the point of the rod, and work downwards towards the butt. When you have got your wood down so that the rod is a little stiffer than you wish it to be when completed, the joints must be made and finished. Then put the rod together, and try it again with the borrowed one, and go on reducing until the two bend exactly to the same amount, through their entire lengths, when the points are pressed against the ceiling.

Machanics are in Demand.—An American contemporary gives some interesting experiences of the death of intelligent mechanics across the herring pond. The same state of affairs is to be found at home; when will the dignity of labour assert itself over the so-called genteel pursuits? A large shoe manufacturer of the State, advertised in Boston and New York for 25 shoe-fitters to work in his factory, offering full current rates and steady work. The advertisement brought one application. About the same time a Boston firm advertised for a book-keeper, and the next day's mail brought 347 answers. During the same month on advertisement for a clerk, in a Detroit paper, brought 130 applications the first day, and a greater number of letters and personal applications the next day. An advertisement for a week in the same city, calling for a good carpenter, brought only four replies. It is altogether probable that in any considerable city in the land an advertisement for a book-keeper or retail clerk will bring 50 times as many replies as an advertisement for a fair workman in any trade. Further, it is fairly certain that, with equal capacity, industry, and thrift, the man who learns any trade will achieve a reasonable competence sooner than the man who sticks to clerking; while the chances for materially improving one's condition are more numerous in the trades than behind the counter or at the desk. Why is it then, that boys all want to be clerks? Why is it that intelligent parents encourage them in looking for a chance to "get into business," and in looking down on mechanical employment—as though there could be any calling more wretchedly mechanical than average clerking? Why is it that teachers almost invariably train their pupils to "look above" mechanical pursuits? What the country wants now is workmen—intelligent, industrious, thrifty workmen—men who can do skilfully the work that waits for the doing—who can invent new means and better processes for developing the crude resources of the land, and for converting brute matter into life-sustaining and life-enriching wealth. Mere clerks and record-keepers are at a discount: there are too many of them. And the professions, so called, are almost equally crowded with men who have nothing to do. There never was a time when ability to do something real and practical was worth so much as now. Yet our young men swarm after clerkships. Why is it, when the mechanical world offers such superior inducements to energy and intelligence?

Duplicating Fret-saw Patterns.—Those who wish to duplicate the above-named patterns find the use of impression paper sometimes tedious and inaccurate. A correspondent recommends the following method:—Take two pieces of wood of proper size, cut any number of sheets of common writing paper to the same size as the wood, place the sheets on one piece, and tack the other piece of wood to it, with the paper between. Paste your design on one side, and saw through paper and all. Saw the holes first, and then the outlines accurately; and when done you will have as many beautiful designs as you wish, with the least possible labour.

ORNAMENTAL LATHE SCREWS.

THE Council of the Amateur Mechanical Society having—as we stated to our readers in our January number—unanimously resolved that the fractional and unmanageable screw pitches at present in use should be superseded by *aliquot pitches*, proceeded on the 10th ult. to consider a report by Dr. Edmunds upon the question of screw-threads, *i.e.*, the form and cross section of the *thread* of the screw—a question which stands apart altogether from that of the *pitch* or the inclination of the thread, which, in new screws, is to be an aliquot fraction of the English inch. The report brought up by Dr. Edmunds also dealt with the ornamental lathe-mandrel in reference to the form of its face and nose, the pitch of its screw thread, and the question of its bore. After a protracted consideration of the question, the Council resolved unanimously to adopt the suggestions contained in Dr. Edmunds' report, and they recommend as follows:—

1. That all new screws for ornamental lathe-work should he pitched at an aliquot position of the English inch.

2. That the cross-section of thread should be an isosceles triangle of 50°—the apex of the triangle being flattened down or rounded off 7¼ per cent. of the pitch (more exactly 7·23 °/ₒ), *i.e.*, 14½ thousandths of the inch upon a finished cylinder screwed ·1 inch pitch or ten threads to the inch.

