shown in Canada. This was given at Dundurn park on the occasion of the reception of the Marquis of Lorne, in 1881.

In 1882 Mr. Willson returned to New York and obtained employment with the Fuller Electrical Co., as inspector of construction work. After leaving this employ he was about a year with the Remington Gun Company (1885-6), and then went to Akron, Ohio, where he carried out some interesting experimental work in arc head-lights, as adapted to railways, on the Cleveland, Akron and Columbus Railroad, in 1886-7. From 1887 to 1890 we find him again in New York in business on his own account, in experimental work in association with Geo. F. Seward, of New York, and J. T. Morehead, of North Carolina, in developing the work of the Willson Aluminum Company, who in 1890 started to put in a plant at Spray, a suburb of Leaksville, N.C, for the reduction of aluminum and other ores by electricity.

Coming to Mr. Willson's discovery, it should be stated that as far back as December, 1887, he had been able to reduce refractory ores by electricity, and carried out such work on a large scale while employed in the shops of the James Brady Mfg. Company, Brooklyn, and in the early part of 1892 had completely worked out the problem of producing calcium carbide on a commercial scale. This was at the works at Leaksville, where he lived from 1890 to Aug., 1893, when he once more returned to New York, his present home. At the shops in Brooklyn, in 1887-8, he was working at the electrical reduction of all oxides—calcium oxide among others—and had a plant of 20 electrical horse-power, which was enlarged when the scene of his work was transferred to Leaksville.

Some writers dealing with Mr. Willson's remarkable discovery, have claimed for him, what he never laimed for himself, that is, the discovery of acetylene gas itself. As long ago as 1862, Wohler, by fusing an alloy of zinc and calcium with carbon, made impure calcic carbide in a powdered condition, and used this as a source from which to obtain acetylene by the action of water. No further advance was made till 1892, when Macquenne prepared barium carbide by heating a mixture of barium carbonate, powdered magnesium and charcoal, by which combination he obtained acetylene by treating it with water; while later still Travers made calcium carbide by heating together calcic chloride, carbon and sodium. Now, while acetylene is the simplest compound among the hydrocarbons—being formed of two atoms of carbon united to two atoms of hydrogen—it could only be produced in very minute quantities. Its value was known and appreciated, but how to obtain it in quantities sufficient to apply it to the science of commercial life, appeared so far beyond reach that attempts at this object have been few, if any. Indeed, Mr. Willson's own discovery was made, like many of the world's greatest scientific revelations, by chance during his search for another object. While working with his electrical furnace, trying to form an alloy of calcium from some of its compounds, he noticed that a mixture containing lime and powdered anthracite, acted on by the arc, fused down to a heavy semi-metallic mass, which having been examined and found not to be the substance sought, was thrown into a bucket containing water, with the result that violent effervescence of the water marked the rapid evolution of a gas, the overwhelming odor of which enforced attention to its presence, and which on the application of a light burnt with a smoky but luminous flame. It was acetylene gas.

Further experiments showed that in a properly built electrical furnace, finely ground chalk or lime, mixed with powdered carbon in any form (whether charcoal, anthracite, coke, graphite or peat) can be fused, forming the compound known as calcium carbide, and that when this is brought in contact with water a double decomposition takes place, resulting in the formation of calcic oxide or lime and acetylene gas, the small cost of the gas not only bringing it within the range of commercial use, but enabling the chemist or manufacturer to build up a host of other compounds on a scale of cheapness hitherto undreamt of. An article that has hitherto been made in grains can now be manufactured by the ton, and made available for such a variety of purposes in the sciences and arts that no one can yet calculate the changes it will produce in the conditions of life. The fact that acetylene gas gives a light which the spectrum shows to have all the elements of sunlight, and which can be produced probably at one-half the cost of common gas or electric light, gives us only one element in the practical value of calcium carbide. Such is the vista opened before the world by Mr. Willson's wonderful discovery.

The remarkable properties of calcic carbide and acetylene, and their commercial developments, are referred to more in detail in another part of this issue. To us it must be a source of pride that a discovery of such far-reaching importance to the world was made by a son of Canada; and though Mr. Willson is now a naturalized citizen of the United States, he cherishes the warmest feelings towards the land of his birth. He is now building for his mother and sister a beautiful homestead at Woodstock, in which he takes much pride and interest. Mr. Willson was married August 27th, 1895, to Miss Mary Parks, eldest daughter of the late Wm. H. Parks, for a long time speaker of the Legislature of California.

THE CHICAGO CANAL, AND SOME SANITARY PROBLEMS CONNECTED THEREWITH.*

BY DR. P. H. BRYCE, M.A., TORONTO.

Probably most people know the character of the work on the Chicago Canal from an engineer's standpoint better than I do, but you may not have learned the reasons why it has been undertaken as a sanitary work. As you are aware, Lake Michigan has a height of 579.60 feet above sea-level at Sandy Hook, and is some two feet higher than Lake Huron. As you will also observe from the diagram before you, the waters of the lake at Chicago are separated from those of the Des Plaines River, which flows into the Mississippi River, by some two miles only of a water-shed. The elevation of this land between the two greatest water systems of the continent is only some 6 or 8 feet, and is, indeed, so little that in the construction of the canal a spill-way, or the river diversion works, has had to be planned, whereby the lower portion of the valley of the Des Plaines will, during flood time, be relieved of the flood waters in the upper reaches of the river when they exceed 600,000 feet per minute, by their being turned into the lake through this aqueduct, some 12 miles long and 200 feet wide, and having a fall of 6 feet to the mile.

The little stream called the Chicago River, at its

* An address before the Engineering Society of the School of Practical Science, Toronto.