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World of MODEL ENGINEERING

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WORKSHOP
PROJECTS
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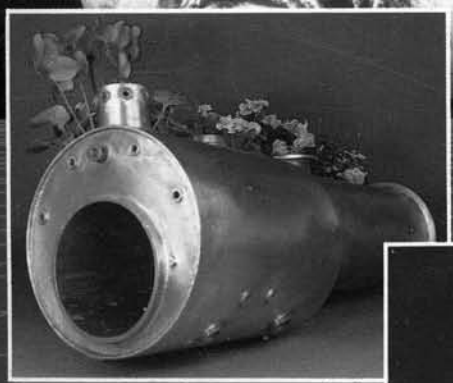

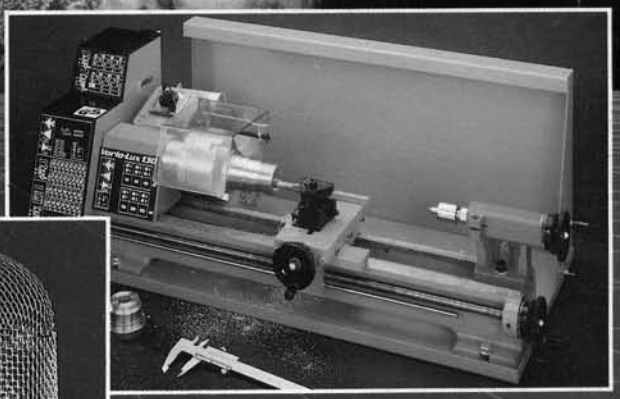

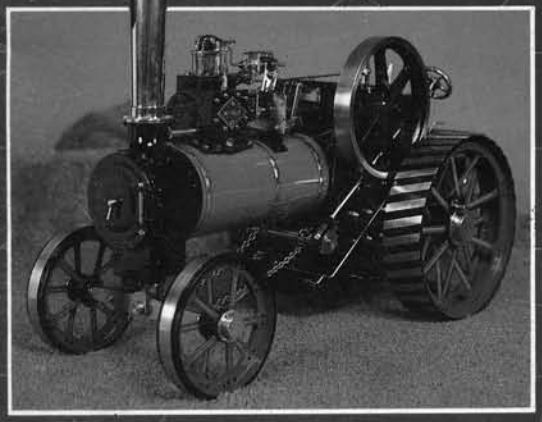

NO3

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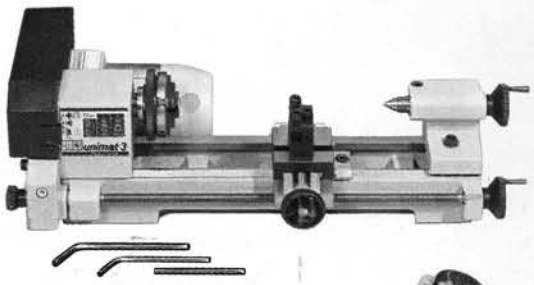
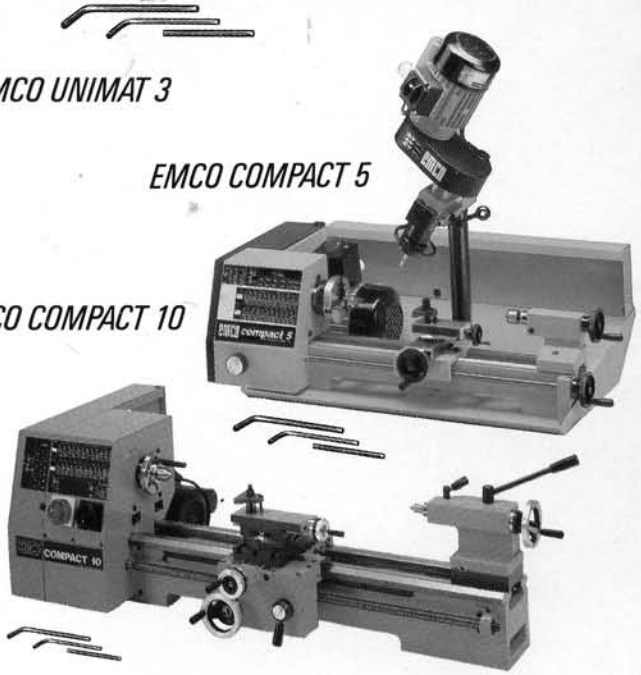


EMCO UNIMAT 3

EMCO COMPACT 5

EMCO COMPACT 10



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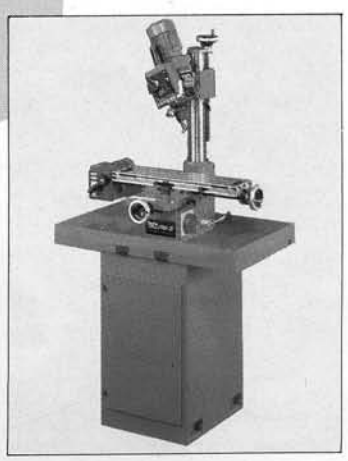

EMCO COMPACT 5
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EMCO FB-2

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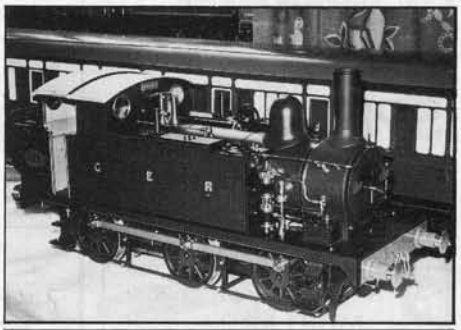

