

**How Steel Files are Made.**

These useful tools are essential to the operations of almost every branch of mechanism. They are necessary agents in the fabrication of the most delicate watchwork, mathematical instruments, steam engines, printing presses, houses, and ships. As a consequence vast quantities of them are required in every department of industry, and to supply the demand they are manufactured extensively in various parts of our country, and a very large number are annually imported.

Files are made of the best English cast steel. The rods for the blanks are obtained of such sizes as are suited to the character of the files to be furnished. The first operation is that of forging the blanks from the rods. This is done by blacksmiths who must be very skillful, quick, and exact workmen, as the metal must not be heated above blood-red temperature. All the blanks for each size of file must be exact in length and swedged to the proper shape, after which the tangs are forged. The next operation is that of annealing them, to render them soft and ductile. This is done by putting them into an annealing oven, or placing them in a box protected from the air by being buried in sand, then heating them to a red heat, and cooling slowly. After this they are ground to a smooth face, and are ready for cutting. The burring or cutting of the fine grooves on the face of files is the most tedious operation connected with their manufacture. This is performed

by workmen who require long practice and great skill of hand and eye to render them experts. They sit at work astride of wooden horses, with their feet in leather stirrups (endless straps), the top of each passing over a file, and holding it firmly down on the anvil. The blank is held upon a sole of pewter resting on an iron block, and each operator cuts the burrs with a short broad chisel held in the left hand, and a heavy hammer in his right. This hammer is something of a curiosity; it resembles a crooked necked squash, with a cross slice cut off each end, but for all this it is a scientific *rapper*, notwithstanding its uncouth appearance. Being very heavy to be swung for long periods of time with one hand, were it not crooked downwards the strain of the blows would principally come upon the wrist, whereas it is distributed more equally over the whole arm of the operator, who commences to cut at the point of the blank, and with great dexterity shifts the chisel at every blow, and raps away until he has cut a whole series of angular grooves nearly up to the tang. When one series of grooves are cut, the operative slacks his stirrups, and releases the file. The edge and crossbars of files are cut in the same manner, and the face of the metal is lubricated before each row is commenced. The ridge thrown up by each cut determines the position of the next, and the operator quickly determines the spot to strike by the touch of his finger, which holds the chisel, and is trailed along the surface of the file. The largest sizes of files are cut by men, the smallest by women and girls. The angular grooves of double cut files have their faces in the form of numerous rows of fine hard angular teeth. It frequently happens that the face of blank files are not uniform in their texture as regards hardness. On this account some of the grooves require an additional rap to form the burr. This is a peculiarity which has been very difficult to overcome by any of the machines which have been employed to make these simple tools.

After the files are cut, they are ready for tempering, and are prepared for this process by a thin coating of a composition of salt brine, flour, and charcoal dust, and sometimes pounded cow's hoof. This is to protect the teeth from being burned, and from oxidizing when heated. The files are heated in a bath of molten lead, which is always of a uniform temperature. The temperer takes each prepared file singly, dips it into the molten lead, holds it for a few seconds until it is of a red heat, then lifts it out, gives it a rap with a lead hammer on a pewter anvil to knock off

the burned scale, and straighten it, if curved, then plunges it into a bath of cold salt brine, and it is tempered. This process must be performed with great tact to avoid the curving of the files by the heat, and consequent cracking when suddenly cooled. After this, the tangs are softened by dipping them in the molten lead and allowing them to cool slowly, in order to remove their brittleness. The files are next scoured with fine sand and water by brushes, then put into lime water, and afterwards thoroughly washed. They are next dried, rubbed over with some oil and turpentine, and are considered finished. Before being packed for market, each file is thoroughly tested by the foreman as to its quality of temper and the burr on its face.

Although all the processes of the file manufacture are but repetitions of the same operations which are performed every day by the operatives, yet these require long practice and tact to execute accurately. It has been suggested that instead of one, a number of files might be taken up at once by the temperer and submitted to the hardening process in order to facilitate the operations. It has also been suggested that chisels having a number, instead of one edge, might be used by the cutters, and several burrs cut with one blow of the hammer instead of a single one as is now the case. Such suggestions have already been acted upon experimentally without any practical benefit.

Various machines for cutting files have been constructed and put into operation. It is now more than twenty years since machine-cut files were brought to our notice, and at the present moment there are several machines in some of our file factories; the work which they have executed looks well, the burrs being beautifully regular, yet such files are not equal in quality to those made by hand labor, hence the latter have the preference and bring the best prices. The hand-made files have a sharpness of burr which machines have generally failed to imitate, and yet to us this appears inexplicable, as it seems reasonable that machinery might be constructed to cut files as well, in every respect, as can be done by hand.

