

small, the large one is preferable; because it has more driving surface and has a long leverage from the axle tending to make the machine run much lighter. The greater durability of the steel wheel may also be considered from an economic standpoint.

The Reels:—These are run in different ways on the various machines. In some they are driven by bevel cog gears and in others by chain. The former works fairly well in nice even grain and on smooth ground, but on rough ground or in heavy and lodged crops it is not steady enough. The reel will stop (if it catches a bunch of grain) until the slack is taken up in the cogs and then it will jump forward very quickly, scattering the grain all over the table. The chain reel will run steady and smooth at all times, providing the chain is kept tight, because the chain does not wear slack like the cogs. The chain reel may also be preferred from an economic standpoint because it does not cut and wear like the cog gear.

We find two styles of butter being used on the binders of the present day, the canvas butter and the kicking butter. The canvas butter works very nicely in straight, even grain, but it does not last very long and works very poorly in down or tangled grain. The kicking butter will handle all kinds of grain and is very simple with very little about it to wear out rapidly and is therefore preferable. One essential feature of a butter no matter what kind, is, that it has a lever on it to move it back and forward to suit the length of the grain. This lever assists greatly in short grain where you can not move the knoter far enough forward to tie the sheaves in the centre. By moving the butter back the grain can be made to run into right position.

The elevator of a binder should be a little wider than the table. The canvas on the elevator reaching about 3½ inches farther forward than the table canvas. This is necessary to allow the butt of the straw plenty of room when it is dropped on the table. Some binders bother badly by dragging the grain at this point if the elevator is not constructed as I have outlined. To assist in delivering the grain from the elevator there should be an extra roller placed at the top of the under elevator to help in delivering the grain to the packers. The top elevator of all binders should be floating so that it can move up and down two or three inches when any large masses of grain run into it and thus prevent the elevator plugging. When the grain leaves the elevator it runs down the deck to the packers. The construction of the deck here plays an important part. Some people favor the steep deck so that the grain will run down more rapidly. But I think the moderately steep deck (say about 45° with the angle of the elevator) has the advantage providing it is made roomy as any deck should

be. On the steep deck the grain rushes down too quickly and if the grain is heavy and tangled it is likely to block the packers and needle and causes them to stick. On the other hand the moderately steep deck when equipped with three packers lets the grain down at just about the right rate to let the arm clear itself every time. After the grain has reached the deck it is the work of the packers to make it into sheaves. The efficiency with which they do this depends mostly upon the number present. In some machines two are used and in some three are used. The three packer machine is the most successful, it

sharp. If the bill hook is too slack or too tight the knoter will not work. When it is too slack it lets the twine slip out and when it is too tight it will break it. If the knife works loose it will flop around and not work right when it is thus out of position. The disc may get loose and let the twine slip or it may be too tight and break it. Both the disc and the bill hook are regulated by steel springs and should be closely attended to. A kernel of grain often gets under the tongue of the bill hook and holds it up. This should be looked for if the knoter is letting the twine slip out of the hook while the spring is still



The First Reaper—the Breaking of Dawn.

packs the grain down evenly from head to butt. While the two packer machine is inclined to pull it down head first if it is heavy and tangled and is thus more likely to clog the deck. The three packer machine is much to be preferred, other things being equal, and is now being placed on most all the machines.

We now come to the most important and most essential part of the binder, the knoter. This is of the same general construction in all machines, but on the different makes of binders it differs slightly. Some binders never give any trouble in tying, while others are very easy put out of order and some are, in fact, very hard to

tight. Too much twine tension should not be used on the twine, just enough to make the twine run even and steady. If careful attention is paid to all of the above items any half decent machine will tie.

In the preceding paragraphs I have dealt mainly with the importance of the binder by its introduction and performance. I am now going to show how its importance must increase with its improvement. The binder at the present time is a very successful and thorough machine but time must bring many little improvements which will greatly improve its performance. Of the many improvements that are like-



The Marsh Harvester—the End in Sight.

keep in order. If a binder is missing sheaves it takes a man who understands the mechanism to make it work properly. There are several small things that effect a binder's tying ability. They are small in themselves but they are the parts which exercise an all important influence. Poor twine is often the cause of missed sheaves; it may break or if the twine is full of coarse spots it is likely to stick solid in the needle. This should be watched very closely and poor twine discarded. A dull twine knife is another cause of missing sheaves; when it is so dull that it tears the twine, rather than cutting it; keep it

ly to effect the binder, there is one in particular which I think will effect the usefulness of the binder and assist the farmer more than any other. This is the grain shocker. Possibly some will say that the grain shocker is not a part of the binder, but I claim that although the automatic grain shocker is a piece of machinery, built separate from the binder, it is a part of the binder because it is used directly in connection with it.

This machine, we may say, is as yet only in the experimental stage, but it has proven fairly successful in a great many cases and is the latest addition to the

farmer's harvesting equipment. It is as yet treated with much scepticism and doubt. Many intelligent men have been heard to say that its success was impossible but we find in looking up history that the same thing was said about the self binder. Many men stated that it was impossible for a self binder to work and later these were the men who purchased this machine in large numbers. Is there any doubt but what this will be the case with the grain shocker? Shocking grain is not nearly so intricate a piece of work as is binding.

The importance and efficiency of the binder will be increased 50 per cent. by the use of the grain shocker in connection with it. It will, in the first place, solve the problem of labor for the farmer during the harvest. It will save stray heads and straws which are scattered by the arm when delivering the sheaves and would otherwise be wasted. The grain would always be shocked right up to the binder, which would be a great advantage in case of sudden rain. The stook made by the shocker would be undoubtedly better because they would all be exactly the same. The machine would build just the same and just as good stooks after a hard day's work as before; while this would be well nigh impossible for a man. After a hard day's work the man is bound to do poorer work than he would do at the beginning of the day.

The firms handling these machines claim that they do not increase the draft because the balancing of the side draft completely overcomes the difference in draft. But this I think is absurd. If we wish to get work out of a machine we must put work into it, so therefore I claim the shocker will require some extra power for its operation. But if it does the work efficiently, would it not be easier, cheaper and safe to apply a little extra horse power than to depend upon hand labor?

I do not consider the grain shocker as it stands to-day a perfect machine in the same sense that I do not consider any machine of the present day absolutely perfect. But I will not claim that the grain shocker is absolutely practical at the present time, under all conditions. But if we are to bring them to perfection, which we hope to do, their use should be commenced at once and thus allow a greater chance for their immediate improvement in the places where they are weak. The sooner their use is commenced by the farmers the sooner will they have the effect I have mentioned in a preceding paragraph.

The binder has by its introduction, improvement and successful performance exerted as great an influence upon the advancement of the human family as any other machine produced up to the present time. Its improvement in the near future will make it the most useful machine in the agricultural world to-day.