

CHIMNEYS AND DRAFT.

IN this age of science and practical development, the form, size and proportion of furnaces and chimneys, to be the best for steam users, take a prominent place, says Noah J. Tilghman, in *Power*. All desire the greatest amount of steam from the ton of coal or cord of wood as the case may be.

I here propose to deal with practical results, regardless of theory, but wherever practice and theory go together, they shall be accepted. I think best to state my experience first as the shortest way to the facts. Although a mechanic and somewhat acquainted with water power and machinery before, I had my first experience with steam engines and the setting of steam boilers in 1854, when my partners and I bought an engine, two boilers and other machinery. We asked the builders to give us a draft for the setting of the boilers, the shape and style of furnace and chimney, size and proportions, and also to send us a competent man to superintend the work. When all was ready we went to work, but in a short time steam failed to keep up as at first. We cooled down to find the trouble, and found the boilers covered with a scale of soot. We cleaned it off, and went on as at first, but soon had to clean again. On examination we found that the part of the boiler plate just over the bridge brick walls was clear of soot, while between the bridge walls the boilers had the scale of soot. We had been instructed that these several walls (Fig. 1) were to form smoke chambers, and as the unconsumed gases or smoke would roll over the walls into the spaces, it would ignite again and make extra heat. Then a consultation was held. I proposed filling the smoke chambers with brick work up to the top of the walls. This was objected to, upon the ground that the builders ought to know the way to do it. Then I agreed to make the change at my own individual expense, and if not for the best, to change it back as at first; so I made the change. The boilers never had to be cleaned afterward, and steamed better than ever before.

The plan given for the chimney was that it should be at the base, inside, 24 inches square, and steadily enlarged as it went, which we were told would increase

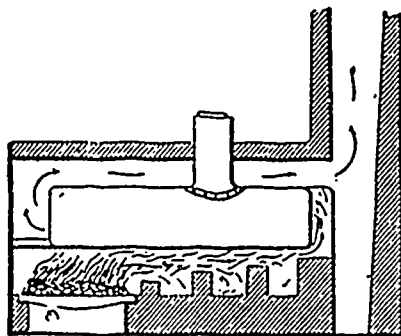


FIG. 1.

the draft. The chimney we never changed, but have found that it was not the best shape. This idea was in the mind of the old chimney builders for private residences to burn large sticks of wood. I have been a steam user ever since I began in 1854, but I have never gone back to the bridge walls.

In the year 1880 I was contemplating the building of another mill and wishing to know all about furnaces and chimney drafts, I went to several of the cities and visited the machine shops and chimney makers. But no one could tell me anything definite in regard to the matter. Quite a number said, "I can not say positively, but the opinion is that the chimney should commence with a suitable size at the base and enlarge somewhat as it goes up, but do not know all about it." So I went home knowing no more than when I left. But with a determination to know, I made a smokestack 12 feet long, 10 inches square at one end, and 12 inches square at the other end, and then built a furnace to set it on, with a fixture so that two men could reverse it, first large end up, second small end up. With fire in the furnace, we reversed it a number of times, and found that with the small end up it produced very much the stronger draft; when the large end was up, the draft was weak. This was the result at each and every trial. So with me the old draft theory was exploded.

I then examined many chimneys of various styles, from the mud and ladder to the fine brick, and inquired and found how each acted. With many of the fine chimneys with narrow smoke entrances, the draft was poor, and they smoked inside of the house too much for the comfort of the inmates. The mud ladder chimneys (the four sides of which had a frame much like ladders, the rounds being very close together and plastered with mud), were generally about three feet at the ground and

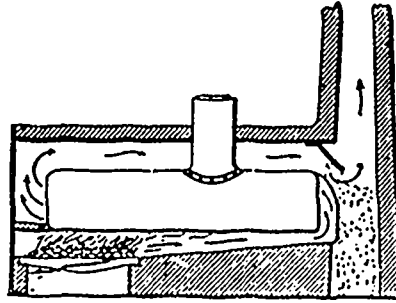


FIG. 2.

two feet at the top, and from 15 to 20 feet high. These chimneys all possessed an excellent draft, notwithstanding the high arch under which the wood was burned.

I then set about the building of the contemplated mill. I made my own plans for the brickwork but was warned and warned again by the bricklayers that my plan would not do. But the work was completed. Fig. 2 shows a side view, and, although not perfect, it will show the shape and style.

I will give a few facts that may be of interest to your readers. There were 20 feet of grate bar surface. At the farther end of the boiler the smooth brick pavement was seven inches from the boiler. The chimney at the base inside was 34 inches square; at the top it was 24 inches square, and 53 feet high. We used various kinds of fuel, green sawdust from a sawmill, chips from a planing mill, cordwood, hard and soft coal, coal dust, and other wastes from coal and wood yards. The draft was good, and the results all we desired. Here is the reason for it: first, if you fire a pile of wood the volume of blaze and heat will be greatest just where the flame leaves the wood, then it assumes a cone shape, so the nearer the inside of the chimney comes to fitting the tapering blast, the better will be the draft. If the chimney should be too large, or enlarged at the top, the cold air will fall in around the top and small end of the blast and weaken the draft.