Quite an extensive business is carried on in the re-cutting of worn out files, and in the vicinity of New York there are great numbers of small shops, where such operations are carried on. The old files are first softened by taking out their temper, then they are ground to a smooth face, re-cut, tempered, and finished.

File-cutting was introduced into our country from England, and is now mostly conducted by manufacturers and mechanics who are natives of that country. They have brought to our shores all the skill and industry for which they are so justly distinguished, and they produce files equal in every respect those made in Europe, and yet England still supplies us with the vast majority of our files. Our steel comes from England, while the Sheffield filemakers now manufacture their own steel, and are thus enabled to meet rivals in every market in the world. Until we make our own steel (and we do not see why we should not do it), our toolmakers must labor at a great disadvantage in competing with those tools which come from abroad.

A blunt or worn file may be partially sharpened to do a considerable amount of work by steeping it for a short period of time in a warm solution of sulphuric acid and water, then washing it well in hot water. One quart of sulphuric acid to six of water are mixed together to form the solution. Sulphuric acid should never be poured into hot water, as it is liable to produce an explosion similar to red-hot iron coming in contact with water. The acid should be mixed first with two parts of cold water then boiling hot water put in to make it up to the degree of dilution necessary. The acid bites away a portion of the steel from the sides of the grooves or burrs, thus leaving their edges much sharper. Some use a little soda in the hot water employed for washing these acid-

cut files; it neutralizes any free acid that may be left adhering to them.

**The Atlantic Telegraph Cable.—John Bull in a fit of Mulligrubs.**

According to the *London Times*, sober, quiet, beer and beef-fed John Bull does not intend to get up a jollification in view of the successful laying of the cable; in fact, he intends to be very cool indeed, and will exhibit a degree of stoicism in proportion to the enthusiasm of the Americans. The observations of the *Times* will be found very pungent and amusing. The *Agamemnon* is represented as "returning to Portsmouth, when its officers and crew were paid off, without any one testifying interest in their proceedings. No one gave it a second thought, or cared whether they go or stay, or even who they were." Such indifference is, indeed, sublime; but how stands the case with the "Americans," as the English always call us? The *Times* thus sums up our exhibition:—

"The news was received with all that enthusiasm of large 'posters,' speeches, and bunkum addresses; no town or community too small to present its address of congratulation. New York, and every other city to the furthest West, went off into ecstasies. It was a dozen anniversaries of Independence rolled into one. There were as many salutes as at Cherbourg; three hundred and thirty-three guns from the batteries; a hundred guns here, a hundred there; a hundred monster rock blasts in the Central Park, and some heavy salutes from the top of the Astor Hotel. All the church bells were rung. Every house was illuminated in that extempore fashion which tells better than our own brilliant uniformity. All the world was out in the streets. There were the banners of every nation and of no nation, and transparencies with sentiments, verses, puns, allegories and devices, in which, if England had not quite its due meed of honor, it was not, at least, forgotten. The *Agamemnon* was the greatest of kings; Cyrus, the new, made a grander union than that of Media and Persia; the cable had opened a new field of usefulness; the *Niagara* and the Hudson had beaten the Atlantic, and the union of the two worlds—it reads almost like a profaneness—was actually ranked with the Declaration of American Independence. The cable itself is declared to be the wedding ring of the two cousins—the strongest bond of amity—the deed of eternal partnership. But it is in vain to think of beating our neighbors—now hardly transatlantic—at this sort of description. They have a special gift at 'heading.' Every heading in the *New York Herald* tells like a sixty-eight pounder; but we have not space for the whole battery—only for a shot or two:—'The Metropolis all in a Blaze'—'Union of the Whole World'—'Quarter of a Million of People in the Streets'—'Scenes, Sights, and Sensations'—'Message of Mayor Tiemann to the Lord Mayor of London'—'More Salutes to-day'—'Was ever anything like this display?'—'International Official Courtesies'—'Tremendous Sensation'—'Some of our people going off Half Cocked'—'But the Telegraph a sure thing'—'Everybody crazy with joy'—'Now is the time for a Universal Jubilee'—'Excelsior,' &c. To wind up the day there were volcanoes of fireworks, chiefly, as it appears to us, from the tops of the large buildings, concluding with the conflagration and destruction of the City Hall, from the roof of which the principal volcano had been discharged.

