Science and Art.

Steel for Tools.

A great diversity of opinion exists, and many crude ideas are to be found afloat respecting the best methods of tempering steel instruments. Numerous recipes may be found scattered here and there throughout various works, purporting to give the best kinds of liquids or *pickles* for tempering; but they are generally given without discrimination. One mechanic tries to temper a tool by a recipe which another states he has found to be perfection, and lo! he fails to effect his object. He then tries another method and succeeds to his satisfaction, and straightway denounces the recipe which was successful in the hands of another, and extols his own method. Why is this? Recipes for tempering tools, are generally given upon the experience of particular cases, and not arranged scientifically. The process of tempering of tools, not only embraces the pickles to be employed for dipping the heated tools into, but also the temperature to which these tools should be heated; and more than all this, it embraces a knowledge of the quality of the steel to be tempered. No person can be a skillful instrument maker, nor can he temper tools accurately, unless he has a sound knowledge of the various kinds of steel; because the method that would be successful for tempering one kind, would utterly fail for tempering another kind of steel. There is a great diversity of steels, all sold at the same price in the market; therefore, unless tool makers have a knowledge of their various qualities, and purchase with discrimination, it is easy to perceive how that one person will fail to temper a tool by one process, by which another will succeed perfectly. A tool maker must suit his tempering process to the quality of his steel, and it should be of a character adapted for the purpose intended. The hard steel suitable for a pick, or a cold chisel, is made by a different process from that designed for surgical instruments, and in tempering, it must be treated differently. Our object at this time is not to present any theory or description of processes for tempering tools, but to direct the attention of instrument and tool makers to the importance of acquiring a knowledge of the various kinds of steel manufactured, and to caution them in reference to the purchase of the particular qualities most suitable for their business. We make these remarks because we are positive that most of the trouble and expense caused in the failure of so many steel instruments, such as dies, chisels, and other forged tools of which we have heard so much, is attributable rather to improper selection of the steel from which they are made, than the processes by which they have been tempered.

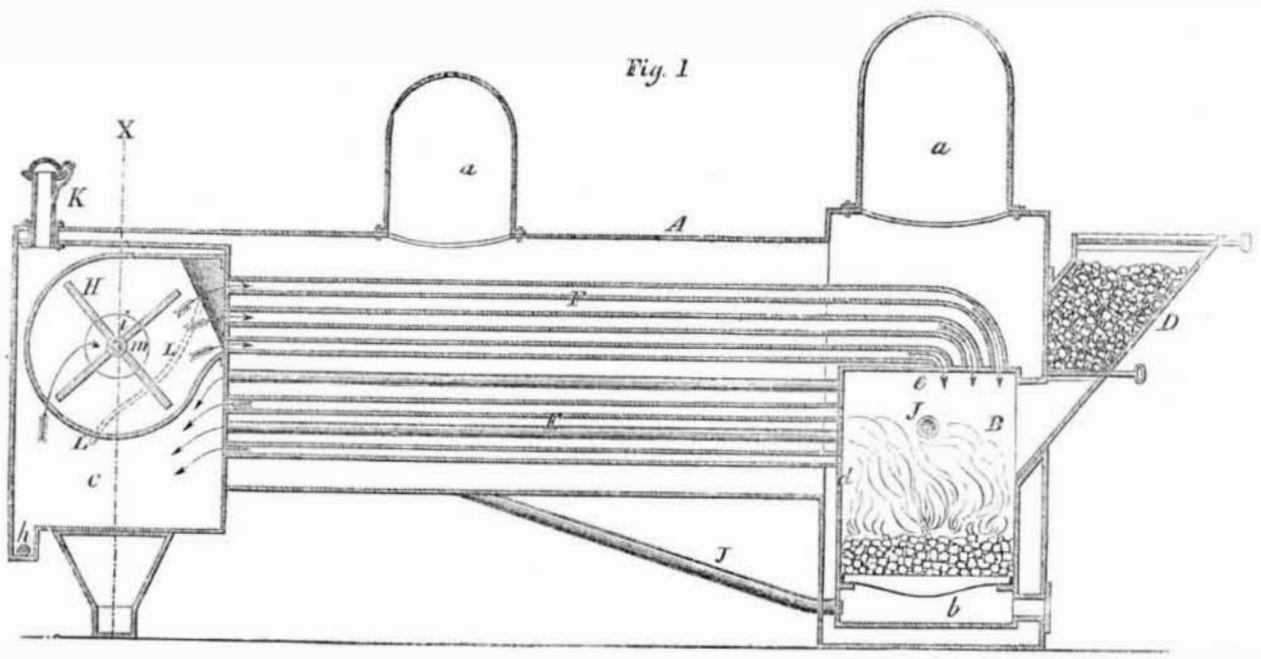
Smoke-Burning Furnace.

In Great Britain, where bituminous coal is largely employed, much attention has been bestowed on the practicability of efficiently and economically consuming *all* the fuel, so that nothing should be discharged into the stack but pure carbonic acid gas and nitrogen, instead of as usual discharging many cinders or small coals, much "smoke," (which derives its color from similar but smaller particles of valuable fuel) and great quantities of carbonic oxyd or half burned gas, a gas ranking in value between the coal gas usually employed forillumination, and the dead and fire-extinguishing carbonic acid. Smoke burning has never been esteemed a matter of so great importance in this country with any of our various fuels, whether wood, soft coal, or anthracite, but the reports of scientific experimenters employed by government and by various private parties, show it to be a matter of no little moment. The flames frequently seen at the tops of the chimneys of steamers are due to the combustion of escaping gases at those points, but owing to their dilution with the obnoxious acid or other causes, we have rarely seen them of sufficient brightness to indicate to the eye any very intensely concentrated heat. Occasional leaks of air into the fire-boxes of locomotives have, however, induced the metal of the same not in contact with the boiler to become red hot, and this fact alone is enough to prove that with wood for fuel much gain might sometimes be derived from simply supplying fresh air to the furnace or flues above the grate. This mingling of air with hot smoke is in fact the basis of all the devices which have been promulgated for smoke-burning, but they all sink into insignificance in comparison with the novel arrangement here presented. This attempts, and, as it would appear, with success, to assort the gas, reserving and returning all the unburned portions, and rejecting the remainder.

