TABLE I. CONCLUDED

Efficiency Results

(76) Thermal efficiency referred to i.hp. (2547 ÷ Item 72) × 100 .... per cent
(77) Thermal efficiency referred to b.hp. (2547 ÷ Item 74) × 100 .... per cent
(78) Engine efficiency (referred to Rankine cycle) based on i.hp. (2547 ÷ Item 73) × 100 .... per cent
(79) Engine efficiency (referred to Rankine cycle) based on b.hp. (2547 ÷ Item 75) × 100 .... per cent

Specimen Diagrams

(80) Sample diagram from each cylinder..........
(81) Sample steam-pipe diagram..........

NOTE 1: When the engine drives an electric generator the following additional data and results applicable especially to a.c. generators should be entered in the table.

Electrical Data

(82) Average volts each phase .... volts
(83) Average amperes each phase.......... amp.
(84) Power factor .... per cent
(85) Total output in kilowatts.......... kw.
(86) Net output in kilowatts (See Par. 15) .... kw.
(a) Field volts ....
(b) Field amperes ....

Power and Economy

(87) Electrical horsepower developed (Item 86 ÷ 0.7457)..........
(88) Steam consumed per net kw.-hr. (Item 45 ÷ Item 86)... lb.
(89) Dry and saturated steam or superheated steam consumed per net kw.-hr. (Item 46 ÷ Item 86).......... lb.
(90) Equivalent steam consumed per net kw.-hr. (Item 47 ÷ Item 86) .... lb.
(91) Heat consumed per net kw.-hr. (Item 49 ÷ Item 86).. B.t.u.

NOTE 2: When testing a marine engine having a shaft dynamometer, the form should include the data obtained from this instrument, in which case the brake horsepower becomes the shaft horsepower.

TABLE II. DATA AND RESULTS OF RECIPROCATING STEAM-ENGINE TEST

(Short Test)

(1) Dimensions of cylinders..........
(a) Diameter of piston and tail rods..........
(2) Date ....
(3) Duration .... hr.
(4) Pressure in steam pipe near throttle by gage.... lb. per sq.in.
(5) Pressure in receivers by gage.......... lb. per sq.in.
(6) Vacuum in condenser.......... in. mercury
(7) Percentage of moisture in steam near throttle or number of degrees of superheat.......... per cent or deg. fahr.
(8) Total steam consumed per hour.......... lb.
(9) Total dry and saturated steam of superheated steam consumed per hour .... lb.
(10) Equivalent steam consumed conforming to conditions agreed upon per hour.......... lb.
(11) Average mean effective pressure in each cylinder. lb. per sq.in
(12) Revolutions per minute.......... r.p.m
(13) Indicated horsepower developed.......... i.hp.
(14) Steam actually consumed per i.hp.-hr.......... lb.
(15) Dry and saturated steam or superheated steam consumed per i.hp.-hr. .... lb.
(16) Equivalent steam consumer per i.hp.-hr. conforming to conditions agreed upon.......... lb.
(17) Engine efficiency (referred to Rankine cycle based on i.hp.) .... per cent

Interconnection of Hydro-Electric Energy in the Northwest

Interconnection of all hydro-electric energy in the State of Washington, to link up with the energy of Oregon and California and to afford a connected power chain all along the Pacific Coast, is a feasible project as far as this state is concerned, declare Seattle electric experts in connection with the proposed project from British Columbia to Mexico.

This vast linking of hydro-electric energy, establishing a superpower transmission project, is one of the big future electrical developments to come with the industrial and population expansion of state rural and urban districts, admitted local power authorities. While this proposal is under consideration here, a committee representing the American Association of Engineers, Oregon Chapter, has undertaken a survey in the Oregon district of a connected superpower system from Canada to the Mexican line.

"Like further railroad electrification, this superpower plan is a project of the future, to be carried out when economic conditions warrant," declared William H. McGrath, vice president of the Puget Sound Power and Light Co., recently. "There is a superpower system now operating in this state on a smaller scale, and only the construction of approximately fifty miles of transmission lines is needed to have all the state linked up from Spokane to Seattle and from the British Columbia line to a point near Portland." Linking up with Portland would mean a superpower transmission project connecting Washington, Oregon and British Columbia and as far inland as Spokane, he said.

As a result of the power lines erected by the Puget Sound Power and Light Co. for the electrification of the western end of the Chicago, Milwaukee & St. Paul Ry., the Cities of Seattle and Spokane are now linked, with electricity being sent by the Seattle company to the Washington Water Power Co., of Spokane, when needed and vice versa. This connection, however, would not have been possible had it not been for railroad electrification.

Only thirty miles of transmission lines would be necessary to fill the gap between Everett and Mount Vernon, thereby connecting the northern and southern divisions of the Seattle company. Power for the northern division is furnished by the Nooksack water-power plant and a steam plant at Bellingham, while power is also furnished the Skagit district from lines of a Canadian company crossing the international boundary.

The southern division, which is separated from the northern part of the state by the thirty-mile gap, is a small superpower system in itself, with water-power plants at Snoqualmie, White River and Electron, including steam plants at Tacoma, Seattle and Everett, all connected with Spokane over the Milwaukee electrification lines.

The other gap, which separates Washington and Oregon, is but twenty miles long—between Olympia, reached by the Seattle plant, and Tenino, where a private company operates a smaller power line, operating it south to a point near Portland. The filling in of these two gaps with transmission lines would automatically link up all of this state practically to Portland; or the electrification of the Northern Pacific line between Seattle and Portland would also effect this chain of power energy, it was pointed out.

"The first step," said Mr. McGrath, "would be the joining of the northern and southern divisions. Then a high-power line could be built from Electron to Portland as the next step. This latter line, however, would aggregate a cost of somewhere around $5,000,000."

While entirely feasible, this scheme is for the future, awaiting a sufficient industrial and population increase, emphasized Mr. McGrath.

STEPS TAKEN BY PORTLAND CHAPTER, A. A. E.

First steps toward the establishment of a gigantic power system which would link up all hydro-electric energy on the Pacific Coast, from British Columbia to Mexico, have just been taken by the executive committee of the Portland chapter of the American Association of Engineers of a committee of seven to study the feasibility of the plan.

The committee is composed of P. A. Cupper, state engineer; O. Laurgaard, city engineer; J. C. Stevens, F. D. Weber, D. C. Henry, Fred Hesse, W. H. Cullers, P. Libenbaum, F. F. Henshaw, E. R. Cunningham, R. W. Barnes, Thomas Pumphrey, R. H. Dearborn, W. S. Turner and L. T. Merwin. This committee will select a subcommittee of seven, who will survey the potential power possibilities and formulate a definite plan for co-ordinated development of existing plants.

The Chamber of Commerce is backing the engineers in their investigation and will assist in collecting data.

The object of the plan is eventually to establish what is technically known as a superpower transmission project, leading features of which are conservation of energy, adequate supply at all times and economical operation of establishments supplied. It is planned to utilize such existing plants and equipment as are not in positions of economic disadvantage.

Such a system is now in use between Boston and Baltimore.

Takes Over Railway Load

Operation of the Jersey City power plant of the Hudson & Manhattan Railroad Co. (familiarly known to New Yorkers as the Hudson Tubes) has been taken over by the New York Edison Co., which has tied it in with its own system. This step is in line with a tendency in many electric railway circles to divorce their power-plant problems from those of transportation; and on the other hand, it increases the diversity of the central-station load.