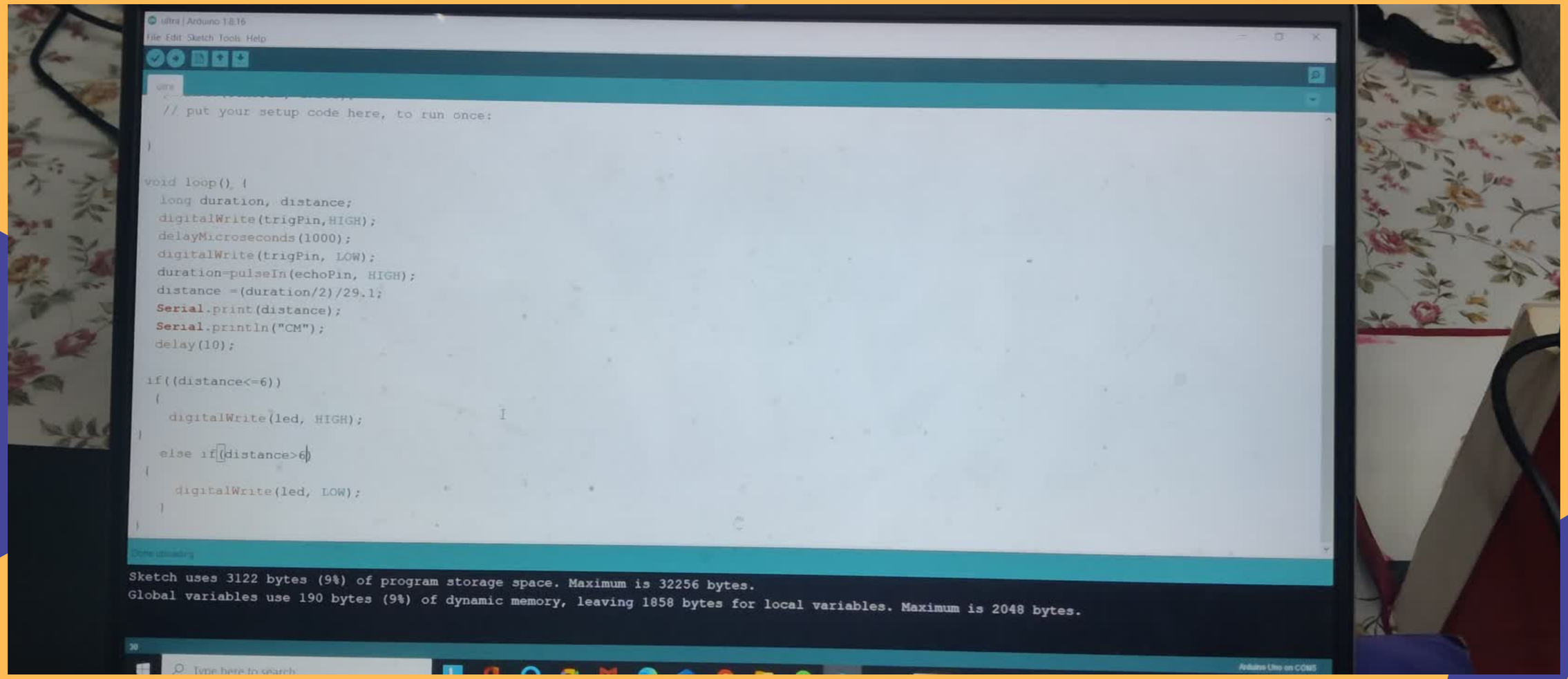
ARDUINO BASED WORKING MODEL:
WATER LEVEL INDICATOR
PROTOTYPE -2:ULRASONIC SENSOR







VIDEO OF A WORKING MODEL OF WATER LEVEL INDICATOR (PROTOTYPE -2)



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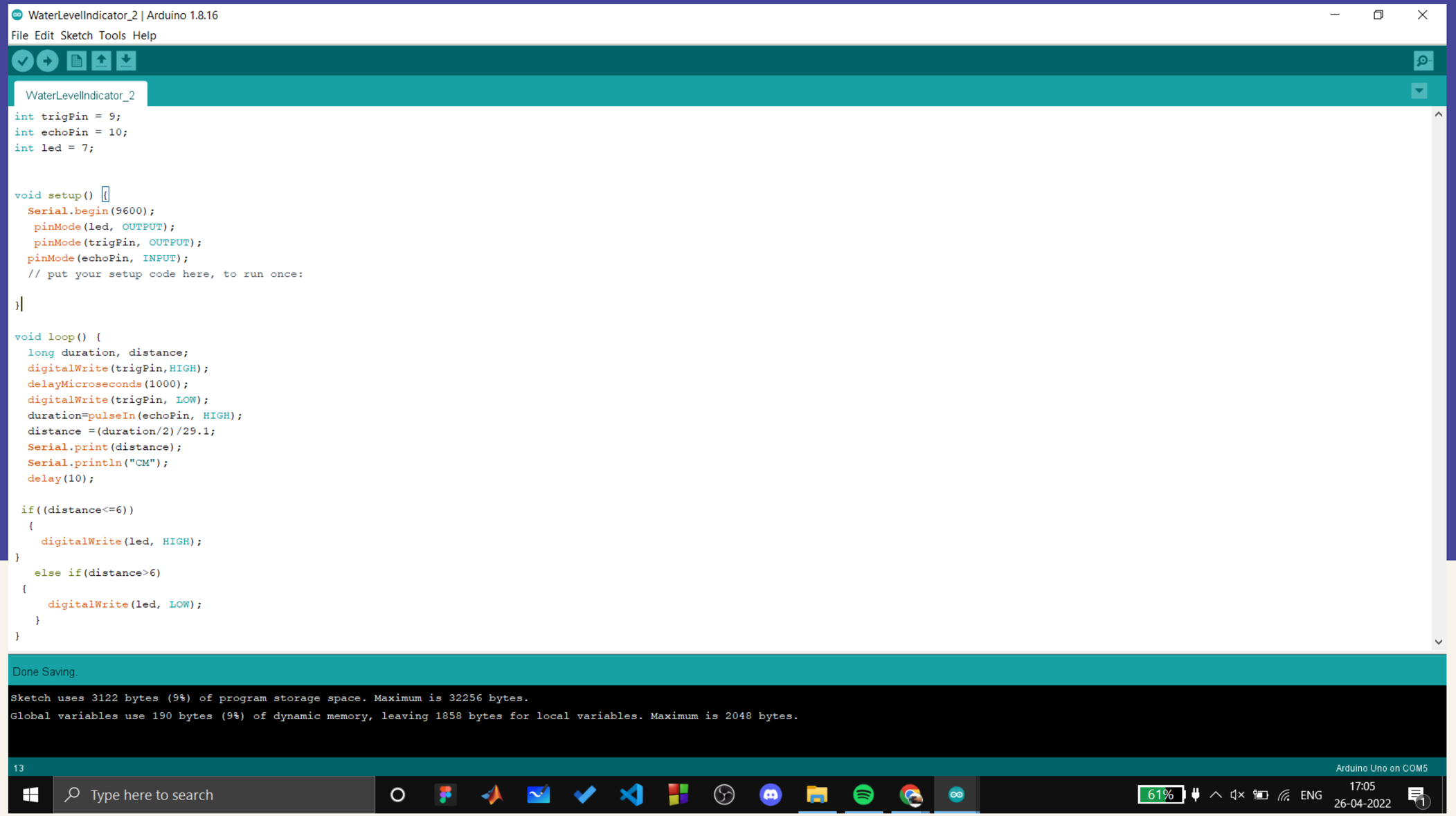

