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CHASING SCREW THREADS.

The operation here illustrated is that of chasing, or, in other words, cutting threads or screws, in the lathe, by hand, which is the most delicate operation performed in a hand lathe, and requires skill of the very nicest kind. In the early days of steam engineering, when screw-cutting lathes were unknown, good hands at chasing were eagerly sought. At that time, many large engineering firms in England used threads of a particular depth and angle, unlike those used by others, to the end that the machinery manufactured by each firm could not be sent elsewhere for repairs. Among these private threads, the "Maudsley" and the "Sharp" threads attained most prominence. They were deeper than those now in use, and have been superseded by the Whitworth or standard thread of to-day.

Thomas Maudsley, the founder of the celebrated engineering firm now known as Maudsley, Sons, and Field, had, as far back as 1830, a remarkably efficient screw room, as it was then termed, conducted under the supervision of Mr. Sheriff, who was probably the most expert chasing hand of his time. In Maudsley's private model room, screw cutting by hand was then carried to a high degree of perfection. Among the eminent men who served their apprenticeship in this room were Sir Joseph Whitworth, James Nasmyth, and George and John Rennie. Among its productions was a model of the (at that time) monster (160 horse) marine engine built for the English man of war *Dee*. This model, which was displayed at the London Exhibition of 1851, had many hand-cut threads in it with a pitch of 100 to the inch, their fit being so perfect as to enable them to sustain very severe strains. The teeth of such a chaser are so fine that, to the ordinary machinist's eye, it would be taken for a scraper, nor would the error be perceived until the tool was applied to the work.

The first operation in chasing an outside or male thread is to start the thread, that is, to cut on the work a shallow spiral groove; this is accomplished by running the lathe at a fast speed, and passing the point of a graver or V tool, under a moderate pressure, along the end of the work, the heel of the tool being pressed firmly against the rest, which should be placed as close to the work as possible. This part of the operation requires a great deal of practice, to enable the operator to strike the thread at the correct pitch and true at the first attempt. Beginners will find it an excellent plan to leave about three eighths of an inch in length, of the end of the work to be chased, a sixteenth of an inch larger in diameter than the required finished size, so that, if the first few attempts to strike the correct pitch fail, the marks may be turned out without reducing the work below the required diameter. When a correct pitch is struck, the chasermay be applied, as shown in our engraving, and, while pressed lightly against the work, moved along the rest as nearly at the proper speed as can be judged, and the teeth will find the groove and travel along it. The chaser should be held so that its hind teeth press the hardest against the work, which will keep them in the starting groove, and act as a guide, while the front teeth extend the groove, carrying the thread forward to the requisite length. It is highly important to keep the rest free from the burrs made by the

heel of the graver or other tool; otherwise the edge of the chaser will strike against them, and, being retarded in its course, will cause the thread to become "drunken." The leading bottom edge of the chaser should also be rounded off to enable it to glide over such obstructions on the face of the rest. If the metal upon which a thread is to be chased have seams in it, the starting groove should be cut as deep as possible, so as to keep the thread true. The front tooth should come even with the edge of the chaser, so that it will be a full tooth, and the tops of the teeth should stand at an acute rather than at a right angle to the left hand side

caused by the cannon shot striking the target; and it being observed that the fracture nearly always occurred across the section above referred to, the clearance grooves were made with a hollow curve, which obviated the defect. In this connection we may also remark that threads whose tops and bottoms are rounded are much stronger than are those whose angles terminate in a point or angular corner (a fact also demonstrated on the trial above referred to); hence those cut by hand are, in this respect, superior to those cut by the lathe.

Inside or female threads, that is to say, threads cut in the bore of anything, are cut by hand with an inside chaser, which cannot, under any circumstance, have rake upon the top face of the teeth, as the latter necessarily cut at a distance from the lathe rest; and were they made to cut freely, they would rip in, and more power would be required to hold them than can be sustained by the hands of the operator. It is a good plan to bore a small hole in the top of the lathe rest, into which a small pin may be placed to act as a fulcrum, against which the back of the chaser can be pressed to force the teeth into the cut. Inside or female threads are started by pressing the chaser teeth lightly against the bore of the work, and moving it forward at the same time, the thread being started (if a right hand one) at the outer end of the bore, which is rounded slightly off so that the chaser shall not catch. Much experience is required to enable the operator to judge the exact speed of chaser movement required for any particular pitch of thread.

