SHAVINGS EXHAUST SYSTEM.

By J. L. NELSON, in "Packages."

The proper way to construct the main suction pipe of a shavings exhausting system is to reduce the area, or diameter, of it from the fan outward, according to the area of the branches that are given entrance into it.

Carry the fan inlet area back until the first branch entrance is encountered, and then start the reducing directly behind this first entrance, and continue to reduce as long as there are branch entrances to make.

Always try to have the area at any and every

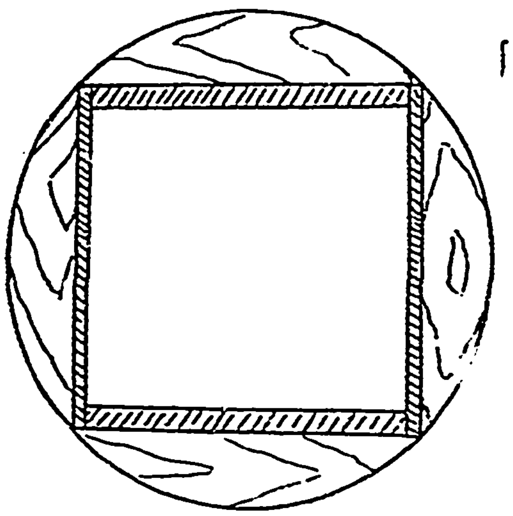

FIG. 1.

part of your main pipe equal to the combined areas of all the branch pipes that have entrance behind, or, at least, not more than ten per cent. greater (no less) than these combined branch areas, and if you have your main constructed in this manner, all else being right, there is little fear but that your system as a whole will be a success.

"But," said a friend to whom I made the above statements some time ago, "that is a bare statement, and I want to know how you reason it out, that it should be so. Why is it that an exhauster system with a reducing main suction pipe will, as you claim, be much more efficient than a pipe that carries its full exhauster inlet area back through the full length of the factory, so far as there are branch entrances to be taken?"

This, to me, seemed a very thoughtless question to ask, and had the friend mentioned given the subject a few moments' serious thought, he would, undoubtedly, have deduced more than one very good and sufficient reason why it should be so. Anybody, and almost without preliminary thought, will grant that a river bed must increase in holding capacity according to the number of branch streams that flow into it, in its course downward towards the sea, and what is more natural and reasonable, outside of various other reasons that will be mentioned later on, than that a river of air, such as that which is sucked through an exhauster system in operation, should require increased area of piping to accommodate the increased flow given by the branch streams of air that join with the main draft in its course towards the exhauster.

This seems so obviously correct that one would wonder that anyone would be so thoughtless as to construct a main suction pipe of the same diameter throughout its full length, and yet I have seen this very thing done more than once.

Not more than a three-hou s' run from where I now sit, and in the very large planing mill of one of the most extensive lumbering concerns in this country, two 55-inch single exhausters are installed, and both, to the great detriment of their efficiency, are connected to piping constructed so that it carries its one diameter back through that portion of the mill in which the respective exhausters are doing duty. I have, more than once, figured that either one of these two fine 55-inch exhausters, with their inlet diameter of 22-inches, and area of 280 inches, should, under ordinary circumstances, be able to easily accomplish all the exhausting to be done in that factory, and I would guarantee to put in a system of piping which, connected to only one of the present fans, would do more and better work than both exhausters are now doing, handicapped, as they are, by their nonsensical piping connection.

Not only no the main suction pipes connected to these two struggling exhausters carry their first diameters back over their full length, but, actually, their initial area is hardly more than half of what it should be, to be equal to that of the exhauster's inlet. In putting in these systems, it was evidently decided by the management, or by the mechanical genius who had charge of the construction, that galvanized iron piping would prove too expensive a proposition, and so the less costly wood was requisitioned for the purpose. Of course, to build up a round, drum-shaped, wooden pipe to 22 inches of diameter shown by the exhauster inlet, was out of the question, owing to the costliness of such a construction, and so an ordinary square box was decided upon.

Now an ordinary square box, if well constructed, and if properly constructed, does not, by any means, make a bad makeshift for a while. For a time, it is probable that a wooden pipe, properly constructed, will give just as good and efficient service as a galvanized iron pipe. The chief objections to the wooden pipe are that it does not stand the wear and tear well, and, also, that it is very prone to leakage. Moreover, its maintenance is very expensive as compared with the galvanized iron, once installed. But when a faulty square wooden pipe is connected up to an exhauster as faultily as the wooden pipes above mentioned were to these two 55-inch fans, there is little wonder that inefficiency is the result.

The entrance into these exhausters, as provided by the manufacturer, is, as has already been noted, 22 inches in diameter but this entrance is circular, and the genius of the mill was here confronted with a very serious question, viz., how to connect his square box main up to the round inlet in the exhauster. What is more natural than that the genius should *solve the question by deciding to "square a circle,"* by fitting four segments of 11-inch radius, with flat bases, into the fan inlet in the manner shown at Fig. 1, thus accommodating the exhauster inlet to his wooden pipe.

