FROM METAL DUST—Durable metal-cutting tools and gears as well as numerous other objects needed to aid our production program are made today from powdered metal.

to last the life of the machines; in other cases additional lubricant must be supplied from time to time.

The history of powder metallurgy goes back at least a hundred years; some claim much longer. It is certain that platinum powder was used in making platinum articles over a century ago. Platinum has a very high melting point. Because of this, great difficulty was encountered in trying to put it into use. Platinum powder was easily obtainable. Scientists found that by pressure and heating at a temperature well below its melting point, satisfactory platinum objects could be formed. Similar results were obtained with iridium.

Powder metallurgy found another important application early in the present century. It was used to produce thin filaments of metallic tungsten for electric lamps. This extremely refractory metal, the melting point of which is about 6,000 degrees Fahrenheit, can be made available in powdered form. After its formation into briquets by pressure and sintering, it can be made stronger and more ductile by hot forge treatment.

New Development

The success of powder metallurgy in putting platinum, tungsten and other refractory metals to work is probably responsible for laboratory investigations made in the past two decades which, in turn, are responsible for the present wide use of the process and the many new uses developing each year.

Progress has now developed to a point where many types of machine parts, instrument parts and tools are made from powders of single metals, metal alloys, metal mixtures that alloy during sintering, metal mixtures that remain unalloyed, and mixtures of metallic and nonmetallic minerals. Pieces, composed of layers of different materials, are fabricated. Others are made of mixtures of metals whose specific gravity is so different that they would separate if melted.

Nearly As Hard As Diamonds

Hard cemented carbide-tool material is one of the most important products of powder metallurgy. It is nearly as hard as diamonds. It cuts metals at speeds several times as great as tools made from molten metals. Its use has greatly speeded up war production. The material consists of very small particles of a hard metallic carbide cemented together with a small amount of an alloy.

Tungsten-carbide was first used as the metallic carbide because it provided great strength and hardness. The cement used with it is a molten alloy formed by cobalt which has dissolved certain small amounts of tungsten carbide while in a liquid state. Tantalum carbide and titanium carbide are also used. No other practical method has been found for making satisfactorily this important tool material.

Wartime developments require a large number of electrical resistance parts made from powdered talc or steatite with electrical and dimensional properties obtainable by powder metallurgy, but in no other way now known. They require parts made of metal mixtures in which each metal retains its original electric characteristics. Alloying often destroys these characteristics. Powder metallurgy is the answer. Combinations of copper and tungsten, and combinations of silver and nickel, tungsten or graphite, are examples.

Metal powders of practically all metals are now available, and also of many alloys. Commercial manufacturers use powders made by the reduction of metal salts by gases, electrolysis or atomization, or by mechanical disintegration of the metals themselves. Relatively pure iron oxide ores, in the presence of a reducing agent, form an iron-sponge at a temperature below the melting point of the metal. The sponge is pulverized mechanically. The atomization process consists of spraying a molten metal into a current of air or steam.

Until recently powder metallurgy was used only when melting and casting was not possible. Newer methods have now changed this. The process is economical, often less costly than the old process which involved melting, forming and machining.

The importance and possibilities of powder metallurgy to America's industries was foreseen a few years ago by Stevens Institute of Technology at Hoboken, N. J. In 1940 it established, under the sponsorship of eleven industrial concerns, a special powder metallurgical laboratory to conduct research work and to teach the art to student engineers in metallurgy. It was placed under the charge of a professor taken from an industrial concern which for several years had been using metal powders in manufacturing processes and had conducted much research in its own laboratories.

Science News Letter, October 2, 1943

ENGINEERING

Electrical Device Locks All Car Doors at Once

➤ GASOLINE may be rationed and car driving limited, but patents for many new devices for automobiles continue to be issued. A "coincidental locking system for automobiles" is among them. The inventors are Robert N. Ward of Royal Oak, Mich., and Roy H. Dean of Detroit. They assign rights in the patent (2,329,309) to the Ternstedt Manufacturing Co. of Detroit.

It is an electrically controlled device which locks all doors at the same time. It may be operated from either front door. By use of a switch the rear doors may remain locked whenever wanted.

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