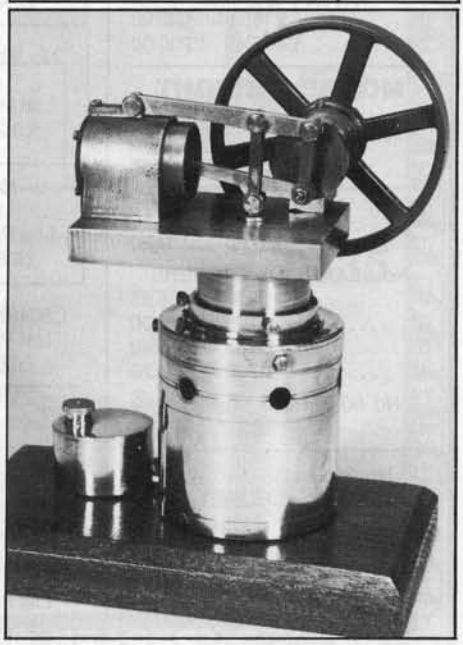

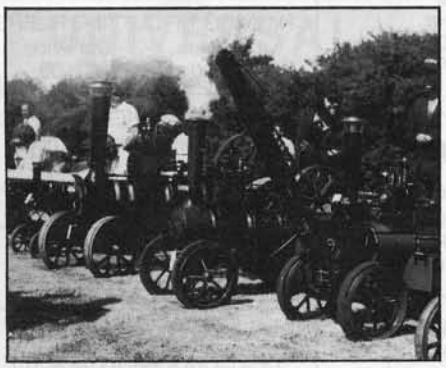

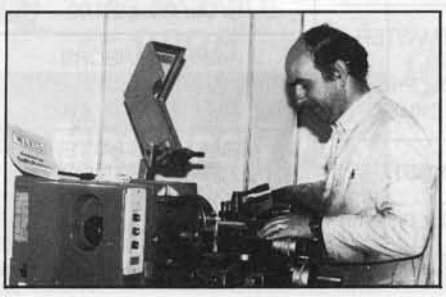

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[With grateful thanks to the staff of Model Engineer magazine for photographic assistance and advice]

"World of Model Engineering 3" is printed in Great Britain by Chase Web, Plymouth with mono and colour origination by Keyboard Komposition Ltd., of Stratford, London for the Proprietors and Publishers, Argus Specialist Publications, Argus House, Boundary Way, Hemel Hempstead, Hertfordshire. HP2 7ST. Front cover origination by Derek Croxon of Chesham, Bucks. Distribution by SM Distribution Ltd.

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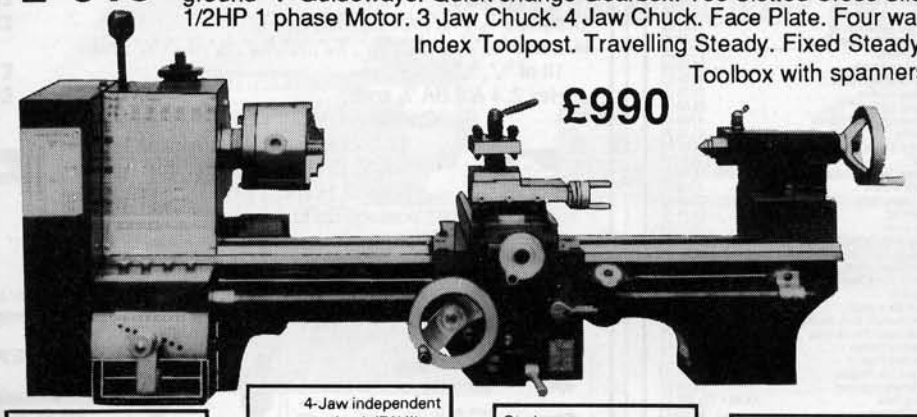

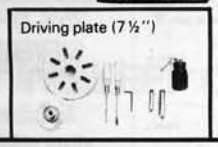

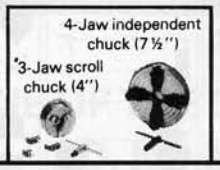

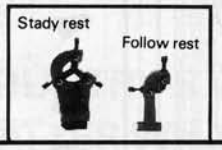

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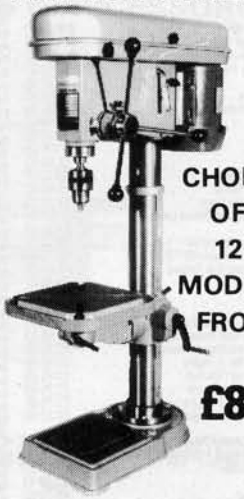

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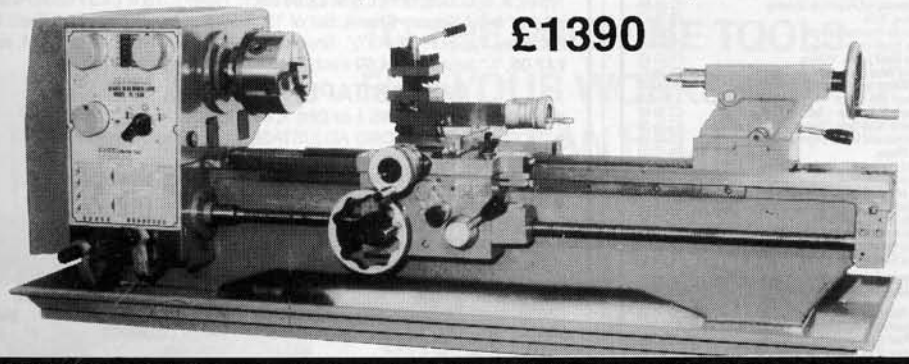

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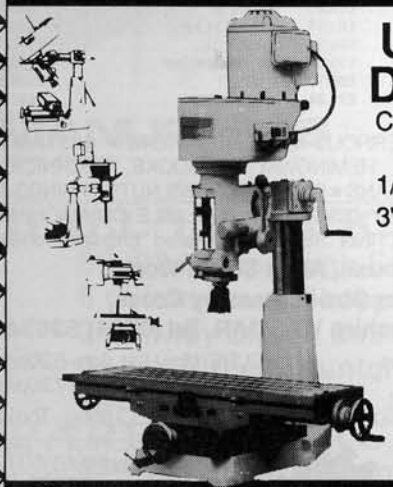

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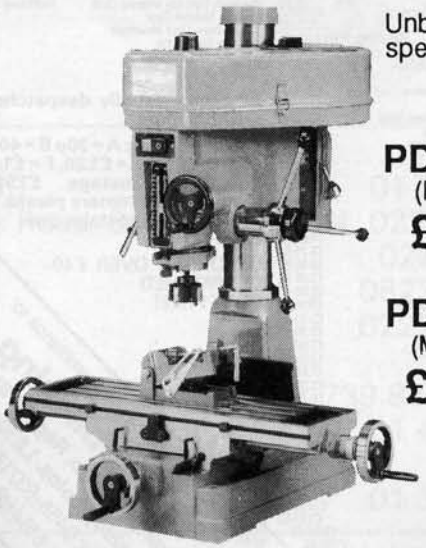

