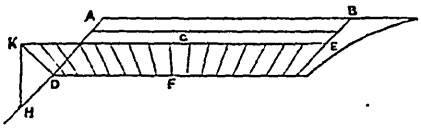
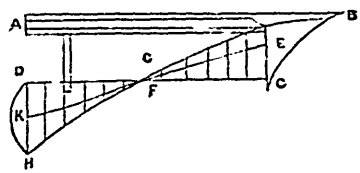
generated by a line moved uniformly forward in a direction at right angles to its length, while it revolved uniformly round one of its extremities. This surface is easily constructed mechanically, thus: take a rectangular parallelogram, A B C D, of the width of nine inches, or as wide as the intended furrow, and of a length equal to four times the width. Bisect B C in E, and D C in F; at F raise a perpendicular F G to the plane of the rectangle, and make it equal to C E. Join E G and produce it to K, making F K equal to F E. Join K D. Draw from every point in C D lines at right angles to C D, meeting the line E K in different points: these lines will form the required surface. The line K D will be found inclined 45° to the horizon, at the angle K D H, which is the inclination at which the furrow-slice is most advantageously laid. To those who are not familiar with solid geometry, these lines may be easily exhibited, by means of a wire inserted at E, and bent at a right angle at K, inserting the bent portion into the



board A B C D at D, so that it will be inclined 45° at D, lying in the direction of E K. Care must be taken that G F be equal to C E, and perpendicular to the board.

It is evident that, as the plough moves on, a particle at E will slide along the line E K, become at G perpendicular to the bottom of the turn-furrow, which should be parallel to the sole, and at K be at an angle of 45° with that line. If the slice were a solid substance, this line, E K, would be all that is required to turn it in its proper position; but as the soil is generally loose, and would crumble to pieces, a support must be given to it by a surface at least as wide as the slice. This surface is generated by drawing lines from different parts of D C at right angles to this line, and meeting the line K E. These lines will be at different angles to the

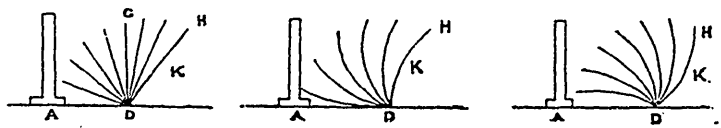
Horizontal Plan of the Plough.



A B, the Sole. C, the Fin. D C, the bottom of the Turn-furrow.

horizon, nearly horizontal at C, where the fin of the point begins, perpendicular at F, and at 45° beyond it at D. The curve thus generated will be found to turn over soils of a moderate tenacity very perfectly. If it is very light, the surface may be formed by arcs of circles with a considerable diameter, the concave part upward; if it is very tenacious, the convex part of the arches may be upward. Thus the surface may be varied without altering the fixed line E K. The annexed figures will explain this. The distance of the perpendicular F G from the fin of the share may also be varied, either lengthening or shortening the turn-furrow as experience may show to be most advantageous.

Sections of the three different Turn-furrows, at different distances from the Heel.



A plough has lately been constructed on this principle; it promises to realize the expectations formed of it. In soils of a loose, mellow nature, it answers completely, and does the work more perfectly than any other plough. It unites the parallelism of the sole and bottom of the turn-furrow of the Flemish plough with the improved shape of the turn-furrow. By adopting the variations in the shape of the turn-furrow which we have suggested, this plough may be adapted to any soil, and be used with or without wheels.

Ploughs were formerly made of wood, having those parts covered with iron where the greatest friction takes place, the share and coulter only being of iron; but in consequence of the greater facility of casting iron in modern times, most of the parts are now made of this metal. The beam and stilts are still usually of wood, but even these are now sometimes made of wrought iron and cast iron. The advantages of iron are its durability and the smaller friction it occasions when once polished by use. The inconveniences are the additional weight of the instrument, and consequent greater friction of the sole. Recent experiments have proved this to be greater than was generally suspected. A great improvement has been introduced by making the points of the shares of cast iron, which, by a mode of casting the lower surface on a plate of metal, makes one surface much harder than the other; and as the softer surface wears more rapidly, a sharp edge is always preserved.

The stilts of the plough are mostly of wood. Where the soil is light and crumbling, without stones, a single handle or stilt is sufficient; but where some force is occasionally required to prevent stones or other obstacles from turning the plough out of its course, two stilts are most convenient, placed at a more obtuse angle with the sole of the plough.

The force required to draw a plough depends not only on the nature of the soil, but also on the shape of the plough, and especially on the position of its different parts with respect to each other, so that they do not counteract each other.

If a plough were drawn in the direction of the sole, the obliquity of the turn-furrow would cause it to turn towards one side, and it would require a considerable force to keep it straight. In order to prevent this, the line of draught is placed at an angle, which varies with that of the turn-furrow and the force required to push the furrow-slice over. To adjust this angle, so as to cause the plough to keep in the intended line, there is a contrivance at the end of the beam to change the position of the ring, by which the plough is drawn to the right or left of the line of the beam, and another by which it may be raised or lowered, In most ploughs the beam, having been originally set at a small angle, with the sole towards the right, has an arch of wood or iron at the end. The end of this iron, which is called a bridle or clevis, has several projecting hooks in the oblong curve which terminates it, on which an iron ring is hung at different heights. By these contrivances the plough may be drawn from a point on either side of the beam, and higher or lower, as may be required. When the plough is found to *take too much land*, as ploughmen