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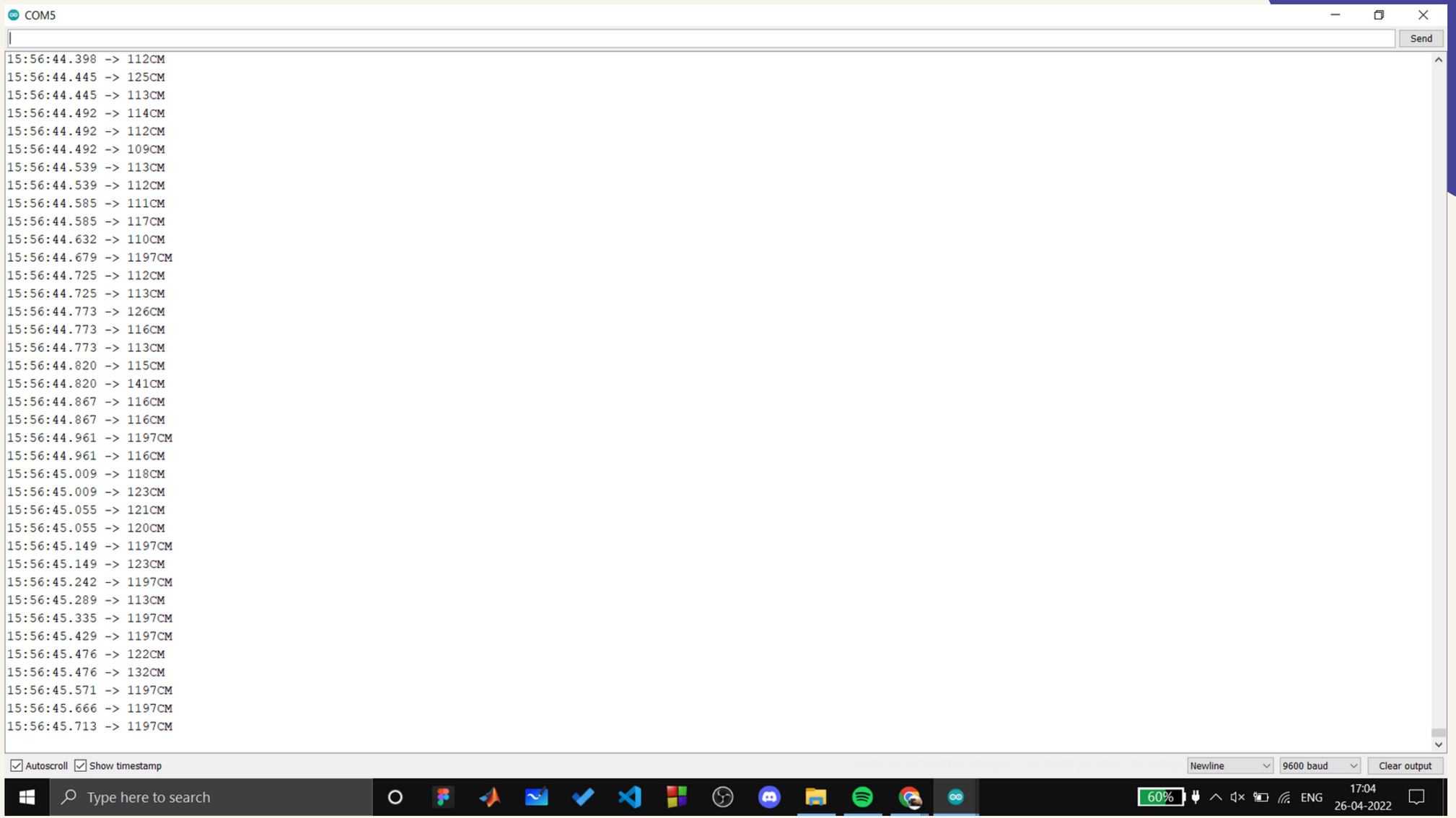
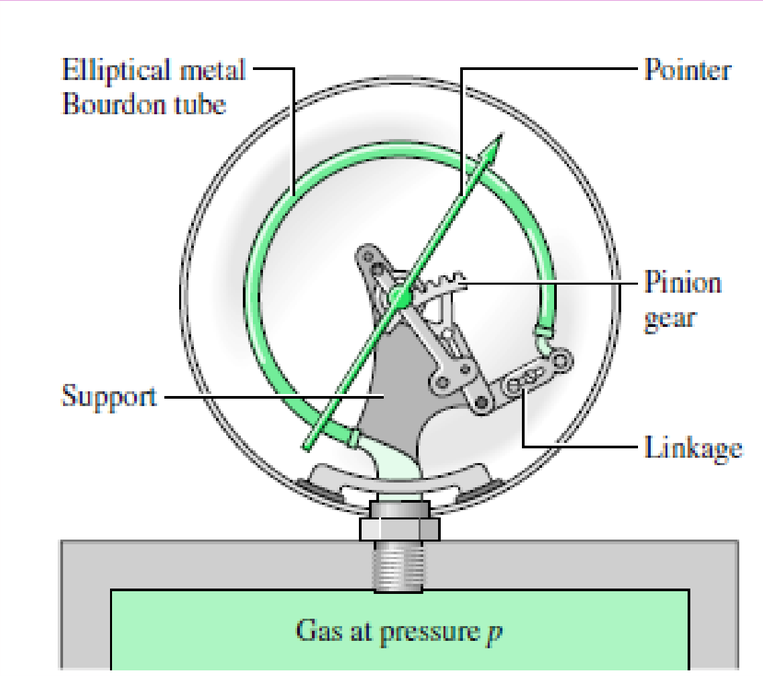
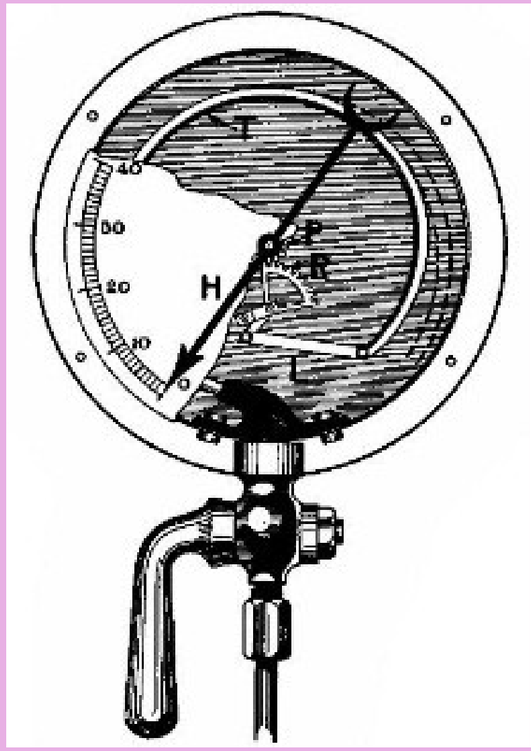