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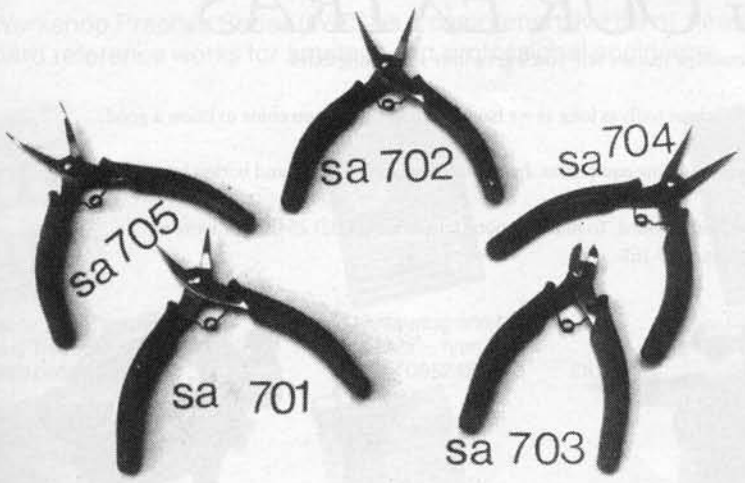

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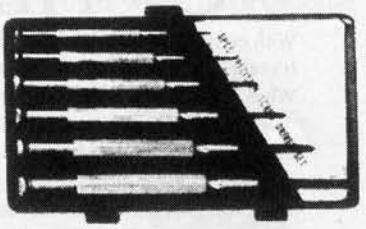

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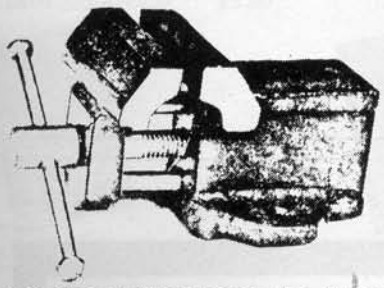

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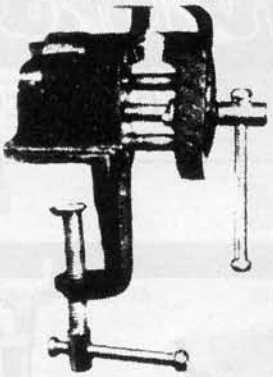

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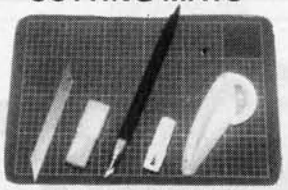

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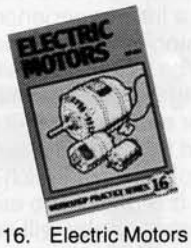

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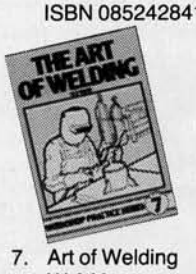

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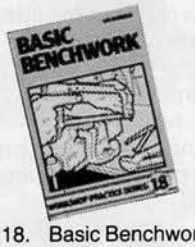

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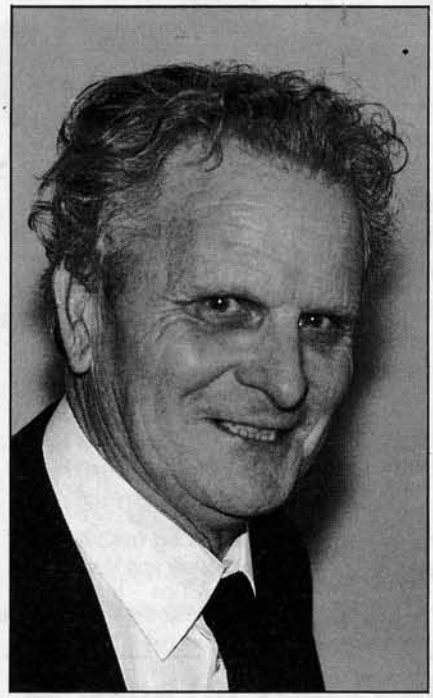
MODE & MODEL

This is the third issue of "The World of Model Engineering." I hope that I will again be able to offer readers plenty to interest them within the model engineering field. As always, I am, in particular, trying to offer something for those who are either new to the hobby or have only a little experience, as well as something to interest the people who have been involved with model engineering for some years. Hopefully too, one or two juniors will get hold of a copy and be bitten by the bug . . .

It is a hobby from which, once the bug bites, it is difficult to escape! After all, what other hobby will enable one to recreate engineering masterpieces from beginning to end, in such a way that they actually work? For it is working models that we are basically after. I have endeavoured to cover fields of the hobby which are often not written about or possibly are written up in a way that is not too easy for the less informed to understand.

I have given some inkling of workshop practice, and how the making of one's own equipment helps improve workshop facilities. Simple projects are included which will increase the reader's skills. We have a look at some outstanding models and, of course, no "World of Model Engineering" would be complete without a peep into someones workshop!



When I visit some of the various societies to give talks and, indeed when talking to people in general, the question I am frequently asked is, what is the difference between model-making and model engineering? Now I must confess that I find this something of a puzzle to answer. My answer is usually that the model engineer makes models using the same, or virtually the same, materials as were used in the original machine. Whilst that is basically true it is not by any means the whole answer.

The boat modeller building a model of a timber boat from wood is using the same material and possibly the same methods as were used to build the original. He or she is not usually classed as a 'model engineer' though, but then builders of wooden boats were never classed as engineers in the first place!

Then again model engineers do not just make models; we tend to include the making of clocks and the making of tools in model engineering. These are not even models and so the field widens. It is, then, difficult to define what exactly the name implies but it is possibly fair to say that usually the model engineer will construct articles that work in the same way as the original and there will be a large proportion of metal used in the construction because, after all, this is what the name 'engineering' implies.

Now I hope readers will not think that, because I have said this, I am biased against other forms of modelling because I am not. I admire modelling but am more impressed by the person who makes a model from scratch rather than a kit. But if a person does not feel he or she has the expertise to work without kits, or perhaps cannot spare the amount of extra time involved, then so be it. Any form of modelling will give pleasure, both to those performing it and to those who view the finished item. I applaud all modellers but I personally feel the model engineer has to do that little bit extra to make a model...

There are those who will now want to disagree with me so let me explain. It may well be that the man making a boat will spend a great deal more time on that model than will the person making, say, a simple tool of some sort. The aircraft modeller will have to adjust his aircraft for perfect flight as well as construct it. The military modeller will have to take extreme care to produce those exquisite models that we see, either as single items or in the form of dioramas.

