Oil to Rival Gasoline in Engines

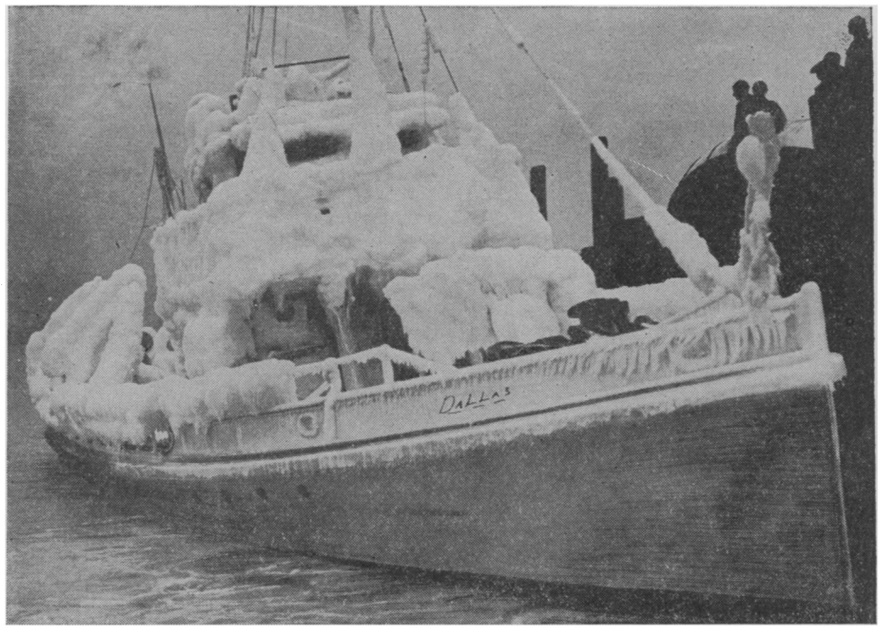
Engineering

By Douglas W. Clephane

Among the unsolved mysteries of the war period is the manner in which Rudolf Diesel, inventor of the heavy oil internal combustion engine, met death. All that is known is that he strangely disappeared from an English channel steamer a few months before the outbreak of the war when the oil engine was undergoing trials for commercial, military and naval uses.

He evidently died with the fear that his engine did not have the tremendous future he had at first believed. It is reported on good authority that both France, the country of his birth, and Germany, where he developed most of his inventions, had turned down plans for the extensive military and naval use of an improved design oil engine. If he could have lived a few more years he would have seen the Diesel engine driving scores of submarines which almost won the war for Germany, and if he were alive today he would see the heavy oil engine rapidly replacing the steam and gasoline engines. Such a revolution is now taking place in the engine industries of the world that this generation may see the day when our motor cars, airplanes, airships, locomotives, power plants as well as the shipping of the world will be driven by Diesel oil engines at a fraction of the present cost.

It was reported that when he disappeared Diesel was going to England to present plans to the British Admiralty which he believed would revolutionize the navy. When the war broke out a few months later both England and Germany charged that the inventor had met with foul play at the hands of the secret service of the other country. Not the slightest evidence was ever uncovered to support such a murder theory, and a most extensive investigation failed to reveal what happened to him after he boarded the steamer. Some say he jumped overboard because of disappointment over failure to have his engine more generally adopted. However, he had amassed a fortune reported to have been over a million dollars from his inventions, and his early work in the oil engine field had been given due recognition by various museums. Additional mystery was added by the fact that his family received a telegram announcing his safe arrival in London—but it was sent from Geneva, Switzerland.



THE U. S. COAST GUARD CUTTER DALLAS, powered with two 150-horsepower Diesel engines, drives through storms that make her a virtual iceberg

Although Diesel did not live to perfect his engine for use in the many fields to which it is now being applied, it is interesting to note that he is one of the few inventors who have obtained entire credit for their early work. All heavy oil engines which inject the fuel into the compressed air and depend on the heat of that compressed air for ignition are known as Diesel engines, and his patents were never successfully questioned.

In the last ten years the Diesel heavy oil engine has rapidly replaced the steam engine in shipping and power plant installations and engineers are finding that it may eventually replace even the gasoline engine in aircraft, motor cars and trucks, and that the possibilities of its extension to other fields are unlimited.

