

this problem is found at D, Fig. 7. It is by holding the file at the same angle with the sheet metal, as shown at C, and then lowering the near end of the file, that the noise is stopped.

The side F shows how the lowering of the file handle changes the cut from "against the metal" to one which is noiseless and smooth-cutting. It is in this manner that the file must be moved in order to make it cut smooth and noiseless. It is evident that the more the file is moved toward being parallel with the metal horizontally, the more the file handle will have to be depressed in order to make the file cut noiselessly. It must also be kept in mind that the more the file is moved in either direction, from a position "square" with the metal, the more fleaming the tooth will be, the smoother it will cut, and the quicker it will get dull.

Here is the guide to making all sorts of saws and cutters do good, smooth work. They must all be sharpened so they run true and without the least vibration, then they must be filed or ground as above described, and there can be dependence put upon their doing good work. And just one more word in regard to filing or grinding saws for smooth cutting. Do it the moment it is found that the saws or cutters show signs of getting dull. Never try to see how much work you can get out of a saw with once filing. That does not pay. Just as soon as the points of a saw can be seen, then it is time to file it. The above is a most excellent rule, and if carefully followed will result in keeping all the saws and cutting tools in perfect condition for doing perfect work.

#### MACHINE TROUBLES AND THEIR REMEDIES.

A double surface planer, after a long period of excellent service, developed an occasional and very annoying peculiarity on the part of the lower head, of once in a while cutting too deep for a revolution or so. Sometimes the deeply-cut chip would appear with astonishing regularity for the entire length of a board. Then, again, two or three boards in succession would be finished with the washboard cut, while at other times the planer would run for days with only an occasional roughly-cut board in its total product.

Indeed, the planer had become so much of a puzzle that no one knew whether it would cut 10,000 feet of surface without a mark, or if there would be from one to a dozen boards in each thousand that would be marked with occasional or frequent deeply-cut knife marks, while the rest of the boards would be perfect.

At last it was observed that the sunken tool marks were more apt to be in evidence just after the planer-knives had been ground. Then, it was soon noticed that after the belt had been tightened, there would be very few of the knife marks in evidence. With a tight belt and dull knives there would never be a low cut in any of the boards.

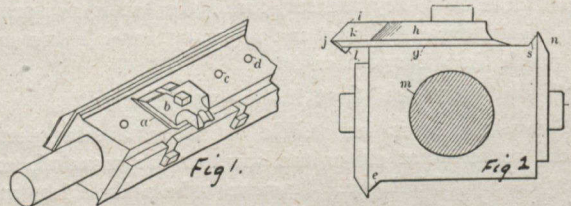
With the above noted peculiarities in view, the repair man began a quiet still-hunt for the cause of the occasional high cutting of the lower knives. After quite a long period of observation, during which a number of things were found which should be and were changed, and a number of theories run into the ground as worthless, the real cause of the trouble was located, and, as is usual in such cases, the remedy at once became apparent and the cure was rapid and complete.

It was found that the lower head bearings had become somewhat worn in their bearings, and that a certain amount of lost motion had there developed, which caused the head

shaft to be loose under certain conditions—or to become troublesome under those conditions, for the journals were, of course, loose all the time.

When the belt got a bit slack, the journal would flop up a bit under a heavy cut, and the knives would dig into the under side of the board, making a high cut, which appeared as a low cut when the board was turned over to be looked at. When the planer-knives were newly ground and very sharp, the angle of the knife was such that the knife possessed a tendency to draw into the cut. This tendency was evidently much greater when a heavy cut was being taken, hence the manifestations noted above, where the lower cutter-head would only occasionally take a high (low) cut and dig into the board, the trouble being greater with a sharp knife, a loose belt and a heavy cut. A little babbitt metal poured into each box, and some careful scraping thereof, cured the trouble quickly and thoroughly.

It often happens, particularly in the job shop, that a bead of some kind of a light moulding shape is required near the middle of a wide board. It is quite a task to set up a four-side machine just for a one-inch strip down the middle of ten or eleven ten-foot boards, and if the job could only be done on the double surfacer, it would be a very great convenience. For this purpose the writer at one time designed the little affair for this purpose which is shown by Fig. 1. Briefly stated, it consists of a cutter of the required shape to do the work, an adjustable chip-breaker placed underneath the little cutter, and a bolt for holding the cutter in place. The chip-breaker is shown at *a*, the



cutter at *b*, and several holes along the head are provided as at *c* and *d* for fastening the beader in place anywhere along the length of the cutter-head.

The proper arrangement of beader cutter and its chip-breaker is more plainly shown by Fig. 2, in which an end of sectional view of the cutter-head is presented. In this engraving the cutting portion of the tool *l* is shown projecting from circle *l* to circle *j*; the distance radially between those two circles will be the depth to which the beading tool will cut. But the length of this tool in this projection, beyond circle *k* is from *l* to *j*, a distance considerably greater than from *k* to *j*, showing the decreased depth of cut when measured by the projecting length of cutter, as is the case with all tools of this kind.

#### Setting Up the Cutters.

Thus, in setting up all tools for the purpose indicated above, it is necessary to measure the projection of the tool on the line *jl*, radial to the cutter-head, the line or circle *kl* being the line followed by the plain cutter-knives located on the chip-breakers *e* and *f*.

It is sometimes difficult to locate the circle *l* sufficiently accurate to permit the measurement from it of the circle *j*, but the planer man will find several ways in which it can be done. One way is to measure the radial distance between the cutting edge of the plain knives and the shaft. This distance being known, a straight-edge may be placed lengthwise of the cutter-head, bearing across *j*, parallel with the shaft, and the distance measured at either end of the