

water into steam which will become further heated after ignition. On account of the high specific heat of water, it requires a large quantity of heat to evaporize it or raise its temperature after it is vaporized. Since this heat must be absorbed from the heat of combustion of the charge it follows, necessarily, that the temperature of the mixture in the cylinder will be materially reduced. If very much water is introduced it may absorb so much of the heat generated during compression that the gases will not be hot enough to ignite readily. Especially will this be true if the charge is somewhat lean. This accounts for the fact that a leak of water from the jacket to the cylinder makes it difficult to start the engine.

Cooling, in the method just described cannot be carried out completely. Some writers declare that it is never conducive to good economy in any case because it reduces the temperatures and pressures in certain circumstances it may be advantageous to use. In kerosene engines and in many alcohol engines provisions are made to use a water spray and the result of such use is always a smoother running engine. A heavily loaded kerosene engine will pound heavily after it has run for some time unless a large amount of jacket water or spray is especially, because it is sufficiently cooled by the fresh charge of cold gas and air, although it is customary to bring the water jacket as close around both valves as can be done conveniently.

The volume of the compression space is an important consideration in gas engine design and a knowledge of the part it performs is equally of value to the man who operates an engine. In steam engine practice it is a well recognized fact that the clearance space should be small in order to insure the best economy. What is true in this respect in the steam engine is equally true in the gas engine. The highest economy demands small compression volume. There is a practical limit beyond which high compression can not be carried, and this limit is different for every different kind of fuel used.

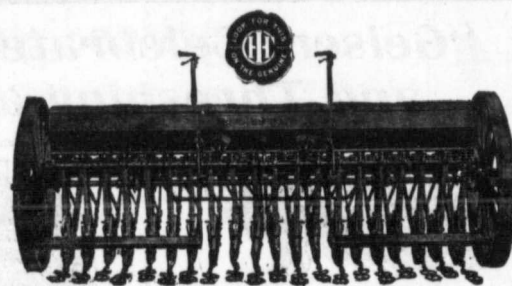
In a previous lesson the statement was made that there is an exact relation between heat and work. If work is done upon a gas by compressing it, it becomes heated, and if the gas afterwards expands and does work upon its piston its temperature falls. When the charge in a gas engine is compressed its temperature rises in proportion to the amount it is compressed. If compression is carried too high its temperature may reach the point at which it will ignite. The

of water is used. It seems advantageous in some types of engines, both from an economical and mechanical point of view, to use a small amount of water in the cylinder, in addition to the regulation method of cooling by means of jacket water.

Water ignition is also practiced in some cases as respects the products of combustion, by introducing it into the exhaust pipe. The effect is to absorb the heat from the gases and allow them to escape at a lower pressure, thus acting to some extent as a muffler. This practice does not of course, affect the heat in the cylinder itself.

In very large engines the piston must be cooled as well as the cylinder because the heat in the central part of a large disc of iron, which exposes relatively a small surface to the cool cylinder walls, can not part with its heat capacity rapidly enough to keep the central part of a safe working temperature. Cooling, in such cases is accomplished by circulating water under pressure within the hollow part of the piston, using either flexible connections of telescoping pipes to convey water.

It is also necessary to cool the exhaust valve by a water jacket owing to the high degree of heat of the exhaust gases. The admission valve does not need cooling if gasoline ignites at comparatively low temperature, and it has been found by experience that if it is compressed much above eight-five pounds per square inch, pre-ignition will take place. Alcohol vapor on the other hand, is less volatile and needs a higher temperature in order to burn, consequently it will stand a higher compression, and with higher compression it yields greater power for a given quantity of alcohol consumed. For this reason alcohol engines, designed primarily to use alcohol, have a smaller clearance volume than do gasoline engines. Engines designed to work under varying conditions and different fuels are usually given a clearance volume equal to from twenty to twenty-five per cent of the volume displaced by the piston. There are certain well-known laws which govern the pressure, volume and temperature of gases, which will presently be briefly alluded to. It should be understood in passing, that the three quantities, pressure, volume and temperature are inter-dependent, that is, when one changes, unless some means are taken to maintain one of them constant. The principal law connected with pressure and volume is known as "Boyle's Law." It may be stated thus: The pressure of a gas varies inversely as the volume



## Deering Drills

One of the great advantages in owning a Deering drill is that the furrow openers of the single disk, double disk and shoe drills are interchangeable, consequently if you have need for any one of these styles of drills and have but one style of furrow opener you can purchase either or both of the other two styles and have a drill for all conditions of ground—hard and dry, trashy, muddy or well prepared seed bed.

The Deering drill will not sag. It is equipped with a truss rod which makes it impossible for this drill to sag, regardless of the length of time it may have been in use.

The Deering drill has a continuous axle which runs the entire length of the machine, imparting a continuous and positive action to the feed runs, whether the machine is being driven straight down the field or around sharp curves. The seed is always deposited evenly.

## No Disk Troubles



Note that oil reaches the bearing from the inside, the same as on the double-disk drill bearing.

There is no need of ever having any trouble with the disk bearings. They are made as nearly dust proof as it is possible for a bearing to be made, and have most convenient oiling facilities. The oil pipe runs through the bearing standard from the top of the disk where it is covered with a threaded stopper. The oil lubricates the bearing from the inside of the cones and works outwardly. For this reason the oil that lubricates the cone is free from grit, and it will force out any grit or dust that may have gotten into the bearings. In oiling, the operator is not obliged to dig out oil holes or get into an unnatural position in order to reach the oil hole.

Oil reaches the bearing from the inside, thus insuring a lubricant free from dirt and dust.

## Deering Implement Line

The Deering spring implement line includes Disk Harrows, Smoothing Harrows and Cultivators for summer fallow purposes as well as drills. It will be well worth your while to examine these implements carefully before making a purchase.

Any Deering agent will be glad to show you these implements and explain their merits. Write the nearest branch house for catalog.

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