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# SHALL I BUY A TRACTOR?

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## SUMMARY

There are several advantages in using a tractor that are hard to measure, such as ability to do fall plowing early, or getting the plowing done in a dry fall when the soil is too hard to plow satisfactorily with horses. However, when considering the question of buying a tractor a farmer should ask himself the following questions:

### I. Can I run a tractor?

Almost anyone can run a tractor if he will secure the proper instruction regarding its operation. This instruction may be received from an experienced operator if enough time is taken, by attending a school on tractor operation, or by studying books of instruction issued by the manufacturers.

### II. Can I farm more land with a tractor?

The possibility of increasing the farm area is indicated by the following figures which are given by Minnesota farmers using tractors. (1) Thirty men using two-bottom outfits increased their farms seven acres on the average. (2) Eighty-seven men using three-bottom outfits increased their farms 39 acres on the average. (3) Ten men using four-bottom outfits increased their farms 32 acres on the average.

### III. Are my fields adapted to the use of a tractor?

Reasonably large fields free from sloughs, stumps, and stones are required to obtain the most satisfactory results.

### IV. Will a tractor make it possible to keep fewer horses?

One hundred and twenty-seven Minnesota farmers kept an average of two less work horses after purchasing the tractor.

### V. Is it possible to save on feed?

Fourteen Kittson County farmers saved an average of $45 worth of feed per farm during the plowing season because the horses were comparatively idle.

### VI. Can I save hired help?

Eighty-eight farmers out of 145 using tractors were able to reduce the amount of hired help as compared to that needed for the same acreage before the purchase of the tractor.

### VII. Can I use a tractor to advantage in work other than plowing?

Farmers who are satisfied with the tractor made more use of their machine at farm work other than plowing than did those who were dissatisfied.

### VIII. How much land will the various outfits plow per day?

Figures given by 127 farmers of Minnesota using tractors show that: (1) Thirty farmers using two-bottom plow machines plowed on the average six acres a day. (2) Eighty-seven farmers using three-bottom plow machines plowed eight acres a day. (3) Ten farmers using four-bottom plow machines plowed ten acres a day.

### IX. What size should I buy?

Figures given by these 127 Minnesota farmers showed that: (1) Two-bottom plow machines were used on 30 farms averaging 266 acres. (2) Three-bottom plow machines were used on 87 farms averaging 313 acres. (3) Four-bottom plow machines were used on 10 farms averaging 354 acres.

### X. How much does it cost to plow?

The cost with a two-bottom plow running 500 hours per year was 94 cents per hour, or 1.58 per acre for plowing.

The cost with a three-bottom plow running 500 hours per year was $1.24 per hour, or $1.55 per acre for plowing.

The cost with a four-bottom plow running 500 hours per year was $1.52 per hour, or $1.52 per acre for plowing.

The more work secured from a tractor the less the cost of operation. (See Table No. 1.)

### XI. What do neighboring tractor owners think?

A farmer who contemplates purchasing will be able to get many practical suggestions from neighbors who have succeeded with a tractor.

The Wind-up of a Tractor School

**This school was held June 18-23, at Hallock, under the joint auspices of the Kittson County farm bureau and the local implement companies. The school was attended by 100 farmers and farm boys.**

### XII. How can I learn to run a tractor?

(1) By getting suggestions from neighbors who have had experience. (2) By studying the book of instructions sent out by each company and general books on gas-tractor operation. (3) By attending some of the various short courses on the operation of tractors conducted by the tractor companies and the schools of agriculture. (4) By working on a tractor with an experienced man.

### XIII. What care should I take in starting the new machine?

When the new tractor is started it should be loaded lightly and care should be taken to see that the bearings do not run hot and that the oiling and cooling systems work properly.

### XIV. How should I care for a tractor?

Study your tractor so as to know the use of each part. Remember that the better the care a tractor receives the longer it will last and the less trouble it will give.