2. PRESSURE GAUGE

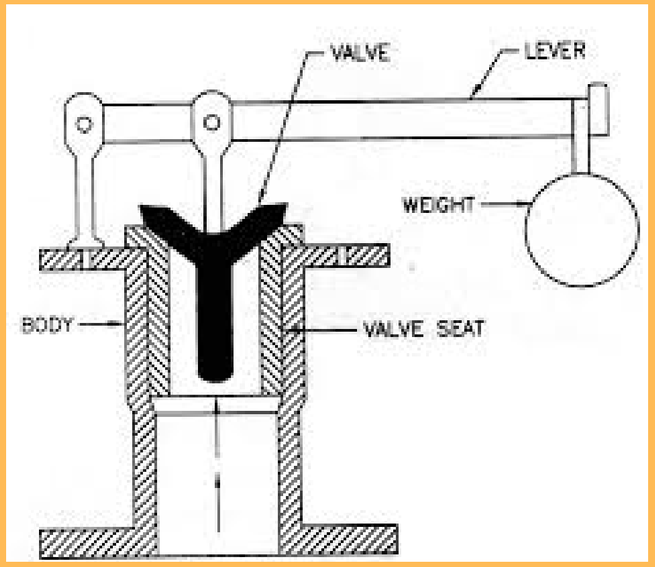
A pressure gauge is used to measure the pressure of the steam inside the steam boiler. It is fixed in front of the steam boiler. The pressure gauges generally used are of Bourden type. A Bourden pressure gauge, in its simplest form, consists of an elliptical elastic tube bent into an arc of a circle. This bent up tube is called Bourden's tube. One end of the tube gauge is fixed and connected to the steam space in the boiler. The other end is connected to a sector through a link. The steam, under pressure,flows into the tube.

As a result of this increased pressure, the Bourden's tube tends to straighten itself. Since the tube is encased in a circular curve, therefore it tends to become circular instead of straight.

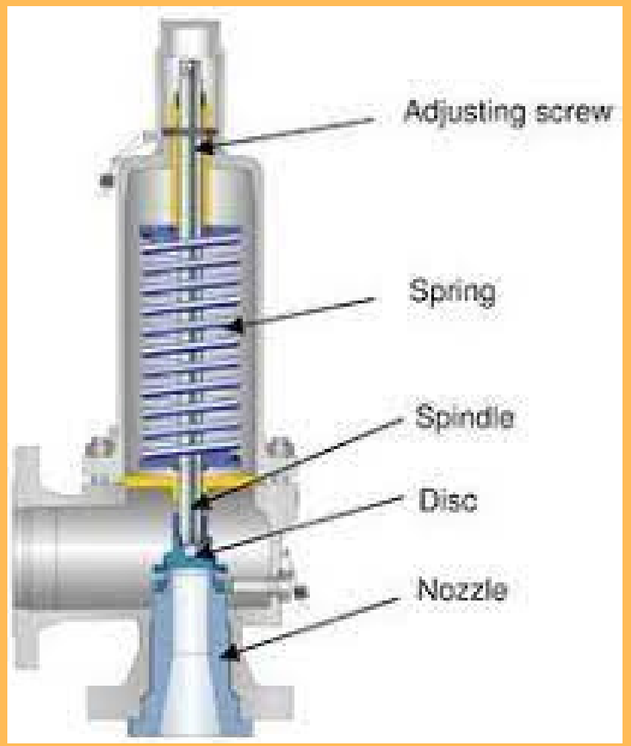




3. SAFETY VALVES



These are the devices attached to the steam chest for preventing explosions due to excessive internal pressure of
steam. A steam boiler is, usually, provided with two safety valves. These are directly placed on the boiler. The function of a safety valve is to blow off the steam when the pressure of steam inside the boiler exceeds the working pressure. The ollowing are the four types of safety valves:



1. Lever safety valve
2. Dead weight safety valve
3. High steam and low water safety valve
4. Spring loaded safety valve.

It may be noted that the first three types of the safety valves are usually employed with stationary boilers, but the fourth type is mainly used for locomotive and marine boilers.

