/ho further developed and adapted his engine to more uses. During that year, Fricks of Denmark were producing usable diesel-powered locomotives.

Canadian National was the first railway in North America to use diesel locomotive power. The first ones appeared in 1925 and later that year they made an experimental run from Montreal to Vancouver, halting only to refuel and change crews. They made the run without difficulty in slightly more than 67 hours.

Dieselization really got under way in 1951 when CN embarked on a five-year program to replace its steam engines.

Bob Burns, manager of CN's Rideau Area based in Belleville, said that diesel power has allowed the size of freight trains to be doubled,

the average speed to be increased by 40%, and gross ton-miles (a unit of measurement used in the railway industry) to be nearly tripled.

"Although the steam engine served the industry well for more than 100 years and still produces nostalgia among many of us, it has been the diesel which permitted the railway industry to retain its important role and enhance the economic well-being of Canada," he commented.

Diesel locomotion is so highly specialized that Canadian National operates its own four-year apprenticeship program for the five crafts involved in diesel locomotive maintenance: mechanical, electrical, pipe-fitting, sheet metal and carman. A similar training program must be taken by qualified mechanics if they are without experience of railway diesels.

How it works....

A Simple Explanation For Non-Technical Readers of How the Diesel Engine Operates . . . . . .

The principles on which the petrol engine works are familiar to many, for this type of power unit has come into general use in cars and motorcycles. The diesel engine, on the other hand, is not so well known. Although its popularity for many duties is rapidly increasing, it remains somewhat of a mystery to the uninitiated.

The Diesel Cycle

The diesel engine itself is quite simple mechanically and has a similar arrangement of pistons and cylinders, valves, connecting rods, crankshaft and crankcase to the petrol engine. Considering only the four stroke engine, the diesel cycle also comprises inlet, compression, power and exhaust strokes. Here, however, the similarity ends, for in place of carburetor, coil and spark plugs, we have fuel injection pump and fuel injectors.

The fuel used in the modern high speed diesel, usually gas-oil, is a colourless liquid which does not vaporise at ordinary temperatures. It therefore cannot form a combustible mixture of fuel and air, as does gasoline, but is burned in the engine by being forced into the combustion chamber as a very fine spray. The air necessary for combustion is first drawn into the cylinder

and compressed by the piston to a high pressure - usually about 550 lb/per sq. inch. The air is heated rapidly by compression, just as in using a bicycle pump to inflate a tire, and the heat is sufficient to ignite the fuel spray when injection takes place. This is the characteristic feature of the diesel or, as it is correctly termed, the compression ignition engine.

Consider now the full sequence of events which comprise the four strokes of the diesel cycle shown in the illustration.

First, the inlet stroke: the piston moves downwards in the cylinder, the inlet valve opens and air is drawn in. The inlet valve closes at the end of the stroke.

Second, the compression stroke: both valves are closed and the piston moves upwards, compressing the air in the cylinder and heating it.

Third, the power stroke: just before the piston reaches the top of the compression stroke, the fuel is injected into the combustion chamber in a finely atomised spray. The temperature of the compressed air is sufficient to ignite the fuel which burns rapidly. The resulting high pressure forces the piston downwards, providing power.

Fourth, the exhaust stroke: following the power stroke, the exhaust valve opens, and the piston again moves upwards, sweeping out the products of combustion ready for a fresh charge. The valve closes, and the cycle is thereafter repeated.
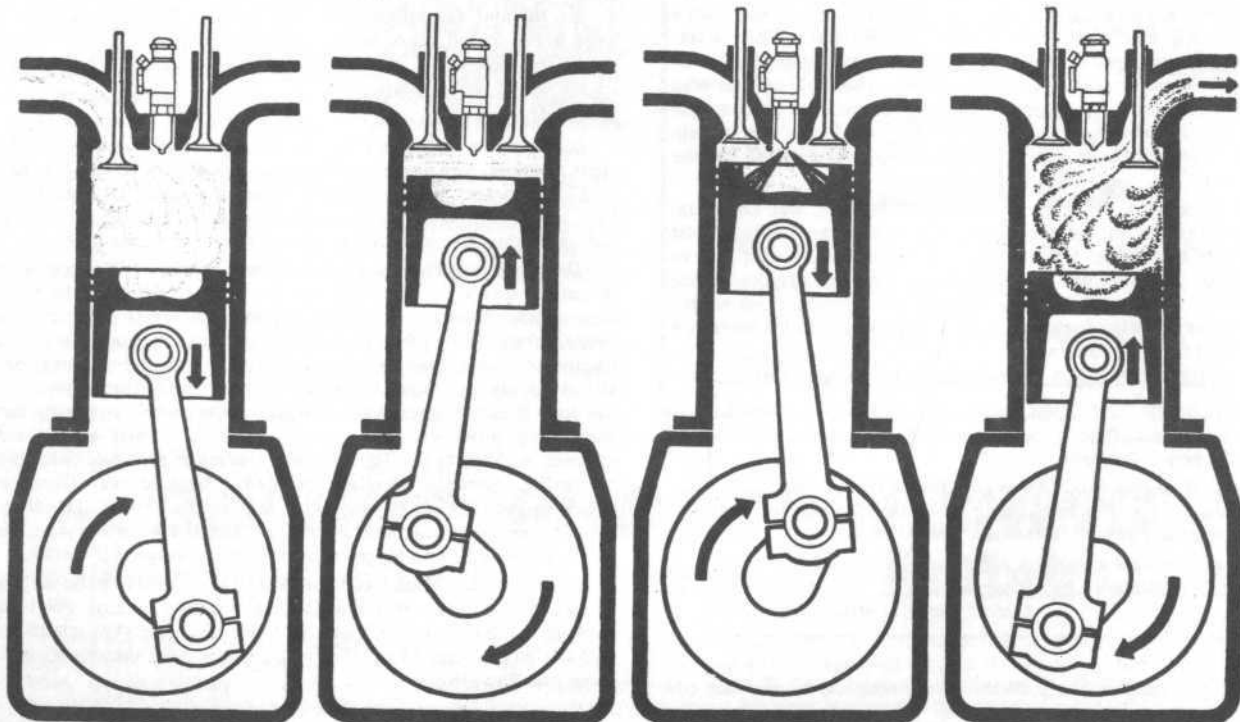
(i) *Inlet stroke.* Air is drawn into the cylinder.

(ii) *Compression.* The air is compressed and becomes hot.

(iii) *Injection.* Fuel is sprayed into the hot air, ignites and burns. The high pressure forces down the piston.

(iv) *Exhaust.* The burnt gases are evacuated.

The sequence of operations in a four-stroke diesel engine.