

(d) By establishing a Government bureau for disseminating information regarding honest, unbiased fire tests on material, together with Government experiments on different full-sized buildings.

ECONOMY IN THE INDEPENDENT PLANT.

The superior economy of an independent steam plant compared with purchased electric power under a particular set of circumstances has often been demonstrated; but it is not often, perhaps, that the economy is so pronounced as in a case recently made the subject of a report by F. W. Dean, mill engineer and architect, of Boston. The circumstances of this case were somewhat peculiar, but they enforce the lesson that only the large central electric station can sell power at rates that are economical to large consumers of power.

The plant in question, considered by Mr. Dean, was that of a packing company which had a steam boiler plant of about 300 horse-power, used mainly for heating and cooking purposes, and for running one of its two refrigerating machines. Power to operate the machinery of the plant was purchased from a local electric power company. In the afternoons of the winter season, when the power company's lighting load reached its peak, there was often not enough power to run the packing plant, which, therefore, had to in stall and operate an 80 k.w. generator driven by an engine supplied with steam from its own plant. At times the purchased power failed altogether, and at such times only part of the machinery of the packing plant could be operated.

Purchased regular power amounted to 123 E.H.P. For various irregular uses, such as the operation of the large, motor-driven refrigerating machine, elevators, fans, and for one department during the fruit season, there was occasional need of additional 73 M.H.P.; and additional machinery to be at once installed would require 57 M.H.P. more. The lighting requirements called for 34 E.H.P., making a total of 323 E.H.P. required. Owing to the fact that alternating current was used, it was decided that for an independent plant a 300 k.w. generator would be necessary as soon as the contemplated extension of the plant was in operation. Double this power was likely to be soon required, owing to the rapid expansion of the packing company's business, and two 300 k.w. generators had to be considered if the factory was to be assured of running all the time.

Mr. Dean's discussion of the apparent and the actual cost of purchased power to the packing company is worth following in some detail, because, although his argument is obvious enough, it is based on reasoning that often escapes business men who might be supposed to see it for themselves. It is indispensable, says Mr. Dean, that a factory should be able to operate constantly, and this requires in this case a full power equipment of engines and generators exactly as if no power were purchased. The cost of the purchased power was at the rate of \$24 per horse-power per year, and the payments were based on the maximum readings of the ammeters each day. The maximum reading would be 138 E.H.P., while the actual average was 123 H.P. The latter is 89 per cent. of the former, and the cost of average power was, therefore, $\$24 \div 0.89 = \27 . The real cost of power to the company was thus \$27 per H.P. per year, plus the fixed charges on its own engine plant and some other charges, such as a portion of the coal used, a portion of the labor costs, and some oil, waste and supplies. If the company furnished its own power, the \$27 charge would be eliminated, and there would remain only the fixed charges, plus coal, attendance, oil, waste and supplies. To make this definite,

if the whole steam plant were used for power only, and consisted of a first-class condensing Corliss engine with electric generator, the costs would be as follows:—

Estimated Cost of 1,000 I.H.P. Steam Plant.

Engine and condenser at.....	\$20 00	\$20,000 00
Foundations	5 50	5,500 00
Electric generators	12 00	12,000 00
Boilers	7 50 per I.H.P.	7,500 00
Smoke flue	75 " "	750 00
Chimney	2 50 " "	2,500 00
Heater	1 00 " "	1,000 00
Pumps	50 " "	500 00
Buildings	20 00 " "	20,000 00
		<hr/> \$69,750 00

Cost per indicated H.P. 69 75

The costs of operation were estimated as follows:—

Fixed charges, 13 per cent. of \$69.75.....	\$ 9 07
Attendance	3 21
Oil, waste and supplies.....	20
	<hr/> \$12 48

Cost of coal, including banking, and assuming a good bituminous coal, was estimated as follows:—

One I.H.P. x 1.75 lbs. x 9 hrs. x 310 ds. = 2.441 tons.
2,000 lbs.

2.441 tons at \$2.75 (the local price)..... = \$ 6 71
Add from fixed and operating costs..... 12 48

Total cost of steam power per I.H.P. per year.... \$19 19

This figure would reduce to about \$18 per I.H.P. when heating and cooking were charged with their proper share of the fixed charges and attendance.

The true cost of purchased power was estimated as follows, after reducing \$27 at the switchboard to the cost per indicated horse-power, or $\$27 \div 0.85 = \22.95 . The figures were, of course, based on the assumption that, while power was purchased, an independent plant capable of running the whole factory would also be installed.

Summary of Total Cost of Power.

	Per I.H.P. per year.
Purchased power	\$22 95
Fixed charges on own steam plant.....	9 07
Attendance on own steam plant, say.....	75
Oil, waste and supplies	05
Coal	1 00
	<hr/> \$33 82

This figure, \$33.82, can properly be compared with \$19.19 for the cost per I.H.P. from an independent steam plant, or with \$18 for the steam plant, if allowance for division of the steam charges is made. From this comparison it was clear that the company would effect a great economy by installing an adequate, economical steam plant and discontinuing the purchase of electric power.

METHOD OF DESIGNING A LONG SPAN CONCRETE GIRDER.

The Pierce Arrow Motor Car Company, Buffalo, N.Y., desired a clear floor space from wall to wall in their new garage located at their Buffalo works. Their cars have an exceptionally long wheel base, and it would greatly facilitate the handling of same to have a garage in which there were no columns. As the new garage was a continuation of the one already built the width was fixed at 54 feet 4 in-