



# THE ALADDIN STORY OF

## A Record of Achievement for American Brains and Capital --- Remarkable Growth of the Industry.

Illustrations by Manufacturers Record and Earth Mover. ---By JAMES PRESTON PORTER

# ALUMINUM

The good old North State, on one occasion, furnished the entire world with a new industry, or now mammoth proportions, which is doubtless familiar to those who resided in Wilson in the nineties. It was in that city that a chemist, who since has become rich and famous, was carrying on experiments with a small electric furnace in his search for a cheap process for manufacturing metallic aluminum. One day into this furnace he put a mixture of lime and coke, turned on the current and awaited results. He was disappointed to find only a greyish looking substance, which was not at all what he was looking for. Disgusted, he threw the mass into a bucket half filled with water and went on with another experiment. About twenty minutes later, lighting a cigarette, he threw the burning match into the bucket of water and was utterly surprised to see it burst into a mass of flames. Investigating closer, he found that this substance which had been produced, and which he thought was worthless, was calcium carbide, which is now universally used for the making

nearly eighty million pounds of the white metal. The remarkable and steady growth is aptly and clearly shown by the table of production prepared by the United States Geological Survey, Washington, D. C., and illustrated in this article. According to the Boston News Bureau, Mr. Arthur B. Davis, president of the Aluminum Company of America, in a speech at Detroit last fall, stated that his company was producing at that time eighteen million pounds of aluminum where ten millions were made in 1914. This would indicate that last year the output was in the neighborhood of one hundred and forty million pounds. And it would not surpass the expectations of those in a position to know if the output for 1916 exceeded two hundred million pounds, taking into account the new plants and large extensions to the ones already in operation.

The actual profits rolled up by the Aluminum Company last year should read more like a fairy story rather than the plain facts taken from a stockholder's report. By referring to the illustration showing the prices of me-

daily feasible by the International Powder Company at that point. Carborundum and its allied industries were developed there by Mr. Henry Atchison; likewise the greatest growth of the carbide industry was also witnessed at Niagara Falls. The real development of the aluminum industry starts in the late eighties, from the Hall process, which was invented by the late Charles M. Hall, former president of the Aluminum Company, and it is by this process

powdered metal, known as aluminum bronze powder, is used in printing, lithography, and in the manufacture of explosives. Aluminum foil is also being used to replace tin foil in some cases. As an alloy of certain kinds of steel it is almost indispensable. In brewing plants it is used for large vessels, and probably the next drink of beer you take came out of an aluminum vat. It is also used for vessels in varnish and sugar factories, soap and

hundred thousand horse-power, while an additional fifty thousand horse-power will no doubt be developed at the Falls, three miles below this point, and still another fifty thousand horse-power will likely be developed at the different power sites below the Falls. All of this current will doubtless be used for the smelting of aluminum, and when it is remembered that the same corporation, using twenty-five thousand horse-power at its Maryville plant for the same purpose, employs 600 men at that point, it is a simple process of arithmetic to figure out a working force for the smelting and aluminum plants alone at Badin of thousands of men, which would mean a new city for North Carolina at that point of from fifteen to twenty thousand people, after the full plans have been carried out, and all the plants are in operation.

It will be remembered that in the first part of this article it was stated that the original plans of the French Syndicate called for the development of over ninety thousand horse-power, and an annual production of twenty-four million pounds of metallic aluminum so that with the development of two hundred thousand horse-power there should be an annual capacity of fifty million pounds of metallic aluminum, all of which is perfectly clear in the not distant future to those men who are entirely familiar with the growth and development of the industry.

The building of this dam will create an immense lake some eight miles long, extending to Whitney, and no doubt in the next few years it is likely to create a summer play ground along its shores which may compare with Lake Texaway and the famous Sapphire Country near Asheville, in the Land of the Sky.