But the boat modeller will need only to know how to cut and sand wood and possibly drill small holes, as

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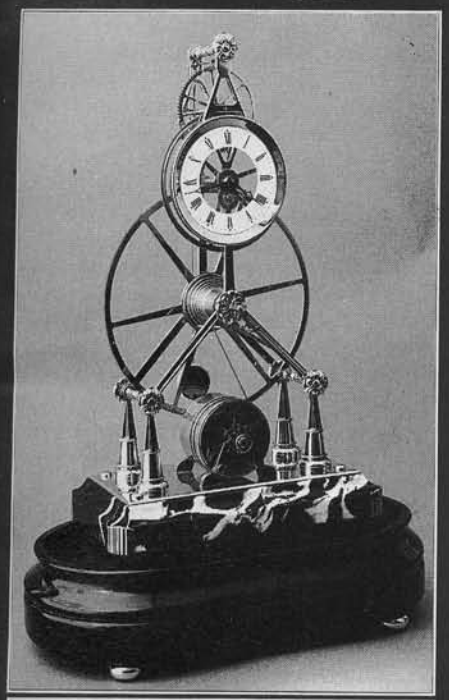
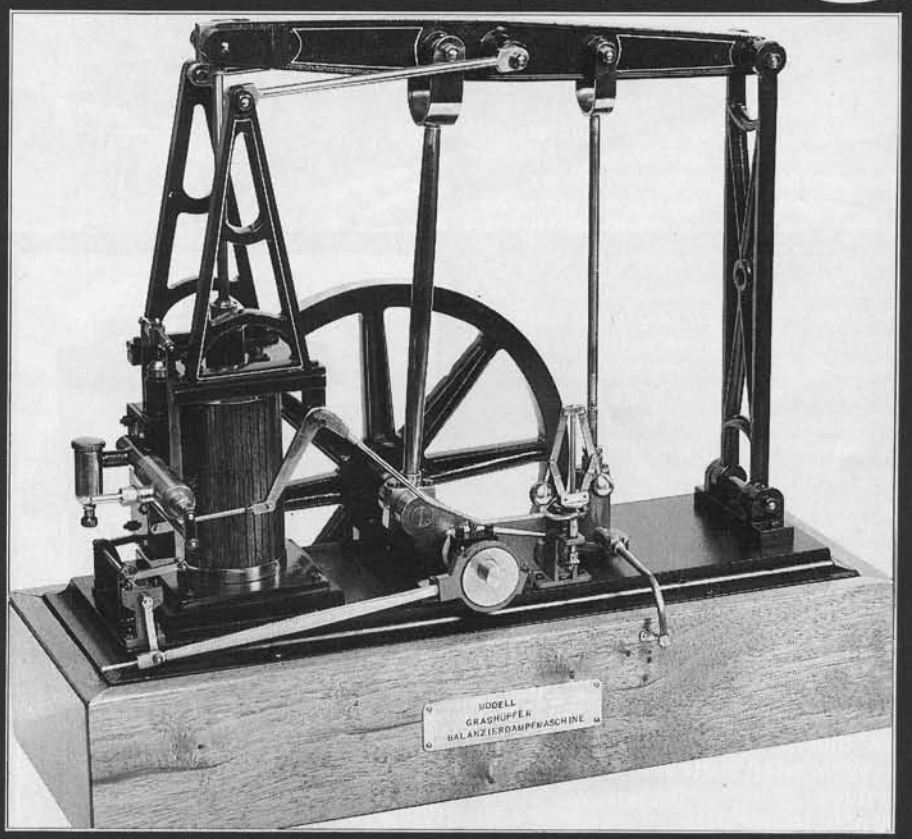
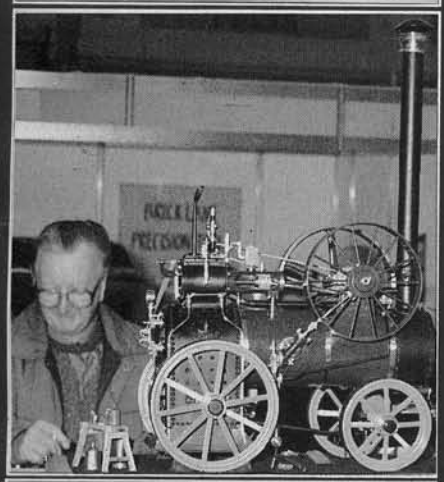
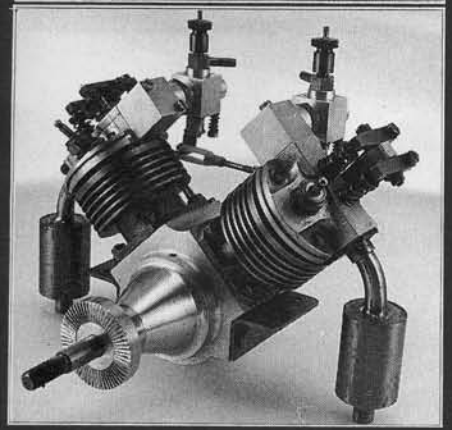




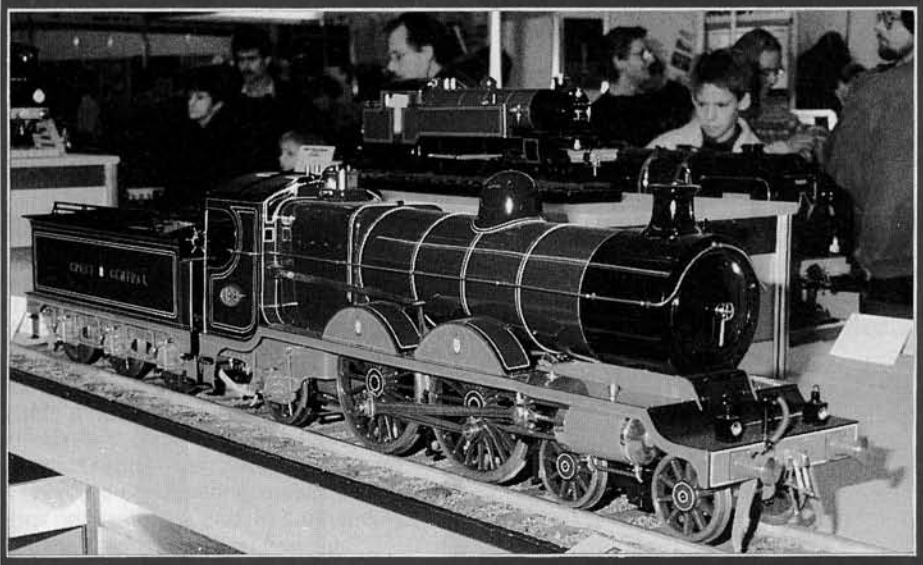




Locomotive modelling (previous page) may be the most popular but is by no means the only field open to the model engineer. This 'Grasshopper' beam engine (above) is made from castings and is an interesting short term project when a locomotive seems too demanding. Other options are clockmaking (above), not strictly modelling but using the same skills, portable and traction engines (left) or internal combustion engines such as this two-cylinder aero type (bottom left).

