CENTERING MACHINE.

A writer to the *English Mechanic* on the above subject says :—Many amateurs find a difficulty in centering their work truly for the lathe, and various devices have been designed to overcome this difficulty. One consisted of a kind of box, with conical recess, which is placed over the end of the bar to be centred, and a centre punch is driven down through the handle ; but if this centering cone is held a little on one side, instead of the dent being in the centre, it is eccentric. I have designed two or three machines intended to overcome this difficulty. The following consists of a bed or plate, 1, which may be of a suitable length, and placed either vertical or horizontal. There are two kinds of poppits shown, each having a hollow cone. The one shown at 2 has a mandrel like a lathe, being kept to the left by a spring. One end carries a drill, or hollow cutting cone, for pointing small bars, to be used with a hollow centre chuck. The handle, 3, is to feed the drill in its work. The poppit, 4, has a centre punch, which is also kept back by a spring. The handle, 5, is forced against the end of the punch by a spring behind it. To use it, pull back the ball at the end of the handle as far as it will go, and let it spring back against the end of the punch.

THE COMPOSITION AND WORKING OF ALLOYS.

Bronze Alloys.

A bronze in imitation of gold may be made of 45·5 parts copper, 3·5 parts tin and 1 part zinc—50 parts. Bronze medals are generally cast of an alloy of 50 parts copper and 2·8 parts tin. This alloy is very hard. A softer bronze for medals than the above is composed of 46 parts copper and 4 parts tin. Ancient bronze nails were made of 40 parts copper to 1 part tin, and were very flexible. Soft bronze is composed of 18lb. copper to 2lb. tin. Hard bronze is composed of 20lb. copper to 5lb. tin. The ancient bronze mirrors are said to have contained 16 parts copper to from 7 to 8 parts tin. At the time of Louis XIV. of France, a period when the art of casting statues was much cultivated in France, statues were cast of an alloy of 30·6 parts copper, 0·11 parts tin, 2 parts zinc, and 0 6 parts lead. The statue of Louis XV. is cast of 82·4 parts copper, 10 3 parts zinc, 4 parts tin, and 3·2 parts lead. The bronze of the ancient Greeks consisted chiefly of copper and tin, but was frequently alloyed with arsenic, zinc, gold, silver, and lead. All their shields and weapons of war were made of bronze, as well as coin, nails, kitchen ustensils, &c. All the ancient nations seem to have understood the art of tempering bronze and copper, and the ancient Mexicans understood the art of converting bronze into edged instruments in a high degree, but the art of tempering and hardening bronze and copper has been lost to modern nations; but as we understand the working of iron better than the ancients, and have steel, an alloy of iron and carbon, which the ancients did not have, we do not miss this art much.

Bell-metal Alloys.

One hundred and forty-four pounds copper, 53lb. tin, and 3lb. iron, are said to make a superior bell. Iron, copper and tin do not unite well, if each is added separately to the other. but if tin-plate scraps are melted in a crucible together with tin, and then this tin and iron alloy added to the molten copper, it will unite readily. Another alloy that is highly recommended is composed of 53·5 parts copper, 6·11 parts iron, 2·13 parts lead, and 3·9 parts tin. This alloy has a good, sonorous sound, even if the mould is not thoroughly dry. House bells are made of 4lb. tin to 16lb. copper. Soft musical bells are made of 3lb. tin to 16lb. copper. Common bell-metal consists of 50lb. copper to 15 or 20lb. tin. The silver bells of Rouen, France, consist of 40lb. copper, 5lb. tin, 3lb. zinc, and 2lb. lead. Too much tin causes bell-metal to be brittle. The gongs or cymbals and tam-tams of the Chinese are composed of 40lb. copper to 10lb. tin. To give these musical instruments their proper tone, they are plunged in cold water while hot, after being cast; cooling in water deprives the metal of almost all its sound. It is tempered and very slowly cooled, which imparts to it peculiarly powerful sound. If bell-metal is suddenly cooled, it becomes less dense and hard, and is increased in malleability, but the tone of the metal is decidedly impaired, and bells ought never to be cast in damp moulds. When bells are cooled suddenly they should be reheated and tempered by cooling slowly.

Type Metal.