Over at Badin the construction work, both on the dam and the aluminum smelting plants is proceeding with tremendous and feverish activity induced no doubt by the remarkable high price of the metal, which is at this writing around 60 cents per pound, and at which figure there is an enormous profit. Who would not speed up production under such circumstances? The Manufacturers' Record of Baltimore sometime ago stated that there probably would be one plant of steel and reinforced concrete construction, covering twenty acres of ground. Work on buildings is now going on day and night, electric lights being strung over the area for that purpose.

There is already a water and sewer system in the new town, and electric current brought in over a line from the sub-station of the Southern Power Company, in Albemarle, and which will be used for lighting purposes and as a source of power for construction work and the smelting of aluminum in the plants already constructed until the current from the large dam is available next December. The company has already provided a club house and nearly 300 cottages for the comfort of its employees, and a modern up-to-date industrial town is the making.

The company's own railroad runs from Salem Southbound Railroad will build a right-of-way to the property from Whitney, some six or seven miles away, and it is freely predicted that the Winston-

for this work twenty miles of standard gauge railroad track, over thirty 110-foot cranes, the same amount of hoisting engines, two locomotive cranes, over twenty locomotives and nearly 100 freight cars, besides a large amount of the various kinds of machinery necessary for an enterprise of this character.

As long ago as 1914 it was said in responsible circles that this was to be

the necessary element of peace and is a very pertinent at the present, when the question of producing nitrates for the electrical process is before the country, remembering that our sole supply is now from Chile, which would be immediately cut off if our coasts should be blockaded by an enemy in time of war.

The aluminum industry, it is true, has



The "Narrows" of the Yadkin River, Near Which Point is Being Erected a Dam Costing Millions for the Aluminum Company of America.

that practically all of the aluminum in this country is made. This process has been improved from time to time, and the one which is now used was first installed at the company's plant in East St. Louis several years ago. Briefly speaking, Bauxite, the ore from which the metal is extracted, and technically known as hydrous oxide of aluminum, is ground up fine, then mixed with caustic soda by means of steam under pressure. This mixture goes through several processes, then is mixed with two substances technically known as cryolite and fluorspar, after which it is put into shallow vats containing electrodes charged with electricity, and after treatment thus for a certain time, it goes to the electric furnace, and finally emerges from the plants as the white metal itself in the form of ingots.

The mineral Bauxite is produced chiefly in Arkansas and Tennessee, and there is a town in the former State named after the mineral where, according to reports, there are deposits so large and so available that railroad tracks are laid over the beds of the ore, which is then mined with a steam shovel in a manner similar to the iron deposits of Michigan, and the famous porphyry copper deposits of Nevada and Utah. It is said that of the other minerals used in its manufacture, the fluorspar is brought from France and India,

candle plants, and is largely employed in dye works and explosive plants, where vessels are required of metal that will not corrode nor tarnish nor become affected by certain acids employed in these industries. It is also used in connection with the production of peroxide of hydrogen, citric acid, glycerine and a number of less known chemicals. It is the lightest metal known, being only a little over two and a half times as heavy as water, while its admirable physical properties in many respects make it exceedingly valuable for various uses too numerous to mention here.

The Aluminum Company of America has large plants scattered all over this country, and even in Canada. It is backed by some of the largest financial interests in Pittsburgh, including Henry C. Frick, the famous coke king and millionaire, the Mellon banking interests and others. It is considered one of the most efficient and richest corporations in the entire country. The capital stock is twenty million dollars, all of which has been issued and is closely held. At the last sale made several months ago the quotation was \$495 per share, on a par valuation of \$100.00.

