

Burning the coal.—The rate at which the coal is used up in the furnace depends entirely upon the rate at which the air passes up through the fuel bed. This supply of air converts the coal substance into a gas. It oxidizes the lower layers of the coal the heat from which distils the gases from the upper fresh charge. But it is impossible to supply sufficient air beneath the average fire bed to burn the gases completely. To complete the combustion, a second current of air must be supplied above the bed of coal. This second current of air should be regulated by opening or closing the damper in the fire door to suit the quantity of combustible gases rising from the fuel bed. The flow of these gases will depend upon the quantity of air passing through the fuel bed, the condition of the fuel bed, and the presence of freshly fired coal. After the coal has been charged and the coal gas from it evolved, the damper in the fire door may be almost or even completely closed, since with the ordinary fire door sufficient air leaks through its crevices to supply sufficient air to burn the combustible portion of the gases then leaving the fuel. Experience alone will show the best method of operating a particular furnace, but the following is a rational scheme of working:—

Immediately after firing a new charge of coal on to a hot bed of coals, close the ash-pit door and admit a good supply of air through the fire door to burn the gases distilled from the coal. After these gases have passed off, less air over the fire is required, and it is then possible to adjust the furnace so that it may heat the house for some hours without attention. The amount of coal burned during this time will depend on the quantity of air which passes through the grate and up through the fire. This flow of air varies with the thickness of the fire, the size of the fuel, the quantity of ashes on the bars, and the "pull" or draft on the top of the fire which tends to draw the air through it. The "pull" or draft is caused partly by the furnace, and principally by the chimney, which contain gases at a higher temperature and lighter than the outside air. These light gases tend to rise in the furnace and chimney, and pull behind them air through and over the fire bed. Their effect in drawing the air through the fire bed may be reduced, by turning the damper in the flue, by admitting air into the flue or through the fire door, and by closing the damper in the ash-pit door. The damper in the flue throttles the flow of gases. Care must be taken not to close it to a point where the chimney draft is so slight that poisonous gases from the furnace pass to the house. Nor should it be closed soon after firing, unless the gases over the fire are burning freely, since by doing so the rising column of unburnt gases and air may explode. The air admitted into the flue acts as a damper, because it cools the gases passing to the chimney, and takes the place of air which would otherwise pass through and over the fire bed.

The first draft to be closed should be the turn damper in the flue; if this does not throttle down the air sufficiently, close the draft in the ash-pit door and also the draft in the fire door in order to maintain the correct proportions of air above and below the fire. If the draft is still too strong, open the damper which admits air to the flue pipe, and finally, if required, open again the damper in the fire door. There are two good reasons for using as little as possible those dampers which reduce the draft by allowing air to pass in and cool the gases. In the first place it is clear that the air must all come originally from outside and so cool the