lected, also, that the wind cannot escape into the garners or screen-room, if they are tight; for as soon as they are full no more can enter.

By careful attention to the foregoing principle, we may fix fans to answer our purposes.

The principal things to be observed in fixing screens and fans, are,

1. Give the screen 1 inch to the foot fall, and between 15 and 18 revolutions in a minute.

2. Make the fan blow strong enough, let the wings be 3 feet wide, 20 inches long, and revolve 140 times in a minute.

3. Regulate the blast by giving more or less feed of wind.

4. Leave no place for the wind to escape but at the end through the wall.

5. Wherever you want it to blow hardest, there make the tube narrowest.

6. Where you want the chaff and cheat to fall, there widen the tube sufficiently.

7. Make the fans blow both the wheat and screenings, and carry the dust clear out of the mill.

8. The wind tube may be of any length, and either crooked or strait, as may best suit; but no where smaller than where the wheat falls.

CHAPTER VII.

ARTICLE 84.

OF GUDGEONS, THE CAUSE OF THEIR HEATING AND GETTING LOOSE, AND REMEDIES THEREFOR.

THE cause of gudgeons heating, is the excessive friction of their rubbing parts, which generates the heat in proportion to the weight that presses the rubbing surfaces together, and the velocity with which they move.

The cause of their getting loose is, their heating, and burning the wood, or drying it, so that it shrinks in the bands, and gives the gudgeons room to work.

To avoid these effects,

1. Increase the surface of contact, or rubbing parts, and, if possible, decrease their velocity; so much heat will not then be generated.

2. Conduct the heat away from the gudgeon as fast as it is generated.

To increase the surface of contact, without increasing the velocity, lengthen the neck or bearing part of the gudgeon. If the length be doubled, the weight will be sustained by a double surface, and the velocity remain the same; there will not then be so much heat generated: and, even supposing the same quantity of heat generated, there will be a double surface exposed to air, to convey it away, and a double quantity of matter, in which it will be diffused.

To convey the heat away as fast as generated, cause a small quantity of water to drop slowly on the gudgeon. A small is better than a large quantity; it should be just sufficient to keep up the evaporation, and not destroy the polish made by the grease, which it will do if the quantity be too great; and this will let the box and gudgeon come into contact, which will cause both to wear rapidly away.

The large gudgeons, for heavy wheels, are usually made of cast iron. Fig. 6, Plate XI., is a perspective view of one of the best form; a a a a, are four wings, at right angles with each other, extending from side to side of the shaft. These wings are larger, every way, at the end that is farthest in the shaft, than at the outer end, for convenience in casting them, and, also, that the bands may drive on tight, one over each end of the wings. Fig. 4 is an end view of the shaft, with the gudgeon in it and a band on the end; these bands, being put on hot, become very tight as they cool, and, if the shaft be dry, will not get loose, but will do so, if green: but, by driving a few wedges along side of each wing, it can be

easily fastened, by any ordinary hand, without danger of moving it from the centre.

One great use of these wings is, to convey away the heat from the gudgeon to the bands, which are in contact with the air; by thus distributing it through so much metal, with so large a surface exposed to the air, the heat is carried off as fast as generated, and, therefore can never accumulate to a degree sufficient to burn loose, as it is apt to do in common gudgeons of wrought iron.

These gudgeons should be made of the best hard metal, well refined, in order that they may wear well, and not be subject to break; but of this there is but little danger, if the metal be good. I propose, sometimes, to have wings cast separate from the neck, as represented in fig. 4, Plate XI.; where the inside light square shows a mortise for the steeled gudgeon, fig. 8, to be fitted into, with an iron key behind the wings, to draw the gudgeon tight, if ever it should work loose; when thus made, it may be taken out, at any time, to repair.

This plan would do well for step gudgeons for heavy upright shafts, such as those of tub-mills.

When the neck is cast with the wings, the square part in the shaft need not be larger than the light square, representing the mortise.*

* Grease of any kind, used with a drill, in boring cast iron, prevents it from cutting, but will, on the contrary, make it cut wrought iron, or steel, much faster. This quality in cast iron renders it most suitable for gudgeons, and may be the principal cause why cast iron gudgeons have proved much better than any one expected. Several of the most experienced and skilful mill-wrights and millers assert that they have found cast gudgeons to run on cast boxes better than on stone or brass. In one instance they have carried heavy overshot wheels, which turned seven feet mill-stones, they have run for ten years, doing much work; and have hardly worn off the sand marks.