ing in. When the width getts narrower than an ordinary spade can work in, a curved spade or graft may be used, in which case the digging is not necessarily done on a straight dig, but taken alternately from side to side.

In place of a regular curve, the graft may have an angle face—that is, have straight sides to the middle of the blade—but the sides set at a slight angle, so that the earth does not readily fall from it when lifted. So long as a short-handled scouring shovel can be conveniently used to clear the loose soil, it may be used, but when this is not so, a long-handled shovel or scoop may be used. However, a long-handled shovel cannot be used readily below a certain depth, and a hoeing scoop is handier. In deep drains, a broad but tapering graft should be used where the ordinary graft works readily, and the bottom spit can be taken out with a narrow bottom graft. The bottom grafts require to be strongly made, as they have to take the strain of prising out spits which offer considerable resistance

SCOOPING.

Where land is rocky, or there are many stones, digging cannot progress so freely; even if the stones are small, the spade meets hindrances, but where they are large, or there is rock, the pick-axe and crowbar have to be used. A long-handled hook, with two prongs, is often convenient for hooking out stones or boulders which cannot be conveniently lifted out with a scoop. For ordinary purposes of cleaning the bed to receive the pipes, nothing is so good as the scoop. The pipes are best laid by the aid of a laying hook, which is merely a thin iron rod inserted in a long handle at rather less than a right angle; the pipes are caught up on this and laid directly into place, with little fear of breaking, and without disturbing the bed.

PIPE-LAYING.

The object of a drain is to provide an underground channel for water; and it is not sufficient to assume that, because water will find its own level it is not of consequence to lay the pipes truly, as there are risks of settlement of grit that may work into the pipes; and this, in time of drouth, becomes hard, and closes up so much of the passage. The pipes require to be laid with greatest care.

STONE AND PEAT DRAINS.

So much land has been drained by pipes in the past half-century that one is inclined to forget that there are places where other material can be more profitably employed. Stones may be convenient on hill land, where the cost of taking pipes would be very heavy, apart from the cost of the pipes, in which case it may be economical to use stones. In draining bog land, it is useless to put in pipes whilst the bog quakes, as the pipes would not remain in order for any length of time; in fact, very often they cannot be laid level. In such cases, as much water as can be run off by open drains should be carried off in this manner, and shoulder or sod drains be used to drain off the lower water. When a bog has quite settled, pipes may be used.

Gasoline Engine Inquiries.

Editor "The Farmer's Advocate":

1. Some agents claim that their engines have power specified according to the American rating, and that they will develop considerably more horse-power of Canadian rating. What is the difference between the two, and how can we tell if their claims are correct?

2. What are the special objections to air-cooled engines? Some say they use up batteries faster, and are more expensive to keep up generally. Is this so, and why?

3. Some engines are equipped with a gasoline pump, some draw the fluid direct from the tank located just under the cylinder; the latter are much cheaper. Of what advantage is the pump, and is it worth the extra price?

4. Supposing that 2 h.-p. is the most ever required, what power of engine would be most economical to buy, a 2½ h.-p., a 3 h.-p., or a 4 h.-p.?

5. Will a 2 h.-p. develop its full rating on the same amount of gasoline per h.-p. as will a 4 horse-power?

6. Will a high-speeded engine use up its batteries much faster than a low-speeded one?

7. Is a magneto sparker any more economical than the batteries usually furnished? H.

Ans.—1. Properly speaking, there is no "American" rating, and no "Canadian" rating. The companies in the United States vary greatly in rating their engines, and similarly there is a large variation in the rating of Canadian engines. In both countries there are engines which just test up to the power at which they are rated, and others which have surpluses of 10, 15, 20 and some 25 per cent. of power, hence you will see how incorrect it is to speak of "Canadian" or "American" rating.

The only way to tell accurately whether the engine will develop the power it is said to do is to use the "brake" test. This farmers are in no position to do, as they haven't the necessary apparatus, so that the only way in which you can tell anything about the power developed is to use the engine on heavy loads. This, of course, will not help you in selecting an engine.

2. The chief objection to "air-cooled" engines is prejudice. For small engines, air-cooling is really nicer than water-cooling. For large engines, the air-cooling is not sufficient. The air-cooled engine is simpler than the water-cooled, and, therefore, should not be so hard to "keep up" as water-cooled.

3. The pump is of no advantage provided the gasoline tank can be located close to the engine; in fact, some of the best makers of engines state that the suction method is better. There is one case where the pump is indispensable. The Fire Underwriters' regulations state that the gasoline tank must be outside the building thirty feet distant; and, as suction will not draw gasoline this distance, the pump is necessary.

