

CHAPTER X.

ARTICLE 89.

APPLICATION OF THE FOREGOING MACHINES IN THE PROCESS OF MANUFACTURING WHEAT INTO SUPERFINE FLOUR.

PLATE VIII. is not meant to show the plan of a mill, but merely the application and use of the foregoing machines.

The grain is emptied from the wagon into the spout I, which is set in the wall, and conveys it into the scale 2, that is made to hold 10, 20, 30, or 60 bushels, at pleasure.

There should, for the convenience of counting, be weights of 60 lbs. each divided into 30, 15, and $7\frac{1}{2}$ lbs.; then each large weight would show a bushel of wheat, and the smaller ones, halves, pecks, &c., which any one could count with ease.

When the wheat is weighed, draw the gate at the bottom of the scale, and let it run into the garner 3; at the bottom of which there is a gate to let it into the elevator 4—5, which raises it to 5; the crane spout is to be turned over the great store garner 6, which communicates from floor to floor, to garner 7, over the stones 8, which may be intended for shelling or rubbing the wheat, before it is ground, to take off all dust that sticks to the grain, or to break smut, fly-eaten grain, lumps of dust, &c. As it is rubbed, it runs into 3 again; in its passage it goes through a current of wind, blowing into the tight room 9, having only the spout a, through the lower floor, for the wind to escape; all the chaff will settle in the room, but most of the dust will pass out with the wind at a. The wheat again runs into the elevator at 4, and the crane spout, at 5, is turned over the screen hoppers 10 or 11, and the grain lodged there, out of which it runs into the rolling screen 12, and descends through the current of wind made by the fan 13; the clean heavy grain descends, by 14, into the conveyer 15—16, which con-

veys it into all the garnerers over the stones 7—17—18, and these regularly supply the stones 8—19—20, keeping always an equal quantity in the hoppers, which will cause them to feed regularly; as it is ground, the meal falls to the conveyer 21—22, which collects it to the meal elevator at 23, and it is raised to 24, whence it gently runs down the spout to the hopper-boy at 25, which spreads and cools it sufficiently, and gathers it into the bolting hoppers, both of which it attends regularly; as it passes through the superfine cloths 26, the superfine flour falls into the packing chest 28, which is on the second floor. If the flour is to be loaded on wagons, it should be packed on this floor, that it may conveniently be rolled into them; but if the flour is to be put on board a vessel, it will be more convenient to pack on the lower floor, out of chest 29, and thence roll it into the vessel at 30. The shorts and bran should be kept on the second floor, that they may be conveyed by spouts into the vessel's hold, to save labour.

The rubbings which fall from the tail of the 1st reel 26, are guided into the head of the 2d reel 27; which is in the same chest, near the floor, to save both room and machinery. On the head of this reel is 6 or 7 feet of fine cloth, for tail flour; and next to it the middling stuff, &c.

The tail flour which falls from the tail of the 1st reel 26, and head of the 2d reel 27, and requires to be bolted over again, is guided by a spout, as shown by dotted line 21—22, into the conveyer 22—23, to be hoisted again with the ground meal; a little bran may be let in with it, to keep the cloth open in warm weather;—but if there be not a fall sufficient for the tail flour to run into the lower conveyer, there may be one set to convey it into the elevator, as 31—32. There is a little regulating board, turning on the joint x, under the tail of the first reels, to guide more or less with the tail flour.

The middlings, as they fall, are conveyed into the eye of either pair of mill-stones by the conveyer 31—32, and ground over with the wheat; this is the best way of grinding them, because the grain keeps them from being

killed; there is no time lost in doing it, and they are regularly mixed with the flour. There is a sliding board set slanting, to guide the middlings over the conveyer, that the miller may take only such part, for grinding over, as he shall judge fit; a little regulating board stands between the tail flour and middlings, to guide more or less into the stones, or elevator.

The light grains of wheat, screenings, &c., after being blown by the fan 13, fall into the screenings garner 32; the chaff is driven farther on, and settles in the chaff-room 33; the greater part of the dust will be carried out with the wind through the wall. For the theory of fanning wheat, see Art. 83.*

To clean the Screenings.

Draw the little gate 34, and let them into the elevator at 4, to be elevated into garner 10; then draw gate 10, and shut 11 and 34, and let them pass through the rolling screen 12 and fan 13, and as they fall at 14, guide them down a spout (shown by dotted lines) into the elevator at 4, and elevate them into the screen-hopper 11; then draw gate 11, shut 10, and let them take the same course over again, and return into the garner 10, &c. as often as necessary; when cleaned, guide them into the stones to be ground.

The screenings of the screenings are now in garner 32, which may be cleaned as before, and an inferior quality of meal made out of them.

By these means the wheat may be effectually separated from the seed of weeds, &c., and these saved for food for cattle.

This completes the whole process from the wagon to the wagon again, without manual labour, except in packing the flour and rolling it in.