The modern oil engine is generally similar in appearance to an ordinary engine of equal horsepower. They are both internal combustion machines, obtaining their power from the expansion of hot gases from burning fuel. The expanding gases force down the pistons in the cylinders, thus turning the crank shaft. However, the Diesel engine does away with the complicated carburetor and with electric ignition systems. Instead of drawing in a charge of air and gasoline vapor, which the gasoline engine ignites by an electric spark, the Diesel engine sucks in air only on the downstroke which is compressed on the upstroke to one-twelfth or one-fifteenth of its original volume, thus heating the air to such a high temperature by compression that the oil ignites spontaneously on being injected separately.

The greatest advantage of the oil engine over steam and gasoline engines lies in its economy. The most efficient steam engine returns only about 17 per cent. of the potential energy in the fuel in the form of power, while the gasoline engine does not do much better. The modern Diesel engine has a thermal efficiency of 33 per cent., or, in other words, the Diesel engine wastes only 67 per cent. of the fuel, while the steam engine wastes from 83 to 90 per cent. Because low priced oil can be used, the fuel cost is often one-third that of similar gasoline engine and steam installations.

By doing away with the carburetor, ignition, and high explosive fuel, the fire hazard, which is such a dangerous factor in shipping, aircraft and automobiles, is practically eliminated. (*Turn to next page*).

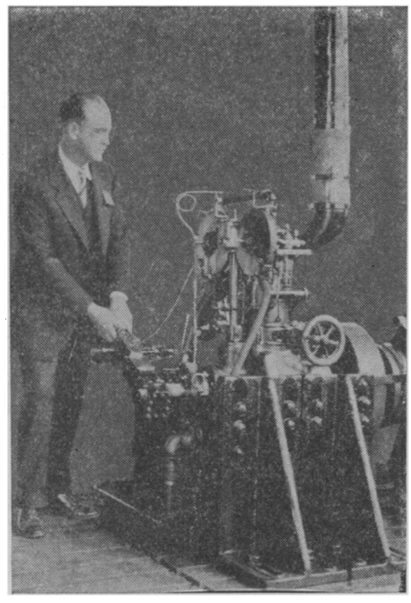
Diesels Compete with Gasoline Engines—*Continued*

As the oil engine operates at high compression all working parts must be more substantially built than in other engines, thus making its weight much more and the first cost higher.

Solutions are being found for practically all the problems of the oil engine, and experiments being conducted by the National Advisory Committee for Aeronautics, the Navy Department, and several engine manufacturers, indicate that the Diesel engine may eventually be the ideal power plant for aircraft and automobiles. The British airship R101, now nearing completion in England, will be the first airship to be equipped with Diesel motors. Five 650 horsepower units are being installed in this ship, and the experiments which have been made on the engines have led the U. S. Navy Department to specify that Diesel engines are to be used on the two new American airships now under construction, if they are available when the ships are completed. At least one American manufacturer is about ready to produce a lightweight power plant for airplanes which will weigh about 3 pounds per horsepower.

As fire is one of the main problems both in airships and airplanes these developments are particularly significant. The heavy oil fuel actually acts as a fire extinguisher for some blazes and will not ordinarily burn under atmospheric conditions. If the oil engine can be successfully adopted to aircraft, which seems merely a question of time, the often repeated story of pilots and passengers cremated alive in the burning wrecks of their airplanes will be a thing of the past. The use of the Diesel engine will also add greatly to the carrying capacity and cruising radius of aircraft, as a tank of oil will give more miles per pound of weight than gasoline, and the fuel economy will reduce the cost per mile of air transportation.

In Europe the oil burning motor car, truck, and motorcycle have ceased to be novelties, and such installations have proved their efficiency for many uses. The adoption by American automobile manufacturers of the Diesel engine will probably be slower as gasoline costs much less in this country, and economy of operation is not such a big factor here as abroad. So far a satisfactory high speed oil engine has not been developed, and the greater first



DIESEL ENGINE FOR AIRPLANES, now being tested experimentally by the National Advisory Committee for Aeronautics

cost will be a drawback to its adoption in the highly competitive low priced car field. However, it has successfully proved its worth in the heavy motor truck and tractor field, where fuel constitutes a large proportion of total operation costs. As most of the troubles from gasoline engines come from the carburetor and ignition systems the elimination of these devices will be a big factor in favor of the future adoption of the oil engine to the motor car use. It is reported that at least six large factories in Europe are engaged exclusively in producing oil engines for automobiles and trucks, and many automobile companies in this country are known to be conducting experiments along this line.