## CAN I RUN A TRACTOR?[1]

Almost anyone can run a tractor successfully if he has had experience or will secure the proper instruction. The necessity for experience or instruction is illustrated by the experience of two Kittson County farmers, Stevens and Olson.

Stevens bought a tractor several years ago and wore it out in a comparatively short time, but he bought another which he has been running since with such success and satisfaction that he recently purchased the third machine and is now using two tractors in operating an eleven-hundred-acre farm. A good deal of custom work is done in addition.

A neighboring farmer, Olson, purchased a tractor three or four years ago and has had rather unsatisfactory results. He was quite frank in saying that his lack of success was largely due to the fact that at the beginning he did not understand the principles of a gasoline engine. In addition to the trouble in operating, the tractor was practically worn out at the end of four years. As a result of Olson's high depreciation cost, his total cost per acre for plowing was $2.69, as compared to $1.49 for Stevens. Stevens also made a large saving in feed while Olson saved none.

Because of his lack of knowledge, the machine probably received very poor care, consequently this high rate of depreciation. He was rather disgusted because his cost was high, but thought with his experience and the coaching he had received from his neighbor, Stevens, he could do well with a new tractor. This was very expensive experience. If he had taken steps to secure definite instruction at the beginning he undoubtedly would have saved money and would have been better satisfied with his machine.

[1]Special thanks are due the Office of Farm Management, United States Department of Agriculture, who furnished from their unpublished investigations in Minnesota all the data in this bulletin except those which relate specifically to Kittson County. In the fall of 1917 fourteen Kittson County farmers with the assistance of County Agent W. V. Longley studied the cost of operating tractors on their farms, and data relating to Kittson County were obtained from them.

## CAN I FARM MORE LAND IF I GET A TRACTOR?

If actual practice may be taken as a guide, the average number of acres Minnesota farmers might count on adding to their farms may be illustrated by the following figures which were given by Minnesota farmers using tractors.

TABLE I. INCREASE IN SIZE OF FARM BY USE OF TRACTOR

| Size of tractor | Number of farms reporting | Original acres per farm | Average number of acres added after purchasing a tractor |
|---|---|---|---|
| Two 14-inch-bottom plow | 30 | 259 | 7 |
| Three 14-inch-bottom plow | 87 | 274 | 39 |
| Four 14-inch-bottom plow | 10 | 322 | 32 |

The size of the tractor is measured by the number of bottoms pulled rather than the horse-power of the engine, because of the variation in rating among different makes.

Among 149 Minnesota farmers reporting, 44 increased their farm area an average of 105 acres, and farmed with two horses less after purchasing the tractor. One hundred and five of these farmers did not increase their acreage but farmed with an average of two less horses. Twenty-two of the 149 did not give the size of plow they were using, therefore they could not be included in the table.

## ARE MY FIELDS ADAPTED TO THE USE OF A TRACTOR?

The fields must be of reasonable size, because if too small there must be considerable time spent in turning at each end. As few tractors swing as short as horses, it usually takes longer to turn with a tractor, hence fields of fair size or length are even more desirable than where horses are used.

There should be no sloughs or potholes, as the tractor must either make extra turns or spend considerable time going around, while horses are frequently able to go through. Stones and stumps are a decided drawback, as the tractor can not dodge them as can horses and hidden stones are likely to damage the plow seriously and cause much delay.

## WILL A TRACTOR MAKE IT POSSIBLE TO KEEP FEWER HORSES?

The saving in work horses depends very largely upon the type of farming. If corn is one of the principal crops grown, as many horses are required for cultivating as for plowing, hence it is impossible to reduce the number of horses by the use of a tractor unless it is possible to secure a motor corn cultivator that is satisfactory. In the northwestern part of the state where small grains are the main crop, the saving in horses depends upon the extent to which the tractor is used at various tasks besides plowing, such as seeding, disking, and harvesting. This is quite obvious, for at the time of seeding and harvesting nearly as many horses are needed as would be required to do the plowing; therefore, merely plowing with a tractor would not enable one to reduce the number of work horses kept.