3.1 LEVER SAFETY VALVE

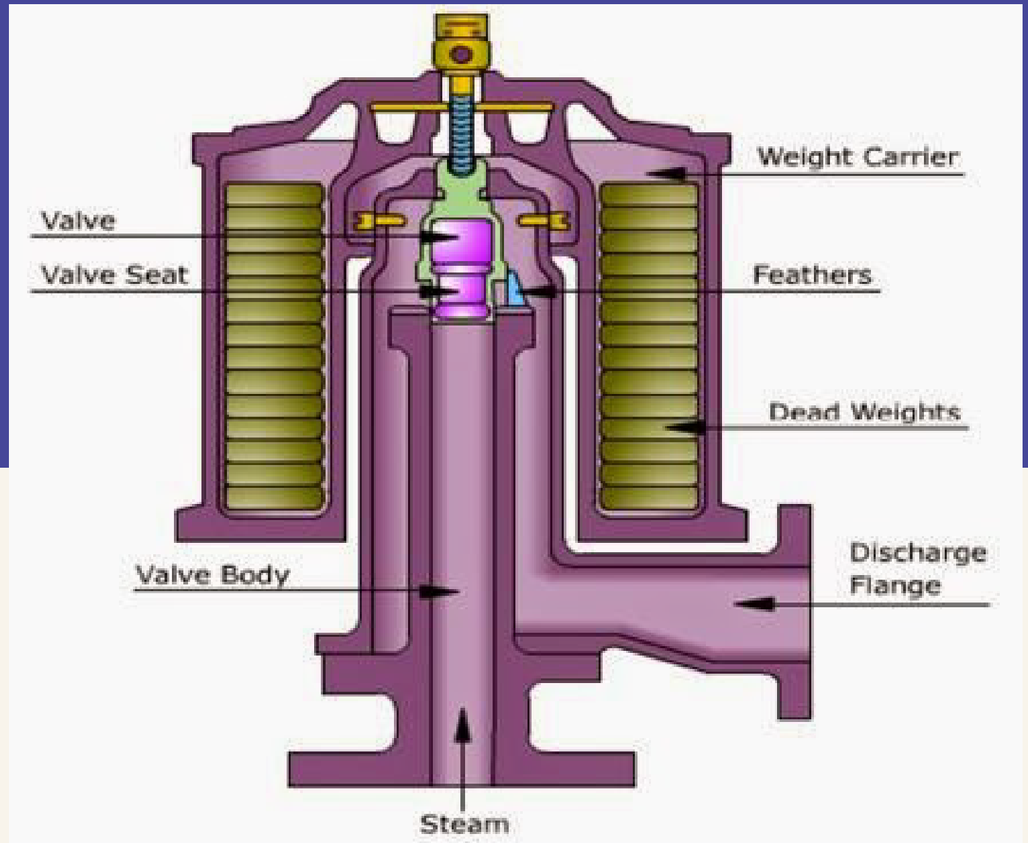
A lever safety valve used on steam boiler serves the purpose of maintaining constant safe pressure inside the steam boiler. If the pressure inside the boiler exceeds the designed limit, the valve lifts from its seat and blows off the steam pressure automatically. A lever safety valve consists of a valve body with a flange fixed to the steam boiler. The bronze valve seat is screwed o the body, and the valve is also made of bronze.

3.2 DEAD WIGHT SAFETY VALVE

A dead weight safety valve, used for stationary boilers is made of gun metal, and rests on its gun metal seat. It is fixed to the op of a steam pipe. This pipe is bolted to the mountings block, riveted to the top of the shell. Both the valve and the pipe are covered by a case which contains weights. These weights keep the valve on its seat under normal working pressure. The case hangs freely over the valve to which it is secured by means of a nut. When the pressure of steam exceeds the normal pressure, the valve as well as the case (along with the weights) are lifted up from its seat.

3.1 Lever Safety Valve

3.2 Dead Wight Safety Valve

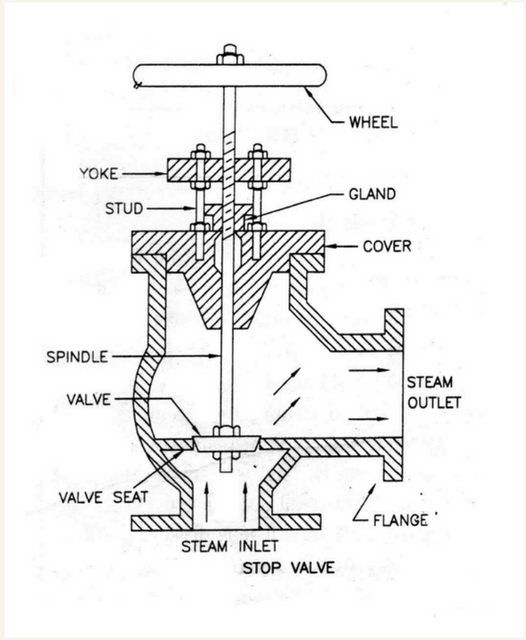


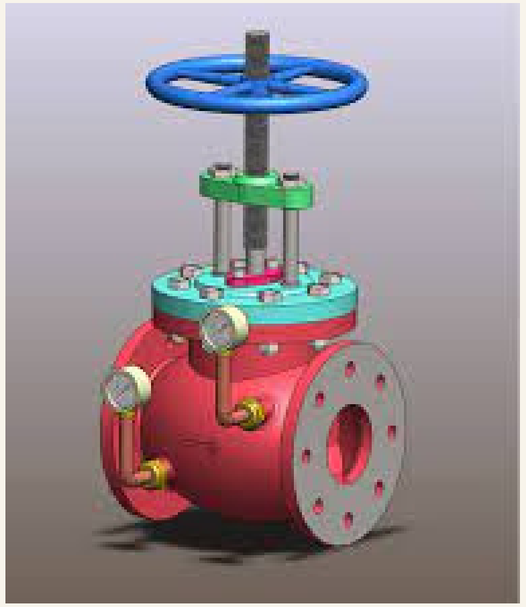
4. STEAM STOP VALVE

It is the largest valve on the steam boiler. It is, usually, fitted to the highest part of the shell by means of a flange. The main functions of a stop valve are:

1. To control the flow of steam from the boiler to the main steam pipe.
2. To shut off the steam completely when required.

The body of the stop valve is made of cast iron or cast steel. The valve, valve seat, and the nut through which the valve spindle works, are made of brass or gun metal. The spindle passes through a gland. The spindle is rotated by means of a hand wheel.