It will be seen by our mathematical readers that the thread thus defined has its altitude exactly equal to the length of its base, and therefore that, in a homogeneous material—such as steel or other metal—it will have its substance distributed in the best possible manner, in order, on the one hand, to resist deformation or stripping, and, on the other, to endure the wear and tear of frequent fixing and unfixing. Dr. Edmunds's thread will also have the unique advantage that its pitch is equal to its depth, and therefore that, without reference to a complicated table or a trigonometrical calculation, the extent to which the shaft of the screw is incised by the groove of the thread is seen at once by its pitch. The altitude of this truncated triangular thread being exactly equal to the length of its base; the length of the base of the thread expresses also its pitch and its depth. Therefore, upon a shaft screwed (say) ten threads to the inch, the pitch—*i.e.*, one-tenth of an inch—giving the length of the base of the thread, gives also the depth of the groove by which the radius of the shaft is shortened. The tensile strength, the resistance to torsion, and the resistance to deflection which remains in the shaft after the screw thread has been cut upon it, are thus easily seen. In callipering a bolt for this screw-thread, twice the radial shortening has to be allowed for diametrical diminution, while the truncation of the tops of the threads leaves the very bottom of the groove unoccupied and permits of a slight rounding-off of the tool-point—a fact which will further recommend this thread to skilled mechanicians for scientific purposes.

To give a practical example, we take the new mandrel-nose hereafter further described, which is ·9in. long over all, ·9in. in diameter outside its finished screw thread, with a cylindrical base of ·15in., finished ·95in. in diameter—one-fortieth of an inch in radius beyond the tops of the screw thread, and ten threads to the inch. Having turned up a cylinder 1· inch in diameter, and bored this out ·375 inch as accurate in bore and finish as a rifle—the cylinder for the nose being left, say 1·5 inch long—we finish off the first ·15 inch at the base of the mandrel-nose to a true cylinder, exactly ·95 inch in diameter.

The next ·75 inch we finish off to a true cylinder of exactly ·9 inch in diameter. The next ·2 inch we finish off to ·9145 inch in diameter. The next ·2 inch we cut down and finish off to ·7145 inch in diameter, and the last ·2 inch to ·7 inch in diameter. The first short cylinder, at the base ·15 inch in length, is left ·95 inch in diameter in place of the groove which has hitherto been turned out at the base of the nose, and which has had the same effect in weakening the mandrel-nose that cutting a corresponding groove round the base of a tree would have upon the strength of its trunk. This short cylinder will in future give vastly increased strength to the base of the mandrel-nose, and, at the same time, will serve as a true cylinder upon which chucks may be centred so accurately that, as Dr. Edmunds thinks, mandrels may hereafter be made interchangeable with regard to important and valuable chucks which have been fitted with proper accuracy, just as modern high-power objectives are now interchangeable with regard to the screwed noses of microscopes.

Now an accurately drawn diagram of the screw thread and mandrel-nose, already defined, will show that we have to obtain a finished nose, which, when its thread is accurately truncated, is exactly ·9 inch in diameter outside the thread. Therefore, the second cylinder, ·9 inch in diameter and ·75 inch in length, represents the screwed portion of the nose; if the thread, instead of being cut up to a sharp edge and subsequently truncated 7½ per cent., be left with original surface of the finished cylinder to form the truncated tops of the threads, and in this way a finer surface and more accurate callipering of the diameter outside the thread can probably be secured. The third cylinder, ·2 inch in length and ·9145 in diameter, represents the cylinder on which the thread should cut up absolutely sharp, and this is to be a gauge by which the thread is cut on the second cylinder. The fourth cylinder, ·2 in length and ·7145 inch in diameter, represents the solid stem of the screw shaft, ·7 inch in diameter, *plus* the ·0145 inch, which, having been truncated from the tops of the threads, will not require to be incised upon the shafts, and therefore is to be used as a working margin for gauging the bottom of the thread. The fifth cylinder, ·2 inch in length and ·7 inch in diameter, represents the stem which must be left absolutely intact in cutting the thread. In these four cylinders we therefore have the top and the bottom of the thread in original plan, and as left finished, shown side by side, and serving to gauge each other within the last limits of mechanical accuracy.

Upon the base thus prepared for screwing the nose, a set of accurately-made cutters is to be used, for cutting the thread of the mandrel-nose—the last cutter having only a single tooth, finished accurately to 50°, and rounded off at the point 7 per cent. of the pitch, which, for a one-tenth inch pitch, amounts to ·007 inch. The first two or three cutters must also have been ground with approximate accuracy to 50° angle, but they must not have cut the thread up quite sharp upon the ·9145 cylinder, nor must they have trenched at all upon the ·7145 cylinder. The final single toothed cutter, in perfect order, must then be adjusted upon the slide-rest, so that in revolving, it just makes a barely perceptible trace with its rounded point upon the ·7145 cylinder; and then being traversed accurately and slowly upon the edge of the first cylinder, by means of the spiral apparatus or screw-lathe, the thread will be finished. On examination, the ·7 inch cylinder must appear intact, the ·7145 inch cylinder just perceptibly grooved by the point of the tool, the ·9145 inch cylinder cut up to an absolutely sharp edge, the ·9 inch cylinder cut up with a beautiful plane-top just sufficing to prevent its easily bruising. The end of the ·95 cylinder must not be broken in upon. The cutter leaves no trailing-off thread to weaken the base uselessly, but enables the groove to be cut out fully to the last fraction. The chuck-screw thread must correspond, and begin with a blunt-full end inside the ·95 hollow cylinder, which is to engage with the short solid cylinder at the base of the mandrel-nose, and the entry of which will be facilitated by a slight rounding-off of the sharp edge inside the base of the chuck.

