Two- (Stroke) Cycle Engine.—(1) Consider the piston at the end of its stroke in the bottom position. The cylinder is then full of air at nearly atmospheric pressure, and this is compressed during the first or upward stroke of the cycle to the usual top compression pressure of 500 lbs. per sq. in., as in the second stroke of the four-stroke cycle.

(2) During the second stroke, combustion, expansion, expulsion of the burnt gases to the exhaust and the filling of the cylinder with fresh air are the operations which have to be effected. Fuel is sprayed into the cylinder during the early portion of the stroke, through the inlet valve, by compressed air as before. This valve then closes and expansion occurs while the piston passes through about 78% of its stroke, at which point the exhaust valve opens and the products of combustion begin to pass out. Air

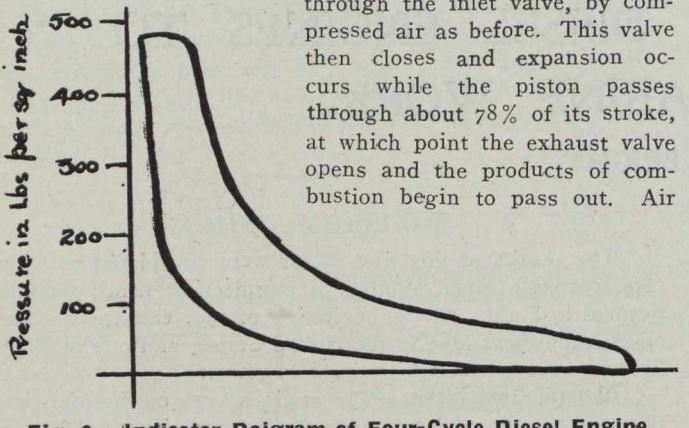

Fig. 2.—Indicator Daigram of Four-Cycle Diesel Engine.

under pressure of about 4 to 8 lbs. per sq. inch then enters the cylinder through a separate valve or port in the cylinder, being supplied from a so-called scavenge pump, which is quite separate from the air compressor for the provision of fuel injection and starting air supply.

All the exhaust gases are thus forced through the exhaust ports and at the end of the stroke the cylinder is left full of pure air with all the valves closed ready for the first stroke of the next cycle.

The indicator diagram for this cycle, as seen in Fig. 3, does not differ materially from that of the four-stroke cycle, as seen in Fig. 1, the most notable difference being the rapid fall off of pressure to F along E F; also during the process of exhaust the cylinder is filled with air from the scavenge pump. There is no longer a horizontal line representing the entrance of the air at atmospheric pressure, as in the four (stroke) cycle diagrams, since all the air is admitted at a pressure above atmospheric.

Figs. 1 and 4 are illustrations of Diesel engines used for electrical installations and pumping.

The main advantages of the Diesel engine are:—(1) Its ex-

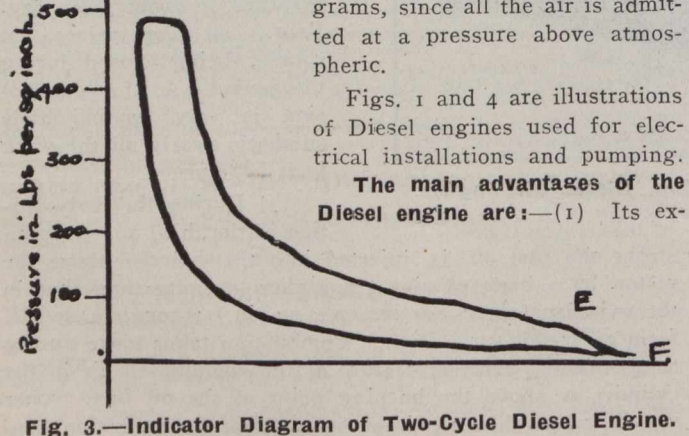

Fig. 3.—Indicator Diagram of Two-Cycle Diesel Engine.

treme economy in fuel consumption over a wide range of load, and the entire absence of stand-by losses. Makers guarantee, on full load, fuel consumption to not exceed .46 lb. of fuel per b.h.p. per hour.

(2) Its ability to use a safe, cheap, compact form of fuel, in the shape of high flash-point residual oils, obtainable in large quantities all over the world.

(3) Its freedom from pre-ignition, due to the fact that air only is compressed and not a mixture, thus eliminating a not infrequent cause of breakdown in other forms of internal combustion engines.

(4) No carburetters, vaporizers or troublesome ignition devices are requied on the Diesel.

(5) The engine can be started up from cold and put on load in one minute, and is ready for any load up to its full capacity at any moment.

(6) Lastly, one of its most important features is its great reliability, even when running for long periods with variable conditions of load.

Application of Diesel Engines to Marine Work.—A marine engine must, before everything, be absolutely reliable, and with the present perfection of the steam engine, as a result of close on a century's practical experience, it is easy from this to see that the Diesel engine had to stand a long, severe trial during its progress up to the present before it could be seriously considered as a motor for marine work. After some eighteen years, during which the engine has proved its excellence for stationary work, with a reliability equal to the best steam engine and excelling all others, it may be said to have proved its worth beyond question. Of course, marine practice is in many ways different to stationary working. Marine engineers are naturally a little apt to exaggerate this point, still, there is no doubt that the conditions of service at sea are in general much more severe than on land. That over 400 vessels at

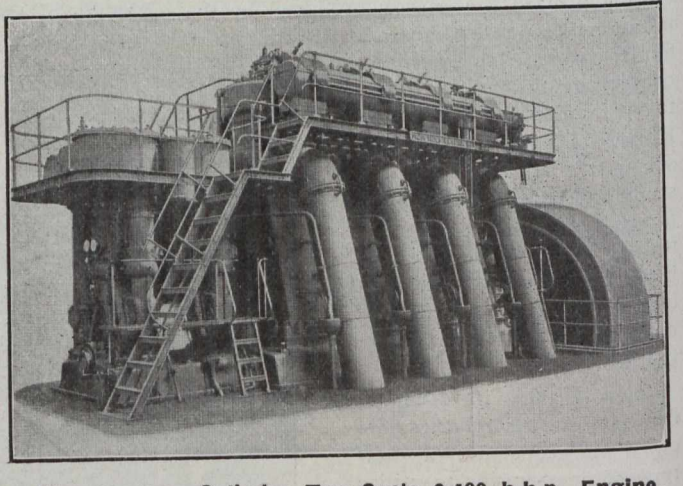

Fig. 4.—Four-Cylinder Two-Cycle 2,400 b.h.p. Engine.

present equipped with Diesel engines, many of these running for years, and the many that are being built is proof that there will be many such vessels in the future.

Advantages of the Diesel for marine work are:—(1) Reduction in fuel cost over steam or other known engines.

(2) Reduction in weight of fuel carried for same power, giving greater cargo space.

(3) The Diesel engine is relatively much more efficient than any steam engine in fuel consumption at low speed. This fact is of particular importance for vessels which run most of the time much below their full power and speed, such as war vessels, trawlers, coasting boats and boats on internal waterways.

(4) There are no stand-by losses, which may be an important point worth consideration when ships make frequent calls at ports.

(5) Fuel can be stored almost any place in vessel.

(6) Economy of space, and economy in weight of Diesel engines as compared with steam engines and accessories weigh on an average one ton to every 5 to 8 i.h.p. Diesel engines and accessories of slow speed type, that is, under 200 revolutions per minute, weigh one ton to every 10 to 15 b.h.p. For high speed types it is as much as 25 b.h.p. per ton.

(7) The reduction in staff, as no stokers are required.