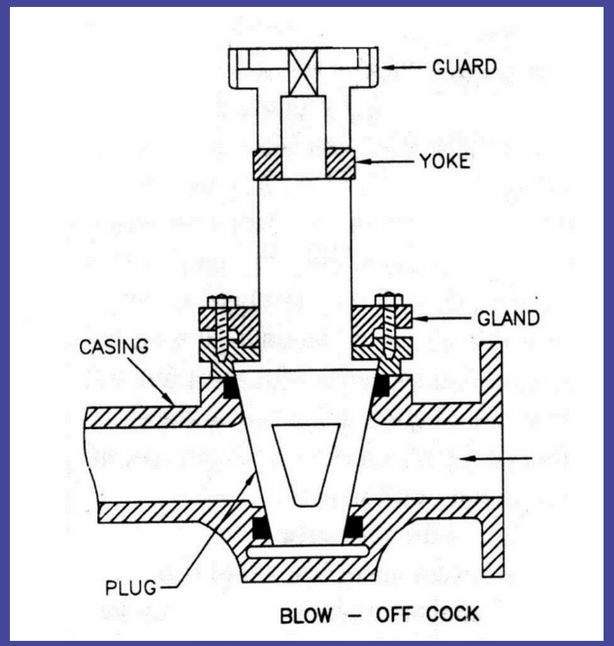


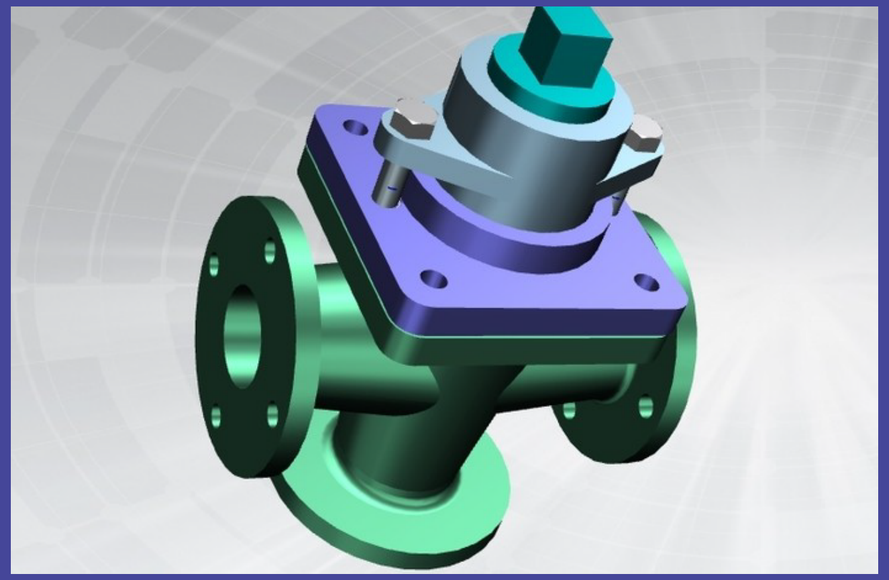
5. BLOW OFF COCK

It is an important The major functions of a blow-off cock are:

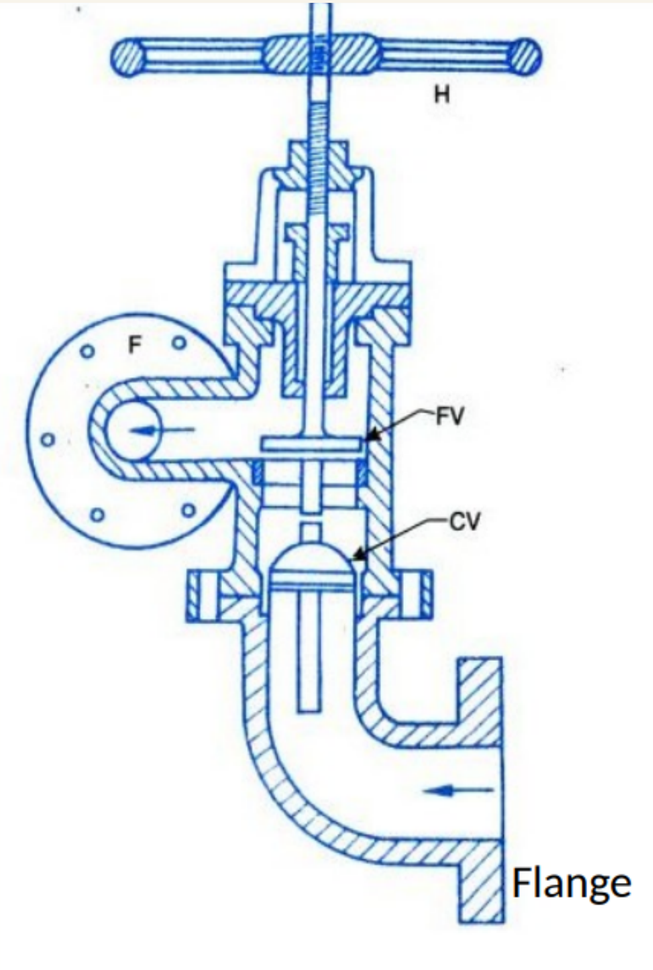
1. To empty the boiler whenever required.
2. To discharge the mud, scale, or sediments that are accumulated at the bottom of the boiler.

The blow-off cock is fitted to the bottom of a boiler drum and consists of a conical plug fitted to the body or casing. The casing is packed, with asbestos packing, in grooves around the top and bottom of the plug. A water level indicator, mostly employed in the steam boiler consists of three cocks and a glass tube. The steam cock keeps the glass tube in connection with the steam space. The water cock puts the glass tube in connection with the water in the boiler. Drain cock is used at frequent intervals to ascertain that steam and water cocks are clear.



