Titanium is widely used as a biomaterial due to its high strength, relatively low modulus, combined with excellent corrosion resistance and biocompatibility. However, it does not possess any anti-bacterial properties and therefore post-operative infection remains a significant risk. Recently the addition of silver and copper to conventional biomaterials has been shown to produce a material with good anti-bacterial properties. In this paper, we investigate the selective laser melting as a method of producing anti-bacterial Ti-6Al-4V containing elemental additions of Cu or Ag. The addition of Ag had no effect on the microstructure or strength, but did result in a significant increase in the ductility of the alloy. In contrast, the addition of Cu resulted in an increase in strength, but decrease in ductility, along with a change in the structure of the material. The Cu-containing alloy also showed moderate anti-bacterial properties and was superior to the Ag-containing alloy.