Practically every traveler on American railroads has protested at one time or another against the smoke of locomotives, and this is believed to be one of the reasons for the increasing preference for motor bus and motor car travel. Several long stretches of railroad have been electrified, thus doing away with smoke and lowering operation costs. Several of the largest American railroads plan to eventually electrify all their main lines. However the success of the first large Diesel electric locomotives on these lines has caused railroad executives to ask if this type engine may not eventually furnish the main railroad locomotive power. Not only does this locomotive do away with the smoke nuisance, but it can be operated much more economically than the traditional steam engine. The engineer can devote his whole attention to the road ahead instead of having to watch a multitude of gauges. Although the Diesel electric engine costs nearly twice as much as the steam locomotive, its greater economy, its long running time without overhaul being necessary, and the abatement of the smoke nuisance, are believed to be factors which will make it rapidly replace the steam engine on long hauls and for switching use.

Many railroads, especially those in Europe, are adopting either the direct drive Diesel, or the Diesel electric-drive railway single car, for branch lines where the traffic does not warrant the use of an engine. These cars have met with such success and popularity that many branch lines that constantly showed a loss with steam operation are now operating at a profit, allowing increased service to small communities.

The greatest application of the Diesel engine has been to merchant shipping. Diesel lived to see the first ship equipped with oil engines in 1910 but success was not assured at the time of his death in 1913. In 1927 over one-half of the shipping under construction was to be equipped with Diesel engines, and this does not take into account the large number of ships which were being converted to Diesel drive. The U. S. Shipping Board alone has spent in the last four years or has contracted for Diesel electric or direct Diesel drive installations totaling $25,000,000. Five years ago many ships were installing oil burning equipment under their steam boilers without using Diesel engines, but today the majority of such conversions are to the Diesel drive. These installations are of two types, first, the direct drive, in which the oil engine turns the propellers directly, and second, the Diesel-electric, in which the Diesel engines drive generators. These in turn furnish power to electric motors which drive the propellers. In ships of this type the motor controls are often carried directly to the bridge, allowing the captain to control the speed of his vessel without the necessity of signalling the engine room.

A. C. Hardy, one of America's leading Naval architects, recently said: "The Diesel equipped ship's fuel bill is (*Turn to next page*)

Gnats Threatening Sight of Children

Entomology

Fifteen hundred children in the Coachella Valley Union High School at Thermal, California, suffering with serious conjunctivitis, or pink eye, due to the ravages of the California eye gnat, have caused the House Appropriations Committee to insert an item of $12,000 in the Second Deficiency Bill for the purpose of allowing experts from the U. S. Bureau of Entomology to go out there to see if they can destroy this pest.

A letter to Dr. C. L. Marlatt, chief of the Bureau of Entomology, from E. P. Carr, president of the Coachella Valley Mosquito Abatement District, was read into the record, according to hearings before the committee, just issued.

The gnat, known scientifically as *Hippelates pujio,* is said to have increased to an alarming extent in the Coachella Valley in the last five years.

It hovers in swarms about the eyes, noses and mouths of persons and stock. Small children are especially helpless against it. Over one-half the school children in this region now have serious eye trouble caused by the gnat, and ten per cent. of them have contracted chronic trachoma.

The district and the State of California have both done all that they can do, but have not been able to locate the breeding places of the gnat. The president of the district declared:

"Basic and preliminary scientific problems of life history must be worked out, we believe. Such pioneer research work is of national importance and is more than our local organization can compass."

Representative Phil D. Swing, Republican, of California, has declared in a statement to the committee that these were no ordinary gnats. "My people are a hardy, sturdy type of pioneers and are able to resist any ordinary inconvenience such as would come from ordinary flies, gnats, or mosquitoes," he said. "This thing is entirely new. The belief exists that these gnats came from some foreign country through the importation of date palms. Unless it is controlled it will render that part of the country uninhabitable."

Common house flies, according to Dr. Marlatt, act in Egypt somewhat in the manner of this Coachella Valley gnat. They will swarm about the eyes, causing all sorts of eye troubles.

Florida is also having some trouble with eye gnats, he said.

Science News-Letter, March 2, 1929

Diesel Engines—*Cont'd*

roughly a third of that of the steamship, and the advantage is cumulative, extending into every phase of the ship's operation."

