to work on the farm. I do not know whether there was any more production on my account, but I feel that I did a little toward helping to win the war."

"It is a shame for any one to shirk work when our poor, crippled soldiers need help," is the final sentence in another letter.

"I help to milk sixteen cows," says Arthur, "four or five being my share. I see lots of the boys wearing their farm service badge to school. I am only twelve, but felt that I was doing a patriotic service in helping father this summer." So he was.

"The school fair has made me long to be an up-to-date farmer in every way. I expect to be a farmer as my life occupation. I had a garden of my own, 20 by 30 feet, and grew enough of vegetables to last us all summer. I worked hard to keep it in shape."

"Between us we got the crop off the 200 acres, and it was a bumper one. But surely we need it with this terrible war raging. Boys on the farms around here are doing their bit for their country and the boys at the front. They are not giving their lives, but they are giving their strength in harvesting the crops. I have just turned eighteen and like farming very much."

"I am willing to go to the front if I can't work on the farm. I work till dark every night. I will be proud to receive recognition for the bit I am doing for my country."

"I took a man's place on the farm, thinking I was doing a patriotic service. My boss had no other help but me, and between us we handled a hundred acres. I am going back to school now. I am hardly old enough to enlist or else I would do it."

So the interesting human documents run, revealing the mind and purpose of these sons of the Dominion who will make or mar the Canada to be. Reference has been made to the Soldiers of the Soil. It is the alliterative title of a movement of co-operation by the Y. M. C. A., the various Sunday School associations and five of the protestant denominations, to encourage the boyhood of Canada to assist in farm production, and already responses have come from every province. The S. O. S. initials stand for the wireless call, and S. O. S. directors have been appointed in local churches and communities to further act co-operatively. In Guelph these agencies worked so effectually that two hundred boys and girls engaged in work on gardens, vacant lots and farms, with crop results in the city alone estimated at a value of $25,000.

It is worth while giving a paragraph in conclusion to the interesting and wise experiment of a country minister, Rev. W. L. Davidson, of Burgessville, who gathered a bunch of forty farm boys in his locality, secured the loan of a dozen motor cars and took the crowd on a personally-conducted trip to Niagara Falls, visiting historic spots on the way as a reward for their summer toil. Wise preacher, lucky boys!

Is there not a solution of "the rural problem" suggested here?

Automobiles, Farm Machinery and Farm Motors.

Horse-Power of Motor.

Please give us the following information regarding, first, the horse-power developed on the belt from a motor truck wheel (h.-p. of motor being 22.5 A. L. A. M., 3¾-inch bore, 5-inch stroke) geared up as follows: diameter of truck wheel 35 inches; speed of truck wheel, 100 revolutions per minute; diameter of keyed driven pulley B, 10 inches; diameter of keyed driver pulley C, 20 inches; diameter of driven pulley D on machine, 8 inches. The pulleys B and C are to be keyed to shaft A.

Second, please give the rule for figuring out the h.-p. developed at pulley D when diameters of E, B, C and D are any size one wishes to use.

J. S. E.

Horse-power of Motor.

1 and 2. J. S. E. is under a misapprehension. The way in which the engine is connected up has nothing whatever to do with the horse-power at the pulley D, except that a small amount of power is lost in friction at the jack-shaft bearings. If the motor rating of 22.5 h.-p. is correct the power developed at pulley D on the machine under full load will be 22.5 h.-p. less the friction on the jackshaft, which might amount to ½ h.-p. or possibly more.

Perhaps a few words regarding horse-power may help. Years ago when steam engines began to be used it was necessary to have some means of comparing their power with that of horses. As a basis of calculation measurements were made of the work that was done by large horses, these were averaged, and then in order to make sure that the engines would do as much work as their rating called for a liberal addition was made to the average mentioned above, and it was decided that one horse-power should mean the power that would raise 1 pound 500 feet high in 1 second, or, in other words, do 500 foot-pounds of work in 1 second or 33,000 foot-pounds in 1 minute. Now, suppose that J. S. E. in driving his truck up a hill has used high gear until his engine speed has dropped to 300 r.p.m. and he realizes that he is going to stall the engine if he continues, he then drops into intermediate or low gear and keeps the engine going at 300 r.p.m. as before and the truck goes up the hill quite easily. Why? Is it because his engine is turning out more power than before? No, it is because the car only goes about one-third or one-half as fast on this gear as on high, and he can keep the engine at 300 r.p.m. on less gasoline than when on high, so that he is actually using less power, that is, he is doing work at a slower rate than when on high.

