

CHAPTER XXII.

ARTICLE 153.

OF THE USE OF DRAUGHTING TO BUILD MILLS BY, &c.

Perhaps some are of opinion that draughts are useless pictures of things, serving only to please the fancy. This is not what is intended by them; but to give true ideas of the machine, &c., described, or to be made. Those represented in the plates are all drawn on a scale of $\frac{1}{8}$ th of an inch to a foot, in order to suit the size of the book, except Plate XVII., which is a quarter of an inch to a foot; and this scale I recommend, as most buildings will then come on a sheet of common paper.

N. B. Plate XXIV. was made after the above directions, and has explanations to suit it.

The great use of draughting mills, &c., to build by, is to convey our ideas more plainly, than is possible by writing, or by words alone; these may be misconstrued or forgotten; but a draught, well drawn, speaks for itself, when once understood by the artist; who by applying his dividers to the draught and to the scale, finds the length, breadth, and height of the building; or the dimensions of any piece of timber, and its proper place.

By the draught the bills of scantling, boards, rafters, laths, shingles, &c. &c., are known and made out; it should show every wheel, shaft, and machine, and their places. By it we can find whether the house be sufficient to contain all the works that are necessary to carry on the business; the builder or owner understands what he is about, and proceeds cheerfully and without error: it directs the mason where to put the windows, doors, navel-holes, the inner walls, &c., whereas, if there be no draught, every thing goes on, as it were, in the dark; much time is lost and errors are committed to the loss of many pounds. I have heard a man say, that he believed his mill was 500*l.* better from having employed an experienced artist, to draw him a draught to build it by; and I know, by experience, the great utility of them. Every master builder, at least, ought to understand them.

ARTICLE 154.

DIRECTIONS FOR PLANNING AND DRAUGHTING MILLS.

1st. If it be a new seat, view the ground where the dam is to be, and where the mill-house is to stand, and determine on the height of the top of the water in the head race, where it is taken out of the stream; and level from it for the lower side of the race, down to the seat of the mill-house, and mark the level of the water in the dam there.

2ndly. Begin where the tail-race is to empty into the stream, and level from the top of the water up to the mill seat, noticing the depth thereof, in places, as you pass along, which will be of use in digging it out.

Then find the total fall, allowing one inch to a rod for fall in the races; but if they be very wide and long, less will do.

Then, supposing the fall to be 21 feet 9 inches, which is sufficient for an overshot mill, and the stream too light for an undershot; consider well what size stone will suit; for I do not recommend a large stone to a weak, nor a small one to a strong stream. I have proposed stones 4 feet diameter for light, 4,6 for middling, and 5 or 5 feet 6 inches diameter, for heavy streams. Suppose you determine on stones 4 feet, then look in table I., (which is for stones of that size,) column 2, for the fall that is nearest 21 feet 9 inches, your fall, and you find it in the 7th example. Column 3d contains the head of water over the wheel, 3 feet; 4th, the diameter of the wheel, 18 feet; 5th, its width 2 feet 2 inches, &c., for all the proportions to make the stone revolve 106 times in a minute.

Having determined on the size of the wheels, and also of the house; the heights of the stories, to suit the wheels, and machinery it is to contain, and the business to be carried on therein, proceed to draw a ground plan of the house, such as Plate XVIII., which is 32 by 55 feet. (See the description of the plate.) And for the second story, as plate XIX., &c., and for the 3d, 4th, and 5th floors, if

required; taking care to plan every thing, so that one shall not clash with another.

Draw an end view, as Plate XX., and a side view, as Plate XXI. Take the draught to the ground, and stake out the seat of the house. It is, in general, best to set that corner of an overshot mill, at which the water enters, farthest in the bank; but great care should be taken to reconsider and examine every thing, more than once, to see whether it be planned for the best; because, much labour is often lost for want of due consideration, and by setting buildings in, and laying foundations on, wrong places. The arrangements being completed, the bills of scantling and iron work may be made out from the draught.

ARTICLE 155.

BILLS OF SCANTLING FOR A MILL, 32 BY 55 FEET, 3 STORIES HIGH; THE WALLS OF MASON WORK, SUCH AS IS REPRESENTED IN PLATES XVIII., XIX., XX., AND XXI.

For the first Floor.

- 2 sills, 29 feet long, 8 by 12 inches, to lay on the walls for the joists to lie on.
- 48 joists, 10 feet long, 4 by 9 inches; all of timber that will last well in damp places.

