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TRACTOR is rated as an 8-16, meaning that it has a drawbar pull of 8 horse-The main difference power. between the eight horses and the tractor is that 'the horses can exert a pull of eight horsepower for 10 hours and more for short periods as when they come to a tough spot in plowing or a grade on the road, while the tractor can develop 8 horsepower for 24 hours a day and 6 days a week but has very little reserve for the tough spots and the grades. They are rated very close to their capacity. Steam engines used to be underrated and consequently

## THE CANADIAN THRESHERMAN AND FARMER

Draw Bar Horsepower-What It Means

By J. MACGREGOR SMITH, Saskatchewan University

a dynamometer (a strong spring balance), see Figure 8, which shows one type. You may see this device in use at some demonstration and we want you to go right up and read the pull and by finding the speed, at which the engine is travelling, you can immediately determine the drawbar horsepower. On the other hand if a salesman comes to you

BRAKE FOR TESTING TO COM TO

were seldom lacking in power. A tractor must be used reasonably and not solely with the idea of sticking it, as many operators try to do. Overloading means a short lived machine. Remember that fact. If an engine is guaranteed to pull a two furrow plow, don't put on a third plow if it means working the engine very hard all the time. With the two it will have enough reserve for the tough places. An engine is rated as a 15-30 H.P., meaning it has 15 horsepower at the drawbar and 30 horsepower at the belt pulley. If the tractor had only a 15 horsepower motor and it required 15 horsepower to move the machine along the ground you can readily see that none will be available at the drawbar for plowing or other work.

To tell how many horsepower an engine is developing we must know the number of pounds it is pulling and the speed at which it is travelling in feet per minute. The number of plows tells us very little. We have seen a 30 horsepower tractor pulling 8 plows and within a short distance the same size of an engine could only pull 4 plows. The difference was mostly due to the soil, which in the first case was light and in the secting and condition of the plows has also something to do with it.

The pull is tested by means of

and says: "I will guarantee my tractor to pull 2000 pounds at a speed of 234 miles per hour," you can now readily figure out the drawbar horsepower. The distance in feet per minute will equal:

5280×11 \_\_\_\_\_242

 $60 \times 4$  then

2000 lbs.  $\times$  242 (ft. per minute)

=14 2/3 H. P. 33.000 (one h. p.)

or another tractor is guaranteed to pull 1800 pounds at 2<sup>4</sup> miles per hour. What drawbar horsepower is developed?

We will work this problem in one step instead of two: 1800 the  $\times$  5.280

1800 lbs.  $\times$  5,280 (ft. in a mile)  $\times$  11

(miles per hour)

 $33,000 (1 \text{ h.p.}) \times 60$ (mi, in one hour)



It is practically impossible to tell how many plows a tractor can pull, but any reliable manufacturer will guarantee a definite drawbar pull at a certain speed, and what more can you ask? Nothng. But it is up to you to understand the relationship between the pull, the speed, and the rated horsepower of the tractor and the work which you may expect it to do. It may be working in light of sandy soil or heavy clay. It may be in a level country or a hilly country. All factors must be considered.

For example, let us suppose we have an engine rated at 30 H. P. at the drawbar, we want to know how many plows it could pull at 'two miles per hour? We will assume each plow takes 750 pounds of a pull. Since 1 horsepower equals 33,000 foot pounds of work per minute, 25 horsepower must equal 33,000×25 or 825,000 foot pounds of work per minute available at the drawbar. Now 2 miles per hour equals 176 feet per minute, so that each plow will require 750×176=132,000 foot pounds of work per minute. So if we divide 132,000 into 825,-000 our answer will be the approximate number of plows, which in this case is 6. This is not a panacea for all ploy and tractor troubles but it very clearly shows what factors decide how many plows an engine can pull. The kind of soil and speed each enter into the final result.

We also show a cut of a small dynamometer, see Figure 7, suitable for horse-drawn implements such as plows, etc. We have found in summerfallowing good loam soil with a 14 inch gang plow, plowing 8 inches deep, that a pull of 1000 to 1100 pounds was exerted. Five large horses were used which means a pull of 200 pounds per horse, about 1/8 of can readily see that the term-HORSEPOWER-is a very practical one.

How can these things be demonstrated in the most practical way? The best opportunity at present is to make them a feature of a plowing match or an agricultural fair in your county. A dynamometer will show exactly what pull is required by any plow at any depth. This is worth knowing. If a man was 'thinking of buying a tractor and he knew how much was required to pull a plow in his vicinity, it would hlp him to choose the proper plow for a tractor of a known drawbar horsepower. In connection with the plowing match one or more tractors might be demonstrated and the drawbar pull of each ascertained. It offers a splendid field for the right kind of man to demonstrate something of real value to the farmer, who should know how much power is required to pull his different implements. It will help in the arrangement of his farm work. It will also decide many problems that are now engaging the attention of practical men.

## That Settled It

Some years ago, Dr. Jas. B. Angell, at that time president of Michigan University, while traveling through a prosperous farming community in western Ohio, was attracted by a square brick building set solidly on a hilltop and surmounted by an aggressive cupola.

Drawing rein at a neighboring farm house, he inquired what the building might be.

"That there building," drowled



its weight. Let us suppose that they travelled 2 miles per hour then:---

1000 (lbs.) × 176 (ft. per minute)

\_\_\_\_\_5 1/3 H. P. sity!"

## 33,000 (ft. pounds per min. in 1 h.p.)

The problem is the same with

either tractor or horse and you

the farmer, "is Highgate University."

"Impossible !" exclaimed Doctor Angell. "You must be mistaken; that surely cannot be a university !"

"Yes, it can," asserted the Buckeye calmly. "I know it is, because I am one of its alma maters."