4. The point of maximum efficiency in nearly all engines is when running about 75 to 80 per cent. of their full load; therefore, if two horse-power is the most ever required, then a two-and-a-half horse-power engine is the proper engine to buy.

5. It takes a little more gasoline to develop one horse-power with a big engine than with a small one, because there is so much extra weight of machinery to move. The difference would only be slight as between two and four horse-power engines; but if you undertake to develop one horse-power on a ten horse-power engine, the difference would be very marked.

6. The high-speed engine uses up its batteries faster than the low-speed one. There is some difference of opinion as to the reason of this. One is disposed to say off-hand that, as there are more contacts in the same time with the high-speed engine, it will use its batteries faster; but the contacts are of shorter duration. Suppose the engine runs 1,000 revolutions per minute, and that there is a contact during one-tenth of each revolution, then the current is being drawn from the batteries during one-tenth of each minute. Let us take another engine with the same kind of contact, running only 100 revolutions per minute. Since the contact occupies one-tenth of each revolution, the current is drawn from the batteries during one-tenth of each minute, as before; so that, although there are more contacts per minute in the one case than in the other, yet the time during which current is drawn from the batteries is the same in the two cases. Then, why should the high speed engine use up its battery the faster? In each case the battery has nine-tenths of a minute to recuperate. In the one case this period of recuperating is divided up into 900 shorter periods; in the other it is divided into 90 periods. In all probability the battery will recuperate more where the periods of recuperation are longer, and this may explain why the battery on the low speed engine lasts the longer.

But there is another cause: When contact is made, it takes the current an appreciable time to rise to full strength, just as it takes a team or an engine some time to get its load moving at full speed. And the weaker the batteries, the longer it takes. Now, on a high-speed engine, when the batteries are becoming weak, the contact ceases before the current has reached full strength. Hence, it follows that the battery that has ceased to fire a high-speed engine regularly, would do for some time on a slow speed. This is frequently seen on any engine with weak batteries—the firing is quite regular while the engine runs slowly, but as soon as speeded up, explosions are missed at regular intervals.

7. Theoretically, the magneto sparker should be more economical, and this is true with high-tension magnetos costing somewhere in the neighborhood of $50; but, with low-priced magnetos, experience shows that there is not much difference in price of upkeep between batteries and magneto, unless the batteries get wet; then the magneto would be the more economical. WM. H. DAY.

Modern Haying in Bruce.

Editor "The Farmer's Advocate":

This subject is appropriate to the season, for in another week the mower will be levelling the heavy crop of early grasses and clover, whose value depends very much upon the condition in which it is saved. To do this properly, an understanding of when to cut and how to cure it is required.

A very great change in the system of curing hay has been adopted in the last few years, partly on account of the absence of stumps, and partly by a new way, through the use of machinery. The matter of cutting requires the least knowledge, although great mistakes may be made in neglecting the proper time.

Orchard grass should be cut when very succulent. Do not let it become woody. The same may be said of timothey, and, in fact, of all the clovers, and here comes the difficulty with mixed grasses; they are seldom ready together. A common mixture here is timothy and red clover. These can never be timed together; one will be too green, and the other too ripe. In this case I would advise cutting when clover is ready, unless much the great part was timothy, when a few days might be allowed in favor of the timothy.

Having decided when to cut, curing follows. This, then, is a very important part, and we shall confine the subject to clovers. I would not advise cutting if there were signs of rain, for it is so much more difficult to dry when soaking wet in the swath. Cut clover when dry, and have the tedder follow soon after, to loosen the swath (which is more or less compacted), when drying begins at once. A second going over with the tedder may be advisable, followed, when sufficiently dry, by the side-rake, leaving it in windrows ready for loading with the hay loader.

The introduction of the tedder, side-rake and loader has lessened the necessity of cocking up and turning over so often, as was done formerly, and apparently the hay is made just as well, with much less labor.

In curing alfalfa, great care must be exercised to handle it as little as possible when dry, as there is such a tendency for the leaves to break off, thus losing much of the best of the hay. Better to ted and rake in the morning or evening, when the plant is toughened by the slight dampness so common evening and morning.

To sum up: Do not let the clover be too ripe before cutting, and, if the weather is reasonably dry, do not cut when wet, as the drying is quicker than otherwise; and do not ted or rake when the leaves are crispy dry, though the loader may work with little waste.

Apparently, the introduction of the tedder, the

Prince of Kelton (imp.) (11148) [2776].

Clydesdale stallion, recently sold by Henry M. Douglas, Stayner, Ont., to Parker & Stewart, Elliott's Corners, Ont.