

position and affinities, unfavourable to the action of fertilizing agents. This balance of affinities is broken up by the plough, the particles are separated and exposed to the action of water and air, fermentation is essentially promoted, and the earth rendered permeable to the tender roots of young plants. As a soil in its quiescent state has formed its chemical changes, and its particles may be considered as filled with the substances of which their position would admit the combination, it is evident that to give greater fertility, new particles must be exposed, and new chemical changes produced, until the whole mass is saturated.

To show how the changing the position of the particles of matter promotes fermentation, we have only to look at the manure in a heap or yard, part of which has been so pressed as to exclude air, and part has been moved by the trampling of animals, or otherwise, so as to be exposed to the moisture and the air. It will be found that the fermentation in the last is much more advanced than in the first; and that the moving of the hard pressed, by admitting the formation of new chemical changes, is much hastened in its decay. So with soils; when broken up and pulverized, this important end, fermentation, is gained, which in those compact and unmoved is impossible, as the free action of the atmospheric agents, moisture and air, are excluded. Both air and water undergo decomposition when brought in contact with newly turned soils, and act an important part in the fertilization of the earth.

In all soils there is always more or less water and air, but in the unmoved soil they are in a state of comparative rest, they have parted with all the valuable gases or salts they contain to the earths with which they have come in contact, and can of course contribute no further to chemical changes; now if this soil is disturbed, new surfaces are exposed to the water and air as they are renewed, and a continuation of the beneficial results is certain. The chemical combination of water with soils, is on much the same principle as water with lime, though the adhesion or union is not so strong; still this union or affinity is increased by the frequent moving of the soil. This is proved by a fact, that portions of soil were taken from a cultivated and from an uncultivated field near by, and subjected to examination, and it was found that the fallow retained moisture longer than the exhausted part, and when both were equally dried, the fallow earth acquired moisture from the air much more rapidly than that from the uncultivated field. This fact is interesting, as showing the absurdity of the doctrine which maintains that corn or other vegetables should never be hoed in very dry weather. The contrary is the fact, and the oftener the earth is moved the better.

Moving the earth and pulverizing it thoroughly, while it enables it to feel more fully the effects of air and moisture, also gives it a higher temperature, and of course renders it more congenial to vegetation. Thus a thermometer inserted into the earth finely pulverized a few hours before, to the depth of three inches, rose two or three degrees higher than when placed in undisturbed earth close by. This is accounted for by the partial circulation of the warmed atmosphere through the loosened and friable soil. Ploughing or moving earths, however, when they are wet, has the effect of destroying this permeability, by smoothing the exposed surfaces, and rendering them hard and solid when dry. That pulverization increases the chemical powers of the soil, is evident from the fact, that manure of any kind, will produce a more lasting effect on fallows, than when applied to lands not cultivated or moved.

Mr. Bland says—

"The best remedy, when in the process of fallowing, it is necessary to plough lands too wet, is to plough the furrows upon edge as much as possible, that the water may drain away the easier, with a greater surface being thus left for the action of frosts, sun, air, &c., to operate upon."

It is the custom with many farmers when they plough their summer fallows, to have them harrowed down as smooth as may be, between the times of ploughing. This practice is wrong; as

the ground should be left in that manner that gives the largest surface to the air. The harrowing, therefore, after the first breaking up, should precede the plough, until by their continued operation the soil is made fine enough for the reception of the seed. There can be no doubt that the aration, and consequent fertilization of soils, goes on more rapidly when the temperature is the highest, or during the summer months, or when vegetation is most vigorous, as the chemical changes dependent on fermentation and combination are then the most active; and one ploughing at that season, for beneficial purposes, may be considered almost equal to two at another; yet ploughing at other times, when the soil is fit for it, cannot be neglected without injury.

As decomposition goes on more rapidly and beneficially in most substances when covered, but exposed to moisture and warmth, there is a decided advantage gained by fall ploughing, in covering the weeds, stubble, &c., that may be on the surface, so that a longer period for their decomposition will be secured for the benefit of the next crop, and their mechanical influence will be favourably exerted in keeping the land light, and preventing that compactness in texture so unfavourable to drainage. On lands where injurious weeds are found, such as the thistle, Johnswort, daisy, &c., the roots of which survive the winter, fall ploughing to be followed by a summer fallow, has a good effect, as exposing to destruction by freezing many of their roots, and thus facilitating the cleaning of the soil.

