

The Gasoline Engine in Cold Weather.
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started as easily as in warm weather by the expenditure of a few minutes time and by the expenditure of only a fraction of the energy necessary in cranking the engine until it starts.

In the first place we must understand that gasoline inside the engine cylinder in any other form than that of gas is practically useless; the gasoline must be vaporized. Vaporization of any substance requires heat, and the amount of heat depends on the degree of volatility of the substance. Gasoline is fortunately a very volatile substance and does not require very much heat to vaporize it. If a saucer filled with gasoline is placed in a moderately warm room it quickly evaporates, but if placed out doors when the temperature is below freezing it will require a long time to evaporate, the length of time being proportionate to the temperature; in fact, if the temperature is below zero it will require hours to evaporate a saucerful of gasoline.

No doubt most gasoline engine operators have observed that even in warm weather the mixer of their engine is always icy cold when the engine is running, even if the mixer is in proximity to a warm part of the engine, and in certain conditions and temperatures of the atmosphere it becomes covered with white frost. The explanation of this rather curious phenomenon is simple; a very simple experiment will explain it. If a little gasoline is poured on the skin of the human body it quickly evaporates, and the place where it was applied feels chilly for a few moments. This chilly feeling is more pronounced if pure alcohol, a more volatile substance, is used in place of gasoline. What causes this chilly feeling? The gasoline or alcohol can be at a temperature which precludes the idea that the cold is inherent in the liquid, and still the same feeling will be experienced. The reason is that the evaporation of the gasoline or alcohol absorbs heat from the skin faster than the blood can supply it, thus reducing the temperature at the point of application. For the same reason the rapid evaporation of the gasoline in the mixer absorbs all the heat within its reach, thus drawing all the available heat it can from the metal of the mixer. This principle of absorbing heat by the evaporation of volatile substances, is the fundamental principle in the manufacture of artificial ice. By the evaporation of ammonia, under certain conditions, the temperature of surrounding substances can be reduced many degrees below the freezing point of water.

The reason why an engine will start up on a cold morning after

prolonged cranking is explainable from the fact that a small part of the energy expended in cranking the engine is converted into heat inside the cylinder, gradually warming it up to a point where it contains heat enough to vaporize the gasoline which is carried in with the air in the form of a fine spray. When air or any other gas is compressed adiabatically during the process of cranking, it becomes heated a certain definite amount for each pound of increase in pressure. The work done on the gas by compressing it is thus turned into heat. Even if the cylinder relief cock is left open, there will yet be enough compression of the gas to affect the temperature of the cylinder quite materially.

It can easily be seen that cranking the engine is a slow method of warming up an engine cylinder, especially so if the engine is of any size and turned comparatively slow. Small engines which can be cranked quickly with the relief cock closed, will start up quicker in cold weather than the larger ones, due to the fact that, as the full compression is obtained in the cylinder, far more heat is evolved than is the case when a large percentage of the compression is allowed to escape through the relief cock. From the foregoing discussion it is readily apparent that the principal thing lacking, and whose absence is mainly responsible for the trouble experienced in starting gasoline engines in cold weather, is heat.

What is the use trying to supply this heat by the laborious and painful process of cranking the engine, when it can be supplied with hardly any physical exertion. If the mixer and intake pipe are supplied with heat from some external source the same end will be attained, the gasoline will be vaporized before entering the cylinder of the engine, and the engine will start readily. Many people, however, object to the application of heat to those parts, owing to the supposed danger from the gasoline in the tank and piping catching fire. If proper precautions are used there is no danger whatever. Be sure that all the openings in the gasoline tank, if it is close to or is a part of the engine, are closed, or what is just as good, protected by screens in the openings; flame will not pass through even a coarse screen. Neither will a flame pass through a pipe filled with gasoline, but it will pass through a pipe filled with gasoline vapor if there is no screen in the pipe. If you are assured of these things the mixer and air pipes can be readily warmed by many methods which will suggest themselves to the ingenious operator. Gasoline can be poured over the mixer and intake pipe in small quantities and lighted up. A piece of rag or

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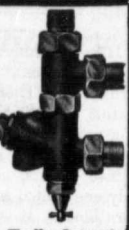
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