Now, coming back to J. S. E.'s query. His machine bearing the pulley D is manufactured to be run at a given speed, and his motor engine for best results should run at a given speed, and the only advantage of introducing pulleys B and C between the engine and the machine is to obtain a speed suitable for the machine. The fewer pulleys he uses between the truck wheel and D the less friction there will be and the more power he will have left for his machine.

I surmise that what J. S. E. really wants is the rule for calculating the speed of D. Let E = diameter of truck wheel, B = diameter of pulley B, C = diameter of pulley C, D = diameter of pulley D, R = r. p. m. of truck wheel. Then each revolution of E will produce E ÷ B revolutions of B. Therefore, E ÷ B x R = r. p. m. of B and also of C, since both are keyed solidly to the same shaft. Similarly C ÷ D x E ÷ B x R = r. p. m. of D.

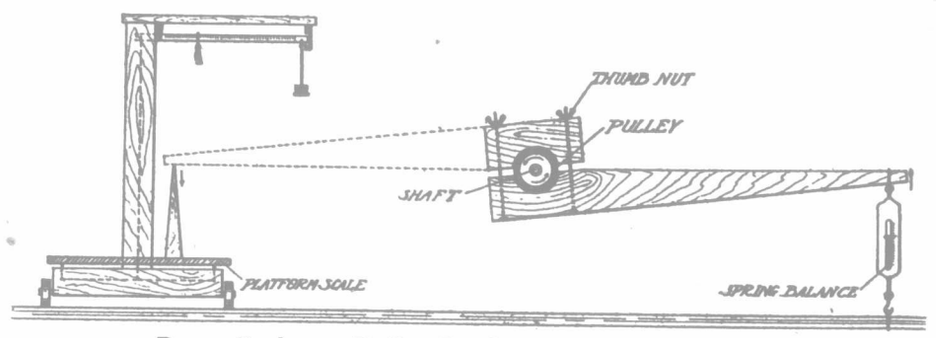
In other words for each pair of pulleys obtain the ratio between the diameters of the driver and the driven, multiply these ratios together and this in turn by the r. p. m. of the original driver and we obtain the speed of the final driven pulley.

Or it may be that what J. S. E. wants is the rule for calculating the horse-power of an engine. There are many of them. The rule adopted by the American Licensed Automobile Manufacturers' (A. L. A. M.) Association for use by its members is as follows: Square the diameter of the piston, multiply by the number of cylinders and divide by 2½. This gives the A. L. A. M. rating. The rule is based on the supposition that each cylinder has 1,000 feet of piston travel per minute. That's the reason that it omits the r. p. m. It is a poor rule. If the piston travel is materially less or greater than this the rule is not approximately accurate. For such cases the following rule is much used: Square the diameter, multiply by the length of stroke, then by the r. p. m., and then again by the number of cylinders and then divide by 19,000. Some, however, divide by 15,000, and the whole matter of rating by rule is in a very unsatisfactory state.

Or perhaps J. S. E. wants to know how to determine the horse-power by the brake test. It is done as follows: Make a prony brake as shown in the drawing. It consists of two pieces of wood shaped as shown and provided with two thumb bolts having thumb nuts, by which the brake may be given any desired pressure on the face of the pulley. The faces that bear on the pulley should be greased with heavy grease. The drawing shows the brake on the pulley, and ready for a test. The apparatus should be so adjusted that at full load the spring balance is at right angles to the top of the lever, which points straight to the centre of the pulley. The test and calculations are made as follows:

1. Run the engine with the brake tight enough to produce a full load for the engine.

2. Note the number of pounds shown on the balance. Let this be W. If a good strong spring balance is not available an ordinary pair of platform scales may be substituted, and the lever made to press down on the platform as shown by dotted position of lever. Care should be taken that the pressure on the scales is perpendicular.



Prony Brake on Pulley Ready to Test Horse Power.

3. Measure the distance in feet from the point of contact with the scales to the centre of the pulley. Let this be L feet.