In Kittson County the men who farmed the largest area with the least number of horses were those who were able to make the widest use of the tractor for other work than plowing.

The extent to which some Minnesota farmers have reduced the number of horses kept is shown by Table II:

TABLE II. REDUCTION IN NUMBER OF HORSES NEEDED BY USE OF TRACTOR

| Size of tractor | Number of farms | Number of horses before purchasing | Number of horses after purchasing | Additional acres farmed |
|---|---|---|---|---|
| Two 14-inch-bottom plow..... | 30 | 8 | 6 | 7 |
| Three 14-inch-bottom plow.... | 87 | 8 | 6 | 39 |
| Four 14-inch-bottom plow..... | 10 | 9 | 8 | 32 |

This shows that on the average about two work horses are replaced by each machine. It appears that work horses have not been replaced to the extent that might be expected. Undoubtedly this is largely because so many of the operators were not well informed in operation of the tractor, and consequently kept about the usual number of horses on hand to take up the farm work at any time that something went wrong with the tractor. Inability to depend on the tractor and the resulting necessity of keeping sufficient horses on hand to take up the farm operations, should something go wrong with the tractor, was a frequent complaint. However, the fact that in most cases additional land was farmed, must be taken into consideration. Those men having the three-bottom plows farmed an average of 274 acres with 8 horses before purchasing the tractor, and an average of 313 acres with six horses after purchasing the tractor. Not only may the number of work horses be reduced but a reduction may be made in the grain given the horses that are kept. Fourteen Kittson County farmers estimated that they saved, during the plowing season of 1917, $45 worth of feed per farm. The amount was arrived at in the following way: If a farmer ordinarily fed 18 quarts of oats a day to each horse when plowing with the horses, and reduced the feed to 6 quarts a day when plowing with the tractor, he saved 12 quarts each day for each horse. This daily saving was multiplied by the number of days of plowing to get the total saved in feed per horse. Multiplying the saving for each horse by the number of horses he had, gave his total saving in feed. In some cases the horses were turned out to pasture and no grain was fed.

## CAN I SAVE HIRED HELP?

The possibility of farming more land with the help already available, or of saving hired help, depends very much upon the type of farming and the extent to which the tractor is used in the several tasks on the farm.

After purchasing their tractors, 9 of the 14 Kittson County farmers stated that they farmed an average of 183 acres more per farm with the same amount of help. This made an average increase of 67 acres per man. Since small grain is the principal source of income in this county, this could more easily be done than in regions where corn is an important crop. Nearly all of the coöperators said they were able to save in hired help.

The saving in hired help on 145 Minnesota farms reporting is shown in Table III:

TABLE III. REDUCTION IN NUMBER OF MEN NEEDED BY USE OF TRACTOR

| | Number farms reporting | No. that saved in hired help | No. not saving in hired help | Total days plowing | Total days' work other than plowing |
|---|---|---|---|---|---|
| Farms reporting tractor profitable investment | 123 | 84 | 31 | 24 | 27 |
| Farms reporting tractor unprofitable investment | 22 | 4 | 18 | 19 | 19 |

Table III shows that about two thirds of the farmers regarding tractors as a profitable investment were able to save hired help. It is also apparent that those who found the tractor unprofitable did not make as extensive use of the machine as did the men who believed it to be profitable. The table shows that the men who reported the tractor a profitable investment used the machine an average of five days more for plowing and 8 days more for other work, such as seeding, disking, and hauling, than the unsatisfied group. This greater variety of use undoubtedly accounts for the fact that these farmers were able to save more in hired help than those who used the tractor almost entirely for plowing.

## CAN I USE A TRACTOR SATISFACTORILY AT WORK OTHER THAN PLOWING?

Comparing 123 Minnesota farmers who said that the tractor was a profitable investment with 22 who said it was not, the more work secured from the tractor seemed to be the factor that largely accounted for these 123 men being satisfied with their tractors.

