A chain grate stoker consists of an endless chain which forms the support for the fuel bed. The chain is made of cast iron links connected by pins. The chain is held over two sprockets as shown figure, and travels from one end of the furnace to the other end. The sprocket at the front end is driven by an electric motor. The coal is fed at the front end through a hopper which is carried by the chain to the other end, hence into the furnace. The air necessary for the combustion of the fuel is supplied through the air inlets below the traveling grate. The secondary air is supplied through the openings in the top roof as shown in figure.

The rate of fuel supplied to the grate and hence the heat to the boiler can be controlled by two means. The first means is to control the depth of the coal bed on the grate by controlling the feed to the hopper. In the second method, the speed of the chain grate can be adjusted to meet the boiler operation requirements. The chain grate stokers are widely used for burning non-caking (that does not form a solid mass while burning), free burning, volatile and high ash content coals.

Advantages of chain grate stokers
1) It is simple in construction and operation.
2) Its initial and maintenance costs very low.
3) It doesn’t have ash cleaning problems.
4) Combustion control is simple, by control of feed or chain speed, along with the air supply.  5) Its combustion efficiency is high.

Disadvantages
1) It is suitable only for small capacity plants.
2) Coal losses are high as the unburnt coal may also move with ash.
3) If caking coal is used ash clinker problems may rise.
   • In the traveling grate stoker, the chain grate is replaced by grate bars that support the burning fuel.
   • Also the grate is inclined towards the inlet of the furnace.
   • The fuel movement is accomplished and controlled by vibration of the grate.
   • The air supply similar to the chain grate stoker

Spreader or Sprinkler Stoker
In this type stoker, coal from the hopper is fed on to a rotating feeder which in turn feeds the, to a spreader or sprinkler, and feed according to the requirements. Feeder is a rotating drum fitted with blades on its periphery. Other type of feeders such as reciprocations, endless belts or spiral worms can also be used. The feeder continuously supply the coal on to the spreader, a fast moving drum with blades, which in turn distributes and feeds the coal on to the grate as shown in figure. The fuel feed rate and the supplied to the boiler can be controlled by controlling the feed to the hopper or by controlling the spreader speed.
Fig. shows the schematic arrangement of a spreader stoker. In this type stoker, coal from the hopper is fed on to a rotating feeder which in turn feeds the, to a spreader or sprinkler, and feed according to the requirements. Feeder is a rotating drum fitted with blades on its periphery. Other type of feeders such as reciprocating rams, endless belts or spiral worms can also be used. The feeder continuously supplies the coal on to the spreader, a fast moving drum with blades, which in turn distributes and feeds the coal on to the grate as shown in figure. The fuel feed rate and the supplied to the boiler can be controlled by controlling the feed to the hopper are by controlling the spreader speed.

**Advantages of spreader stoker**

1) Its operation is simple and economical.
2) A wide variety of low quality coals can be burnt successfully.
3) Preheated air can be used for improving the efficiency of operation.
4) The fuel burns rapidly and hence the caking tendency is very low, even with the use of caking coals. 5) It can responds quickly to load variations

**Disadvantages**

1) It is not possible to burn varying sizes of coal and only crushed, sized coal can be used.
2) A part of the charge is burnt in suspension and hence fly ash is discharged with flue gases. This necessitates a suitable dust (or fly ash) collector system.
3) Un-burnt carbon particles may escape through the flues and reduce the combustion efficiency.

**Single Retort Stoker:**

The principle of construction of a single retort stoker is illustrated in Fig. In this stoker, fuel is burnt on a retort. The fuel is fed through a hopper and pushed on to the retort by a piston ram movement.

With the feeding from the bottom, gradually the burning coat rises up. Above the green coal an incandescent coke layer is formed, and above which the ash layer is formed. With the continuous feeding of green coal, the ash level rises that is removed by ash raker.
Multi Retort Stoker

It contains a series of retorts (5 to 20) with tuyers and pushers. It also consists of a fuel hopper and a coal pusher at the hopper end as shown in figure. The coal fed through the hopper is pushed by the main pusher driven by a ram. The distributing pushers in the retorts push the coal and distribute it to all the retorts. The movement of the fuel bed by the pushers helps in minimizing the clinker formation. The primary air enters the wind box below the retorts, and flows through the retorts. An air damper is provided at the air inlet in the wind box to control the airflow to the furnace. The airflow to the extension grate at its entry is further controlled by another damper, since the extension grate requires small quantity of air with less fuel burning on it. The ash formed from all the retorts falls into the ash pit.

Advantages of multi retort stoker

1) Since the combustion rate is high, such a stoker is most suitable for high capacity power plants.
2) The combustion efficiency of this stoker is very high.
3) As the fuel is pushed off by the pushers, they perform the cleaning action as well.
4) Automatic combustion control can be adopted in this stoker.
5) This stoker can respond quickly to variations in demand.

Disadvantages

1) The operation and maintenance is expensive.
2) The initial investment is high.
3) Ash clinker problems may arise.
4) It needs a larger area for installation and operation.
5) Low grade, high ash fuels cannot be burnt successfully.