A ship, to sail lively, must be free from barnacles. Water will run more rapidly through a smooth box or rough passage. So it is clear that from the grate bars to the top of the chimney the whole way should be made as smooth as possible. The bridge walls are a hindrance to a draft, and no good.

In the successful experiment just given, I placed a sheet of iron at the point where the blast enters the chimney, giving it a downward dash, which successfully threw all the sparks into the base of the chimney, from which they could be taken in the absence of firing. This chimney never sent out fire, although having a good draft.

A GOOD PLAN.

A SET screw on a moving part is a most dangerous thing, particularly if it is within reach. Why are they made to project about an inch above the surface? Why so much thread on a fixture that is as permanent as a key? We were taught many years ago to leave set screws only two threads above the surface of the job, and we think it is a good plan yet.

A SUCCESSFUL BUSINESS YEAR.

The sales of Magnolia Metal have been so enormous and the business so prosperous in the last year that the Magnolia Metal Co.'s stock has been recently made \$1,000,000.

Of the lumber situation in California at the present time, the San Francisco Iron and Wood wittily remarks: It takes ten mills to make a cent.

PICKARD & ROWAN, HEPPWORTH, ONT.: We like the LUMBERMAN very much.

NOTES AND QUERIES

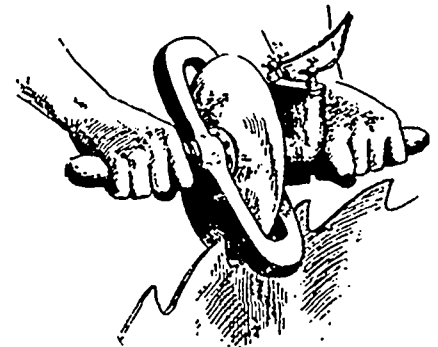
Questions and answers are inserted under this head free of charge, and all are invited to avail themselves of this column. Correspondents need not give their own name for publication, but it must be made known to the editor. Anonymous communications will find space in the waste basket.

No. 39. ABOUT STEAM BOILERS. It matters little all that has been written on the management of steam boilers, some new problem is continually coming up; or some one who has not learned on the particular point which is his worry seeks information. We give our readers the benefit of the following remarks by a writer on practical subjects in *Power*: "A boiler should never be blown out while hot. Portable tubular boilers should stand at least twelve hours after the fire is out before letting out the water. Stationary boilers should stand long enough to allow the brick walls to cool. I usually let my boilers stand from eighteen to twenty-four hours, and by so doing I keep the dirt in solution and can wash it out without any trouble. In case there is any scale I use a boiler pick and a good scraper. When there is any lime in the water, the latter should pass through a good purifier before being pumped into a boiler. Water should never be pumped into a boiler cold, as it makes hard firing and allows all the impurities in it to enter the boiler. In case the scale is hard, and can not be easily removed, saturate it with coal oil before filling the boiler with water. This will loosen the scale without harm to the boiler. A good skimmer properly constructed and properly attended to will do much toward keeping a boiler clean, but cannot be relied upon. All boilers should be opened and thoroughly cleaned once in two weeks, as they are often burned by relying on some automatic device for keeping them clean that fails to do its work."

No. 40. HOW TO PLACE THE KNOCK.—Mr. Robert Grimshaw, who always talks about mechanical matters in a thoroughly practical manner, and ever with a heap of good sense, makes this observation on how to place the knock: "I have been watching you, Bagley, with a great deal of interest as you have been endeavoring to locate that knock by sound. Whatever place you go to it seems to be in some other. Now, while your hearing is very sharp, there are some senses that are more acute than hearing, and feeling is one of them. Just take one end of this long lead pencil between your front teeth and rest the other end first on one place and then in the other about the engine, and you will find that you can hear through your teeth better than you can through your ears. You can detect differences in the amount of vibration that the ears would not be sensitive to, and you will not be fooled by the reflection of the sound from the walls, as in the case of hearing. I think that you will agree with me that the piston-head is a trifle loose on the rod, and that is a matter about which you will have to wait until shutting-down time before you can do anything. The lead pencil located it at once, and you were in doubt as to whether it was in the cross head or in the cylinder as long as you trusted to hearing."

AN ELECTRIC SAW GRINDER.

IF there is any work connected with running a saw-mill more unpleasant than filing a saw, says "Quirk" in *The Tradesman*, I have failed to find it. Emery grinders have been made, but the best are too expensive to come into general use. The inclosed sketch shows what I fancy would be a convenient little machine for



ELECTRIC SAW GRINDER.

sharpening and gumming saws. As is well known, an emery wheel must touch a saw very lightly, or it will so heat the saw as to soften the steel, or as we say, take the temper out. The power therefore required to drive the wheel would be insignificant, so that a very small electric motor would answer the purpose. The entire machine need weigh but a few pounds, and being self contained, would be portable and easily applied to a saw without taking it from the mandrel. If these few words and sketch lead to something useful being brought out, I shall be glad.