TABLE IV. DAYS OF WORK PER SEASON

| | Number reporting | Number days plowing | Number days other tractor work | Number days at belt work | Total days of tractor and belt work |
|---|---|---|---|---|---|
| Farmers who said tractor was a profitable investment | 123 | 24 | 12 | 14 | 50 |
| Farmers who said tractor was an unprofitable investment | 22 | 19 | 6 | 12 | 37 |

About two-thirds of these farmers ran a three-bottom outfit while the others had two- and four-bottom outfits. They averaged 260 acres per farm in crops. The men who believed the tractor was a profitable investment were farming with two horses less after purchasing the tractor and had an average of 37 acres more in their farms. Those who said the tractor was an unprofitable investment were farming with only one horse less after purchasing the tractor and had added an average of only 6 acres to their farms.

The men satisfied with their tractors used them more. They plowed five days more per season and averaged 2.4 acres more per day. This gives the impression that the dissatisfied group did not get satisfactory results because they did not understand the operation of the machine, or did not have sufficient work to justify a tractor.

The question as to whether the tractor proves satisfactory for disking and seeding on plowed land, seems to depend very largely upon the condition of the soil. In Kittson County nearly every farmer visited said that if the soil were dry no trouble was experienced because of packing the soil. Some said that packing dry soil was beneficial. Of the 135 farmers throughout the state who were asked this question, 94 said it was satisfactory and 41 said it was not.

## HOW MANY ACRES CAN I PLOW PER DAY?

What to expect from the various sizes is shown in Table V.

TABLE V. ACRES PLOWED PER DAY OF TEN HOURS WITH A TRACTOR

| Number of farms | Bottoms per plow | Acres plowed per day |
|---|---|---|
| 30 | 2 | 6 |
| 87 | 3 | 8 |
| 10 | 4 | 10 |

It will be seen that the increase in number of acres plowed is not in proportion to the increase in the number of bottoms. This can be explained by noting that every time one bottom is filled up with trash, the whole outfit is stopped and the more bottoms in the outfit the more often this happens. This naturally reduces the number of acres plowed per bottom.

## WHAT SIZE TRACTOR SHOULD I BUY?

In considering the size of machine to buy, careful consideration must be made of the possible tasks to which the machine may be put. With the increasing popularity of small thrashing separators for neighborhood use, and the increasing number of silos, a farmer should carefully consider his present and prospective power requirements for these uses as well as, the power needed for plowing.

The adaptability of tractors of various sizes is well indicated by the following figures showing the size of tractor used by 127 Minnesota farmers.

TABLE VI. SIZE OF TRACTOR USED BY 127 MINNESOTA FARMERS

| Size of plow | Number of farms | Average size of farm after purchasing tractor |
|---|---|---|
| | | Acres |
| Two-bottom | 30 | 266 |
| Three-bottom | 87 | 313 |
| Four-bottom | 10 | 354 |

From Table VI it will be seen that more than two thirds of the tractor owners reporting are using three-bottom machines. Added weight is given to the figures by the following quotation taken from United States Farmers' Bulletin 963, giving the experience of tractor users in Illinois.

"Even on farms of comparatively small size the 3-plow tractor is recommended by the largest percentage of owners. This, taken with the other facts seems to indicate that the 2-plow tractor does not increase sufficiently the amount of work which one man can do, hence does not possess, except to a slight degree, the greatest advantage of tractors in general, namely, timeliness

in performing farm operations through much more rapid work than is possible with horses. Moreover, a 2-plow tractor does not ordinarily develop enough power to make it suitable for operating grain separators, ensilage cutters, etc."[2]

## WHAT DOES IT COST TO RUN A TRACTOR?

Two hundred Minnesota farmers using tractors submitted figures on the cost of operating tractors. These figures have been tabulated with a view to determining the cost of operation per hour. The work done includes plowing, custom work, road work, and belt work.