From this interesting example of an exercise in scientific screw-cutting, it will be seen that, with Dr. Edmunds' thread of exactly 50° flattened down 7½ per cent. of its pitch, the ten-thread screw encroaches upon the radius of the shaft by one-tenth of an inch, and lessens its diametrical measurement by two-tenths of an inch. In the same way it will at once be seen that a screw of 30 threads encroaches upon the radius of the shaft by one-thirtieth of an inch, and lessens its diametrical measurement by one-fifteenth of an inch. Similarly with every screw, the mere number of threads per inch gives all the data both of screw thread and of shaft. This simplification will be of great importance in scientific and amateur work. This thread is easily and accurately cut by a point 50°, and fixed on a level with the centre of the shaft to be screwed.

3. That the ornamental mandrel-nose and back-poppet cylinder screw be pitched at ten threads to the inch.

4. That the base of the nose of the mandrel, instead of being grooved out as at present in the Holtzapffel lathe, be a cylinder larger in diameter than the screwed portion of the mandrel-nose.

The only reason, we believe, why the ornamental lathe mandrel is still turned out into a groove at its base, is, that it was so done by Mr. Holtzapffel's grandfather. Probably at that time, when the nose had to be screwed by hand, this was an unavoidable defect, but by the method of Dr. Edmunds, which we have described above, and with the aid of the spiral or screw-lathe wheels to guide the tool, there is no necessity whatever to maintain this defective construction. Two cases were mentioned to the Council of the Amateur Mechanical Society, in which finely executed lathe-mandrels, constructed on this plan by Holtzapffel, have had their noses broken off, and when we consider that the ornamental lathe mandrel-nose is virtually the basis upon which hundreds of pounds' worth of costly ornamental chucks and other apparatus is gradually built up, it is clear that no pains ought to be spared to make the mandrel a model of mechanical proportion, and of artistic skill.

Several models of mandrel-noses, executed by Dr. Edmunds, upon the method we have already described, were placed before the Council for examination, and we append dimensions of the mandrel-nose and face, which Dr. Edmunds recommends for the ornamental lathe. The face is much larger than at present, being 1·75 inch in diameter, and giving a clear face bearing of ·4 inch outside the ·95 inch. base of the mandrel-nose, which we have already described. The end of the nose is coned out at 15° from its axis to a base of ·5 inch wide. Into this hollow cone conical-cylindrical chucks will be held by a tubular steel-screw passing in from behind as is at present done in the watch-lathe. For many delicate purposes such chucks will be very useful, and can easily be made in great variety. The centre point also will fit into this cone for all work not of extraordinary weight. Dr. Edmunds pointed out that for wooden chucks the extended face-bearing would be of great value, while for metal chucks it might be more or less fully occupied according to the weight of the chuck, and the accuracy of fit required. Dr. Edmunds urged that it was inexcusable folly to shirk the expenditure of one or even two days' extra labour in finishing a mandrel-nose and face up to the level of a Withworth guage; and, arguing that, as long as things that were equal to each other were each equal to a third, there was no reason why duplicate and interchangeable mandrel-noses and chucks should not be made with as much certainity as Whitworth cylinder guages or surface plates. Finally, Dr. Edmunds showed that for the sake of durability, all wearing surfaces that could be hardened without lessening the strength of the mandrel-nose should be left hard, and he thought that by the skilful use of emery wheels, the face and cylinder-base of the nose could easily be finished off so as to be left quite hard up on the surface. The same could certainly be done with the extreme end of the mandrel-nose which, he advised, should have its thread ground off at an angle of 45° with the axis of the mandrel, but so as to leave intact the end of the stem cylinder ·7 inch in diameter. As to the tips of the thread upon the cylinder of the mandrel nose, he thought there would also be no insuperable difficulty in tipping them down by the emery wheel, after cutting them up to a sharp edge upon a .9145 cylinder, and so managing as to have these fairly hard upon their outsides. But on this point we had not yet had time to make practical experiments.