Six parts lead and 2 parts antimony form a very hard and brittle alloy used for small type. Eight parts lead and two parts antimony form a softer alloy that is used for larger type. Ten parts lead and two parts antimony form an alloy that is still softer, and is used for medium-sized type. Fourteen parts lead and 2 parts antimony form an alloy that is softer than any of the above alloys, and is used for the largest-sized type. A small amount of tin is sometimes added to the above mixtures, and some typefounders add 1 or 2 per cent of copper. Both of these metals improve the quality of the type, when used in small quantities. Forty parts lead, 8 parts antimony, and 2 parts tin form an alloy that is used for stereotype plates. Six parts lead and 2 parts tin form a coarse solder, used by plumbers. This alloy melts at about 500° Fah. Two parts lead and 4 parts tin form the fine solder used by tinners. It melts at about 358° Fah.

Lead Alloys.

Ninety-four parts lead and 6 parts antimony form an alloy that may be rolled into sheets, and is a little harder than pure lead. This alloy is much used for sheathing for ships. Twenty-four parts lead and 4 parts antimony form an alloy that is used in place of Babbitt metal for filling small boxes and bearings. Twenty parts lead and 4 parts antimony form an alloy that is a little softer than the above, and is used for the same purpose. Either of these may be hardened by the addition of more antimony ; but care must be taken not to use too much antimony, for it will cause the alloy to lose its fluidity, and it cannot be run into the boxes. All alloys of lead and antimony are rendered more fluid by melting them under a covering of oil. Five parts lead and 5 parts tin make a beautiful white alloy, used for organ pipes. The mottled or crystalline appearance, so much admired in the pipe, is caused by using an abundance of tin. One hundred parts lead and 2 parts arsenic form an alloy from which drop shot is made. Eighteen parts lead, 4 parts antimony, and 1 part bismuth form an alloy that expands on cooling. This alloy is much used for metallic patterns for snap mouldings.

Spelter-solder Alloys.

A good solder for copper and iron is composed of 3 parts zinc and 4 parts copper. A softer solder that is used for ordinary brass-work is composed of equal parts of zinc and copper. A very hard but fusible solder is composed of 2 parts zinc and 1 part copper. This solder is so hard and brittle that it can be easily crumbled in a mortar when cold. The two first solders are first alloyed and cast into ingots. The ingots are allowed to cool in the mould and then reheated nearly to redness upon a charcoal fire, and are broken up on the anvil, or in a mortar, into a finely granulated state, for use.

Hard-solder Alloys.

The following metals and alloys are usually used as solder in the art of hard soldering :—Fine or pure gold rolled or beaten into sheets, and into shreds or small pieces, is used as the solder for soldering chemical vessels made of platinum. Silver solder is composed of 4 parts silver and 2 parts yellow brass. Yellow brass is much used for hard soldering. The brass is used in this solder, so that the operator can tell when the solder is fused by seeing the blue blaze caused by the burning of the zinc. This solder is either rolled into thin sheets and cut into small bits for use, or is granulated while hot. The gold solder, the composition of which is given under the head of gold alloys, is rolled into thin sheets and used for soldering gold alloys. Gold soldering is generally done with the blowpipe, as the work is seldom large enough to require the brazier's hearth. Pure copper, in shreds, is sometimes used for soldering iron. Spelter solders, granulated while hot, are used for soldering iron, copper, brass, gun metal, German silver, and sometimes for gold and silver alloys. As a cheap substitute for silver solder the white or button solders are commonly employed for the white alloys, such as German silver, gun metal, &c. The flux most generally used in hard soldering is borax. In fact there is very little hard soldering done without the aid of this flux. It is generally granulated, and used in the dry state for large or heavy work, and for small work it is generally used in solution with water.

Soft-solder Alloys.

The soft solder used by plumbers, called sealed solder, is composed of 2 parts tin and 4 parts lead. This solder melts at 450° Fah. The common solder used by tinsmiths is composed of 4 parts tin and 2 parts lead. This solder melts at 350° Fah. The bismuth solder is composed of 7 parts bismuth, 5 parts lead, and 3 parts tin. This solder melts at about 225° Fah. All the tin and lead solders become more fusible the more tin they contain. Thus 1 part tin and 10 parts lead melt at about 550° Fah. ; while 6 parts tin and 1 part lead melt at about 375° Fah. ; and all the tin, lead, and bismuth solders become more fusible the more lead and bismuth they contain. The fluxes used in soft soldering are borax, sal-ammonia, chloride of zinc, common resin, Venice turpentine, tallow, and sweet oil. Those most commonly used for ordinary work are common resin and chloride of zinc.