for heating. Fifty years from now New York City will be warmed, as well as lighted, by water power.

When that time arrives, and the power is fetched over wires from distant dam sites on suitable rivers, the furnaces and steam heating apparatus in the dwellings and office buildings of New York, Chicago, Boston and other cities will be replaced with electrical contrivances. All the heat required for the warming of a house will be brought into it by a wire, and distributed by suitable connections to the various rooms.

Then there is the matter of cooking. It will be done fifty years from now, and probably very much sooner, by water power conveyed in the shape of electricity, over wires. In fact, the same current that is used for heating the house will be employed by the housewife for all of her culinary purposes. She will not be obliged to bother with a range—that clumsy piece of ironmongery being entirely done away with. Instead, her kitchen will be provided with an ordinary table, on which a few simple pieces of apparatus will stand—the requisite current for boiling, frying or any other kind of cooking, being turned on with a switch.

The discovery of the possibilities of electrical transmission over wires has called attention to what may be done with water power. When it was necessary to use such power—if employed at all—at the waterfall, the factory had to be put on the spot, whether the situation was desirable or not for commercial reasons. Thus the great Massachusetts cities of Lowell and Lawrence have literally grown up around the falls of the Merrimac; and the same may be said of many other towns, such as Holyoke on the Connecticut, and Paterson on the Passaic.

Now, however, that it has become practicable to pick up the power from a cataract and carry it on a wire over great distances there is a complete change in the problem. A waterfall is no longer a mere local interest, but a public utility. It is easily possible to establish a generating station in one spot, and from it to supply the whole of a great region. This, in fact, is the idea on which the Water Supply Commission of New York State is now busy.

The power generated and converted into electricity at dam sites on rivers will be carried to the city—whether it be New York or any other centre of population—by wires and delivered at sub-stations. For this purpose special buildings will be erected, each sub-station taking a certain amount of current off the wire, and supplying a given arena with just what it needs for lighting, heating, running machinery and other purposes.

Before very long the problem of transmitting electricity economically over 200 miles or more of wire will have been solved. But a considerable time will be required to build the dams and construct the plants for generating and transmitting the current. Also, the replacement of steam by electricity will be necessarily gradual. It is not to be expected that owners of expensive steam power machinery will hasten to throw it away the minute that wires are run into a city. Hence the estimate of fifty years as the approximate period likely to elapse before the electrification of New York will have become a fully accomplished fact.

The problem where New York is concerned is especially interesting for the reason that the metropolis—including Manhattan Island—is to-day the greatest power-utilization centre in the world. As above stated, all the power employed is now produced by steam.

But the price of coal is destined to go steadily higher and higher, and electricity, when furnished by water power, will be very much cheaper. Thus there must come a time, and that before very long, when currents from the rivers will displace steam on the island of Manhattan and its neighborhood. The burning of fuel for the production of energy will be entirely abandoned, and all the machinery of the metropolis will be driven by the flow of distant streams.

GREAT ADMIRALTY HARBOR AT DOVER COMPLETED.—Continued from Page 74.

tons. These piles were brought from Dover in Tasmania, a distance of 13,000 miles. This timber is one of the heaviest of woods, and when cast adrift sinks like a stone of account of its great density.

At intervals of every 50 ft. two sets of six piles were driven firmly into the ocean-bed opposite one another; across the piers so formed strong iron girders were placed, and in this way the temporary staging was carried seawards. Although all this work was purely temporary, it had to withstand the full force of the storms and tidal currents as well as hundreds of tons of heavy machinery. Some of the cranes upon it turned the scale at 400 tons apiece.

In the sea between these piers great blocks weighing from 26 tons to 42 tons apiece, which form the seawalls, were laid. Before they could be laid, however, it was necessary to remove the loose debris from the Channel bed. A giant grab, a jawlike contrivance with a double row of formidable teeth, descended to the bottom of the sea with open mouth. There it worked its way into the chalky bed, fastened its teeth into it, and came up with a dripping mouthful of flint and chalk that filled a railway truck. By this means the upper crust was eaten away until the solid bed was reached. Divers were then sent down in bells, whose duty it was to level the bed ready for the blocks. These bells were the largest ever used. In all seven were employed. These measured seventeen feet long and ten feet wide each. They were lighted by electricity, and fifty feet below the surface their interiors were as bright as day. As the huge blocks were lowered into the sea they were guided and placed in position by the dress-divers who worked from small boats. The walls of the National Harbor alone has cost £4,000,000, and the sum expended upon the commercial harbor amount to £1,250,000.

A NEW TEST FOR CONCRETE.

A VERY INTERESTING METHOD for the testing of concrete and materials composing the same was presented recently by Mr. J. S. Owens, Assoc. M. Institute of Civil Engineers, before the Society of Engineers in London.

Mr. Owens' methods, which are described very fully in his paper, and which are summarized here, present a new way of arriving at the various percentages of materials used in concrete and to enable the engineer to determine whether too much sand, or too much stone, has been used to the proportion of the cement required. The test may be briefly summarized as follows:

The methods which have been tried in the past to achieve this result are: (1) inspection; (2) making briquettes, breaking when set, and noting if of uniform strength; and (3) mixing pigment with the concrete, making briquettes, breaking when set, and examining fracture for even distribution of pigment. The author criticized these methods, and showed their lack of value for the purpose. He stated that it had been ascertained experimentally that inspection alone could not detect the difference between concrete having 1 part of cement to 2 of ballast, and that having 1 to 3. The following definition of properly mixed concrete was then given: "Concrete in which the various ingredients are as uniformly distributed as the size of the particles composing them will admit." He went on to say: "The question, therefore, is how to determine when this uniformity of distribution has been attained." The principle on which the author's test is based was thus described: "If we take a few small samples from different parts of the heap of concrete, and if we can tell in some simple way whether all the samples contain the same relative proportions of