in the following way: "All the boilers needed are set side by side on the same level, at an elevation sufficient to allow of a deep fire-box and ash-pit, and room enough for an iron barrow to stand under the bottom of the ash-pit doors, all below the bottom of the outer shell of the boiler. In the front of each boiler, a firebrick fire-box is built about four feet square, or six feet long by four feet wide. The grate bars are fixed about four feet below the point where the hot gases leave the vault to pass under the boiler. At the extreme end of the boiler, there is a combustion chamber; from this chamber the heat passes through the tubes in the boiler, after which it passes through and between the economizer or water heater, which supplies the boiler with hot water, then to the chimney, which it reaches at a temperature of about 600° F. I believe with the German scientist Seimens, that if the fire pit be some distance away from the face of the boiler that the fuel will give better results, because it will cause more flue room for the better mixing and combustion of the gases, especially if there are bridges thrown across the flue to break and split up the flames. It would improve the heat still more if a current of heated air could be introduced into the centre of this combustion chamber. It would help to re-burn the moving gases, and increase the heat of the flues. This could be done by carrying an air flue through the centre of the fire box walls. A small 2-inch pipe would do, and it would take sufficient heat from the hot bricks to warm the air passing through. This fire box is extended over four feet above the point where the heated gases leave the fire vault, to pass out towards the boiler. Some of the vaults are covered with heavy iron plates having hinged doors that can be lifted, and a horse cart or railway car load of refuse tipped in at once. However wet the refuse may be, it dries quickly, and the steam it throws off is drawn down and consumed by the fierce heat at the bottom of the fire box, and in the carrying flues, so that before it is lowered down to a point parallel with the boiler flue, it becomes a red burning mass, and another wagon load is tipped in on the top of it. So the process should go on continually night and day when using towns' refuse and garbage.

I have explained this furnace arrangement sufficiently for the reader to understand its advantages, which comes in short to this: that any town can run its own electrical lighting plant, sell electrical power to its manufacturers, pump its supply of water or lift its sewages by erecting suitable plants and using the garbage, refuse and sweepings of the town for fuel, thereby purifying the town's atmosphere, increasing its sanitary qualities, and reducing the sufferings of its inhabitants from disease. The fumes and smoke of the furnace can be completely burnt by having properly arranged flues and secondary combustion chambers, and by using a good steam blast, which, according to Mr. Estcourt's (the public analyst) report, raises the carbonic acid gas from 2 to 14 per cent. The analyst's report of gases generated from rough towns' refuse, including ashes, excrement, sweepings, etc., is carbonic acid 14.6, oxygen 5.4, nitrogen 80.0. The value of coal is about 14.200 units of heat for each pound of coal, which will evaporate 14.70 pounds of water. Two and a-half pounds of dry wood of any kind, of dried bagasse, or dried tanbark, have the same steam-raising quality as one pound of coal. Straw, 3¾ pounds; peat, when dry, two pounds, is equal to one pound of coal. I have been told that the horse street railway of Chicago supplied the fuel used for raising steam to run the cable road from the horse litter, with the addition of a small quantity of coal.

The rough wet refuse or garbage collected in towns during wet weather, or excrements mixed with coal ashes or dust and droppings swept from paved streets will contain about 60 to 70 per cent. of moisture, and taking that into consideration, the value of town refuse is about ten pounds of refuse, equal to one pound of coal for steam raising purposes. The total amount of refuse averages about two pounds per head, per day, the year round, equal to seventy-three pounds of coal per head, per year. This, allowing the population of Toronto city to be 190,000, would make the refuse, if burnt in a first-class destructor with the latest designs of steam blowers, equal to 13.870,-000 pounds, or 6,935 short tons of coal per year, or 19 tons per day, which is abundance of heat to raise enough steam to pump our water supply, saving the city over $28,000 per year. The pumping station is both a central and suitable place to build a destructor of first-class type, easy to get at; for the carts could go level off the Brock street bridge on to the top of the furnaces to deliver their loads.

To be continued.

REPORT OF THE CANADIAN DEEP WATERWAYS COMMISSION.

The agitation for deep waterways from the Great Lakes to the Atlantic by other than existing routes, has been going on for many years. The first convention to discuss plans of the proposed work was held at Burlington, Vt., in 1849, where it was proposed to connect Lake Champlain with the St. Lawrence by a canal larger than the Chambly. The Caughnawaga Canal was surveyed by the Government some forty years ago, but opposition on the Canadian side, and the fact that no similar outlet existed from Lake Champlain to the Hudson, prevented the construction of this work.

After a dozen conventions had been held, at various United States cities and in the lake region, a Deep Waterways Convention was called by the city of Toronto, in 1894, to which representatives from the United States lake cities were invited. The International Deep Waterways Association was formed, which held its first convention at Cleveland in 1895, and from whose proceedings the Act of Congress creating an International Commission originated.

It is impossible to convey, within reasonable space, an adequate idea of the extraordinary development of inland water transportation on the upper lakes—which, for rapidity, extent, economy and efficiency, has no counterpart even on the ocean. More than half of the best steamships of the United States are imprisoned above Niagara Falls, and more than half of the tonnage built in the United States in 1896 was launched upon the lakes. This inland water commerce has built up twelve cities on the southern shores above Niagara, five of which have over 200,000 population, one over a million, and the remainder above 20,000 each, and within these same limits there are 27 dry docks, the largest of which is on Lake Superior and is 560 feet long, 50 feet wide, with 18 feet water. There are 63 life-saving stations upon these lakes, ten of which are Canadian. Of the 53 United States lake stations, all but five are above Niagara. The economy of this inland water transportation is the result of deep water primarily, and, in the second place, of practically unlimited dimensions in other respects for the vessel; there being but the lift of one lock (of ample dimensions) to reach Lake Superior, and none at all between Buffalo and Chicago.

The large cargo steamers, with triple expansion engines, show a coal consumption (for the best practice) of 2 lbs. per developed horse-power per hour. Actual runs give four-fifths of an ounce of coal per mile consumed per