

- 5—a weather-cock, turning on an iron rod.  
 6—the end of the shaft, for hoisting outside of the house, which is fixed above the collar-beams over the doors, to hoist into either of them, or either story, at either end of the house, as may suit best.  
 7—the dark squares, showing the ends of the girders.  
 8—the joists over the water-house.  
 9—the mill-stones, with the spindles they run on, and the ends of the bridge-trees as they rest on the brays a a. b b show the ends of the brays, that are raised and lowered by the levers c c, called the lighter-staffs, for raising and lowering the running stone.  
 10—the water-wheel and big cog-wheel.  
 11—the wall between the water and cog-wheel.  
 12—the end view of the two side walls of the house.  
 Plate XXII. is explained in the Preface.

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## CHAPTER XXIII.

### ARTICLE 158.

#### OF SAW-MILLS.

#### *Construction of their Water-Wheels.*

The wheels for saw-mills have been variously constructed; the most simple, where water is plenty, and the fall above six feet, is the flutter-wheel; but where water is scarce, or the head insufficient to give flutter-wheels the requisite motion, high wheels, double geared, will be found necessary. Flutter-wheels may be adapted to any head above six feet, by making them low and wide, for low heads, and high and narrow for high ones, so as to have about 120 revolutions, or strokes of the saw in a minute: but rather than double gear, I would be satisfied with 100.

## A TABLE

OF THE

DIAMETER OF FLUTTER-WHEELS FROM OUT TO OUT, AND  
THEIR WIDTH IN THE CLEAR, SUITABLE TO ALL HEADS,  
FROM SIX TO THIRTY FEET.

| Head of water. | Diameter. | Width.  |
|----------------|-----------|---------|
| feet.          | ft. in.   | ft. in. |
| 6              | 2: 8      | 5: 6    |
| 7              | 2: 10     | 5: 0    |
| 8              | 2: 11     | 4: 8    |
| 9              | 3: 0      | 4: 3    |
| 10             | 3: 1      | 4: 0    |
| 11             | 3: 2      | 3: 9    |
| 12             | 3: 3      | 3: 6    |
| 13             | 3: 4      | 3: 3    |
| 14             | 3: 5      | 3: 0    |
| 15             | 3: 6      | 2: 9    |
| 16             | 3: 7      | 2: 6    |
| 17             | 3: 8      | 2: 4    |
| 18             | 3: 9      | 2: 2    |
| 19             | 3: 10     | 2: 0    |
| 20             | 3: 11     | 1: 10   |
| 21             | 4: 0      | 1: 9    |
| 22             | 4: 1      | 1: 8    |
| 23             | 4: 2      | 1: 7    |
| 24             | 4: 3      | 1: 6    |
| 25             | 4: 4      | 1: 5    |
| 26             | 4: 5      | 1: 4    |
| 27             | 4: 6      | 1: 3    |
| 28             | 4: 7      | 1: 2    |
| 29             | 4: 8      | 1: 1    |
| 30             | 4: 9      | 1: 0    |

N. B.—The above wheels are proposed to be made as narrow as will well do, on account of saving water; but if this be abundant, the wheels may be made wider than directed in the table, and the mill will be the more powerful.

### *Of Geared Saw-Mills.*

Of these I shall say but little, they being expensive and but little used.—They should be geared so as to give the saw 120 strokes in a minute, when at work in a common log. The water-wheel is like that of any other mill, whether of the overshot, undershot, or breast kind; the cog-wheel of the spur kind, and as large as will clear the water. The wallower commonly has 14 or 15 rounds, or such number as will produce the right motion. On the wallower shaft is a balance-wheel, which may be made of stone or wood; this is to regulate the motion. There should be a good head above the water-wheel to give it a lively motion, otherwise the mill will run heavily.

The mechanism of a complete saw-mill is such as to produce the following effects; namely:—

1. To move the saw up and down, with a sufficient motion and power.
2. To move the log to meet the saw.
3. To stop of itself when within 3 inches of being through the log.
4. To draw the carriage with the log back, by the power of the water, so that the log may be ready to enter again.

The mill is stopped as follows; namely:—When the gate is drawn the lever is held by a catch, and there is a trigger, one end of which is within half an inch of the side of the carriage, on which is a piece of wood an inch and a half thick, nailed so that it will catch against the trigger as the carriage moves, which throws the catch off the lever of the gate, and it shuts down at a proper time.