The largest factor in the production of metallic aluminum is cheap electric current, which can only be developed where there is large water power,

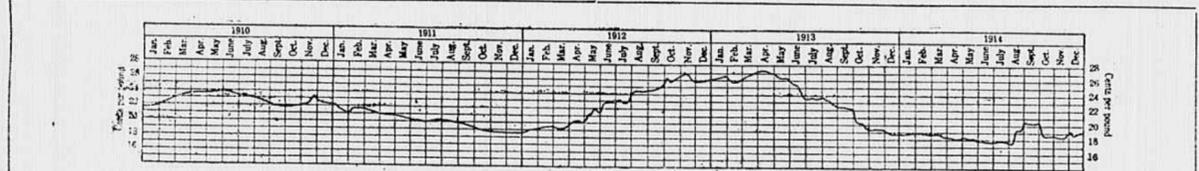
1883	83	1894	550,000	1906	14,910,000
1884	160	1895	920,000	1907	17,211,000
1885	283	1896	1,300,000	1908	11,152,000
1886	3,000	1897	4,000,000	1909	34,210,000
1887	18,000	1898	6,500,000	1910	47,734,000
1888	19,000	1899	7,150,000	1911	46,125,000
1889	47,468	1901	7,150,000	1912	65,607,000
1890	61,281	1902	7,300,000	1913	72,379,000
1891	160,000	1903	7,500,000	1914	79,129,000
1892	269,886	1904	8,600,000		
1893	333,629	1905	11,347,000	Total	456,866,779

The Production of Aluminum in the United States, 1883-1914, in pounds.—From "The Production of Bauxite and Aluminum in 1914," page 191, published by United States Geological Survey.

of acetylene, employed to-day all over the world for lighting purposes. This was recorded the birth of the carbide industry, in which millions and millions of dollars are to-day invested.

With this in mind, it is a peculiar coincidence that over in North Carolina, at Badin, which is less than one hundred and fifty miles as the crow flies, from the birthplace of the carbide industry, there are being developed probably the largest plants in the world for the manufacture of metallic aluminum. This may be called the twin brother of the carbide industry, as it also depends on the utilization of thousands and thousands of horse power of electric current for the smelting of aluminum ingots, which no doubt

talle aluminum at New York for 1910-1914 inclusive, the reader can readily ascertain that the average price obtained was around twenty cents per pound. There was a good profit at even this price, because it is said that the production costs are not more than twelve cents per pound. But the Aluminum Company has undoubtedly profited enormously by war conditions. By the end of 1914 surplus stocks had been absorbed and the price of metallic aluminum was on its way skyward. During the latter part of 1915 quotations at one time reached sixty-three cents per pound, and at no time has the price been under fifty-five cents in the last sixty days. On a production of one hundred and forty-four million



Curve showing price at New York City of No. 1 Metallic Aluminum ingots 1910-1914.—From "The Production of Bauxite and Aluminum in 1914," page 203, published by United States Geological Survey.

will be shipped away to be used in many ways not even dreamed of before the white metal became a commercial possibility. With an estimated development of nearly two hundred thousand horse-power on the Yadkin near this point, it is believed that the ultimate capacity of these plants will be fifty million pounds of metallic aluminum annually, when it is remembered that the plants of the old French company called for the development of over thirty thousand horse-power, and an annual production of twenty-four million pounds, and that the final plans of the Aluminum Company of America will likely be on a scale at least double

pounds the net profit must have been in the neighborhood of between fifty and sixty million dollars, on a capitalization of twenty million dollars, and it has been these large surplus profits which has enabled the Aluminum Company to finance the extensions to its plants in other parts of the country and to carry through without a hitch the enormous development work at Badin, which will probably represent, when completed, an outlay of twenty million dollars, including the sums which have already been spent at that point by the Whitney Reduction Company and the Southern Aluminum Company, whose interests were acquired

and the cryolite from Greenland. The amount of metallic aluminum recovered from Bauxite ore is said to be from twenty-five to thirty per cent, which is a very high average when compared with the different processes for treating other ores for the recovery of gold, silver, zinc, copper, tin, lead, etc.