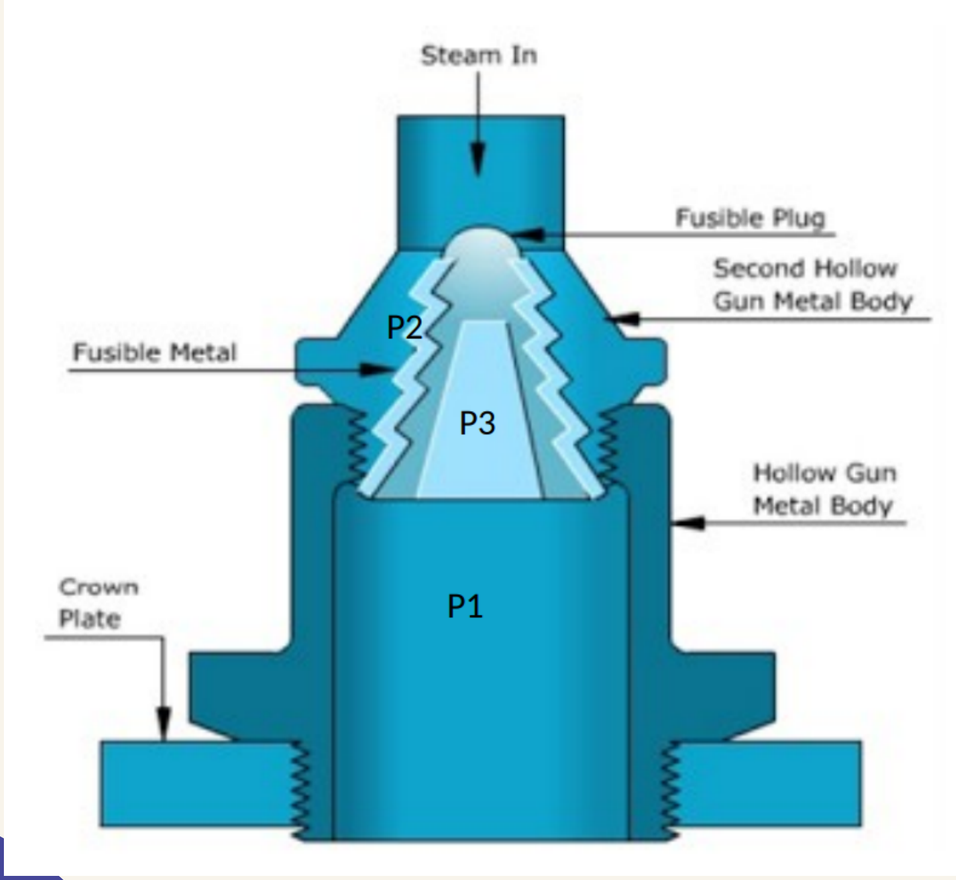


6. Feed Check Valve



It is a non-return valve, fitted to a screwed spindle to regulate the lift. Its function is to regulate the supply of water, which is pumped into the boiler, by the feed pump. This valve must have its spindle lifted before the pump is started. It is fitted to the shell slightly below the normal water level of the boiler. A check valve for marine boilers consists of a valve whose lift is controlled by a spindle and hand wheel. The body of the valve is made of brass casting and except spindle, its every part is made of brass. The spindle is made of muntz metal (Brass with 60% copper, 40% zinc and a trace of iron). A flange is bolted to the end of boiler at a point from which perforated pipe leads the feed water. The pipe distributes the water in the boiler uniformly.

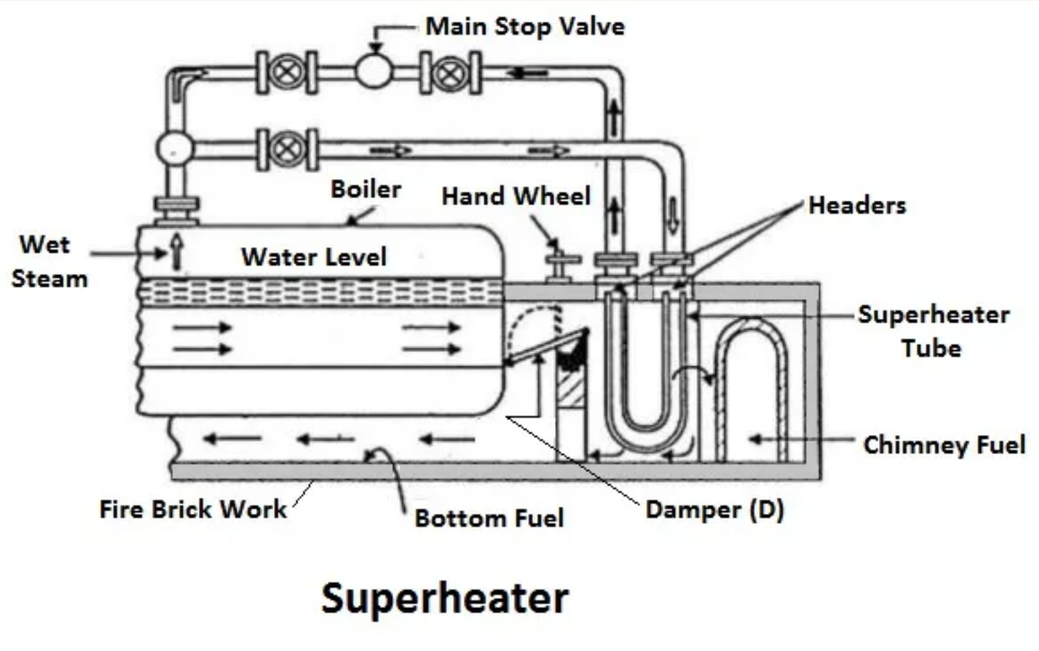
7. Fusible Plug



It is fitted to the crown plate of the furnace or the fire. Its object is to put off the fire in the furnace of the boiler when the level of water in the boiler falls to an unsafe limit, and thus avoids the explosion which may take place due to overheating of the furnace plate. A fusible plug consists of hollow gun metal plug P1 screwed to the furnace crown plate. A second hollow gun metal plug P2 is screwed to the first plug. There is also a third hollow gun metal plug P3 separated from P1 by a ring of fusible metal. The inner surface of P2 and the outer surface of P3 are grooved so that when the fusible metal is poured into the plug, P2 and P3 are locked together.

BOILER ACCESSORIES

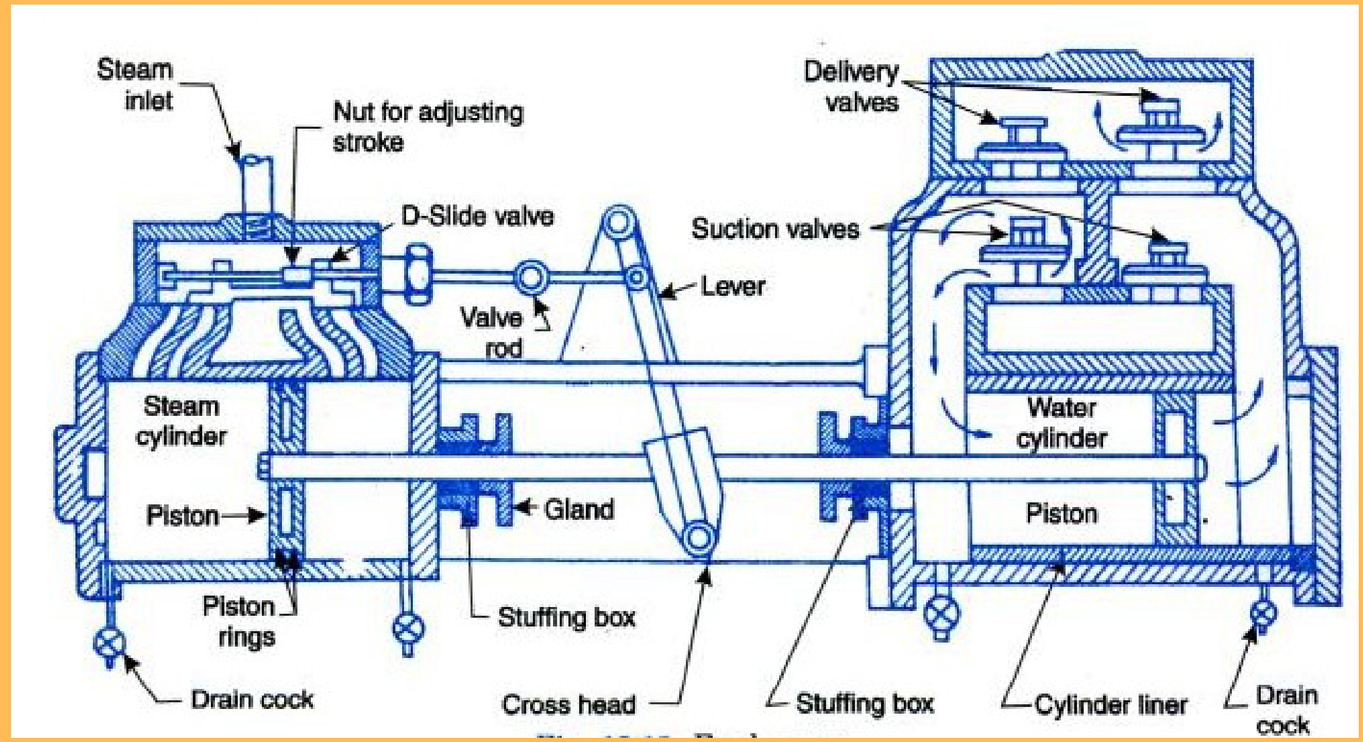
The boiler accessories are the devices, which form an integral part of a boiler but are not mounted on it. They include superheater, economiser, feed pump etc. It may be noted the accessories help in controlling and running the boiler efficiently.



