The Evolution of Agricultural Machinery.

Editor "The Farmer's Advocate":

It is a long stride from the sickle to the modern binder, from the flail to the present up-to-date thresher. I will in brief try to describe some of the advancement made in this line.

The first plow was supposed to be cut from a tree, and propelled by manual labor. This was superseded by oxen being attached, which soon wore out the point. Stone, then iron and steel were substituted. In Ireland, it was customary at one time to attach the horse direct to plow by means of its tail. This abominable practice was abolished by law on account of its cruelty.

In 1856 a glass moldboard was invented by L. B. Hoit, an American, which, from claims of the inventor, threatened to take the lead of everything, claiming superiority over others to clean in any soil, last longer, never rust, and to run one-third easier.

Some fifty years ago, in England, it was thought steam would take the place of horses for plowing, harrowing, etc. The engine used was stationary, and by means of ropes and pulleys the implement was drawn one way, then drawn back, the plow being reversible did not need to be turned at the ends. These machines were also looked upon favorably by New Zealanders, but, of course, not in Canada, as the country was not adapted for it then. We see by this, little headway has been made in steam cultivation, and we need not expect much for some time, if ever. Our Prairie Provinces can use them to a certain extent, but, on account of their drawbacks, it will take time for them to become common.

Milking machines have been in use since at least 1860. They were worked by hand, milked four teats at once, and involved the same principle as at the present day, viz., suction. The whole contrivance was fastened on a pail, and weighed, with pail, six pounds, and cost twelve dollars.

The mowing machine became fairly common about 1860, the principle of cutting being invented some years previous by the Rev. Patrick Bell, of Scotland, and comprised the same principle as is used to-day. The mowers first used were very narrow, drew heavily, and had a severe side draft. Many trials were held, and keen competition was shown for first place, but high cost held them somewhat in disfavor. About this time the revolving hay rake came into general use—and no wonder, as it would do the work of six or eight men. Many of these rakes are in use to-day as pea-pullers. A satisfactory hay-tedder was put out in 1865 by the Howards, of Bedford, England. The forks were fastened on a shaft, and this shaft revolving quickly, shook out the hay. The machine weighed nearly 1,400 pounds, and cost $100, so did not become an especial favorite.

Another machine worthy of mention was a reaper, made mostly of wood, invented by James Collins, of Guelph, in 1864. It had a huge reel and an endless slat bottom, and, by means of a trip, this machine would deliver sheaves, ready to be tied, and out of the way of horses on next trip. I understand such a machine is kept in the machinery hall at the O. A. C. as a relic.

Next came the Marsh harvester, a machine which looked like the present binder, with binding attachment removed. Two men stood on a stand and bound the grain as machine delivered it. For years previous to this the inventors were hard at work on an automatic binder, and in 1865 one was tried, with fair success. It used one or two bands, as was desired, but the mechanism of the binding part was too delicate to work perfectly at first, so it was not until 1875 or 1880 that the binder became general; even then it drew heavily. With the exception of lessening friction, no wonderful improvement has been made since. Automatic shockers have been experimented with, but so far have proved a failure.

A one-tined horse-fork was put on the market about 1865, but was not very satisfactory. A little later came a large fork having eight tines; these stuck in the hay, four from each side, and locked. This was more satisfactory, but as no track was used, one needed some patience and a certain amount of skill to handle it. A chain made of ⅝-inch iron was mostly used, instead of a rope. Power hay-balers are of recent invention; before their introduction, hay was baled by manual labor—a most laborious task.

