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The fixed charges are as follows:

Ve	Pumping ert. triple expansion.	engines, All other type.	Boilers.
Maintenance	2%	3%	5%
Interest	4%	4%	4%
Sinking fund	3%	5%	5%
Oil, waste, packing, etc	1%	1%	
Total fixed charges	10%	13%	14%

Of all the types the vertical triple-expansion engine is probably the only one that will not be replaced as obsolete. Hence its life is assumed as 33^{1/3} years, and that of the others 20 years, making the sinking fund percentages 3 and 5, respectively.

With its limitation the centrifugal pump is an ideal machine for lifting water. At constant speed, however, for a considerable range of capacity, as is often found in water works, or for a varying head where domestic and fire service are combined in the same apparatus, it is inefficient and unreliable. Even on standpipe work, as at Schenectady, N.Y., it has been unsuccessful. The following figures of the comparative cost of pumping by displacement and centrifugal pumps are taken from a recent annual report of a water works:

Pumpage per day, U. S. gal	9,000,000
Head against displacement pumps, ft	207
Head against centrifugal pumps, ft	23
Cost of displacement pumps	\$ 50,000.00
Cost of centrifugal pumps	\$10,000.00
Cost of fuel for both plants, per net ton	\$1.25
Cost of fuel to pump 1,000,000 gal. 207 ft high:	
With centrifugal pumps	\$6.48
With displacement pumps	3.27

Difference in favor of displacement pumps..... \$3.21

For pumping 9,000,000 gal. daily for a year the difference in fuel costs in favor of the displacement pump is \$10,544. The mechanical efficiency of the displacement machinery was 93 per cent., and that of the centrifugal machinery 65 per cent.—corresponding with results attained in general practice.

It is quite probable that an increase in fuel economy of from 6 to 12 per cent. can be obtained by the use of superheated steam in the best types of modern pumping engines. A pumping engine at the Boston high-service station at Chestnut Hill Reservoir has a capacity of 30,000,000 U. S. gal. per 24 hours and its duty record is 178,407,000 ft.-lb. per 1,000 lb. of dry saturated steam. If the duty of this engine should be increased 12 per cent. by using superheated steam, it would then be 190,916,640 ft.-lb., which is about 2,000,000 ft.-lb. above the highest record with the use of superheated steam. The highest known dry saturated steam duty is—in round numbers—181,000,000 ft.-lb., and this would go up to 202,720,000 ft.-lb. with 12 per cent. increase, or considerably above the superheat results thus far obtained.

The tendency in public pumping engine development seems to be toward larger units, and the introduction of the high-duty idea into smaller and smaller units. The present day high-efficiency pumping plant involves the following items:

Vertical triple-expansion pumping engines of the crank and flywheel type;

Long stroke, with rotative speed not to exceed 20 r.p. m., and a maximum piston travel of 200 ft. per min.;

Steam pressure of 175 lb. gauge at the engine throttle; Modified steam jacketing and reheating;

Moderately superheated steam by independent apparatus; Smoke-flue reheating;

Water-tube boilers fitted with mechanical stokers;

Natural draft of at least o.8 in. of water;

Feed-water economizers and automatic damper regulators;

Coal bought on the basis of 14,000 B.T.U. per lb.;

Boiler efficiency of 75 per cent.;

Coal consumption per I.H.P., 1 lb. for large plants and 1.75 lb. for small plants;

Maintenance of engines, 1.5 per cent. for large plants and 3 per cent. for small plants.—The above information was condensed from a paper by Charles A. Hague, read before the American Society of Civil Engineers, May 17, 1911, and printed in the March, 1911, Proceedings of the Society.

CANADIAN CHARTERS FOR FOREIGN ENTERPRISES.*

Barcelona Traction, Light and Power Company, Toronto, \$40,000,000.

Mexican Midland Light and Power Company, Toronto, \$15,000,000.

Vancouver Harbor and Dock Extension Company, Vancouver, \$10,000,000.

Ebro Irrigation and Power Company, Toronto, \$2,500,000. Royal Dome Cold Mines, Hamilton, \$2,000,000. Reciprocity Mines of Porcupine, Toronto, \$1,000,000. Land Corporation of Canada, Winnipeg, \$1,000,000.

Craham Island Oil Fields, Prince Rupert, \$1,000,000.

Eight companies this week account for an aggregate of authorized capital amounting to \$72,500,000. Three of these are responsible for \$65,000,000. The Barcelona Traction, Light and Power Company, capitalized at \$40,000,000, divided into 400,000 shares of \$100 each, has received a Dominion charter giving it power to develop and sell electrical energy. The Ebro Irrigation and Power Company, Limited, has obtained very similar powers in a Dominion charter. Its capital is \$2,500,000 divided into 25,000 shares of \$100 each. Both companies have their head offices in Toronto and members of the legal firm of Messrs. Blake, Lash, Anglin and Cassels are noted as the provisional directors.

The Mexican Midland Light and Power Company, Limited, with capital of \$15,000,000 divided into 150,000 shares, has received an Ontario charter, giving the company power to carry on outside of Canada the business of an electric light, heat and power in all its branches. Among the provisional directors are Mr. T. M. Sanders, civil engineer, and Mr. F. J. Robinson, electrical engineer, of London, England. Mr. T. H. Kilgore, of Toronto, and Mr. E. C. Boeckh, president and general manager of Boeckh Brothers, Limited, brush manufacturers, Toronto, are also directors.

Two big Porcupine companies have been formed, the Royal Dome, while the other bears the appropriate name Reciprocity. The Grasselli Chemical Company, with capital of \$250,000, has been granted an Ontario charter with head office at Hamilton. This is a branch of the American firm of the same name which has its headquarters in Cleveland, Ohio. Evidence of further activity in Northern Ontario is seen in the incorporation of the New Ontario Timber and Trading Company. Real estate movements are reflected in the chartering of the Humber Land Company at Toronto, and the Land Corporation of Canada at Winnipeg. Mr. E. M. Carroll is a director of Wright and Carroll Investments capitalized at \$roo,000, with headquarters at Toronto.

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