For the second Floor.

- 2 posts, 9 feet long, 12 by 12 inches.
- 2 girders, 30 feet long, 14 by 16 do.
- 48 joists, 10 feet long, 4 by 9 do.

For the Floor over the Water-House.

- 1 cross girder, 30 feet long, 12 by 14 inches, for one end of the joists to lie on.
- 2 posts to support the girder, 12 feet long, 12 by 12 inches.
- 16 joists, 13 feet long, 4 by 9 inches; all of good white-oak, or other timber, that will last in damp places.

For the third Floor.

- 4 posts, 9 feet long, 12 by 12 inches, to support the girders.
 2 girder posts, 7 feet long, 12 by 12 inches, to stand on the water-house.
 2 girders, 53 feet long, 14 by 16 inches.
 90 joists, 10 feet long, 4 by 9 inches.

For the fourth Floor.

- 6 posts, 8 feet long, 10 by 10 inches, to support the girders.
 2 girders, 53 feet long, 13 by 15 inches.
 30 joists, 10 feet long, 4 by 8 do. for the middle tier of the floor.
 60 do. 12 feet do. 4 by 8, for the outside tiers, which extend 12 inches over the walls, for the rafters to stand on.
 2 plates, 54 feet long, 3 by 10 inches: these lie on the top of the walls, and the joists on them.
 2 raising pieces, 55 feet long, 3 by 5 inches; these lie on the ends of the joists for the rafters to stand on.

For the Roof.

- 54 rafters, 22 feet long, 3 inches thick, 6½ wide at the bottom, and 4½ at the top end.
 25 collar beams, 17 feet long, 3 by 7 inches.
 2760 feet of laths, running measure.
 7000 shingles.

For Doors and Window-Cases.

- 12 pieces, 12 feet long, 6 by 6 inches, for door-cases.
 36 do. 8 feet long, 5 by 5 inches, for window-cases.

For the Water-House.

- 2 sills, 27 feet long, 12 by 12 inches.
 1 do. 14 feet long, 12 by 12 do.
 2 spur-blocks, 4 feet 6 inches long, 7 by 7 do.
 2 head-blocks, 5 feet long, 12 by 14 do.
 4 posts, 10 feet long, 8 by 8, to bear up the penstock.
 2 cap-sails, 9 feet long, 8 by 10, for the penstock to stand on.

4 corner posts, 5 feet long, 4 by 6 inches, for the corners of the penstock.

For the Husk of a Mill of one Water-Wheel and two Pair of Stones.

2 sills, 24 feet long, 12 by 12 inches.

4 corner posts, 7 feet long, 12 by 14 inches.

2 front posts, 8 feet long, 8 by 12 do.

2 back posts, 8 feet do. 10 by 12 inches, to support the back ends of the bridge-trees.

2 other back posts, 8 feet long, 8 by 8 inches.

3 tomkin posts, 12 feet long, 12 by 14 do.

2 interties, 9 feet long, 12 by 12 inches, for the outer ends of the little cog-wheel shafts to rest on.

2 top pieces, 10 feet 6 inches long, 10 by 10 inches.

2 beams, 24 feet long, 16 by 16 inches.

2 bray-trees, 8½ feet long, 6 by 12 inches.

2 bridge-trees, 9 feet long, 10 by 10 inches.

4 planks, 8 feet long, 6 by 14 inches, for the stone-bearers.

20 planks, 9 feet long, 4 by about 15 inches, for the top of the husk.

2 head-blocks, 7 feet long, 12 by 15 inches, for the wal-lower shafts to run on. They serve as spurs also for the head-block for the water-wheel shaft.

For the Water-Wheel and big Cog-Wheel.

1 shaft, 18 feet long, 2 feet diameter.

8 arms for the water-wheel, 18 feet long, 3 by 9 inches.

16 shrouds, 8½ feet long, 2 inches thick, and 8 deep.

16 face boards, 8 feet long, 1 inch thick, and 9 deep.

56 bucket boards, 2 feet 4 inches long, and 17 inches wide.

140 feet of boards, for soaling the wheel.

3 arms for the cog-wheel, 9 feet long, 4 by 14 inches.

16 cants, 6 feet long, 4 by 17 inches.

For little Cog-Wheels.

2 shafts, 9 feet long, 14 inches diameter.

4 arms, 7 feet long, 3½ by 10 inches.

16 cants, 5 feet long, 4 by 18 inches.

