that in modern marine engineering triple and quadruple expansive engines are now so largely used?

166. Illustrate by outline diagrams the principal methods of arranging the cylinders in ordinary and triple expansive engines.

167. A simple and a compound engine work at the same rate of expansion, and develope the same power. What is the size of the low-pressure cylinder of the compound compared with the cylinder of the simple engine? Give your reasons for your reply.

168. State the mechanical advantages of compound over simple expansive engines, and investigate the ratio of maximum to mean pressures, in (1) a pair of simple expansive engines, and (2) a compound engine of the same power, and working with the same initial pressure and the same ratio of expansion, on the supposition that the steam expands hyperbolically and that the effects of early release, compression, and clearance are neglected. The initial pressure is 115 lbs. absolute. The ratio of expansion = 12, the area of each of the high-pressure cylinders = A. The ratio of area of low to area of high-pressure cylinder in the compound engine = 4·5. The received pressure 24 lbs. per square inch.

169. Explain how in practice the powers developed in the two cylinders of a compound engine may be made approximately equal.

170. Make a sketch diagram illustrating the distribution of the steam in both cylinders of an ordinary two-cylinder receiver compound engine, choosing any symbols you like to represent the governing data. The steam in the large cylinder is supposed to be cut off before half stroke, and the expansion to take place hyperbolically. The effects of clearance, early release, and compression are to be neglected.

171. A triple expansive engine works at a consumption of 1·3 lb. of coal per I.H.P. per hour. The boilers evaporate 8 pounds of water per hour per pound of coal from the temperature of the feed 105°, and at the temperature of the initial pressure of the steam, viz. 165 lbs. above the atmosphere. (Corresponding temperature 366°.) What is the consumption of steam per horse-power per hour? What would it be if the engines were theoretically perfect and working between the above limits of temperature? What is the efficiency of the engine compared to a perfect engine? What is its absolute efficiency? What is the efficiency of the boiler compared to that of a perfect boiler which cools the products of combustion down to the temperature of the feed, the heat of combustion of one pound of coal being put down as 14,000 thermal units? Finally, what proportion of the total heat-supply is wasted by the boiler and what by the engine?

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