well as painting and varnishing, etc. The aircraft man or woman will also need to know how to cut wood and glue it together besides how to trim the plane and fly it. The military modeller may carve and cast his or her own models, and will, undoubtedly, paint them. All, of course, need to get to know something about the thing they are making a model of. None of these has had to master more than five or six skills. The model engineer has to know how to hacksaw, file, drill, tap, ream, thread with dies, solder, braze, turn, mill and many other things as well as how to paint and line the models, and then how to make them work. That, then, is surely the difference between model engineering and other forms of modelling. Not the time and patience required —that is common to all modelling and depends on the complexity of the model and the standard required as to how much is needed. No, it is the fact that more skills have to be mastered that makes the difference.

Readers who are new to the idea or have bought this magazine with the idea of learning about the hobby will possibly be wondering if the hobby is for them, with all these skills to be learnt. To that I would say have no fear, the skills can be acquired as you go along and what is most needed is patience. There are numerous books available which advise on how to use the various tools that are needed and, if these are followed, there should be no difficulty.



Advice can be obtained by joining a club. Most clubs have a wide range of members from raw beginners to highly skilled engineers. There is always a wise old sage who can dispense knowledge and tips that are absolutely invaluable. It is also possible to attend evening institutes where the machinery can be used and help will be given. These are not places where lectures have to be listened to; more often than not the evening classes consist of the use of extensive workshop facilities with an instructor to offer the advice. There is nothing formal. You can make just what you want, or even watch other people doing what they want to if you feel that more can be learnt that way.

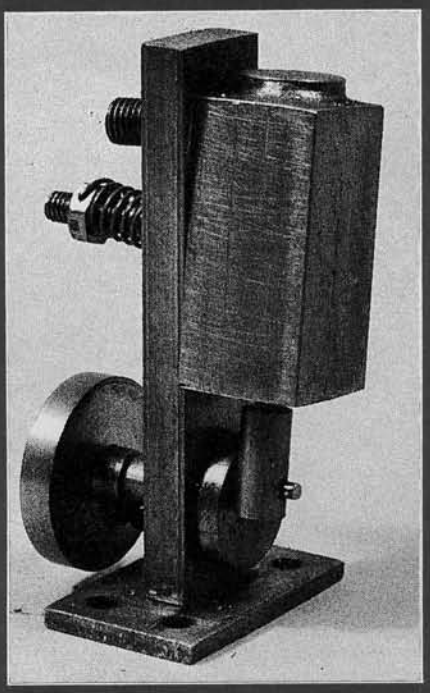
What will it cost? Well, it will certainly cost something as will nearly all hobbies. It can be reasonably inexpensive or it is possible to splash out lots of money and buy lots of equipment. Having a lot of equipment will not necessarily mean making better models. That will depend on how well you learn to use what you have and your own patience. Having too much machinery can be confusing —besides, the more machines that are bought the more machines one has to learn to use!

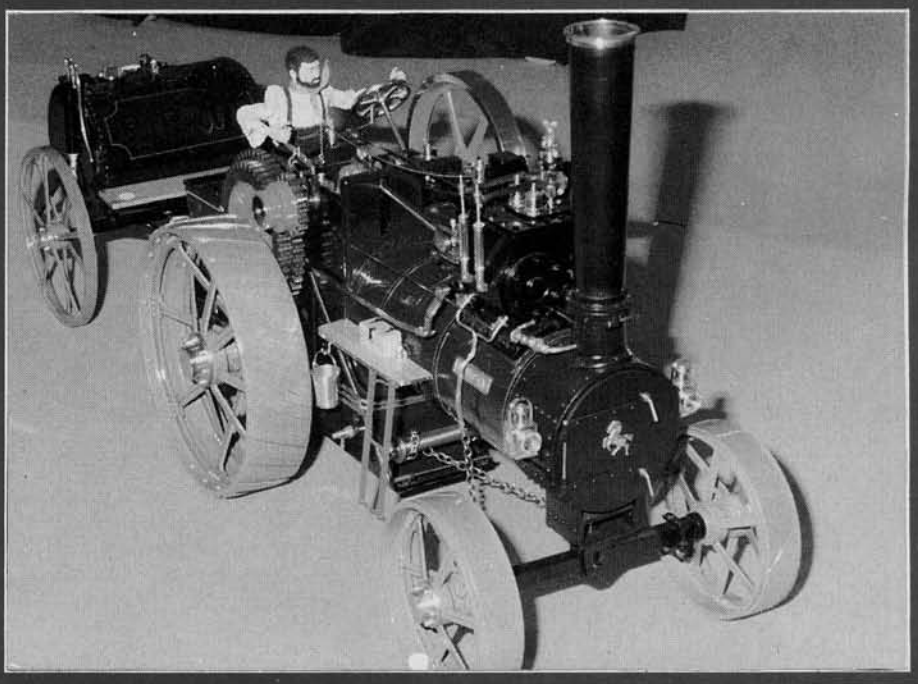
The basic machine that will be required will be a lathe. This can be an old second-hand one or brand new. It can be a large one or small, it is all a matter to suit the individual. There is no need to make massive locomotives that are too heavy to lift; a lot of pleasure can be had from making models in the smaller gauges. It does not have to be locomotives either. There are many other things that can be made, some of which only need very small equipment. It is not necessary to have a large workshop; a tiny cubby hole or a portable bench will do, so most people can, if they wish, start model engineering.

