
PART THE THIRD.

CHAPTER IX.**DESCRIPTION OF THE AUTHOR'S IMPROVEMENTS IN THE
MACHINERY FOR MANUFACTURING GRAIN INTO MEAL
AND FLOUR.**

ARTICLE 87.**INTRODUCTORY REMARKS.**

THESE improvements consist of the invention and application of the following machines; namely:—

1. The Elevator.
2. The Conveyer.
3. The Hopper-boy.
4. The Drill.
5. The Descender.

These five machines are variously applied, in different mills, according to their construction, so as to perform every necessary movement of the grain, and meal, from one part of the mill to another, or from one machine to another, through all the various operations from the time the grain is emptied from the wagonner's bag, or from the measure on board the ship, until it be completely manufactured into flour, either superfine or of other qualities, and separated, ready for packing into barrels, for sale or exportation. All which is performed by the force of the water, without the aid of manual labour, excepting to set the different machines in motion, &c. This lessens the labour and expense of attendance of flour mills, fully one-half. The whole, as applied, is represented in Plate VIII.

ARTICLE 88.

I. OF THE ELEVATOR.

THE elevator is an endless strap, revolving over two pulleys, one of which is situated at the place whence the grain or meal is to be hoisted, and the other where it is to be delivered; to this strap is fastened a number of small buckets, which fill themselves as they pass under the lower pulley, and empty themselves as they pass over the upper one. To prevent any waste of what may spill out of these buckets, the strap, buckets, and pulleys, are all enclosed, and work in tight cases, so that what spills will descend to the place from whence it was hoisted. AB, in fig. 1, Plate VI., is an elevator for raising grain, which is let in at A and discharged at B, into the spouts leading to the different garners. Fig. 2 is a perspective view of the strap, with different kinds of buckets, and the various modes of fastening them to the strap.

2. OF THE CONVEYER.

The conveyer KI, Plate VI., fig. 1, is an endless screw of two continued spirals, put in motion in a trough; the grain is let in at one end, and the screw drives it to the other, or collects it to the centre, as at y, to run into the elevator, (see Plate VIII., 37—36—4, and 44—45) or it is let in at the middle, and conveyed each way, as 15—16, Plate VIII.

Fig. 3, Plate VI., is a top view of the lower pulley of a meal elevator in its case, and a meal conveyer in its trough, for conveying meal from the stones, into the elevator, as fast as ground. This conveyer is an eight-sided shaft, set on all sides with small inclining boards, called flights, for conveying the meal from one end of the trough to the other; these flights are set in spirally, as shown by the dotted line; but the flights being set across the spiral line, the principle of the machine is changed from a

screw to that of a number of ploughs; which is found to answer better for conveying warm meal.

Besides these conveying flights, there are others sometimes necessary, which are called lifters; and set with their broadsides foremost, to raise the meal from one side of the shaft, and let it fall on the other side to cool; these are only used where the meal is hot, and the conveyer short; there may be half as many of these as of the conveying flights. See 21—22, in Plate VIII.; which is a conveyer, carrying the meal from three pair of stones to the elevator, 23—24.

3. OF THE HOPPER-BOY.

Fig. 12, Plate VII., is a hopper-boy; which consists of a perpendicular shaft, A B having a slow motion, (not above 4 revolutions in a minute,) carrying round with it the horizontal piece C D, which is called the arm; this, on the under side, is set full of small inclining boards, called flights, so as to gather the meal towards the centre, or to spread it from the centre to that part of the arm which passes over the bolting hopper; at this part, one board is set broadside foremost, as E, (called the sweeper,) which drives the meal before it, and drops it into the hoppers H H, as the arms pass over them. The meal is generally let fall from the elevator, at the extremity of the arm, at D, where there is a sweeper, which drives the meal before it, trailing it in a circle the whole way round, so as to discharge nearly the whole of its load, by the time it returns to be loaded again: the flights then gather it towards the centre, from every part of the circle; which would not be the case, if the sweepers did not lay it round; but the meal would, in this case, be gathered from one side only of the circle. These sweepers are screwed on the back of the arm, so that they may be raised or lowered, in order to make them discharge sooner or later, as may be found necessary.

The extreme flight at each end of the arms is put on with a screw, passing through its centre, so that they may be turned to drive the meal outwards; the use of which is, to spread the warm meal as it falls from the elevator,

in a ring, round the hopper-boy, while it, at the same time, gathers the cooled meal into the bolting hopper; so that the cold meal may be bolted, and the warm meal spread to cool, by the same machine, at the same time, if the miller chooses so to do. The foremost edge of the arm is sloped up in order to make it rise over the meal, and its weight is nearly balanced by the weight *w*, hung to one end of a cord, passing over the pulley *P*, and to the stay iron *F*. About $4\frac{1}{2}$ feet of the lower end of the upright shaft is made round, passing loosely through a round hole in the flight arm, giving it liberty to rise and fall freely, to suit any quantity of meal under it. The flight arm is led round by the leading arm *L M*, there being a cord passed through the holes *L M*, at each end, and made fast to the flight arm *D C*. This cord is lengthened or shortened by a hitch stick *N*, with two holes for the cord to pass through, its end being passed through a hole at *D*, and fastened to the end of a stick; this cord must reeve freely through the holes at the end of the arms, in order that the ends may both be led equally. The flight arm falls behind the leader about $\frac{1}{6}$ th part of the circle. The stay-iron *C F E*, is formed into a ring at *F*, which fits the shaft loosely, keeps the arm steady, and serves for hanging the hands of an equal height, by means of the screws *C E*.

Fig. 13, Plate VII., is a perspective view of the under side of the flight arms. The arm *a c*, with flights and sweepers complete; *s s s* show the screws which fasten the sweepers to the arms. The arm *c b*, is to show the rule for laying out for the flights. When the sweeper at *b* is turned in the position of the dotted line, it drives the meal outwards. Fig. 14, Plate VII., represents a plate of metal on the bottom of the shaft, to keep the arm from the floor, and 15 is the step gudgeon.

4. OF THE DRILL.

The drill is an endless strap revolving over two pulleys, like an elevator, but set nearly horizontal, and instead of buckets, there are small rakes fixed to the strap, which draw the grain or meal along the bottom of the

case. See G H, Plate VI., fig. 1. The grain is let in at H, and discharged at G. This can sometimes be applied at less expense than a conveyer; it should be set a little descending; it will move grain or meal with ease, and will answer well, even when a little ascending.

5. OF THE DESCENDER.

The descender is a broad, endless strap of very thin, pliant leather, canvass, flannel, &c. revolving over two pulleys, which turn on small pivots, in a case or trough, to prevent waste, one end of which is to be lower than the other. See E F, Plate VI., fig. 1. The grain or meal falls from the elevator on the upper strap, at E; and by its own gravity and fall, sets the machine in motion, which discharges the load over the lower pulley F. There are two small buckets to bring up what may spill or fall off the strap, and lodge in the bottom of the case.

This machine moves on the principles of an over-shot water-wheel, and will convey meal to a considerable distance, with a small descent. Where a motion can be readily obtained from the water, it is to be preferred, as, when working by itself, it is easily stopped, and is apt to be troublesome.

The crane spout is hung on a shaft to turn on pivots or a pin, so that it may turn every way, like a crane; into this spout the grain falls from the elevator, and it can be directed by it into any garner. The spout is made to fit close, and play under a broad board, and the grain is let into it through the middle of this board, near the pin; it will then always enter the spout. It is seen under B, Plate VI., fig. 1. L is a view of the under side of it, and M is a top view of it. The pin or shaft may reach down so low, that a man may stand on the floor and turn it by the handle x.