Aluminum Is Rival Of Steel; Big Factor In Autos

into the fiery furnace of politics has been plunged that metal of chemical magic, aluminum. Little did the first man ever saw it just 100 years ago believe that the light gray powder in the bottom of a test tube would one day become so important a factor in industry, economics—even politics. The first commercial production of the metal in this country dates back only thirty-six years and in 1890 there were in the world only forty tons of it. It was not until the beginning of this century that this illusive element became a commodity at all and could be produced cheaply enough to come into practical use.

Aluminum, merely a laboratory curiosity to the last generation, now enters into everyday life—it meets the human race at hundreds of points of contact. There is probably no American home where it does not shine, although its presence may not be known.

AN AMERICAN MONOPOLY

In the report of the Federal Trade Commission, in which the Aluminum Company of America is charged with having "practically a complete monopoly" of aluminum, much stress is laid upon the employment of the metal in the making of kitchen utensils. Common as aluminum pots and pans are now, they could not be used except by persons of wealth until about fifteen years ago, when the gray element dropped from $4 a pound for sheets to $1—and even then the price was considered an extravagant one. The present quotations for the best quality of sheet, such as is used for pressing into hollow ware, is from 35 to 38 cents a pound, while the price of ingots and other forms of the crude metal is approximately 10 cents less than this quotation.

The metal is today within the reach of many persons who a few years ago would not have thought of utilising it. A survey of any country kitchen or city kitchenette should show at least one utensil made of aluminum. The gray metal is used for not only kettles, pails, pots and saucepans, but for coffee percolators, knife handles and salt and pepper shakers. The lightness and the strength of aluminum make it a good material for vacuum cleaners, carpet sweepers, washing machines and for certain parts of household sewing machines. If the housewife puts up her own preserves she usually uses a fruit jar with an aluminum screw top, and the catsup and the grape-juice that she buys have been boiled in jacketed kettles of aluminum.

"TIN" FOIL OF ALUMINUM

Candy and many other food products, such as cheese, have for years been wrapped in aluminum foil, for this element is so ductile that a pound of it will make 10,000 square inches of foil. A heavier aluminum foil is used for the making of collapsible tubes for shaving creams, tooth powders, paints and similar products which come in a semi-solid state. The foil makers use 2,000,000 pounds a year. In the household, aluminum is the rival of enameled steel ware and of copper vessels lined with tin, for manufacturers maintain that it is noncorrosive and on accounts of its lightness in weight adds to culinary ease.

In millions of American homes the men folks handle aluminum constantly, for it is used for radio condensers, screws, wires, head pieces and for various appliances employed in the new art of communication. Every automobile owner—and there are now about 15,000,000—who examines his car closely will find aluminum somewhere. The metal is one-third the weight of steel and three-tenths that of copper, and it is practically the same in tensile strength. It is used for the bodies of the more expensive cars; for mud guards and for crank cases, and is employed for cast parts quite extensively, even in the cheaper makes. It has been said in public addresses that the automobile industry could easily use 120,000,000 pounds of aluminum a year, and exports regard that as a rather conservative estimate. The motor boat builders are also heavy consumers.

ALUMINUM IN TRANSPORT

All kinds of transportation would be benefited by the use of aluminum, in fact, if the price were low enough. Aluminum and its alloys, such as duralumin, in which there is some steel, can be and is to some extent used for passenger coaches, while eventually even freight cars could be fabricated from such material.

The metal enters into the making of airplanes, both in the machinery and in the wings. The dirigibles, such as the Shenandoah and the ZR-3, have aluminum frames. Both the heavier-than-air and the lighter-than-air craft are dependent upon the aluminum industry. Airplanes made entirely of aluminum alloy have been built.

Aluminum can be finely ground, and it therefore serves well as a paint or a bronze powder. The particles are very flat and naturally adhere to a surface. When combined with oils they make a paint which is unusually adhesive, resists moisture well and keeps away rust. The silvery sheen of the airship body and of the airplane wing is due to aluminum, and in many cities the huge illuminating gas holders have the same coating. Finely screened aluminum powders are needed for making "silver" coated papers and other fabrics. The comminuted metal is also the basis of flashlight powders, and in war was put into the star shells which lighted "No Man's Land." It was an ingredient of the explosive ammonal used by the British as a substitute for cordite. A mixture of ground aluminum and steel makes possible the quick welding of damaged machinery.

RIVALS COPPER AND ZINC

For appliances much exposed to the weather, aluminum is coming into vogue as a competitor with copper and zinc. There are now 160,000 miles of high-tension overhead electric aluminum cable in commission in the United States. Like zinc, aluminum is also used for architectural ornaments. The finial surmounting the new Standard Oil Building in Broadway was cast from aluminum ingots.

Varied as are the demands for aluminum at this time, the industry itself is an infant—albeit a lusty one. It has the same possibilities as the steel manufacture in this country had years ago, and it has been growing just as the tinplate industry did. Unlike the tinplate industry, however, it is not dependent upon the foreign mines for a supply, for the United States leads the world in the mining of the raw material, bauxite, and in the making of the finished metal. The sources of aluminum are abundant.