The development of the industry in foreign countries dates from the patenting of the Heroult process in France in 1888, but the process generally used in Europe to-day is said to be the Bayer process, which the Southern Aluminum Company intended to use in the plants at Badin. But, according to reports, when the Aluminum Company of America took these properties over it was found that the Hall process, which they used at their other plants, was cheaper and more efficient, hence the original plans of the French syndicate have been considerably changed.

There are various other processes which have been patented, known as the McCulloch, Leecne, Serpek, Tone, Sliding-Larsen, Moldenhauer, Betts, Cowles, Childs, Peacock, Kisscock processes, etc., all named after the various inventors, but the Hall process, invented by the late Charles M. Hall, former president of the Aluminum Company, is said to be the best and most efficient, and ninety-seven per cent of the aluminum produced in this country is manufactured by that process.

Side by side with the increase in the production of metallic aluminum kept step the uses to which the white metal has been put. Aluminum is being utilized in a hundred different ways, which accounts for the enormous demands for the metal. Its greatest use is probably for kitchen and cooking utensils, but it is being more and more employed for surgical appliances, jewelry, fancy articles, bearings for machinery, piston rods for automobiles, sheets for automobile bodies, etc. The

Over in Canada, in the Province of Quebec, and at Shawanigan Falls, where there is a very large water power, this same corporation has a large plant which has been turning out millions of pounds of aluminum, but the entire output for 1915 and 1916 has been commandeered by the British government, so none of it will be used in this country. At Niagara Falls, where the industry thrives, they have tremendous plants, and the production is enormous. In East St. Louis also they have plants and the manufacture of aluminum there is going on steadily. At Messena, New York, there is still another plant where aluminum plates, bars, wire, etc., are manufactured. At Saline, Arkansas, and at Bauxite, Arkansas, are located the mines of this corporation, while at Edgewater, N. J., is the rolling mill, it is said, where aluminum ingots are heated and rolled into sheet aluminum, a large part of which is shipped to the immense stamping plants of the corporation at New Kensington, Pa., where they are manufactured into cooking utensils and other wares.

At Maryville, Tenn., is located a small plant, where power developed from the Tennessee River is utilized for smelting aluminum. At this point twenty-five thousand horse-power is utilized and 600 men are employed. But the biggest development of all will come at Badin, N. C., which is situated only six miles from Albemarle, N. C., on the Norwood branch of the Southern Railway, running out from Salisbury. Near this point, at the Narrows on the Yadkin River, there is being constructed a tremendous dam 220 feet high, 1,300 feet long, 160 feet thick at the bottom and 20 feet wide at the top, which will be completed early in next December and will represent an outlay of millions of dollars. It is estimated that the power developed at this point will amount to one



DEVELOPMENT BY ALUMINUM COMPANY OF AMERICA AT BADIN, N. C. 2—Excavation for power-house, 3—Forest of derricks at work in gorge. 4—Saddle-tank locomotives with upper portal of tunnel.

North Carolina's greatest single producing industry. With the events which have transpired in the last six months, there can be no doubt of this fact. An expenditure of twenty million dollars is bound to produce large results. The magnitude of the enterprise, however, may be greater, an rolling mills for both wire and tubes

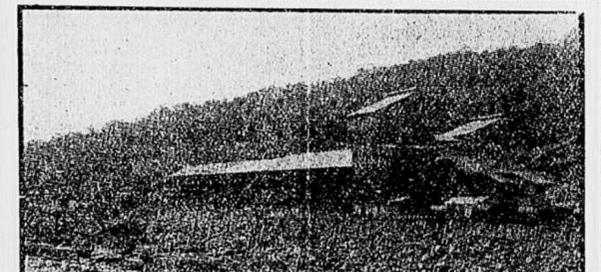
been immensely stimulated by war conditions, but the remarkable rise in the price of the metal was not caused by any use of this material in the manufacture of munitions or war supplies of any kind. In fact, according to the Boston News Bureau, President Davis stated some time ago that his corporation had not sold a dollar's worth of aluminum for war purposes. What then caused the advance in price? Nothing more than your old familiar law of supply and demand.