The following table shows the cost per hour for four sizes of machines running an average of 500 hours per year.

TABLE VII. COST PER HOUR OF OPERATING TRACTOR*

| Size of tractor | Cost of tractor | Cost per hour | | | | | | Acres plowed per hour | Cost of plowing per acre |
|---|---|---|---|---|---|---|---|---|---|
| | | Dep. | Labor | Fuel and oil | Interest | Repairs | Total | | |
| Two-plow ..... | $ 900 | $0.22 | $0.35 | $0.25 | $0.06 | $0.06 | $0.94 | 0.6 | $1.58 |
| Three-plow ..... | 1,450 | 0.36 | 0.35 | 0.33 | 0.10 | 0.10 | 1.24 | 0.8 | 1.55 |
| Four-plow ..... | 1,950 | 0.49 | 0.35 | 0.40 | 0.14 | 0.14 | 1.52 | 1.0 | 1.52 |
| Six-plow ..... | 2,600 | 0.65 | 0.60 | 0.52 | 0.18 | 0.18 | 2.13 | 1.3 | 1.63 |

* This does not include depreciation, interest, and repairs on plows or other machines operated by the tractor.

Table VII is based on an average life of 8 years for the tractor, and 50 ten-hour days, or 500 hours per year. Kerosene is charged at 11 cents per gallon and oil at 45 cents per gallon. The figures do not include any charge for interest, depreciation, and repairs on the plow. This is estimated to be about 10 cents per hour or 12 cents per acre for a 3-bottom plow.

The above items were obtained in the following manner: Depreciation was found by dividing the cost of the machine by the total number of hours the machine was estimated to last. These men estimated the tractor would last from five to fifteen years. The average of these estimates was eight years. The average use per year was 50 days. Estimating ten hours as an average day's work, will make 500 hours per year or 4,000 hours in eight years. Assuming the average cost of a 3-plow machine as $1,450, which is the average of the figures given by Minnesota users, the depreciation charge per hour of use will be:

$1,450 ÷ 4,000 = $0.36, depreciation per hour for a three-plow tractor.

Thirty-five cents per hour was the price set as a fair labor charge for two-, three-, and four-bottom plows. To operate the six-bottom plow machine, two men are reuired. This makes the labor cost 60 cents per hour if 25 cents per hour is allowed for the second man.

An average of 2¾ gallons of kerosene and ¼ gallon of oil were required to plow an acre with a tractor. As the average rate of plowing with a three-plow tractor is about 0.8 acres per hour, the cost of fuel and oil per hour are:

[2] Yerkes, A. P., and Church, L. M. Tractor experience in Illinois. U. S. Dept. of Agr. Farmers' Bull. 963, p. 8. 1918.

| | |
|---|---|
| 2¾ gallons kerosene at 11 cents | $0.30 |
| ¼ gallon oil at 45 cents | 0.11 |
| Total cost of fuel and oil for plowing 1 acre | $0.41 |
| Acres plowed per hour | 0.8 |
| Cost of fuel and oil for plowing 1 hour | $0.33 |

The repairs per year as given by these men came to 3½ per cent of the original cost. This makes $50.75 per year, or 10 cents per hour.

Interest was charged at 7 per cent of the average value of the machine. Naturally the amount of the interest charge would decrease each year because of the decrease in the value of the machine. With an initial investment of $1,450 and an average life of eight years, the average investment would be $725. Interest on this sum at seven per cent would be $50.75 per year.

With an average of 500 running hours per year, the interest charge would be 10 cents per hour.

The items of cost per hour for a tractor capable of pulling three 14-inch bottoms and running 500 hours per year are:

| | |
|---|---|
| Depreciation | $0.36 |
| Labor | 0.35 |
| Fuel and oil | 0.33 |
| Interest | 0.10 |
| Repairs | 0.10 |
| Total cost per hour | $1.24 |

For those who run less than 500 hours per year the interest charge per hour would be more, while for those who run more than 500 hours per year the interest charge per hour would be less, consequently the more work secured per year from a tractor the less the cost per hour will be.