The inventors are Messrs. John Case and Isaac Soule, both of Amsterdam, N. Y., who have made it the subject of a patent dated Dec. 23d, 1856. Figure 1 represents a longitudinal, and figure 2 a transverse section of a boiler arranged according to this invention.

SMOKE-BURNING FURNACE.

Fig. 1

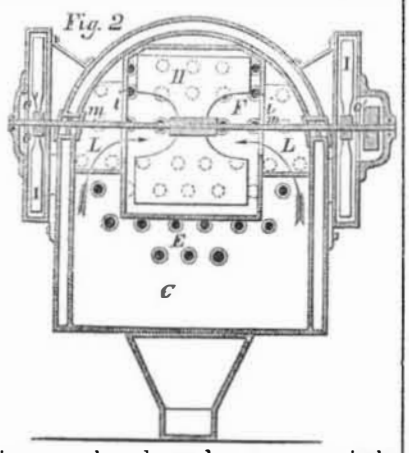


heated condition into the ordinary tubes, E, through the sides of which they impart most of their heat to the water. Emerging from these tubes, the mingled gases, are deflected downwards by the inclined diaphragm, L, represented by dotted lines, immediately following which the heavy cinders are deposited, and the important step of separating the combustible gases from the incombustible ones is performed by the simple gravity of their particles. In the bottom of the fire-box, C, is an opening through which gas is continually escaping into a chimney, not represented, and is thus finally disposed of. In the top of the same fire-box is a broad and powerful fan, H, in rapid revolution, continually drawing in gas at its center, and discharging it at its circumference, from whence it flows back through the tubes, F, yielding up to the water on the passage still more of its heat. The difference in the gravity of the gases in the smoke-box, C, after their deflection downwards by the plate, L, is relied on to furnish a tolerably complete separation, so that the fan urges back to the fire and discharges at *e e*, only carburetted hydrogen, carbonic oxyd, etc., while all the other and deleterious products of combustion escape from the bottom of the box, C, the combustible gases being thus passed in a circuit until fully oxydized or burned in every instance. The fans, H and I I, are all mounted on the same shaft. One of the fans, I, blows fresh air below the grate, and the other supplies the same vital element above the burning fuel, both pipes for these purposes being represented by like letters.

The inventors have experimented with all the three great varieties of fuel in use. We give the history of the invention and of their experiments in their own words below, as a clear and straightforward statement of what they have done and intend to do, premising, however, that as in the experimental construction no water was present to absorb the heat from the flues, that portion relating to the comparative temperatures at different points is entitled to but little consideration.

"The first successful experiment in burning smoke, and the combustible gases produced in the ordinary consumption of fuel, was made early in July last. The apparatus used was a rude one, consisting of a fire-box, smoke chamber, and two flues made of five inch stove pipe, with the necessary fans for supplying the grate with cold air, and for returning the heated air and hydro-carburetted gases to the fire-box. The smoke was at first introduced below the fire. This did not fully answer our expectations, and it was then admitted above. The result was so satisfactory that a more perfect apparatus, and careful experiments were determined upon. We then constructed a new fire-box 10×12 inches in the clear, a smoke chamber to correspond, and connected them by eight flues, (four direct and four return) of three inch caliber and five feet in length. With this, using only twenty-five pounds of Lackawana coal, an intense fire was kept up for three hours, estimated as sufficient to generate steam enough for an engine of five horse power, all the smoke, sparks, and combustible gases, so far as we could discover, being entirely consumed. During the next three hours coke, bituminous coal, and wood were successively tried with like results. Water placed on the top of the smoke chamber boiled a little sooner than on the top of the fire-box. Oil dropped on the middle of the return flues dried simultaneously with that dropped on the direct flues, showing the fact that nearly or quite one half the heat generated in the ordinary furnace escapes through the smoke pipe to say nothing of the loss due to imperfect combustion. The feasibility of thus sustaining a fire being established, we propose to make in the production of steam, (by consuming all the fuel, and by retaining and using all the heat generated), a saving of from fifty to seventy per cent, and by burning the smoke and sparks to remove a nuisance. We propose also a great economy in the construction of boilers, since by our arrangement they may be made shorter than where the heat is allowed to escape through the smoke stack. Both of which are items of no small consideration.

Fig. 2



We have now a working model of three horse power nearly completed, which we contemplate exhibiting in the city of New York about the middle of April, due notice of which will be given in the daily papers."

For further information address Case & Soule, Amsterdam, N. Y., or E. B. Earle, at same place.

In its general form the boiler is a tubular or "locomotive" boiler. The ash pit, *b*, is closed tightly except on first starting the fire, and when in full operation receives a constant blast of ordinary fresh air at a moderate pressure through the pipe, J, beneath the boiler, into which pipe it is forced by one of the fans, I I. This air rises through the grates and urges the fire in the ordinary manner, and the escaping gases from the fire flow in a highly