Superheater

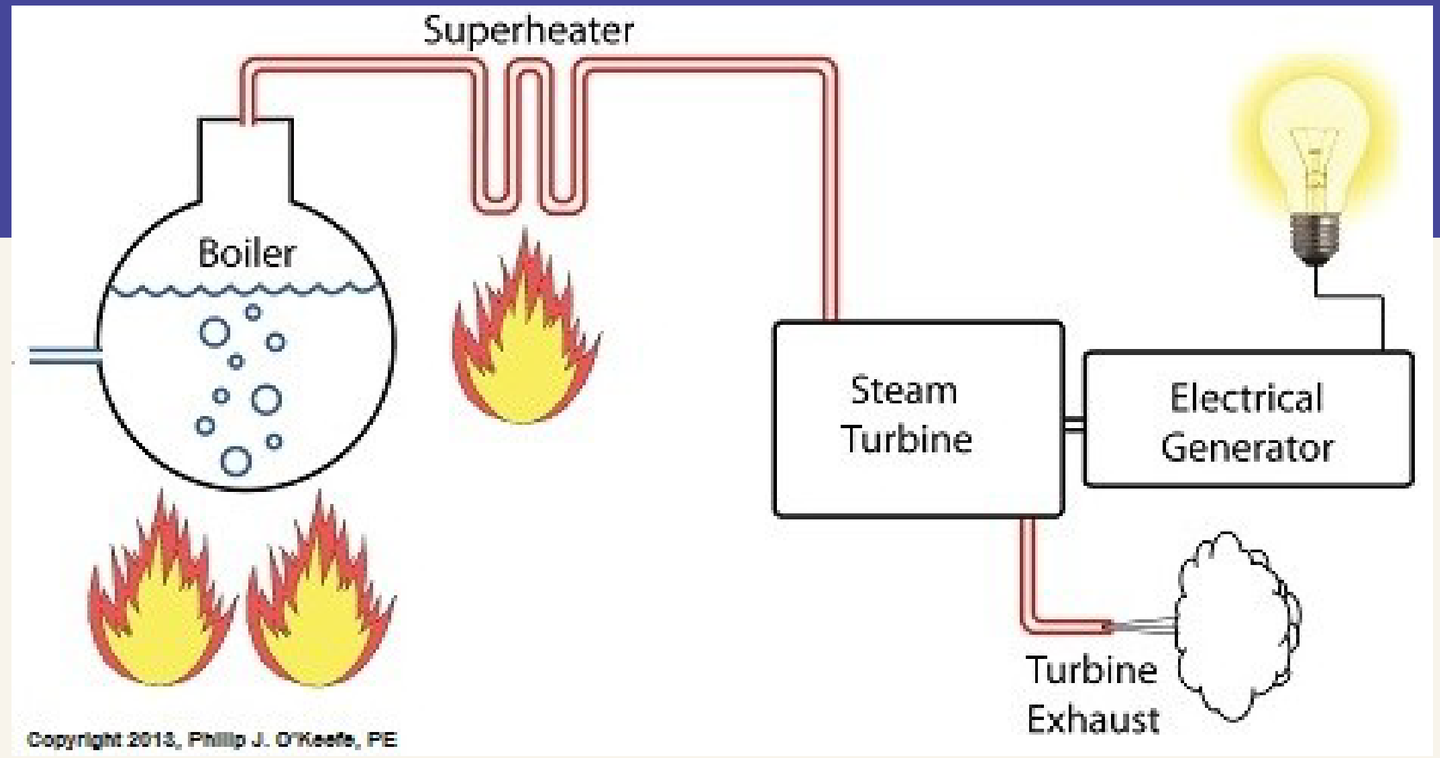
1. FEED PUMP

The water, in a boiler, is continuously converted into steam, which is used by the engine. Thus we need a feed pump to deliver water to the boiler. The pressure of steam inside a boiler is high. So the pressure of feed water has to be increased proportionately before it is made to enter the boiler. Generally, the pressure of feed water pump is 20 % more than that in the boiler. A feed pump may be of centrifugal type or reciprocating type. But a double acting reciprocating pump is commonly used as feed pump these days.



