used for molds, but in such materials the refractory qualities of silica which render it useful for the purpose are neutralized by the other materials.

HOW TO FILE AND SET A HAND-SAW.

The following instructions, although somewhat wearisome, perhaps, to the mechanic, may be of practical use to some of our readers who are removed from saw-sharpening facilities: When a saw is in bad order, the teeth are irregular in length and pitch. This occurs through improper filing, and results in the saw working hard. The reason is that a saw irregularly filed, or set, cuts only with the longest teeth and those that have the most set. To remedy these defects, it should be pointed and filed until the teeth are all of even length, and are pitched so that the front of each tooth is at right angles with the back of the saw. The saw is fastened into a clamp, which consists of a pair of jaws upon a stand, and moved by screws. The ends of the teeth are brought to a level by running a flat file lengthwise of the blade. The best form to give the edge is a slight curve from end to end of the saw, making the middle slightly rounding outward, never hollow.

The handle of the saw when in the clamp should be to the left, and not be changed during the filing. The part held in the clamp should be filed completely before being moved, if the jaws are not long enough to hold the whole. On a rip-saw, the teeth will be filed square on a cross-cut, they are beveled upon alternate sides. Both sides should be filed without moving the saw, which may be done by changing the position and manner of holding the file. A beginner should provide a handle at least a foot long for his files; this will enable him to hold it steadily, which is very necessary for good work. The proper size for a file is three and one-half inches long for a saw having eight teeth to the inch. A saw is set before it is filed. The set given for easy cutting should be such as to make the cut as wide as twice the thickness of the blade.

Several good sets are sold at the tool shops which are self-regulating, and make even work. If only a few of the teeth are short, they need not be pointed, but may be touched with a few strokes at each filing, until the rest are worn down to them. If one has no clamp, a strip of hard wood may be laid upon each side of the saw, and the whole held tightly in a vice. In filing, the strokes should be made from the operator and not towards him. The file should be grasped firmly in the right hand, while the tip is held lightly between the finger and thumb of the other. A safe rule is to work slowly, and to test the teeth as the work progresses with a try square. As long as the faces are kept at right angles with blade of the saw, the backs must come out right.

GRINDSTONES.

What can disable a machine-shop more effectually than to destroy the *grindstone?* Unless the loss were supplied by the modern substitute, the emery grinder, to destroy the grindstone would be to wreck the shop. A thorough study of the subject will develop more requirements than many think, and much ingenuity or skill in designing might be displayed in working out the problem. It should be strong, simple and clean; the trough expanded to catch as much as possible of the drip water and grit; a movable shield securely hinged to keep the water from splashing, and yet permit the stone to be used from either side; rests provided upon which to rest tools and the rod for turning the stone, these rests being arranged to move toward the centre as the stone wears smaller. The bearings should be generous in size, proper provisions being made for oiling without washing the grit into the bearings with the oil, and the ends of the bearings being protected by some device which effectually prevents the entrance of the grit. The stone should be secured to the shaft by nuts and washers, and the washers fixed so that they can not turn with the nuts as they are screwed up or unscrewed. In hanging the stone, great care should be taken to hang it true sidewise, not only for convenience in using, but because a stone that is not true sidewise can never be kept true edgewise.

Suppose a stone to run one-fourth of an inch out of true sidewise, and while in motion draw a line around it within three-eighths of an inch from the edge, on an average. From this line there would be but one-fourth of an inch of stone on one side and one-half on the other. If you had a stone only this in thickness—that is, a stone one-fourth of an inch thick on one side and one-half of an inch thick on the other—would not the one-fourth-inch side wear away faster than the other? That is exactly what it does on that side of the thick stone, only the thicker the stone and the less it is out of truth, the less it wears.

SALT IN THE MANUFACTURE OF FINISHED IRON.