Not only does the oil engine reduce the fuel bill, but it greatly reduces the number of men required in the engine room. In ships of this type the stoker sweating in the bowels of the ship in a stoke hole, with the temperature often well over 100 degrees, is a thing of the past. Possibly the greatest advantage of such ships is the amount of coal bunker space which the oil engine releases for cargo or commodious passenger quarters. In large ships the fuel takes less than a third of the space which coal would require to obtain an equal cruising radius.

Developments in the marine field indicate that the familiar letters S. S. before the name of a ship, indicating steamship, will be eliminated, as the Diesel engine has proved its greater efficiency for practically every type of ship from the small yacht to the largest ocean liner, and the steam boiler is rapidly becoming an obsolete installation.

While the use of the oil engine in land and air transportation is still in its infancy, the stationary oil engine has secured practically a monopoly for pumping on long pipe lines, and its use for large power plants is rapidly increasing. There seems to be no field in which theoretically the oil engine cannot be used more efficiently than *(Turn to next page)*

League of Nations to Broadcast

Radio

Broadcasts by short wave radio of speeches from the League of Nations, especially for the American continent, Japan and Australasia, will be sent out from Holland next month. This announcement was made by the Federal Radio Commission, following the receipt of a communication from the Secretariat of the League at Geneva. Telephone lines will carry the words of the speakers from Geneva, Switzerland, to Kootwijk, Holland, where a powerful short-wave station is operated by the Dutch Postoffice. It has the call letters PCLL, and uses wavelengths of 18.4 and 38.8 meters.

While the broadcast will be of an experimental nature, it is believed if the reception is at all clear a regular broadcasting program will be worked out. International broadcasting is difficult because of the different languages of the radio audiences. The experiments of the League of Nations in March will attempt to reach certain sections of the world where reception conditions are good. A particular effort will be made to reach audiences in North and South America, Japan, Australia and New Zealand with programs given in the language of each country.

The League of Nations has already conducted certain experiments along this line, and reports have been received from 92 listeners in five different continents. These first experiments were mainly for the purpose of receiving technical reports from professional radio operators, but many individuals reported that the reception was entirely clear from their loud speakers. The broadcast in March will be the first attempt to reach particular regions with special programs.

The schedule as announced is as follows: to the American continent, March 12, 19, and 26, one hour, from 5 to 6 p. m., in English, French and Spanish, on a wave length of 38.8 meters; to Japan in Japanese every Wednesday, March 13, 20 and 27, 30 minutes from approximately 8:40 to 9:10 p. m., on a wave length of 18.4 meters; to Australia in English March 14, 21 and 28, 30 minutes on the same wave length, and at about the same time.

The Secretariat of the League of Nations said that while these broadcasts were purely of an experimental nature, it was quite possible that regular programs would be broadcast internationally if the reception of these first programs in March is clear.

Science News-Letter, March 2, 1929

An expert says that in many workshops the natural light is cut down one-fourth by dirty window panes.

Pennsylvania is the only state with a mineral production worth more than a billion dollars a year.

An old Persian belief held that an agate has power to stop a storm.

In years of famine more than one-fourth of the Labrador Indians have been wiped out.

Diesel Engines—*Cont'd*

steam or gasoline engine installations. The greater first cost of such engines is warranted only where the fuel bill constitutes a large proportion of operation costs or where the greater flexibility, safety, and other factors offset the first cost. New manufacturing process and improvements in design now being developed are reducing the cost to a point where the general application of the Diesel oil engine to aircraft, automobiles, locomotives, and other fields is believed to be only a question of time.

It is often said that it will be only a few score years before the petroleum and consequently the oil and gasoline resources of the world will be exhausted. The Federal Oil Conservation Board appointed by President Coolidge in 1924 seems to have exploded this estimate, but there is no question that the free flowing oil is being depleted more rapidly than new fields are being found. The Board reports: "The adequacy of the supply of oil shale as raw material for the extraction of oil is now beyond question. A conservative estimate of the amount of petroleum that can be extracted from the known oil sands is 92,000,000,000 barrels or ten times the total quantity of oil that has been produced in the United States to date."

Assume that the oil supply will fail in the future. Diesel engines will still run. For they will operate on nearly any liquid fuel. And synthetic oil can now be made from coal and lignite.