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The Light Aluminium Alloys

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Notes and Comments.

THE LIGHT ALUMINUM ALLOYS.*

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Chromium hardens aluminum strongly. The chromium-aluminum alloys have somewhat of the qualities of self-hardening steel, retaining their hardness on heating or after annealing. The use of 2·3 per cent. chromium is recommended; 11 per cent. makes a brittle alloy. Chromium-aluminum alloys are being used commercially. Titanium-aluminum alloys are difficult to make and have practically gone out of use. Alloys of aluminum and manganese, up to 5 per cent. manganese, are hard and rigid. When used with copper and nickel manganese makes the hardest light alloy yet produced. The manganese should be employed in the form of a rich aluminum-manganese alloy produced in the electric furnace. The alloys of aluminum and tin are not much used. Tin makes aluminum whiter and more easy to solder. The aluminum-silver alloys are harder, stronger and whiter than pure aluminum, take a higher polish and retain it better than pure aluminum. They are used for making table ware and ornamental articles. The alloys of nickel and aluminum have not yet been found useful. The commercial alloys which go under the name of "nickel-aluminum" are really alloys of aluminum with nickel and copper; when made for rolling, they contain from 2 to 5 per cent. nickel and copper together, the larger proportion being usually copper. The plates of the yacht "Defender" were made of this alloy. The precise effects of tungsten on aluminum have not been satisfactorily determined. An aluminum alloy containing a small amount of tungsten has been used extensively for military equipments. Aluminum alloyed with 2 or 3 per cent. of German silver gives a strong, tough metal which is easily made. An aluminum alloy containing 10 per cent. magnesium is being used in Europe. Zinc is the cheapest and one of the most efficient metals with which to improve the mechanical qualities of aluminum. Up to 15 per cent. zinc, these alloys are malleable; in castings as much as 33 per cent. zinc may be used. Casting in chills gives better results than in sand. The zinc-aluminum alloys are made by melting aluminum and adding zinc thereto. The 15 per cent. alloy can be rolled and drawn. The 33 per cent. alloy, sometimes called "Sibley casting alloy," is extremely rigid, but is not so resistant to shock as the alloys containing less zinc.

In the preparation of aluminum alloys the best results are obtained by the use of pure metals, this being especially the case with respect to zinc. In general, the aluminum should first be melted, the other metal being subsequently stirred in. The melting can be performed in an ordinary graphite crucible, but magnesia-lined crucibles are best for this work. In alloying, recovering of charcoal is needed; but simply for melting, no covering is required. It is important that the metal should not be overheated; it is of the greatest importance that it should never be over a cherry-red. A wrought-

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iron stirring rod may be used, but a carbon rod with an iron pipe for a handle is better. The alloys should be allowed to cool down before pouring. The use of a flux in melting is not recommended. For general castings, green sand is suitable. Large gates, heavy feeders and numerous air vents are necessary. Slabs and rods for rolling or drawing are cast in chill molds, as the metal is soft, uniform and stronger than if cast in sand, and the surface is smoother. Since the alloys are hardened and stiffened by working, they must be annealed frequently during rolling. Slabs or billets are best broken down by a steel hammer while at temperature of 150° to 250° C.; steel rolls with good surfaces should be used, and the rolls should be at temperature of 150° to 200° C.