### *Description of a Saw-Mill.*

Plate XXIII. is an elevation and perspective view of a saw-mill, showing the foundation, walls, frame, &c., &c.

Fig. 0, 1—the frame uncovered, 52 feet long, and 12 feet wide.

Fig. 2—The lever for communicating the motion from

the saw-gate to the carriage, to move the log; it is 8 feet long, 3 inches square, tenoned into a roller 6 inches diameter, reaching from plate to plate, and working on gudgeons in them; in its lower side is framed a block, 10 inches long, with a mortise in it two inches wide throughout its whole length, to receive the upper end of the hand pole, having in it several holes for an iron pin, to join the hand pole to it, to regulate the feed; by setting the hand-pole nearer the centre of the roller, less feed is given, and, farther off, gives more.

Fig. 3, the hand-pole-or feeder, 12 feet long, and 3 inches square, where it joins the block, (Fig. 4,) and tapering 2 inches at the lower end, on which is the iron hand, 1 foot long, with a socket; the end of this is flattened, steeled, and hardened, and turned down half an inch at each side, to keep it on the rag-wheel.

Fig. 5—the rag wheel. This has four cants,  $4\frac{1}{2}$  feet long, 17 by 3 inches in the middle, lapped together to make the wheel 5 feet diameter; is faced between the arms with 2 inch plank, to strengthen the laps. The cramp or ratchet iron is put on as a hoop, nearly 1 inch square, with ratchet notches cut on its outer edge, about 3 to an inch. On one side of the wheel are put 12 strong pins, 9 inches long, to tread the carriage back, when the backing works are out of order. On the other side are the cogs, about 56 in number, 3 inches pitch, to gear into the cog-wheel on the top of the tub-wheel shaft, with 15 or 16 cogs. In the shaft of the rag-wheel are 6 or 7 rounds, 11 inches long in the round part, let in nearly their whole thickness, so as to be of a pitch equal to the pitch of the cogs of the carriage, and gear into them easily: the ends are tapered off outside, and a band is driven on them at each end, to keep them in their places.

Fig. 6 is the carriage; a frame 4 feet wide from outsides, one side 29 feet long, 7 by 7 inches; the other 32 feet long, 8 by 7 inches, very straight and true, the inerties at each end 15 by 4 inches, strongly tenoned and braced into the sides to keep the frame from racking. In the under side of the largest piece are set two rows of cogs, 2 inches between the rows, and 9 inches from the

foreside of one cog to that of another; the cogs of one row between those of the other, so as to make  $4\frac{1}{2}$  inches pitch, to gear into the rounds of the rag-wheel. The cogs are about 66 in number; shank 7 inches long,  $1\frac{3}{4}$  inches square; head  $2\frac{3}{4}$  long, 2 inches thick at the points, and  $2\frac{1}{4}$  inches at the shoulder.

Fig. 7—the ways for the carriage to run on. These are strips of plank  $4\frac{1}{2}$  inches wide, 2 inches thick, set on edge, let  $1\frac{1}{2}$  inches into the top of the cross sills, of the whole length of the mill, keyed fast on one side, made very straight both side and edge, so that one of them will pass easily between the rows of cogs in the carriage, and leave no room for it to move sideways. They should be of hard wood, well seasoned, and hollowed out between the sills to keep the dust from lodging on them.

Fig. 8—the fender posts. The gate with the saw plays in rabbets  $2\frac{1}{2}$  deep and 4 inches wide, in the fender posts, which are 12 feet long, and 12 inches square, hung by hooked tenons, to the front side of the two large cross beams in the middle of the frame, in mortises in their upper sides, so that they can be moved by keys to set them plumb. There are 3 mortises, 2 inches square, through each post, within half an inch of the rabbets, through which pass hooks with large heads, to keep the frame in the rabbets: they are keyed at the back of the posts.

Fig. 9—the saw, which is 6 feet long, 7 or 8 inches wide, when new; hung in a frame 6 feet wide from the outsides, 6 feet 3 inches long between the end pieces, the lowermost of which is 14 by 3 inches, the upper one 12 by 3, the side pieces 5 by 3 inches, 10 feet long, all of the best dry, hard wood. The saw is fastened in the frame by two irons, in form of staples; the lower one with two screw pins passing through the lower end, screwing one leg to each side of the end piece: the legs of the upper one are made into screws, one at each side of the end piece, passing through a broad, flat bar, that rests on the top of the end piece, with strong burrs,  $1\frac{3}{4}$  inches square, to be turned by an iron spanner, made to fit them.