Until about the year 1850, threshing was mostly done by the "armstrong" method (flail). About this time a spirit of unrest manifested itself among the farmers for more labor-saving devices. Many experiments were carried on before the correct principle was arrived at, and that principle holds to this day. Another, and, we believe, the first principle, was to run thin streams of the grain between two rollers and a rapidly revolving cylinder with cross-bars knocked the grain out of heads. The first threshing machine was run by horse-power; it had nothing to separate the grain from straw. Soon a machine was built without wheels—with what was commonly known as the bucket separator. This machine would thresh from 200 to 700 bushels per day. Next came the rakes and steam portable engines, and larger machines with wheels. The size and power of engines kept gradually increasing, until the advent of the traction. The first traction engine the writer ever saw was an upright, about twelve horse-power, and was driven by one sprocket-chain. These were soon superseded by heavier and more expensive engines. Still, with scarcity of labor, the threshers were bound to improve. To make things cleaner in the barn, the dust-collector was used—an attachment fastened on top of machine, with a fan inside. This was driven by a belt, and collected the light dust from inside of machine, delivering it in a canvas pipe where desired. The grain-blower soon followed. This little attachment is not generally known. It was invented by B. Wagner, of this county, and is now made by a Sarnia firm. Practically every machine around here has one, and it gives the best of satisfaction. It should run about 2,200 revolutions per minute, and will deliver the grain any reasonable distance through metal pipes. The straw-blower and self-feeder soon followed. To-day a machine is not considered up-to-date without all these, and some have a straw-cutter on rear of machine. The whole machine (the thresher), with all attachments, will weigh from three tons up.

It is a pleasure to see a modern 18 to 25 h.-p. engine draw one of these monsters before a bank-barn, and, by means of rope and tackle, quickly back it in—a feat no ordinary team has strength to do.

Where are these improvements to end? Surely we cannot have the agricultural inventions in the next century we had in the past.

Ontario Co., Ont. F. H. WESTNEY.

[Note.—The foregoing article was submitted to Prof. Jno. Evans, of the Manual Training Department, O. A. C., Guelph, who, besides a short comment, gives an interesting and instructive account of the history of the plow.—Editor.]

The foregoing caption is, in my humble opinion, rather a large order for one short article. The article, so far as it goes, is instructive. It is truly "a long stride from the sickle to the modern binder; from the flail to the thresher." Evolution of agricultural machinery is far too much pabulum for one meal. You might as well try to bail out the great lakes with a tin dipper, as to attempt to exhaust this subject in one short article, or even in a dozen articles. It would occupy more time than I have at my disposal to cover the entire article. I shall therefore content myself by taking the first implements mentioned in the paper.

The Plow.—The Irish incident and the glass moldboard are unknown to me. The other facts stated under this heading are regarded as probable, for Egyptian history records a plow made from a crooked stick to loosen the soil as it was drawn along. At an early date the plow was shod with iron, for we are told that the Israelites who were not skilled in the working of metals going down to the Philistines to have sharpened "every man his share and his coulter." A history of this implement, tracing its gradual progress from the ancient Sarcle, to its most improved form in the present day, gives a tolerably correct estimate of the progress of agriculture in any country. Virgil describes a Roman plow as being made of two pieces of wood meeting at an acute angle, and plated with iron. The first people to improve the Roman model were the Dutch, who, it seems, embodied in their plow most of the principles regarded as fundamental in the structure of a plow, viz., curved moldboard, a beam, and two handles. About 1730 the Dutch implement was brought into Yorkshire, and formed the basis on which the early English plows were fashioned. The men mostly instrumental in its development were P. P. Howard, of Bedford, Eng.; Robert Ransome, of Ipswich, Eng., and James Small, of Scotland. Small's improved swing plow was designed to turn the furrows smoothly, and to operate with little draft. Ransome, in 1785, constructed a plow with a share of cast iron, and in 1803 succeeded in chilling his plows, making them very hard and durable. The plows of Howard and Ransome were provided with a bridle or clevis for regulating the width and depth of the furrow. These plows were exhibited, and won prizes at the London and at the Paris exhibitions of 1851 and 1855.

The development of the plow on this continent is due mainly to the efforts of Thomas Jefferson, Daniel Webster, Charles Newbold, Jethro Wood, John Lane, and John Deere.

Jefferson, in his Consular reports from France, states that "Oxen plow here with collars and harness," and specifies the function and shape of the parts in the following terms: "The offices of the moldboard are to receive the sod after the share has cut it, to raise it gradually, and to reverse it. The fore end of it should be as wide as the furrow, and of a length suited to the construction of the plow."