In commencing the spring tillage, it is indispensable that the earth, whether it was ploughed in the fall, or is now moved for the first time, should be so dry as to remain friable, and show no symptoms of kneading, and if the fallow is to be manured, perhaps no time is better for that purpose than the spring. This is certainly the case, where barnyard manure, containing, as unfortunately most of it does, foul seeds in abundance, is to be used, as by this early application, the seeds have time to vegetate, and by the repeated ploughings be destroyed before the seed of the grain crop is put in. If the lands are clean, and the manure compost, or fully rotted, the application of it may be delayed till the last ploughing, so as to be turned under with the seed sown, merely covering being all that is required of manure. The Canada thistle is the great enemy that the wheat grower in a large part of our country has to contend against, and this pest can be met no other way successfully than by thorough fallowing. Where the thistle, or other pernicious weeds, tenacious of life, exist in lands fallowed, going over them after each ploughing and picking or gathering all that appear, may be advisable, as greatly aiding in freeing soils from their presence; but in any event the ground should be moved as often as any shoots make their appearance, as this is found to check or destroy them more surely than any other method of treatment.

To derive the full benefit which soils are intended to receive from the process of fallowing, as long intervals should occur between the ploughings as is consistent with the number required to bring it into the proper state for the seed, or the eradication of the weeds with which it may be infested. Many of our farmers allow so little time to intervene between their ploughings, that the changes produced on soils by the action of light, air, moisture, &c., have time for their accomplishment, and nothing is gained by the process but the simple pulverization of the soil. This is true, on lands as fertile as most of those in newly cultivated countries are, may be sufficient; but experience proves that all lands are exhausted by cropping, and hence every reasonable precaution should be used, not only to arrest the progress of deterioration, but prevent its commencement.

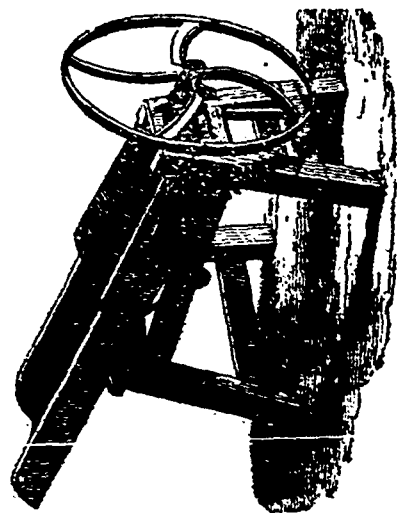
It has been found in England that on most of their long cultivated lands, in which clay forms a prominent ingredient of the soil, that immediately below the earth usually moved by the plough, a hard strata of some two or three inches in thickness is found to exist, almost impenetrable to roots or to water, and has a pernicious effect on the cultivation of crops. This artificial hard-pan, or moorland-pan, as it is called, is at-

tributed to the pressure of the plough on the earth below, and especially to the pressing, smoothing effect of repeated ploughings, at times when the earth was in that state of wetness that disposed it to knead. The fact of the formation of such a body, to break up which requires the application of the deep subsoil plough, should prevent farmers from always ploughing at the same depth, and effectually banish shallow ploughing from thorough fallowing. After the earths have been converted into soil by deep ploughing, exposure to atmospheric agents, and combination with vegetable matter to the depth of eighteen or twenty inches, the formation of such an obstacle to cultivation can scarcely take place; and that such a depth can be obtained is evident from the experience of Marshall in England, and Powell in this country. By gradually deepening his ploughings, the latter converted his soils from shallow ones to fine friable earths, of the depth of sixteen inches, and the excellence of his crops bear testimony to the propriety of the method pursued by him.

The change produced on soils by their exposure to atmospheric agents in the process of fallowing is denoted by their change of colour; and the effects are an increase of the power of absorption; a strengthening of its affinities for vegetable and animal matter; a greater friability or lightness of the particles, so far as their adhesion is concerned; a greater permeability to the roots of the cultivated plants; and a general restoration of the fertilizing and productive properties of the soil. Till, the restorer of good farming in England, considered pulverization alone, all that was necessary to preserve or restore fertility to a soil; but though he doubtless erred in excluding from his system the necessity of returning to the earth in the form of manures, the vegetation that has been taken from it in the form of crops; still it must be admitted that the pulverization effected by summer or thorough fallowing is one of the most efficient preparations the earth can receive, to fit it for the reception of seed, and the accomplishment of the great end of good husbandry, the production of crops.—*Monthly Genesee Farmer.*

Improved Straw Cutter.

Fig. 10.



The Improved Straw-Cutter, of which a design is given, Fig. 10., is valuable to the farmer. We have seen and used many varieties of this valuable machine, but none, in our opinion, is more simple, and better adapted for the purposes designed, than the one here presented. By the means of cutting the feed, it becomes more properly masticated by the animal, and, consequently, yields more nourishment; the stomach is more slowly filled, and, therefore, acts better on its contents, and the increased quantity of saliva thrown out by the lengthened grinding, softens and renders it fit for digestion.

Horses are very fond of this provender most of them, after having been accustomed to it, will prefer it to the best clean oats.