This was done, and, as a result, the efficiency of the exhausters was, right at the base of the system, practically cut in two, even had the main from there outward been properly constructed, reducing according to the branch entrances taken. The area of the inlet provided by the manufacturers of these exhausters was 380 square inches, but now these splendid 55-inch machines which were, and are, quite capable of handling the original volume of draft for which the manufacturer had provided accommodation, were bridled to such an extent that their available area of inlet was just equal to that which is provided for a 40-inch exhauster, having a 16-inch circular inlet of only 200 square inches area. In fact, two 40-inch exhausters, properly connected to this wooden pipe, would have been just as efficient as the two 55-inch exhausters could possibly be, connected as they are, and I do not doubt that two 35-inch fans, with only a 14-inch diameter inlet, and suitably connected to a galvanized iron main, properly constructed, would be just as efficient in this mill, upon less than half the power, as the two bridled, and badly handicapped, 55-inch machines.

My friend, before mentioned, asked me to explain to him why, in the interests of absolute efficiency, it is necessary to reduce the main pipe as it retires from the exhauster, according to the area of the branch pipes that are given entrance into it.

To do this effectively, I will introduce the sketch given below, of a 22-inch diameter galvanized iron pipe which carries a parallel area throughout its full length. The size of exhauster to accommodate an inlet of this diameter is a 55-inch, which we will attach to the left end of the pipe. The area of this pipe is 380 square inches, and the direction of draft through it is, of course, toward the exhauster, as indicated by the arrows.

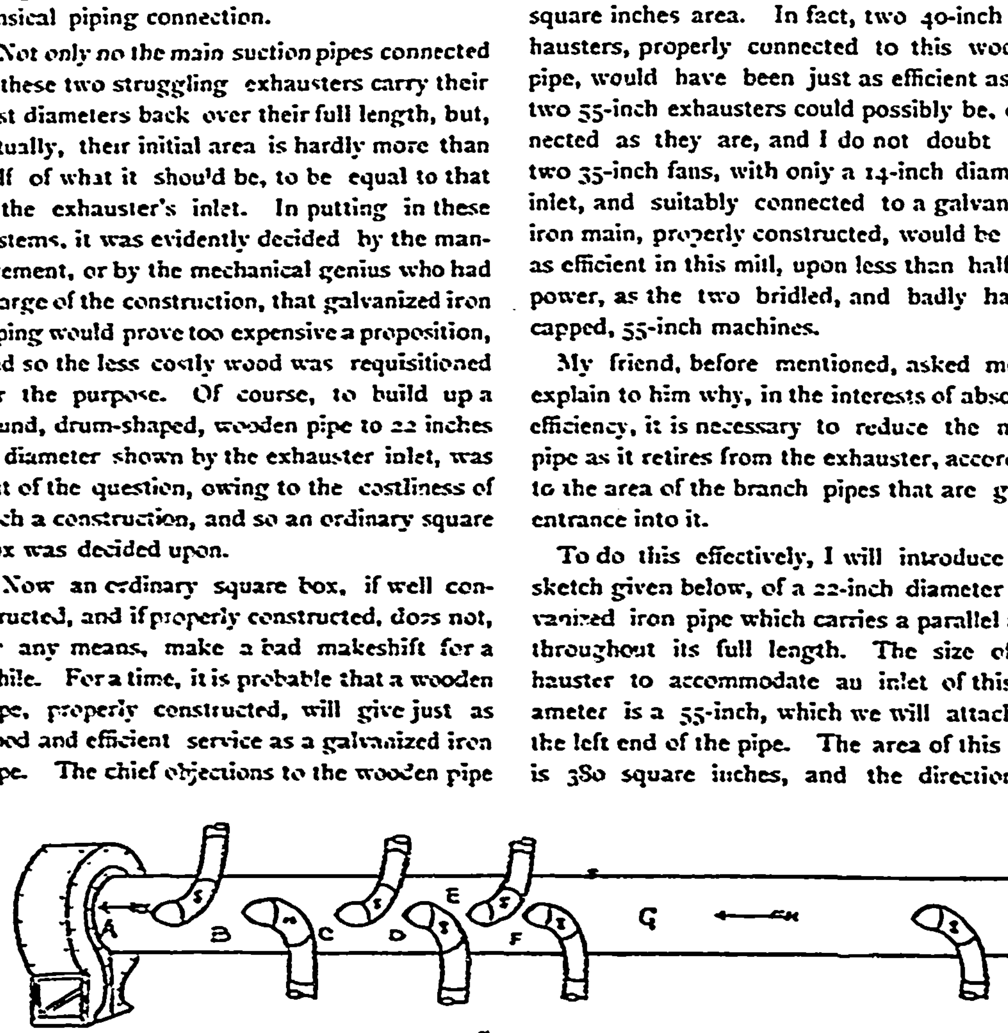

FIG. 2.

Now here we have an exhauster with a 22-inch inlet, to which is attached a galvanized iron pipe of the same diameter throughout its full length. This inlet and pipe have areas of 380 square inches and we have given entrance into it one 10-inch branch of, say, 80 square inches area, and six 8-inch branches, each of 50 square inches area, making, in all, a branch inlet area equal to the main pipe and exhauster inlet areas.

We will suppose the exhauster, or, rather, the fan, is running at a speed of 1,000 revolutions per minute, and that the speed of draft through the branches and main is 150 feet per