* The bolting reels may all be set in a line connected by jointed gudgeons, supported by bearers. The meal, as it leaves the tail of one reel, may be introduced into the head of the other, by an elevator bucket, fixed on the head of the reel, open at the side next the centre, so that it will dip up the meal, and, as it passes over the centre, drop it in. This improvement was made by Mr. Jonathan Elliott; and by it, in many cases, many wheels and shafts, and much room may be saved.

ARTICLE 90.

OF ELEVATING GRAIN FROM SHIPS.

If the grain come to the mill by ships, No. 35, and require to be measured at the mill, then a conveyer, 35—4, may be set in motion by the great cog-wheel, and may be under or above the lower floor, as may best suit the height of the floor above high water. This conveyer must have a joint, as 36, in the middle, to give the end that lies on the side of the ship, liberty to rise and lower with the tide. The wheat, as measured, is poured into the hopper at 35, and is conveyed into the elevator at 4; which conveyer will so rub the grain as to answer the end of rubbing stones. And, in order to blow away the dust, when rubbed off, before it enters the elevator, part of the wind made by the fan 13, may be brought down by a spout, 13—36, and, when it enters the case of the conveyer, it will pass each way, and blow out the dust at 37 and 4.

In some instances, a short elevator may be used, with the centre of the upper pulley, 38, fixed immoveably, the other end resting on the deck, but so much aslant as to give the vessel liberty to raise and lower, the elevator will then slide a little on the deck. The case of the lower strap of this elevator must be considerably crooked, to prevent the points of the bucket from wearing by rubbing in their descent. The wheat, as measured, is poured into a hopper, which lets it in at the bottom of the pulley.

But if the grain is not to be measured at the mill, then fix the elevator 35—39, to take it out of the hold, and elevate it through any conveniently situated door. The upper pulley is fixed in a gate that plays up and down in circular rabbets, to raise and lower to suit the tide and depth of the hold, and to reach the wheat. 40 is a draft of the gate, and manner of hanging the elevator in it. (See particular description thereof, in the latter part of Article 95.)

This gate is hung by a stout rope, passing over a strong

pulley or roller 41, and thence round the axis of the wheel 42, round the rim of which wheel there is a rope, which passes round the axis of the wheel 43, round the rim of which is a small rope, leading down over the pulley P, to the deck, and fastened to the cleet q; a man, by pulling this rope, can hoist the whole elevator; because, if the diameter of the axis be 1 foot, and the wheel 4 feet, the power is increased 16 fold. The elevator is hoisted up, and rested against the wall, until the ship comes to, and is fastened steadily in the right place; then it is set in the hold on the top of the wheat, and the bottom being open, the buckets fill as they pass under the pulley; a man holds by the cord, and lets the elevator settle as the wheat sinks in the hold, until the lower part of the case rests on the bottom of the hold, it being so long as to keep the buckets from touching the vessel; by this time it will have hoisted 1, 2, or 300 bushels, according to the size of the ship and depth of the hold, at the rate of 300 bushels per hour. When the grain ceases running in of itself, the man may shovel it up, till the load is discharged.

The elevator discharges the wheat into the conveyer at 44, which conveys it into the screen-hoppers 10—11, or into any other, from which it may descend into the elevator 4—5, or into the rubbing-stones 8.

This conveyer may serve instead of rubbing-stones, and the dust rubbed off thereby may be blown out through the wall at p, by a wind-spout from the fan 13, into the conveyer at 45. The holes at 44 and 10—11 are to be small, to let but little wind escape any where, excepting through the wall, where it will carry off the dust.

A small quantity of wind might be let into the conveyer 15—16, to blow away the dust rubbed off by it.

The fan, to be sufficient for all these purposes, must be made to blow very strongly, and the strength of the blast may be regulated as directed by Art. 83.

ARTICLE 91.

A MILL FOR GRINDING PARCELS.

Here each person's parcel is to be stored in a separate garner, and kept separate through the whole process of manufacture, which occasions much labour; almost all of which is performed by the machines. See Plate VI., fig. 1; which is a view of one side of a mill, containing a number of garners holding parcels, and a side view of the wheat elevator.

The grain is emptied into the garner *g*, from the wagon, as shown in Plate VIII.; and by drawing the gate *A*, it is let into the elevator *A B*, and elevated into the crane-spout *B*, which, being turned into the mouth of the garner-spout *B C*, which leads over the top of a number of garners, and has, in its bottom, a little gate over each garner; these gates and garners are all numbered with the same numbers, respectively.

Suppose we wish to deposite the grain in the garner No. 2, draw the gate 3 out of the bottom, and shut it in the spout, to stop the wheat from passing along it, past the hole, so that it must all fall into the garner; and thus proceed for the other garners 3 4 5 6, &c. These garners are all made like hoppers, about 4 inches wide at the floor, and nearly the length of the garner; but as it passes through the next story, it is brought to the form of a spout, 4 inches square, leading down to the general spout *K A*, which leads to the elevator: in each of these spouts is a gate numbered with the number of its garner; so that when we want to grind the parcel in garner 2, we draw the gate 2 in the lower spout, to let the wheat run into the elevator at *A*, to be elevated into the crane-spout *B*, which is to be turned over the rolling-screen, as shown in Plate VIII.