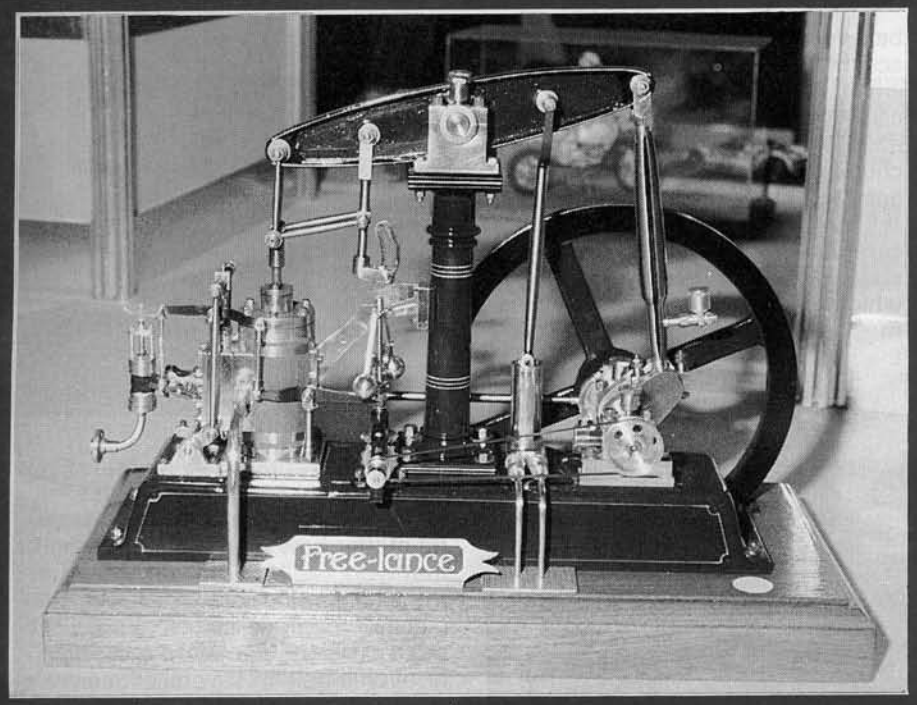
A volume such as this cannot make a model engineer from a new reader. However, I hope it can encourage people to start. I hope those who are model engineers can get some encouragement from it and perhaps pick up some tips. Many of the hints included have been given to me by other people and that is what it is all about —helping each other to gain satisfaction from spare time, and, in the end, having something of which one can say I MADE THAT!

As regards cost, the initial outlay will be the worst part. However a lathe can be obtained on credit facilities and that is the only machine that is absolutely necessary. It is quite possible to buy a lathe brand new for about four hundred pounds, but second-hand ones can be obtained very cheaply indeed. Here again, joining a club will help because amongst members there is a constant flow of machines and materials being passed. If we are thinking of building a five inch gauge model locomotive of moderate proportions then it could well cost another couple of hundred pounds in materials. However, these need not all be purchased at once but as required. As the construction of a locomotive is likely to take anything from two years upwards, the cost can be spread and works out to a mere couple of pounds a week that way.

Over the past few years there has been a steady growth in the number of firms willing to supply parts for models that are already completed. There is also a thriving market in finished models. The latter is not really a concern of ours as the idea of model engineering is to make things for oneself. The supply of ready-made parts is not a new thing; long ago, Bonds of Euston Road, Bassett Lowke and several other firms would supply







certain machined parts which made it easy to build a model. In those days the reason for the supply of these items was different to that of today. Few people had or could afford lathes and so the supply of ready-made parts flourished.

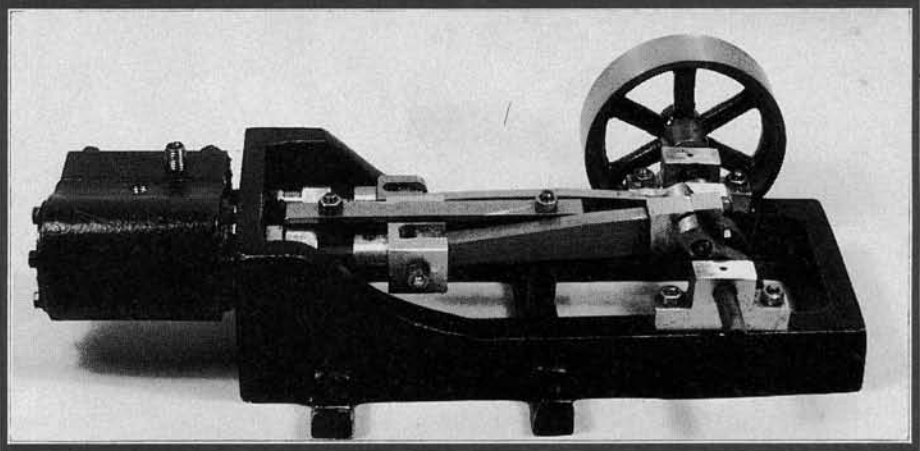
Then onto the market came lathes designed with the modeller in mind. Zyto, Gamage, Myford and many more produced lathes of similar proportions which could be set up at home. Of these only Myford remains, and they have gone from strength to strength. The reason the old names disappeared was that, although lathes were produced which were suitable, the firms did not keep up with the market by supplying accessories in the way Myford did. Now those long-forgotten names have been replaced by new ones, as certain manufacturers realised what a wide interest there was in the hobby and produced equipment to suit it.

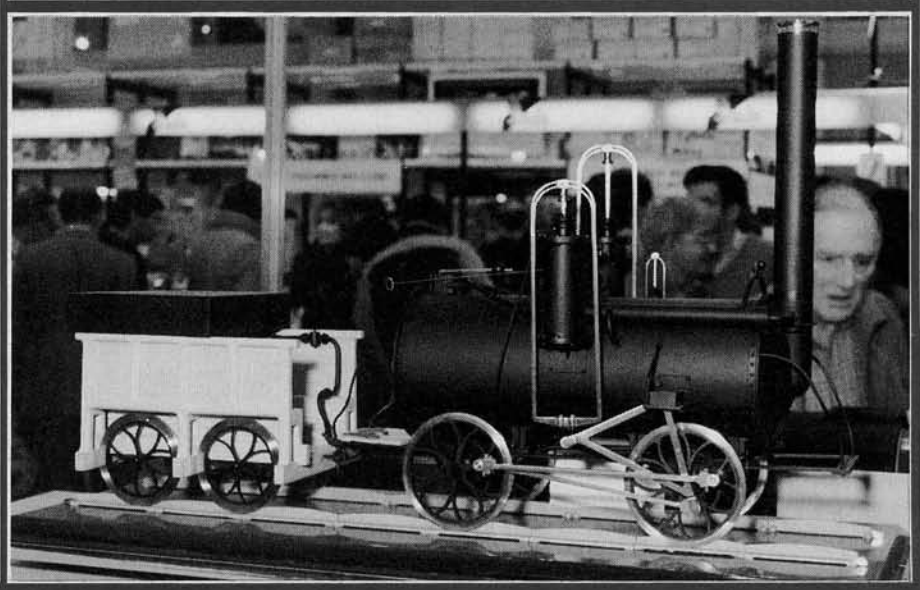
The strange thing is that most of these lathes are imports from countries where the hobby of model engineering is only just beginning to catch on! Anyway, there are now many choices of machine available to the modeller —not just lathes but all sorts of workshop equipment that would never before even have been thought about. All of this makes life very much easier than it was before.