These costs are based on the use of kerosene for fuel, as 85 per cent of the farmers reporting were using kerosene engines. Gasoline would cost more per hour. However, many men prefer to use gasoline as there is less trouble from carbon gathering in the cylinders and on the spark plugs, and little unburned fuel works by the piston rings to dilute the oil and interfere with the lubrication.

Table VIII shows both the hourly cost and the acre cost of plowing according to the amount of use obtained from the engine during the year. Four sizes of tractors are included.

The figures in Table VIII represent average costs under 1917 conditions. It is suggested that each tractor owner revise them to fit his own conditions by computing his costs in the manner used in the table. Those who are interested in keeping records of the cost of operating their tractors may obtain forms from the county agent or the Agricultural Extension Division, University Farm, St. Paul.

In Table VIII the depreciation has been fixed at a certain cost per hour based upon the assumption that the average life of tractors is 4,000 hours of use. This method is satisfactory when the machine has good care and has sufficient use each year that the machine will be worn out before it becomes out of date or before it becomes impossible to secure repair parts. With tractors as with other farm machinery, frequently a large part of the wear

TABLE VIII. COST OF PLOWING PER HOUR AND PER ACRE*

| Hours of use per year..... | ..... | 250 | 500 | 750 |
|---|---|---|---|---|
| Two-plow..... | Acres plowed per hour..... | 0.6 | 0.6 | 0.6 |
| | Cost per hour..... | $1.01 | $0.95 | $0.93 |
| | Cost per acre..... | $1.68 | $1.58 | $1.55 |
| Three-plow..... | Acres plowed per hour..... | 0.8 | 0.8 | 0.8 |
| | Cost per hour..... | $1.37 | $1.26 | $1.23 |
| | Cost per acre..... | $1.71 | $1.57 | $1.53 |
| Four-plow..... | Acres plowed per hour..... | 1.0 | 1.0 | 1.0 |
| | Cost per hour..... | $1.65 | $1.52 | $1.47 |
| | Cost per acre..... | $1.65 | $1.52 | $1.47 |
| Six-plow..... | Acres plowed per hour..... | 1.3 | 1.3 | 1.3 |
| | Cost per hour..... | $2.32 | $2.13 | $2.07 |
| | Cost per acre..... | $1.78 | $1.64 | $1.60 |

* Based upon an average life of 4,000 hours of actual use and sufficient use per year that the machine will be worn out before it must be discarded because of inability to get repairs or because it is hopelessly out of date.

is a result of rusting of metal parts from exposure to the weather while idle. On the other hand, a machine that receives good care and but a few days' use each year is likely to become hopelessly out-of-date or eventually to be discarded because of inability to get repairs. Depreciation because of inability to obtain repairs is likely to be particularly heavy with machines manufactured by companies that are newly organized or are lacking in capital.

## WHAT DO NEIGHBORING TRACTOR OWNERS THINK?

A farmer who contemplates purchasing a tractor can well afford to spend some time visiting the farmers in the neighborhood who have had several years' success with a tractor and who are known to possess good mechanical ability. (1) They can tell him much about which are the successful tractors under the local conditions. (2) They can point out many bad features to avoid and good features to look for in a tractor. (3) They can give advice in regard to the proper size for his farm. It is perhaps unnecessary to add that the advice of men who are not agents for a tractor is the most valuable.

A farmer will generally find it best to purchase a make that has proved successful in the community, because he is then quite sure to get a machine that will be successful under his conditions, and the new operator can secure a great deal of help in locating troubles as well as suggestions for successful operation from neighbors who have had experience with that particular make. Besides, if there are several machines of the same make in a community, repairs can be more easily obtained, as a larger supply of accessories will be carried by the local dealer.

