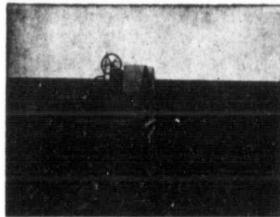


pressure of 65 pounds per square inch for both gasoline and kerosene. The clearance volume is generally made 32 per cent the displacement of the piston. Where relief valves are supplied with motors for purposes of starting it has been found best to allow 50 per cent of the compression to escape.

According to theory, in order to save fuel, it is best to build motors with the shortest possible stroke and the highest possible rotative speed. In this way, the time of combustion is shortened and expansion is made to the greatest extent. The heat losses resulting from the cooling water, are reduced, because the cooling of a motor depends upon the time of burning the fuel in the cylinder. There are other conditions, however, that do not make it practical to build short stroke motors and the practice of 39 two and three plow tractors is to make the ratio of the stroke to the bore —1.24 to 1. Such a motor would have a cylinder four inches bore,



One Drive Wheel—Wheel in Furrow

five inches stroke. This ratio is made because more decrease in stroke means a decrease in time available for various events, such as intake and exhaust. With a short stroke motor, the mixture is likely to be less uniform, and therefore there will be less complete combustion.

The arrangement of cylinders of 37 makes of small tractors is as follows: 14 are four cylinder vertical, 16 are two cylinder opposed, 2 are two cylinder side by side, 2 are one cylinder, 1 four cylinder opposed, and 1 four cylinder horizontal.

The claim is made that with the vertical cylinder motor, there is less wear on the piston and less loss of compression than with horizontal cylinders. The weight of the piston tends to wear the lower side of the cylinder. While on the other hand, the horizontal cylinder is generally handier to get at and is considerably lower down. The advantage of the single cylinder engine over the multiple cylinder is its simplicity. But the single cylinder opponents argue that the parts have to be made heavier and are considerably more difficult to balance. There are a very few companies making single cylinder tractors, but the companies that are building single cylinder machines

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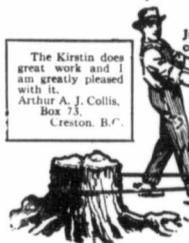
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have a very large proportion of the small tractors that are in operation to-day. The two cylinder opposed engine has the advantage of being well balanced, but has a disadvantage in having a long manifold extending in either direction from the carburetor to the extreme ends of the cylinder. The best results obtain with the carburetor as close to the cylinder as possible. At this writing, it is difficult to say what the tendency in small tractor motor design will really be. Some men in the tractor business believe it will be the automobile type, but that will hardly be as the motor for a tractor will have to be a distinctive design. The problems of the

auto, the truck, and the tractor are entirely different. Each takes a motor of its own. The tractor carries full load 80 per cent of the time; the truck, approximately 40 per cent; and a prominent auto engineer recently told me that the motor in an auto runs at full load less than 10 per cent of the time. The variation in the design of small tractors outside of the motor is very great. Out of 37 different makes I find that 21 have four wheels, with the two rear wheels drivers. This appears to be nearer the standard than any other design and follows large tractor practice. Four makes out of the 37 are three wheels with the two rear wheels drivers. Three

have three wheels with one rear wheel the driver. Three have three wheels with one wheel front. One has two wheels and both are drivers, one has four wheels with one the driver, one has three wheels with one front wheel the driver. What will finally evolve out of these various styles, is very hard to say at this time. Judging from the designs just coming out, that are entirely different from any of these, one would be led to say that standardization in tractors, is a thing of the remote future. The problem of the small tractor has been to do away with side draft while plowing. A large tractor that pulls eight plows will