Previous to the war a large amount of the metal, and even of the materials from which it is manufactured, were imported from foreign countries. All these sources of supply were automatically cut off shortly after the beginning of hostilities, and prices have gone steadily upward, and the Aluminum Company has no doubt rolled up an enormous surplus out of which is being financed the new plants, and the extensions to the old ones.

Thus after the war is over this gigantic American industry will doubtless find itself in a position to produce between two and three hundred million pounds annually at a manufacturing cost not to exceed 10 cents, which will still mean an exceedingly profitable business even should aluminum sell at twenty cents per pound, which is not probable in the next five years.

The Aluminum Company is not exactly a war baby, because it was a grown-up before the war began. It is digesting its profits as it goes along, and is getting steadily bigger. There will be no slump at Badin nor at any of its other plants in various parts of the country. The demand for the metal is growing faster than the supply, and it is destined to become the great rival of copper, especially in the electrical industries, due to its superiority over the red metal in many respects. And it is entirely possible that the output in this country may amount to a billion pounds annually in the next ten years, if the past growth of the industry is any criterion by which to judge the future.

At all events North Carolina is to share in the prosperity of the white metal trade, and is to be congratulated on having in sight the fruition of two previous attempts and several years of development work at Badin, which will not now be abandoned, as the work is in strong hands and will be rushed to completion. A town of which every "Tar Heel" may be proud is assured before many months have gone by and years hence when a stranger asks "What have you got in North Carolina?" the answer will be: "Well, I will tell you about the biggest thing first," and then whoever tells the story will relate how after the Whitney's failed, and after the French failed, Badin grew to be the location of the largest plants in the world for the manufacture of metallic aluminum, producing over fifty million pounds annually, and justly earning its title, "The White Metal City of the Old North State."



Crushing and Concrete Mixing Plant for Use in Constructing the \$9,000,000 Dam at Badin, N. C.

those of the old company, whose properties they have recently taken over. No chapter taken at random from the Arabian Nights is so entertaining or fascinating as an account of the development of the aluminum industry from its infancy less than a generation ago to its present stupendous proportions. It is one of those economic and scientific marvels of which the public has heard very little, as the process of manufacture is highly technical, and ninety-seven per cent of the output is controlled exclusively by a close corporation which has, as a rule, kept its affairs to itself and courted but little publicity save for the advertising of its cooking utensils and other wares which are made in its plants at New Kensington, Pa., a suburb of Pittsburgh.

The evolution of the industry has been the transformation of what was a chemical curiosity in 1883 to what has become a great necessity, commercially speaking, in 1915 and 1916. In 1883 in all the United States the production was only eighty-three pounds, while in 1914 there was produced, according to the United States Geological Survey,

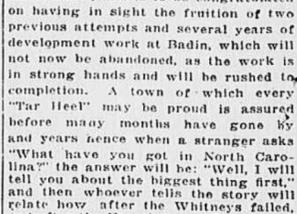
last November by the Pittsburgh Corporation. The electric furnace has been the wizard by which the wonderful progress and transformation in the manufacture of metallic aluminum has been brought about. It was at Niagara Falls that practically all the industries so intimately connected with the electric furnace have had their beginnings. This was because of the tremendous electric current developed and made commer-



The Aluminum Company's Hydro-Electric Project at Whitney, N. C. Showing Concrete Piers for Controlling Gates in Background. There are 20 Miles of Railroad, Some of Which With Trolleys, Pump Cars May be Seen in Foreground.



General Construction View Yadkin River Near Whitney, N. C. Aluminum Company's Hydro-Electric Project.



The Aluminum Company's Hydro-Electric Project Near Whitney, N. C. Showing Mouth of Parallel Tunnel Built by the Old Company at Great Expense. Now to be Plugged Up. Note How Thick the Steel Derricks Stand.