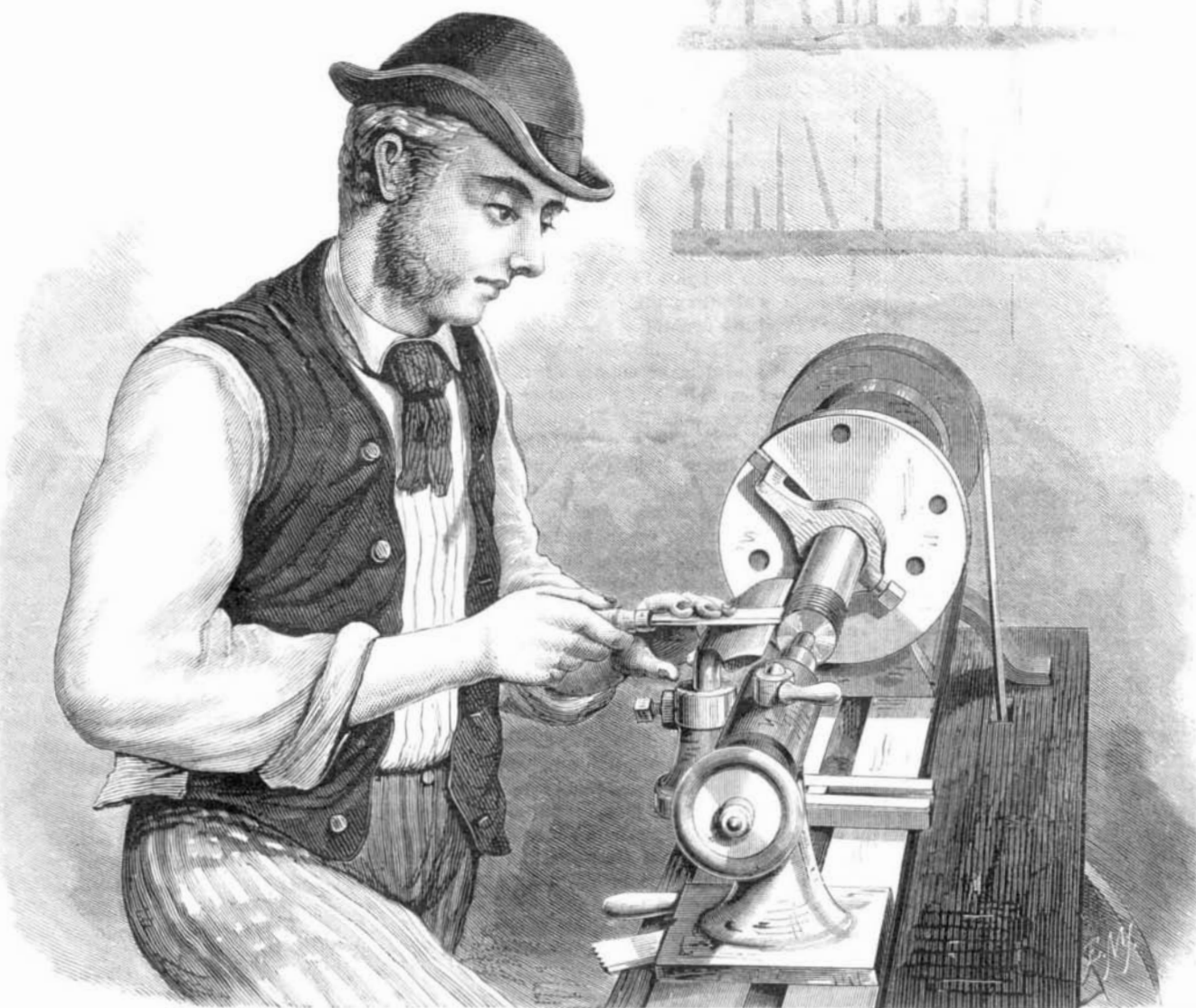
Beginners should always stop the lathe and examine an inside thread as soon as it is struck, for it is an

easy matter to cut a double female thread in consequence of moving the chaser too fast, nor will the error be discovered until the thread is finished and the male thread applied, which will not, in that case, enter.

Double threads are those in which the distance from one thread to another is one half only of the actual pitch of the thread. Their nature may be more clearly understood by supposing a thread of five to the inch to be started by a tool in a screw-cutting lathe, and then supposing the tool point to be moved laterally so as to cut another groove, to the same depth, in the center of the spaces between the thread first cut. If a chaser having ten teeth to the inch be then employed to finish the thread, we shall have a double thread possessing all the elements of distance from one thread to another, depth, angle, and strength of a thread of ten to the inch, although the pitch will actually be that of five to the inch.

Double male threads, to be cut by hand, can be most easily started by the chaser, moving it twice as fast as would be required for a single thread, rounding off the corner of the bolt end and taking care to cut principally with the hindmost teeth.

Taps and all other work requiring great accuracy in the depth and angle of the thread should be finished by a chaser, the work (if of wrought iron or steel) being freely supplied with oil until the finishing cuts are taken, when soapy water should be substituted, which will cause the chaser to cut clean and smooth, and give neatness and finish to the threads of the tap.



CUTTING SCREW THREADS WITH A HAND CHASER.

of the (right hand) chaser, to the end that, when its teeth are parallel with the length of the work, the body of the chaser will lean to the right, and therefore stand well clear of the lathe dog or driver.

The following rules apply to outside or male chasers: For wrought iron or steel, the teeth should be hollow in their length, and should have top rake. For cast iron, the top face of the teeth should be level, or they will cut too freely and rip the threads. For brass, the teeth should be ground at an angle of which the points of the teeth are the lowest. The cutting edge of the chaser should be above the horizontal center of the work; and the body of the chaser should be held as nearly horizontal as will permit the teeth to cut, otherwise the positive or negative rake of the teeth will cause them to cut a thread deeper than themselves.

At the termination of the thread, it is necessary to cut a recess as deep as the thread, in order to give the chaser clearance, and prevent it from ripping into the shoulder, which would form the termination of the thread in the absence of a recess. It is a very common practice to cut this groove or recess with a V tool or graver point, instead of with a round nosed tool, thus producing a recess having a conical instead of a curved outline: the result being to very seriously impair the strength of the bolt, and cause it, under severe strains, to fracture across the section of the bottom of the groove.

In a series of experiments made a few years ago, by the English government, upon targets representing ship's armor, the bolts were found to be unable to withstand the shock