All this time we did not ring a bell, or let off a squib, or light a kitchen dip, or even walk out into the streets, or do anything whatever in honor of the event. In all England we believe that not one man congratulated his neighbor about it. We were all pleased in our own quiet fashion, and somewhat surprised at so complete a success coming so quickly on the heels of repeated failures."

One might reasonably suppose that after the indulgence of this bit of fun at the expense of the "Americans" they would be let off; but not so. The *Times* returns in a most trenchant manner, and coolly appropriates all the credit of the enterprise to British skill and capital. Hear this great organ:—

"Under such circumstances it may be well to state at once that the idea of the submarine telegraph between England and America was started here and worked out here, formed into a practical plan, and into a company. By this company the money was raised almost entirely in England; in fact, all the shares held in America from first to last are scarcely more than half the number taken up in Liverpool in one week alone. The cable has been made in England, English engineers devised and constructed the paying-out ma-

chines at the works of Eaton & Amos, English electricians planned and ascertained by practical experience the best means of working through the wire. All the ships of the expedition, except the *Niagara* and *Susquehanna* last year, and the *Niagara* this year, were provided by the English government, and both on board the *Agamemnon* and *Niagara* English electricians and English engineers were alone employed to submerge the cable—in fact, to accomplish the undertaking. Yet it is actually upon such facts as these that the States go into ecstasies, and get up demonstrations upon their own courage, perseverance, and enterprise in the accomplishment of this scheme, upon their firm belief in its ultimate success, and upon the wealth (some £80,000 or £90,000) they had embarked in it. A banquet is to be given at New York to the captain and officers of the *Niagara*, 'to commemorate the successful laying of the cable.' Not a word of the English electricians and engineers on board that vessel, the men who were sent to lay, and who did lay, the cable. It is generally the fate of those who grasp at inordinate quantities to have even the small share which would otherwise be given to them withheld. This rule is likely to apply in the case of the officers of the *Niagara*; and if they put in a claim to be considered foremost among the agents in this great scheme, they must expect to hear of things which, in the general satisfaction on this side of the water, would otherwise have been forgiven, if not forgotten. They will be told how the rough, and, to say the very least of it, the careless manner in which they threw out the rope from the *Niagara* at Keyham, after the first failure, was nearly destroying that half, and it, in fact, did destroy very many miles of it. They will be told, also, how, even in the last trips, even the character of 'guest' did not suffice to protect the English gentlemen and workmen on board their ship from such annoyance and insult that it was feared that when the vessel joined at the rendezvous the English on board the *Niagara* would refuse to proceed any further in her, and so put a stop for a time to the whole scheme. In fact, it was only through the influence of Mr. Canning on board the *Agamemnon* that such a strike, if we may so call it, among the men was prevented before the vessels left Plymouth. Captain Hudson and his officers will also be reminded how, when the ships returned to Queenstown after the great storm, they were almost to a man against further attempts, and if their opposition had had the least weight with those entrusted with carrying out the undertaking the second voyage would never have been made, and the completion of the Atlantic telegraph deferred at least for many, many years. This is not the first time that American ships have gained great name of a certain kind under false colors, and the officers of the *Niagara* are building up a reputation on the Atlantic cable, with which, however, they have no more real connection than they had, it is said, with the great public ball at Plymouth given in their name, and on which, likewise, they contrived to found a brief reputation for hospitality and profusion.

**Jonah's Whale and the Leviathan.**

We clip from an exchange a curious example of literalism in interpretation, which we commend to our literalist readers as a critical curiosity:—

"A correspondent writes to us on a subject of prophecy as follows: I believe the Leviathan, which Job so clearly and beautifully describes, is not a whale, or any other living monster of the deep. A steam engine on the railroad in itself has no life, yet it moves at the rate of twenty miles per hour with ease; so, for aught we know, the *Leviathan*, or English steamship, may move with the same velocity, and if so, will it not *literally fulfill* the ancient prophecy recorded in the forty-first chapter of Job? Begin with the nineteenth verse, and suppose he is describing a huge steamboat instead of a whale. "Out of his mouth go burning lamps, and sparks of fire leap out. Out of his nostrils goeth smoke, as out of a seething pot or cauldron. His breast kindleth coals, and a flame goeth out of his mouth. He maketh the deep to boil like a pot. He maketh the sea like a pot of ointment. He maketh a path to shine after him. One would think the deep to be white or hoary." Now, I would ask any one who has looked from the stern of a steamboat when sailing, if Job has not described the wake of the boat to the very life?"

The only objection to this is, that the *Leviathan* has been re-christened the *Great Eastern*.—Eds.