A BIT OF HISTORY

To sense fully the importance of the industry and to realise its possibilities, it is well to review bits of very brief history. Although there were earlier experiments, the researches of Hans Christian Oersted made in 1824 with alumnia chloride resulted in the actual separation of aluminum as a metal. A mere grayish precipitate, soft and sleazy to the touch, the substance which he derived was none the less metallic. Later Bunsen and de Ville got further along with a process for making aluminum, but it was not until thirty years later that the French chemist Javel, under the patronage of Napoleon III., made a quantity of it, which was shown publicly in Paris in 1855. A small plant was put up at Battersea, England, in 1859, and a year later aluminum of British make was displayed at an exhibition of the Society of Arts.

Although Oersted was one of the pioners in electromagnetism, he had not been able to apply electricity to the making of aluminum on a commercial scale. A practical process of manufacture was not even in sight until the development of the electrical art which came in the late '80s. In the year 1885 England had succeeded in producing two and a half tons of aluminum, and in this country the output was estimated at as many hundreds of pounds. The Cowles patents taken out in 1886 in the United States marked the beginning of a new era in the industry. In 1888 the process of Charles M. Hall, then a student at Oberlin College, was introduced, and a small plant was erected for experimental purposes at New Kensington, Pa., had risen to twenty-two tons.

The principal backer of Hall and the man who financed his experiments was Alfred D. Hunt of Pittsburgh, father of Roy Hunt, Vice President of the Aluminum Company of America. In 1889 there was formed, as a result of this interest, the Pittsburgh Reduction Company, which in 1907 was reorganised as the Aluminum Company of America, the capital stock of which is now given as $20,000,000. Twenty-five percent of the outstanding stock of the Aluminum Company of America is still held by the family of Mr. Hall, according to the report of the Federal Trade Commission. At the period of reorganisation Andrew W. Mellon, now Secretary of the Treasury, took a substantial interest, as did also his brother, R. B. Mellon.

MELLON BACKED RESEARCH

Many millions of dollars have been spent in the United States since that date in chemical research, with a view of finding new processes of making aluminum or of perfecting existing ones. Mr. Mellon had been deeply interested in experiments of this kind, and in later years he became instrumental in founding the Mellon Institute of Industrial Research in Pittsburgh. While the making aluminum in a laboratory on an experimental scale could be done with comparative ease, if there were no limitation of expense, the large scale manufacture was a problem which required the best chemical and engineering talent.

The Hall process, which by 1890 was fairly well developed by the old Pittsburgh Reduction Company, employs bauxite as the base. The mineral is first heated for calcining and is then finely pulverized. The powder is treated with caustic soda solutions, and a sodium aluminate is formed. From this solution, either by passing carbonic acid gas through it, or by other methods, the hydrate of aluminia is precipitated. This substance is then thoroughly dried, and placed in a bath composed of melted cryolite, where it is heated to a high temperature by an electric current which flows from carbon rods or electrodes. The high temperature separates the metallic aluminum and sends it in a molten state to the bottom of the tank, from which at intervals it is withdrawn and cast into ingots.

THE PROCESS

This electrical process can be applied to the economical and profitable manufacture of aluminum only when the current can be generated at a low cost. The company which hopes to compete in the markets of the world in aluminum manufacture must have the command of hydraulic power. The Pittsburgh organisation owns several water power companies.

Most of the domestic bauxite comes from Arkansas, where the Aluminum Company of America has extensive holdings in Saline County, and other Southern States. It ships the bauxite to East St. Louis for calcining, and performs the final process at Niagara Falls or Marysville, Tenn, or Badin, N. C., or in various points in the South where it has the hydroelectric facilities needed. The cooperation has a plant in Canada and also one at Massena, N. Y., near Ogdensburg, on the Canadian border.

The annual capacity "on paper" of its North American plants is 155,000,000 pounds of aluminum. The company produced last year 138,000,000 pounds. It was not dependent entirely upon the New World bauxite, for it also imported large quantities of bauxite from the European markets—almost as much as it obtained from its own mines on this side of the water. For certain purposes European bauxite is preferred to the American.

BAUXITE YIELDS 30 PERCENT

Chemical engineers estimate roughly that bauxite yields 30 percent of aluminum. It sells at from $7 to $10 a ton, according to quality and source. The cost of making aluminum is largely made up of labor, for there is much handling of the raw material necessary during all the steps of the process.

The biennial Government industrial census for 1923 shows that in that year there were 119 establishments devoted to the making of aluminum products. Many of these plants are quite small, but there are fully thirty-five which have an extensive business. The Federal Trade Commission reports that practically all these manufacturers get their sheets and ingots from the Aluminum Company of America. There is, however, some importation from European sources, such as from France, England, Germany, Norway and Italy. There is a market for waste from the stamping mills, too, which does not pass through the principal American company.

The value of the products of the 119 companies and firms making aluminum goods, such as cooking utensils, was given in the census as $106,930,367, an increase of 133.4 over the off year 1921. Nearly twenty million dollars was paid by these plants to their 16,288 laborers.