Rasps differ from the above in that each tooth stands alone. The diagonal slant of the rows of teeth across the file is varied in degree to suit the work. Thus, while Fig. 18 is suitable for wrought-iron, Fig. 19 is designed for brass or similar soft metal; and while Fig. 17 is suitable for iron or steel, Fig. 20 is for lead. This is necessary to prevent the file from sliding laterally during the forward stroke.

Even in rasps it is found an improvement to let the faces of the teeth stand somewhat diagonally, as shown in Fig. 21, which not only gives the teeth a shearing and hence a cleaner cut, but also enables the steadier using of the rasp.

Some novelties in the holding devices for files claim especial attention. Thus Fig. 22 is a file-handle that will hold the file at either end; hence the file may be cut at what is commonly the tang of the file, thus utilizing both ends of the file. To enable the using of a file over broad surfaces, the tang of the file is sometimes bent, as in Fig. 23, or the handle may be made to accomplish the same end, as in Fig. 24.

Other forms of file-holders are shown in Figs. 25 and 26. These latter, however, spring the file, giving its cutting surface a convexity which is at all times desirable, and in many cases highly advantageous.

For holding stub-files, for use in out-of-the-way places, the holder shown in Fig. 27 is employed.

Messrs. Nicholson give in the later pages of their book some hints on filing, which will prove of interest to all those who are interested in the expert use of the file; and they also explain the advantages arising from their specialties; more particularly their well-known increment cut file, which has attained a very prominent position in our workshops.—*Polytechnic Review.*

PROGRESS IN TOOLS FOR ACCURATE MEASUREMENT.

Eastern mechanical writers assure their readers that there has been, of late, as much, or more, improvement in tools or instruments for measuring as any one branch of mechanics' tools. Only a few years ago the vernier callipers were comparatively unknown, and working to the one-1000th part of an inch a myth; now, in almost every machine shop, the vernier is a common tool, and everything of any importance is measured by it. Standard gauges in the form of cylinders for both outside and inside measurement have been in use in some of the larger and better equipped shops, but have not come into general use on account of their cost. They are made now at more reasonable rates, and should take their place in every shop, seeing that they will be found to more than pay for their cost in the time saved in working up the accurate sizes. The gauge should never be allowed to go into the shop to be used in common, but be kept for reference, and for setting slide gauges. Used in this way they will last a lifetime and retain their accuracy.

Screw thread gauges are now made adjustable, and can be used for fitting threaded work, as they can be closed together even when worn; and in connection with the screw thread gauge is the V or angular gauge of 60 degrees for grinding threading tools and also for turning lathe centers. The practice of grinding threading tools and turning off lathe centers without this gauge—and by the eye only—should never be allowed. "Snap," or calliper gauges are now made very cheaply and accurately, one variety having both outside and inside measurements. Such tools will pay for their first cost in a year.

The idea of making everything to a standard measure should be encouraged in every way possible. The advantage of interchangeable work can hardly be counted in dollars and cents; for instance, imagine every maker of gas pipe to have his own standard of sizes and thread; why the confusion at the Tower of Babel was nothing compared to what it would be if this "no standard" system were to prevail. It would be but little worse than the loose way in which the general run of shops make some of their work — the system of making bolts and nuts, for instance.

CARE IN DRILLING AND BORING.

"When I first came to this country, I was given some engine cylinders to fit up, and in getting my tools in order I found I had no round files, so I asked for some, and was in turn asked what I wanted them for. I replied, 'To correct holes that might not come fair. The rejoinder was, 'If you properly use the tools and jigs given to you, I will give you five dollars for every hole that does not come fair,' and by thunder I found it just so." These remarks were made to us not long since by a working machinist, and they suggest the importance of having holes drilled with the greatest of care. In the first place, holes, whether to receive bolts to permanently fasten or to act as pivots, are the fixed points to which every thing else must accommodate itself, so that if a hole is drilled out of its proper position, it must be corrected, or the other parts will not come in their proper positions. A round file is one of the most awkward tools the machinist uses, and furthermore a hole filed out on one side is not true and is, in fact, a botch job. When a large number of pieces are to be drilled, it will pay to make a jig guide, which, if correctly made, will insure that the holes will be correctly located in all the pieces, which will hence be interchangeable. If holes are to be drilled to fit the bolts or pins, and are drilled from circles struck with compasses, there should be two circles marked for each hole. The largest should be of the size of the bolt, and the smallest about one half that size. The latter will serve as a guide to alter the hole if it does not start true, while the former will serve as a second guide as to truth.

Drills are more apt to run on one side when the point is too thick or when the centre-punch mark, defining the centre of the hole, is not made deep and large enough; therefore, after the holes are marked, it is a good plan to re-mark the centre holes with a large centre-punch.

Another and good plan is to drill a small hole first and then test its correctness of position, altering it if necessary, and then using a full-sized drill.

A well-made flat drill will (in sizes from ⅜ up to an inch) drill faster than a twist drill, providing the holes are not much deeper than their diameters, and also provided that there is ample clearances for the cuttings to find egress.

FIXING THE QUALITY OF BOILER PLATE.

It seems that sharp competition has so cut into prices for steam boilers that boiler makers have prevailed upon plate makers to roll out very inferior stock for them to secure it at a low price. The plate makers now propose to agree among themselves not to produce this dangerous material, and the *Iron Age* heartily approves the proposition. It is impossible, says our exchange, to say what action will be taken by the meeting, but all manufacturers of good brands are interested in keeping up a high standard. This is fully understood and appreciated by the Inspector General, who evidently desires to work to the same end so far as the provisions of the law under which he acts will allow. The present law, however, is considered very defective in fixing the ultimate strength of boiler plate as the standard of quality. It is well known that a hard, brittle iron will sometimes show a tensile strength as high as that of a more ductile plate, and sometimes much higher. Among the greatest strains to which boilers are subjected are those which result from the expansion and contraction of the iron, and a soft, tough plate will best stand this class of strains under ordinary conditions. If buyers of boiler plates wanted only those of good quality, and were willing to pay what they are fairly worth, it would be a matter of small consequence what the law provided. Unfortunately, in times like these of sharp competition, cheapness becomes a matter of prime importance, even with steam users. A meeting of the trade cannot fail to be productive of good results in calling public attention to the fact that the law gives no guarantee of security for steam users against the consequences of using inferior material or accepting cheap and second-rate workmanship in boilers.

WIRE ROPE AS A SUBSTITUTE FOR CHAIN CABLE.—Two of our largest manufacturers of wire rope offer to rig a ship free of expense, including Manton's patent windlass, for the purpose of demonstrating the superiority of wire rope as compared with chain cable. The offer is made by Roebling's Sons and by J. Lloyd Haigh. The latter, a few days ago, completed his contract for the delivery of 7,000,000 pounds of wire for the rope of the Brooklyn Bridge, at a cost of $600,000. The introduction of wire rope for ships' cable is much discussed at the present moment, both in England and the United States. In 1812, the clumsy hemp hawser was displaced by the chain cable, and it is claimed that the revolution thus brought about within the last sixty years in the equipment of ships is no greater than would result from the adoption of wire rope. The merits of the latter, however, remain to be tested in practical navigation.

A CURIOSITY IN BOOK-MAKING.—A woven book has been manufactured at Lyons, the whole of the letterpress being executed in silken thread.