Daniel Webster made a large and cumbersome plow to use upon his farm at Marshfield, Mass. It was over twelve feet long, turned a furrow 18 inches wide and 12 inches or more deep, and required several men and yoke of oxen to operate it.

Charles Newbold, of Burlington, New Jersey, secured, in 1797, the first letters-patent on a plow made almost entirely of iron. It was Jethro Wood who gave the American plow its proper shape. The moldboard was given a curvature that turned the furrow evenly and distributed the wear well. But the application of steel in the construction of plows was brought about by John Lane. About the year 1833 he made a plow from steel cut from an old saw. The moldboard was made up of three strips and the share of one, all of which were fastened to a "shin" or frame of iron. He secured a patent in 1863 on soft-center steel, a material now universally used for all tillage tools and implements. John Deere, in 1837, made from an old saw a plow similar to that constructed by Lane in his first attempt, and in 1847 established at Moline, Ill., a factory for the manufacture of agricultural implements.

Generally speaking, there has been a marked improvement since 1875 in agricultural tools, implements and machinery. The recognition by the manufacturers of the mechanical laws entering into the construction of the plow has done much to overcome the poor results previously attained. The factors involved are the character of the materials used, the finish imparted to the material, the form given to the parts, and the friction between the earth and the plow. These agents receive every consideration in building modern plows, for they constitute the determining factors of price governing the work to be accomplished. The manufacturers of to-day direct their attention to reduce, as much as possible, the enormous amount of motive power that was necessary to draw the old plows. Instead of cast-iron left in the rough state as it comes from the mold, the moldboard is now made of steel, well tempered and highly polished, resulting in greatly improved scouring qualities and reduced draft.

In the next stage of progress, wheels are attached to the plow for the purpose of translating sliding into rolling friction, reducing the draft to a minimum. By carrying the plow on three wheels, one on the land, and two bevelled ones in the angle of the furrow, Mr. Pirie, of Kinmundy, Aberdeenshire, Scotland, disposes with both sole and side plate, and thereby lessening friction and avoiding glazing and hardening of the bottom of the furrow. It also adds to the efficiency of the plow by rendering it independent of skill in the plowman, and the plowing uniform in width and depth of furrow.

The sulky or riding plow is intended to overcome many of the defects possessed by the walking plow. The downward pull is taken up by the wheels, and the friction being thus converted from a sliding to a rolling friction, is much less, and the draft correspondingly diminished; it "floats" better, avoiding the objectionable hard smooth "pan" or bottom. Another form of this plow is the disk, built to overcome bottom pressure, as well as reducing the draft. The moldboard and share of the ordinary plow is substituted by a concave-convex disk, pivoted on the plow beam, and carried on an axle inclined to the line of draft, and also to a vertical plane. As the plow is drawn forward, the disk revolves on its axis and cuts deeply into the ground, and, by reason of its inclination, crowds or throws the earth outwards, and thus turns a furrow. The swivel plow is used where a hillside is to be worked. In this the moldboard is symmetrical about a line drawn from its point to the middle of its rear end, and is pivoted at its front and rear to the landside, so that it can be swung underneath from one side to the other, and thus changed from right to left hand, in order that the furrow may be always turned down hill. Many other devices to increase the efficiency of the plow were introduced from time to time, such as the rolling caster, rolling stationary coulter, fin coulter and knife coulters for cutting the furrow; jointers of various types, to enable the plow to do cleaner work and cover all vegetation.

The plow type is now so modified as to be adapted for particular purposes, according to the condition of soil and character of the surface of farming land. Such are the double-moldboard, for forming turnip drills or ridges, the subsoil plow; the "horse-pick," for displacing and aiding in the removal of earth-fast stones; the brush-breaker and the engine gang plow, consisting of from two to ten bottoms, turning from eight to twelve-inch furrows, used with steam or gasoline tractors on the large farms of the great plains and the ranches of California, and for the past few years in the Canadian Northwest.

O. A. C., Guelph. JOHN EVANS.