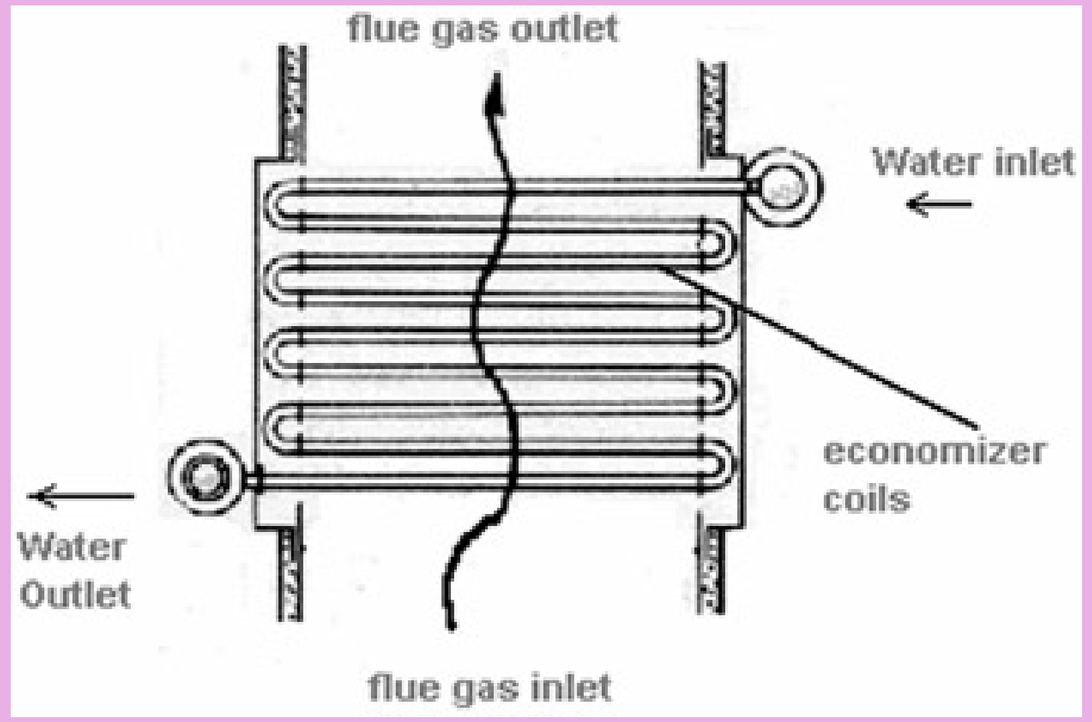
2. SUPERHEATER

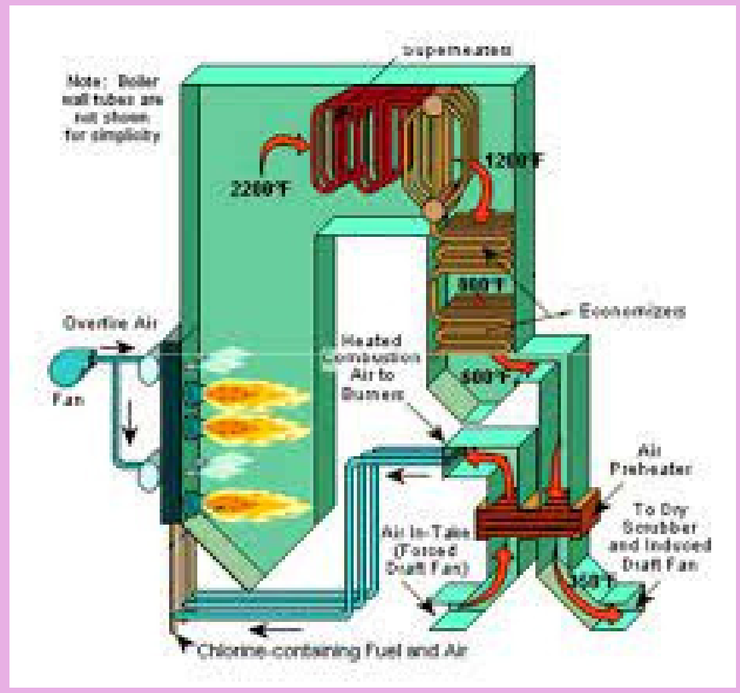
A superheater is an important device of a steam generating unit. Its purpose is to increase the temperature of saturated steam without raising its pressure. It is generally an integral part of a boiler, and is placed in the path of hot flue gases from the furnace. The heat, given up by these flue gases, is used in superheating the steam. Such superheaters, which are installed within the boiler, are known as integral superheaters.



3. ECONOMIZER

An economizer is a device used to heat feed water by utilizing the heat in the exhaust flue gases before leaving through the chimney. As the name indicates, the economizer improves the economy of the steam boiler. A well known type of economizer is Greens economizer. It is extensively used for stationary boilers, especially those of Lancashire type. It consists of a large number of vertical pipes or tubes placed in an enlargement of the flue gases between the boiler and chimney. These tubes are 2.75 m long, 114 mm in external diameter and 11.5 mm thick and are made of cast iron.





4. AIR PRE-HEATER

An air pre-heater is used to recover heat from the exhaust flue gases. It is installed between the economizer and the chimney. The air required for the purpose of combustion is drawn through the air preheater where its temperature is raised. It is then passes through ducts to the furnace. The air is passed through the tubes of the heater internally while the hot flue gases are passed over the outside of the tubes or vice versa.

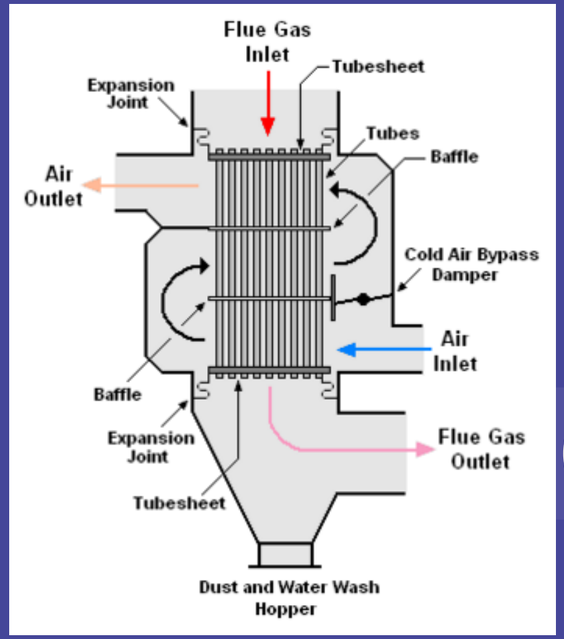
ADVANTAGES:

1.The preheated air gives higher furnace temperature which results in more heat transfer to the water and thus increases the evaporative capacity per kg of fuel.

2.There is an increase of about 2% in the boiler efficiency for each 35-40 oC rise in temperature of air.

3.It results in better combustion with less soot, smoke and ash.

4.It enables a low grade fuel to be burnt with less excess air.



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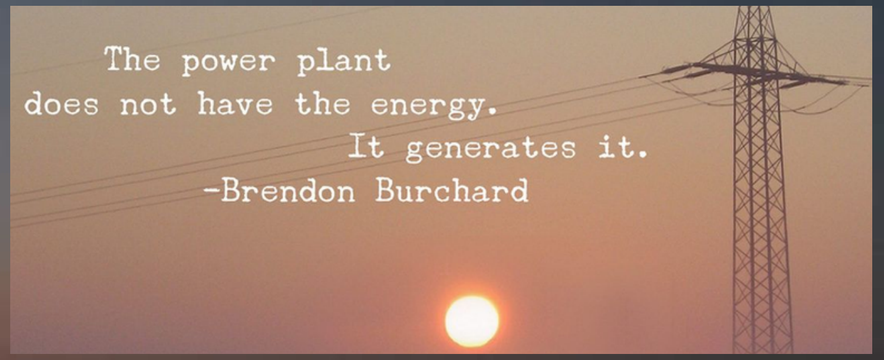
The power plant
does not have the energy.
It generates it.
-Brendon Burchard