4. Find the r. p. m. of the pulley. Let this be N.

5. B. h. p. of engine = W x L x N ÷ 5250.

Or, in other words, to find the h.-p. multiply the weight in pounds by the length of the brake lever in feet by the r. p. m. and divide by 5,250.

It is customary to make the lever exactly 5 feet 3 inches from scales to centre of pulley, and then b. h.-p. = W x N ÷ 1,000.

W. H. DAY.

The Gasoline Situation.

We were sitting in a country hotel in Northern Ontario a few days ago, when a conversation was opened up by some local residents and encouraged by a number of commercial travellers. One man made a statement to the effect that the supply of gasoline for the use of all internal combustion engines, including farm tractors, would be cut off in the very near future. Another gentleman maintained that the gasoline supply could not possibly be exhausted in one hundred years. There were a number of very interesting comments, but we quote these two men because their opinions indicated two extremes. Some people believe that gasoline must be curtailed on the North American Continent because England found it necessary to enact drastic measures. But these well-intentioned folks do not realize that Great Britain does not produce a quart of gasoline, and must of necessity import her entire requirements. The United States, on the other hand, manufactures a tremendous amount of gasoline, and Canada herself turns out a certain limited supply. Taking both these countries together, we find that they do not use all that they produce, but instead have vast quantities for export.

At the present time the United States has a committee in control of the oil and gasoline supplies, and it is interesting to note that this board has been informed by great oil operators and capitalists that there is not only no danger of famine, but, on the other hand, enough lubricant and fuel in sight above ground to carry North America along until 1923. This information is so authoritative that no one in any station of life can question it, but the very men who make it plain that there is no danger also emphasize the fact that the waste of oil as well as gasoline should not be encouraged. An educational campaign is on at the present time to train all those in any way associated with the consumption of these products so that their efforts may result in great economies. Many uninformed people believe that automobiles consume the larger part of the gasoline output, but as a matter of fact they only take about half, and all those machines, the larger number of which are in agricultural districts, are very essential to the life of the people. While all the evidence points to a continued generous supply of materials for lubrication and for fuel, and while it is true that the government is apparently not contemplating any drastic action in connection with automobiles, many local movements are on foot to show owners and drivers just how they can secure the most mileage from their supplies. So much for the conference in the country hotel. We did not take part in the conversation, but we trust we have thrown some new light upon it.

It was upon our return from this trip to the north that we had another experience from which can be taken an excellent object lesson. A man who had been attending a meeting came to us and in a note of alarm stated that his car had been stolen. We drove him to the local police station and there received a clue to the missing vehicle. When the machine was finally located, it was somewhat dismantled. Apparently the thieves had taken it for the purpose of restocking another car, which they were hurriedly getting away with. Our owner found his auto minus gasoline, rugs, tools, etc., and his loss must have been not less than forty or fifty dollars. When the incident closed we asked him why he did not lock his car, and he replied that he had done so for a long time but that people were constantly laughing at him for taking such a precaution. He will lock it in future, however, and we would suggest to you that if your machine is not equipped with some locking device that you immediately purchase one. It does not matter how you tie up the machine as long as you give to the person who intends to steal it a sufficient impediment to make the delay dangerous. Thieves like to get away quickly and quietly. The locking device is their pet aversion.

AUTO.

Power Required to Plow.

A wrong idea prevails in the minds of a great many who are interested in tractors as to the drawbar pull of these machines. Now the tractor manufacturer finds by means of a dynamometer, which is nothing more than a spring scale of large capacity, the number of pounds his tractor will pull at the drawbar under normal conditions. This amount expressed in terms of mechanical horse power establishes the drawbar rating of his tractor.

Bearing the point in mind that a tractor can pull a certain number of pounds at the drawbar, one can understand from the varying soil conditions found on different farms that the number of plows a tractor will pull varies with the kind of soil. By tests it has been found that the draft per square inch of furrow cross section varies in different soils as follows:

In sandy soil	2 to 3 lbs. per sq. inch
In corn stubble	3 " " " "
In wheat stubble	4 " " " "
In blue grass sod	6 " " " "
In clover sod	7 " " " "
In clay soil	8 " " " "
In prairie soil	15 " " " "
In gumbo soil	20 " " " "

From the above table it can be readily seen how