We are indebted to Dr. Edmunds' private notes for the substance of the above, and shall give the interesting subject further consideration, with diagrams, at an early date.

Lacquering Brass.—When properly lacquered, brass work will retain its colour, and resist the action of the atmosphere for a long time; hence the necessity of always lacquering work which should retain a good appearance. The process is rather difficult to execute properly, especially on large surfaces, where the tyro will find the lacquer continually getting a smeary look. Before applying the lacquer the brass must be heated to a certain degree, and the difficulty is to know the exact degree best suited to the particular lacquers and materials used, and the effect to be produced; this kind of knowledge cannot be attained but by experience. If you do not feel disposed to prepare the surfaces of your work by means of filing, &c., another plan, far easier and equally effective, though not producing such a workmanlike job, is the following:—Put the brass work, having previously taken it to pieces as much as possible, into pickle, made of nitric acid and water; this will eat away the outer coat, all the corrosion, and all lacquer, leaving a surface of pure brass. The time required to effect this and the strength of the pickle can be soon ascertained by trial. The work must be carried on in the open air, as the fumes given off are very baneful to health. Thoroughly wash the articles to remove all traces of acid, and then dry them in hot sawdust; they will then be ready for lacquering. Use a camel's-hair brush to lay on the lacquer with, heat the articles as hot as may be held in the hand; be careful not to touch the bright surface with anything that will stain it, and lay on the lacquer as thinly as possible to prevent smears. If the work is too hot it will burn the lacquer, and if too cold this will not set hard. Small thin articles part with a large proportion of their heat in laying on the lacquer, but bulky work is comparatively unaffected; so small articles must be made somewhat hotter than large before lacquering. Only experience will enable you to judge correctly.

CABINET WORK.

NOTES ON MATERIAL AND TOOLS.

WE hear a good bit about amateur carpentry and the amateur carpenter, but, as a matter of fact, amateurs seldom do any carpenters' work, which consists of designing and making roofs and staircases, fixing rafters and laying floors. The joiner's work consists of making doors and sashes, window shutters and panelling. The cabinet-maker deals with hard and fancy woods, and it is in this direction that the amateur usually finds delight—in making boxes, desks, cabinets, and other useful articles. The charm the working of wood possesses for the human mind is wonderful. Almost all boys, as soon as they can walk, want knives to hack wood with, and it is as imperative that a boy should have his tool chest as that a girl should have a work-box. But in after-life leisure is but too often wanting to continue the art, though it is still pursued, in some cases, under extraordinary difficulties. One dear old bachelor is in our remembrance, who, having spent many summer evenings in making a work-box out of a remarkably handsome piece of wood, finally covered it with glazed note paper to hide all defects.

The fascination of cabinet-making is not limited to any class, but extends to all. Many sovereigns at different times have practised it. Peter the Great of Russia is an example; the present Sultan of Turkey is another. A most distinguished Englishman may be added to the list. The present Lord Derby, when Lord Stanley, cut his hand severely in cabinet-making, an occupation which he now so successfully carries on in a slightly different manner.

With such a demand for information, one would suppose there would be a corresponding supply; such, however, is not the case. Numerous books exist on the subject, but none seem to have hit the mark. The men that know their subject cannot write of it; perhaps, if they can, they do not think it to their advantage—if they do teach, practical lessons pay the best.

Under these circumstances a few hints of a thoroughly practical nature, in which to describe the different woods and their properties, for what work best suited; the tools, how to use and how to keep them in order; minute directions for making certain small articles, in which all processes are gone through, as in larger pieces of furniture, and a few designs and general directions for these will be acceptable; but a man will not become a cabinet-maker unless he is able to make his own designs.

Of all wood in use in cabinet-making mahogany stands at the head. It is suitable for almost all descriptions of work; free from knots; less liable to warp than any other woods. It is kept in stock at most wood-yards, and one peculiar thing recommends it—it can be obtained in pieces very long and wide. Some excellent examples of these latter desiderata may be seen in the dado of the reception room at Grosvenor House. The doors there also are fine examples of work in mahogany, especially the *old* doors. This leads us to the remark that there is mahogany *and* mahogany. The two principal divisions of mahogany are Cuban and Honduras mahogany.

The price of Honduras is from 6d. to 10d. per ft. 1in. thick; Spanish commences at 1s. 4d., and advances, according to the beauty of the grain, to 16s. per ft., the more expensive kinds being usually cut for veneers. To attain success in cabinet-