should be exercised to avoid getting sulphur into the forge. When sulphur is present, iron at welding heat is slippery, while with no sulphur present the iron would be sticky. Good blacksmithing coal should have little or no clinkers after it is burnt. For general blacksmithing, the Cumberland coal is the best fuel. It contains very little sulphur and is easily packed about the fire.

To start a fire in the forge use shaving of any material which will start a good fire. After the shavings have started to burn, pack a little coal around them that it may take fire slowly. Now turn the blower crank slowly so there will be a little blast, then put some more coal around it and keep it packed to the center. Do not put any coal upon the fire, but around it. After the coal has been near the fire for a short time it is changed to coke by having all the sulphur and gases burned out of it. It is then in good condition for welding purposes or heating. If coal does not pack hard enough about the fire it sometimes is a good plan to wet it in order to pack it harder and to keep it in the center of the forge. The amount of blast varies, but experience will soon show how much blast should be given. The stronger the blast, the greater the heat until the coke starts to rise in the middle of the fire, then the heat decreases because there is too much space through which cold air can circulate.

In heating and drawing iron, it should be heated to a light red or nearly white color before hammering or drawing it. If it is not heated enough, it will be harder to get it to the shape wanted. When drawing, be sure to get good square corners. To get it square it should be hammered on only two of the sides, the other two being next to the anvil. The same is true with the steel, but steel should not be heated to as high a temperature as iron. It should be heated to a red color and when hammering it, do not pound too hard. Light pounding especially for finishing, will make the best grain in steel tools.

Welding iron or steel is rather a difficult job for an inexperienced person, because it is very easy to burn iron or steel when trying to get it to a welding heat. One end may get hotter than the other or there may form a scale on the outside of the iron which takes a higher heat to melt than the iron itself, therefore when the scale is melting the iron is burning.

Some of the causes which make welding difficult and which should be avoided are:

First, the fire should be absolutely clean. By absolutely clean fire I mean there must be no pieces of iron, steel or other metals in it, and there should be no clinkers or burned out ashes at the bottom.

Second. No fresh coal should come in contact with the iron to be welded.

Third. The placing of the iron. The iron should be so placed that the parts to be welded are in the hottest part of the fire and get the greatest heat possible. If one gets hotter than the other, pull it back a little. When they get near the melting point, the iron will bubble slightly and get sticky, it is then ready for welding. Strike them a sharp blow on the edge of the anvil to shake off any dirt or scale that may be on them. Then put them together as quickly as possible. If they are at the proper heat, they will stick together so that you can let go of it with one hand while you pick up the hammer and strike it a light blow. Then strike it a heavy blow, keep pounding until the iron has cooled below the welding heat, then put it back in the fire and heat until the surface is in melting condition again. Then put it on the anvil and pound it down to the original size of the iron or into the shape you want. Larger irons are easier to weld and a good weld may be done in one heating as they will not cool as quickly as smaller iron.