No matter what equipment we buy it is still essential that we learn to use it properly. It is as well, then, for the beginner to start on a simple project. High quality models will take many years to complete and, if one is not confident of one's own ability, this will seem like an eternity and a feeling of despair will creep in. Making a few simple things to start with teaches one to get the best from a machine and to profit from mistakes that are made. We all make mistakes —go to a factory and have a look at the scrap pile, it will astound you how many spoiled jobs are to be seen! The important thing is to try to make such errors on less important tasks so that when the time comes to build that super gold medal-winning model, the modeller is confident enough to tackle it. For those considering a locomotive or traction engine I would suggest a start with a small stationary engine. Many of the machining operations required for the larger models will be needed to build the stationary engine.

I hope I have summed up what the hobby is all about and given readers an insight into what is required and how to make a start —if, indeed, a start has not already been made...

This beam engine (left) is relatively simple and a good project for beginners, while the horizontal steam engine (below) can be built on a small compact lathe. For something a little different, the old time 0-4-0 (bottom) is a real challenge. This model required a great deal of research, since there are no designs or castings currently available. The previous page shows a fine Great Central Atlantic 'Jersey Lily' 5in gauge locomotive (top) for which Don Young supplies drawings and castings. The very simple oscillating engine (centre) is an ideal first-timers' model while the 2in gauge Aveling and Porter traction engine (bottom) is good for those without the necessary track to run locomotives. The cart behind is a water tank.



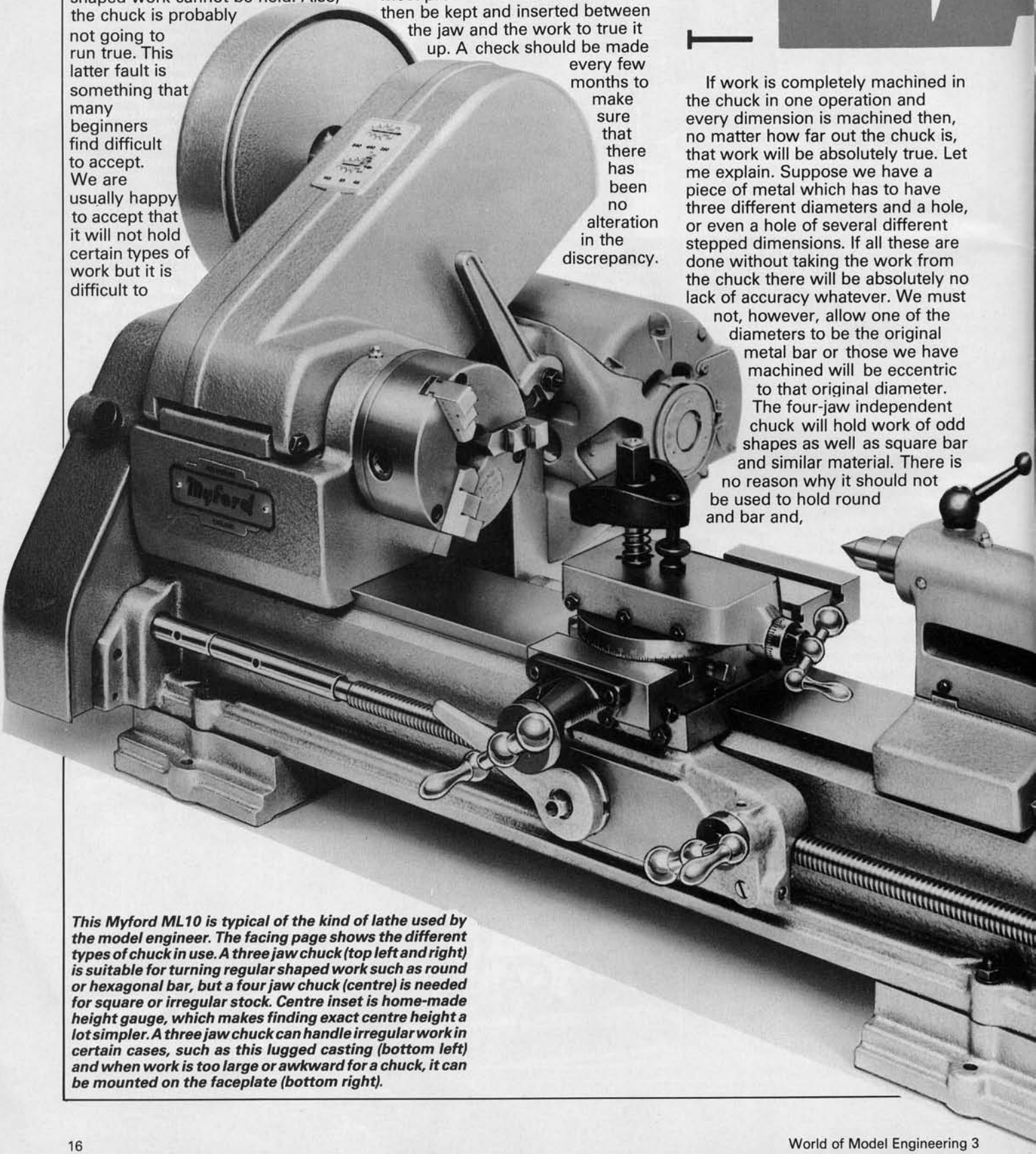


THE LA

Without doubt the most important machine for the model engineer is the lathe. It is a very versatile machine and will perform most jobs that are asked of it, within the limits of its size. Work can be held in several ways. The three-jaw self-centering chuck will hold round and hexagon work and is simple to use, but it does have its limits in that irregular shaped work cannot be held. Also, the chuck is probably not going to run true. This latter fault is something that many beginners find difficult to accept. We are usually happy to accept that it will not hold certain types of work but it is difficult to believe that the chuck will lack accuracy. Frequently this type of chuck will begin its life quite accurate but, within a short period, this will be lost. If we know our chuck and its faults the matter is easy to deal with.