The question of the best method of applying salt in the puddling process has just been discussed by the managers of the mills and forges of South Staffordshire and East Worcestershire at a numerously attended meeting of their associations under the presidency of Mr. Price, manager of the Brettle Lane Iron Works, Stourbridge. Members stated they had thrown dry salt upon the bottom of the puddling furnace before the charge was put in, and upon the iron as it was about coming to the boil; that they had used it as a mixture with manganese, and as a mixture with fire-clay and red ore. It had also been used in solution with water to saturate the bull-dog in the preparation of the fettling, and its use in solution adopted by Messrs. Nettleford was also spoken of. The quantity of salt used varied in nearly every case. As much as four pounds of dry salt had been thrown upon lean iron beginning to thicken, and the result was that the iron boiled fluid; when shingled, was hard like steel; when broken as a bar, was highly crystalline; and after being piled, re-heated and drawn out through the rolls, was very brittle. Thrown upon the furnace-bottom salt benefited the fettling. Used as a "physic" with manganese in iron for sheets it was found of advantage, since the bars were clear, and when rolled out the sheets had a good surface. In getting up lean and soft iron for sheets it was found of especial advantage as a hardener. The mixture was deemed good for steel iron. Mr. Jeremiah Jones, manager of the Terry Hill works, had with advantage used dry salt and manganese, in the proportion of two pounds of the former to three ounces of the latter, in the manufacture of iron for sheets. Salt mixed with fire-clay and red ore and thrown on the bottom of the furnace had been found by Mr. William Farnworth, manager of Messrs. E. P. and W. Baldwin's works, to harden the sheet-iron, and give the sheets a dry surface.

Mr. Farnworth had also experienced good results from throwing cold water on the iron while it was in the furnace. As to the application of salt and water upon the patented method of Mr. Barnett, Mr. Ellis, manager of the Primrose Hill Iron Works, said that he had tried it under Mr. Barnett's directions: One pound to one and one-half pounds of salt were dissolved in a quart of water, and more water was afterwards added. This solution was applied to a furnace for a fortnight with the result that it improved the fettling and the bottoms. The patentee's charge was, however, for his method of application, too expensive, and it was not continued. Mr. Cresswell, mill and forge manager at the Earl of Dudley's works, had employed the solution on Mr. Barnett's principle for some months. He used about as much salt as had been used at the Primrose Hill Iron Works. It had been employed in a single furnace and in a double gas furnace, and the results were the more satisfactory from the gas furnace. A comparison of the yield of a gas furnace worked without the solution and of one worked with it showed a larger yield by one quarter and a few pounds from the latter. The bulldog was saturated with the brine, about one gallon was poured on the double furnace bottom, and when the charge began to thicken about five quarts was put in on each side of the double furnace. One furnace had been worked throughout a whole week, and no scrap ball had to be used. Mr. Cresswell had known one fettling stand nine heats.

After hearing these and other similar experiences, the meeting was of opinion that where hard steely iron was required the application of salt in solution was beneficial, but where pliable and ductile iron was needed, salt should not be used. The information received was not, however, considered to be complete, and the further discussion of the subject was adjourned till after the annual trip of the association, which will be taken at the close of May, to the Castle Iron Works of Messrs. Nettleford, in Shropshire, where the patented method is working successfully.—*Wolverhampton (England) Chronicle.*

EXTRAORDINARY PRODUCTION OF STEEL RAILS AT DRONFIELD.—An extraordinary output of steel rails has been made at the works of Messrs. Wilson and Cammell, Dronfield, for two weeks ending Saturday, May 17. The actual quantity of rails produced was 4,656 tons 18 cwt., being the production for each week as follows.—For the week ending May 10th, during which the time of working was ten shifts, 2,256 tons 7 cwt.; and for the week ending May 17th, during which eleven shifts were made, 2,400 tons 11 cwt. This enormous output is said to be the largest in the world. Leaving out meal times, the quantity of rails rolled is 1 ton in every 47 seconds of the time worked.