Under the upper tier of garners, there is another tier in the next story, set so that the spouts from the bottom of the upper tier pass down the partitions of the lower tier, and the upper spouts of the lower tier pass between the partitions of the upper tier, to the garner-spout.

These garnerers, and the gates leading both into and out of them, are numbered as the others.

If it be not convenient to fix the descending spouts BC, to convey the wheat from the elevator to the garnerers, and KA to convey it from the garnerers to the elevator again, then the conveyers rs and IK may be used for said purposes.

To keep the parcels separate, there should be a crane-spout to the meal elevator; or any other method may be adopted, by which the meal of the second parcel may be guided to fall on another part of the floor, until the first parcel is all bolted, and the chests cleared out, when the meal of the second parcel may be guided into the hopper-boy.

I must here observe, that in mills for grinding parcels, the tail flour must be hoisted by a separate elevator to the hopper-boy, to be bolted over, and not run into the conveyer, as shown in Plate VIII; because then the parcels could not be kept separate.

The advantages of the machinery, applied to a mill for grinding parcels, are very great.

1. Because without them there is much labour in moving the different parcels from place to place; all which is here done by the machinery.

2. The meal, as it is ground, is cooled by the machinery, and bolted in so short a time, that, when the grinding is done, the bolting is, also, nearly finished. Therefore,

3. It saves room, because the meal need not be spread over the floor to cool, during 12 hours, as is usual; and but one parcel need be on the floor at one time.

4. It gives greater despatch, as the miller need never stop either stones or bolts, in order to keep parcels separate. The screenings of each parcel may be cleaned, as directed in Art. 89, with very little trouble; and the flour may be nearly packed before the grinding is finished; so that if a parcel of 60 bushels arrive at the mill in the evening, the owner may wait till morning, when he may have it all finished; he may use the offal for feed for his team, and proceed with his load to market.

ARTICLE 92.

A GRIST MILL FOR GRINDING VERY SMALL PARCELS.

Fig. 16, Plate VII., is a representation of a grist-mill, so constructed that the grist being put into the hopper, it will be ground and bolted and returned into the bags again.

The grain is emptied into the hopper at A, and as it is ground it runs into the elevator at B, and is elevated and let run into the bolting hopper down a broad spout at C, and, as bolted, it falls into the bags at d. The chest is made to come to a point like a funnel, and a division made to separate the fine and coarse, if wanted, and a bag put under each part; on the top of this division is set a regulating board on a joint, as x, by which the fine and coarse can be regulated at pleasure.

If the bran require to be ground over, (as it often does,) it is made to fall into a box over the hopper, and by drawing the little gate b, it may be let into the hopper as soon as the grain is all ground, and as it is bolted the second time, it is let run into the bag by shutting the gate b, and drawing the gate c.

If the grain be put into the hopper F, then as it is ground it falls into the drill, which draws it into the elevator at B, and it ascends as before.

To keep the different grists separate;—when the miller sees the first grist fall into the elevator, he shuts the gate B or d, and gives time for it all to get into the bolting reel; he then stops the knocking of the shoe by pulling the shoe line, which hangs over the pulleys p p, from the shoe to near his hand, making it fast to a peg; he then draws the gate B or d, and lets the second grist into the elevator, to fall into the shoe or bolting hopper, giving time for the first grist to be all in the bags, and the bags of the second grist to be put in their places; he then unhitches the line from the peg, and lets the shoe knock again, and begins to bolt the second grist.

If he does not choose to let the meal run immediately into the bags, he may have a box made with feet, to stand

in the place of the bags, for the meal to fall in, out of which it may be taken and put into the bags, as fast as it is bolted, and mixed as desired; and as soon as the first parcel is bolted, the little gates at the mouth of the bags may be shut, while the meal is filled out of the box, and the second grist may be bolting.

The advantages of this improvement on a grist mill are,

1. It saves the labour of hoisting, spreading, and cooling the meal, and of carrying up the bran to be ground over, sweeping the chest, and filling up the bags.

2. It does all with great despatch, and little waste, without having to stop the stones or bolting-reel, to keep the grists separate, and the bolting is finished almost as soon as the grinding; therefore, the owner will be the less time detained.

The chests and spouts should be made steep, to prevent the meal from lodging in them; so that the miller, by striking the bottom of the chest, will shake out all the meal.

The elevator and drill should be so made as to clean out at one revolution. The drill might have a brush or two, instead of rakes, which would sweep the case clean at a revolution; and the shoe of the bolting hopper should be short and steep, so that it will clean out rapidly.

The same machinery may be used for merchant-work, by having a crane-spout at C, or a small gate, to turn the meal into the hopper-boy that tends the merchant bolt.

A mill, thus constructed, might grind grists in the day-time, and merchant-work at night.

A drill is preferable to a conveyer for grist mills, because it may be cleaned out much sooner and better. The lower pulley of the elevator is twice as large in diameter as the pulleys of the drill; the lower pulley of the elevator, and one pulley of the drill, are on the same shaft, close together; the elevator moves the drill, and the pulley of the drill being smallest, gives room for the meal to fall into the buckets of the elevator.

