MARINE GAS ENGINES, THEIR CONSTRUCTION AND MANAGEMENT

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CARL H. CLARK

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BY

CARL H. CLARK, S.B.

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PREFACE

In presenting the following material the author has not attempted to deal with the matter from a theoretical standpoint. The idea is rather to describe the construction and principles of operation of the standard types in a plain and simple and well illustrated form. It is hoped that it will be found to be adapted to those desiring a systematic presentation of the principles of operation and construction of modern marine gas engines.

Boston, *November*, 1910.

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MARINE GAS ENGINES

CHAPTER I

Types of Engines

The rapid development of the gas engine during the past few years has made possible a great increase in the use of small units of power for various purposes. This is shown by the increasing use of the gas engine in automobiles, power-boats, and many other places where compact powers are necessary.

The gas engine, for small powers particularly, has many advantages over the steam engine. It is self-contained, with no cumbersome boiler, feed pumps, and piping. It is comparatively light and easily installed. As there is no fuel to be handled it is easily kept clean, and as the supply of fuel is nearly automatic, it may be run with the minimum amount of care, and little labor is required beyond the regulation of the lubrication and the fuel supply. Properly installed and in good hands, the gas engine may be nearly as reliable as the steam engine. The underlying principle of the operation of any engine, whether gas or steam, is the fact that a gas tends to expand when heat is applied to it, and if allowed to do so has the power of doing work. Any gas or vapor will absorb heat; during the process its tendency to expand is increased, or in other words, the pressure is increased. If the gas or vapor can then be confined, as in the cylinder of an engine, and allowed to expand, it can be made to do work upon the piston. In the steam engine the heat is applied to the boiler, vaporizing the water and raising the pressure of the vapor in the boiler. The vapor is then carried to the boiler under pressure, and allowed to expand in the cylinder, thus doing work on the piston. The action of the steam engine is thus complicated by the boiler, piping, and pumps, and the operation by the care necessary to feed the fuel, and maintain the proper quantity of water in the boiler.

The gas engine, whether operated on gasoline, alcohol, or kerosene, is of the type technically known as the internal combustion engine. The name originates from the fact that the combustion of the fuel and the consequent generation of heat take place directly in the cylinder of the engine, instead of in a separate chamber, or boiler, as in the steam engine.

Gas engines for marine use may be practically divided into two general classes, the two-cycle and the four-cycle. The cycle of events is the same in both cases, but the means of accomplishing it are quite different. In either type there are four operations to be accomplished during each cycle, viz.: (1) Drawing in a fresh charge of gas into the cylinder; (2) compressing and firing the charge; (3) expansion of the ignited charge and the absorption of its energy; (4) expulsion of the burned and exhausted gases. The completion of this series of events is termed a "cycle."

The "Two-cycle" Engine.—This type, being simpler of the two types, will be described first. The general outline of a two-cycle engine is shown in Fig. 1, where *C* represents the cylinder; the piston *P* moves freely up and down in the cylinder; the connecting rod *R* connects the piston with the crank shaft *S*. As the piston moves up and down it imparts a rotary motion to the crank shaft by means of the connecting rod. The crank case *B*, or chamber surrounding the crank, is made gas-tight. An opening into the crank case is provided with a check valve *V*, which allows gas to enter the crank case, but not to pass out. A transfer passage *T* leads from the base and opens into the cylinder at the inlet port *I*, which is above the piston when the latter is at the lowest point of its stroke, as in Fig. 3. At *E* another port, called the exhaust port, opens from the cylinder to the outside. The exhaust port is somewhat higher up than the inlet port. Both inlet and exhaust ports are covered by the piston except when it is near the bottom of its stroke. The flywheel *F* is provided in order to give a steady rotation.

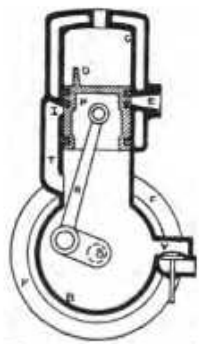

FIG. 1.—Outline of Two-cycle Engine.

For the operation, suppose the piston to be at the bottom of