Volume 21. Toronto, September 14, 1911 Contents of this issue on page 315

The Canadian Engineer

An Engineering Weekly.

THE EARNING POWER OF CHEMISTRY.

Mr. Arthur D. Little, in an address to the Indiana Section of the American Chemical Society, brought to that body's notice the industrial importance of the above subject, and remarked, the world, as viewed by the chemist, presents an aspect different in many ways from that in which it appears to the mind not chemically trained. As the astronomer perceives in the movements of the stars a relationship and coördination to which the average man is blind, and deduces from them generalizations by which both the intellectual and practical life of the community are profoundly influenced, so the chemist, who may be regarded as the astronomer of the infinitely minute, studies the movements and interchange of atoms and the structure of the molecular systems which result therefrom. In other words, the astronomer interprets the universe in terms of certain units, which are the heavenly bodies, while the chemist seeks his interpretation in terms of the ultimate particles of which matter is composed, whether they be molecules, atoms, ions or electrons. And, since the different forms of matter, in their flux and flow, together constitute the universe, the properties of matter and the changes which these properties undergo are of compelling interest and importance to each one of us in every activity of our lives.

Modern chemistry had its birth in the eighteenth century study of the air and its relation to the processes of respiration and combustion. Prof. Ramsay has said that "To tell the story of the development of men's ideas regarding the nature of atmospheric air is in great part to write a history of chemistry and physics."

Raleigh and other chemists have disclosed the presence in the air we breathe of five new gases of remarkable and in some respects unique properties. To one of these, neon, we now confidently attribute the long mysterious phenomena of the aurora borealis. Tubes containing highly rarefied neon may become as commonplace to our descendants as candles were to our forefathers. They glow with a rich, mellow, golden light on the passage through them of an electrical discharge.

The heavy toll of life in mine disasters would be unsupportably heavier were it not for the Davy lamp, the fire-damp indicators, the rescue outfits and the regulation of explosives, all of which have become possible only through the growth of chemical knowledge. Ventilating systems as applied to theatres, halls and dwellings are based on chemical studies of the rates and causes of increase in the carbonic acid content in the air of rooms. The proportion of sulphur permissible by law in illuminating gas finds its justification in similar studies on the air in rooms in which such sulphur-bearing gas is burned.

The chemical and biological study of public water supplies, which received its first systematic development little more than twenty years ago at the hands of Drown and Mrs. Richards in the laboratories of the Massachusetts Institute of Technology, has been the means of saving countless lives throughout the world and has led to such understanding and made possible such control of sources of pollution. Furthermore it supplies the means for correcting undesirable characteristics in a water supply as by use of filtration apparatus, coagulants, water-softening systems and the Moore method for the destruction of the algae which in many waters are the cause of unpleasant tastes and odors.

Nowhere is the practical value of chemistry in its relation to the affairs of every-day life more strikingly demonstrated than in connection with our food supply. Chemical fertilizers are in large and constantly increasing measure responsible for the enormous total of our agricultural products. The whole fertilizer business is under the strictest chemical control, and the farmer buys his fertilizer on the basis of a knowledge of its composition and effective value.

But it is not only on the side of agriculture that chemistry touches our food supply. Chemistry pervades the packing industry, reducing the cost of food by utilization of by-products of the most varied character from oleomargarine to glycerine and soap and from soap to pepsin and adrenalin. To Atwater and his co-workers we owe our knowledge of the energy-producing value of different foods in the human economy and to Wiley and those other chemists behind him on the firing line we are indebted for the far-reaching benefits of the Pure Food Law.

Carbon disulphide made in the Taylor electric furnace has preserved the wine industry of France by destroying the phylloxera as it is ridding our own fields of prairie dogs and our elevators of rats and mice. Breadmaking and brewing are coming each year more and more within the recognized domain of chemistry, which is at the same time greatly enhancing the value of our staple crop by the increasing production of glucose, corn oil and gluten. Exactly one hundred years ago Kirchhof discovered the inversion of starch to glucose by dilute acids. To-day the United States alone is richer by $30,000,000 a year by reason of that discovery.

The woolen industries are dependent upon chemistry for the processes of separating the pure fibre from the grease and dirt from which it is associated in the raw wool, and for the methods of working up this wool waste into oleic acid, soap, lubricating oils and potash and ammonia salts, as well as for the process of carbonizing by which the wool is separated from the burs and other vegetable material with which it is admixed in the fleece.

The refining of petroleum involved the solution of many difficult chemical problems. The Chicago fire is said to have been started by Mrs. O'Leary's cow which kicked over a kerosene lamp. In those days, however, it was not necessary to invoke the cow to start a conflagration with kerosene. Much of the lighting oil upon the market at that time would flash below 100° F. We owe our present safety in the use of kerosene largely to the work of Prof. Chandler.

The production of illuminating gas is wholly a chemical process. When coal gas was first employed for lighting the Houses of Parliament the members might be seen gingerly touching the pipes to discover if they were not indeed hot from carrying such flame. That gas is now so cheap is due in large part to the development by Lowe of the chemical process for making water gas by passing steam through a bed of glowing coals and to the chemical processes for gas enrichment. By the Blaugas system illuminating gas is now produced in liquid form and distributed in steel bottles to isolated consumers like so much kerosene.