## HOW CAN I LEARN TO RUN A TRACTOR?

There are several ways of learning the operation of a tractor. (1) A great deal can be learned by constantly consulting with successful tractor men in your community on the operation of your machine. (2) Every company sends with each machine a book of instructions that are quite complete. These books should be studied right from the time you begin the operation of the new tractor. Every time you make an adjustment or something goes wrong, consult

this book of instructions. General books on tractor operation are a great aid but will not be so valuable as a book of instructions dealing directly with your particular make. (3) Considerable instruction is now being given through schools conducted by the companies and through the agricultural schools. These schools all include considerable practical work with tractors. The courses vary in length from one week to three months. (4) By far the best single method is to work in the field with an experienced operator. However, enough time must be taken to enable one to become thoroly familiar with the principles of a gas tractor. A combination of these methods, especially the last two, is an excellent plan. Any time or expense involved in studying the operation of a tractor will be amply returned in the saving of time and repairs.

## WHAT CARE SHOULD I TAKE IN STARTING A NEW TRACTOR?

When the new machine is started it should be loaded lightly and frequently stopped and inspected to see if the oiling and cooling systems are working properly; whether there are any bearings running hot, nuts working loose, or leaking water and gasoline connections. Too much care can not be used the first two or three days, as carelessness at this time may cause damage that will be highly expensive and cause considerable delay.

A new tractor usually has more or less dirt in the fuel tanks which soon finds its way to the carburetor and interferes with the flow of fuel, often clogging the pipes. The remedy is to clean the pipes.

In spite of the care in assembling and collecting, small metal particles are frequently left in the crank case. These will either be splashed around with the oil and work into the cylinder or will clog the oil screen at the inlet to the oil pump. This makes it advisable to remove all old oil from the engine after it has been run a few hours in order to get rid of these metal particles.

## HOW SHOULD I CARE FOR THE TRACTOR?

The life and daily service of a tractor are largely dependent on the care which the machine receives both while in service and out. A tractor can not be operated by boys and inexperienced men with any degree of success. The successful use of a tractor depends more upon the operator than upon the machine. Too much stress can not be placed upon a thoro understanding of the principles of a gasoline or kerosene engine, such as carburetion, ignition, and transmission.

Learn to know every part of your tractor, its purpose and the attention it should be given, by studying the machine with the aid of the instruction book sent out by the company, and by persistently asking questions.

When an engine is delivered, it is supposed to be in running order. A good operator will make it his first rainy-day job to make note of the valves as to timing and adjustments, the width of the gap between the points of spark plugs, the opening of the breaker points, and carburetor adjustments. Then when by accident, necessity for repairs, or as a result of meddling, these parts are put out of adjustment, causing the engine to miss or otherwise run improperly, they can be correctly adjusted. A tractor operator should train himself to tell the condition of his machine by the sound. The ear can be trained much more rapidly than one would believe at first thought, and can become a very sensitive and accurate indicator of the condition of the machine. Missing cylinders, riding valves, leaking manifolds, dry gearing, incorrect timing, and

other incorrect adjustments or failure of automatic devices may be first detected by the ear.

In most engines, when burning kerosene there will be more or less unburned fuel which will work by the piston rings down into the crank case, diluting the oil there. Some engines are worse than others in this respect. A good operator will change the oil in a kerosene engine twice a week. The bearings will last longer and the compression will be better for so doing. More oil will be used but less fuel and fewer repairs will be necessary.

Overloading is the most common abuse of the tractor. Demonstrators and salesmen do it to make a good showing, and the purchaser desires to show himself as effective an operator as the demonstrator, believing the tractor should do what it did on exhibition. The tractor will do more work per season if loaded reasonably, for by so doing the delays and repairs will be reduced to a minimum. If the machine operates smoothly and powerfully, it should not be changed and tampered with in an effort to make it do more. "Tinkeritis" is a sad malady for a tractor operator. There is a wide difference between inspecting and tinkering. Work overtime in inspecting the machine and indulge sparingly in tinkering.