One way to get accuracy is to carefully measure the amount the chuck is out of true and note at which of the three jaws the error is most prominent. Metal shims can then be kept and inserted between the jaw and the work to true it up. A check should be made every few months to make sure that there has been no alteration in the discrepancy.

If work is completely machined in the chuck in one operation and every dimension is machined then, no matter how far out the chuck is, that work will be absolutely true. Let me explain. Suppose we have a piece of metal which has to have three different diameters and a hole, or even a hole of several different stepped dimensions. If all these are done without taking the work from the chuck there will be absolutely no lack of accuracy whatever. We must not, however, allow one of the diameters to be the original metal bar or those we have machined will be eccentric to that original diameter. The four-jaw independent chuck will hold work of odd shapes as well as square bar and similar material. There is no reason why it should not be used to hold round and bar and,



This Myford ML10 is typical of the kind of lathe used by the model engineer. The facing page shows the different types of chuck in use. A three jaw chuck (top left and right) is suitable for turning regular shaped work such as round or hexagonal bar, but a four jaw chuck (centre) is needed for square or irregular stock. Centre inset is home-made height gauge, which makes finding exact centre height a lot simpler. A three jaw chuck can handle irregular work in certain cases, such as this lugged casting (bottom left) and when work is too large or awkward for a chuck, it can be mounted on the faceplate (bottom right).

ATHE

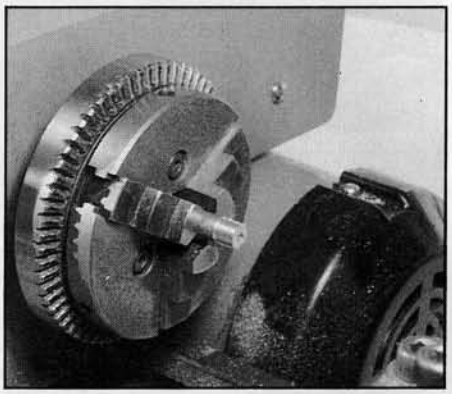
The lathe is the cornerstone of the model engineer's equipment, and it pays to be familiar with its capabilities. It's a supremely versatile machine which can perform a wide variety of tasks.

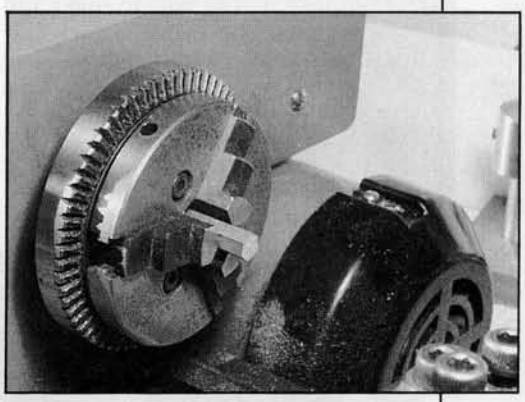
in fact, by using a clock gauge to check it, such bar stock can be held far more accurately than it can in a three-jaw.

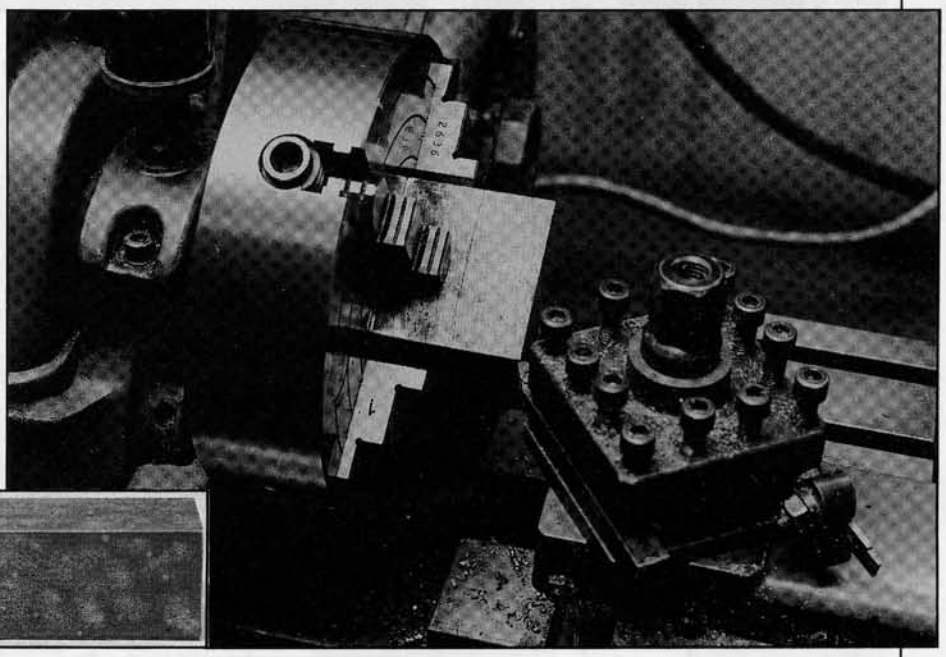
The faceplate is used to hold odd shaped work and particularly castings. It can be used in conjunction with angle plates to set work on it in any desired position.

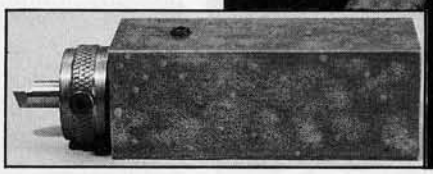
Turning between centres involves putting a centre in each end of the work and suspending it between the soft centre in the lathe headstock and a hard centre in the tailstock. A device like a small faceplate with a protrusion on it is used to drive the work round via a carrier which is held on the work with a screw. There must be a flat surface on the work to enable this screw to grip and so, if round bar is turned in this way, a flat must be put on it for the drive.

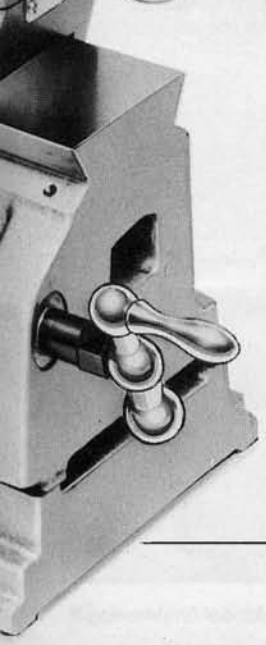
Lathe tools come in a variety of shapes depending on what metal they are to cut and what type of turning is being done. These days it is possible to purchase tools with

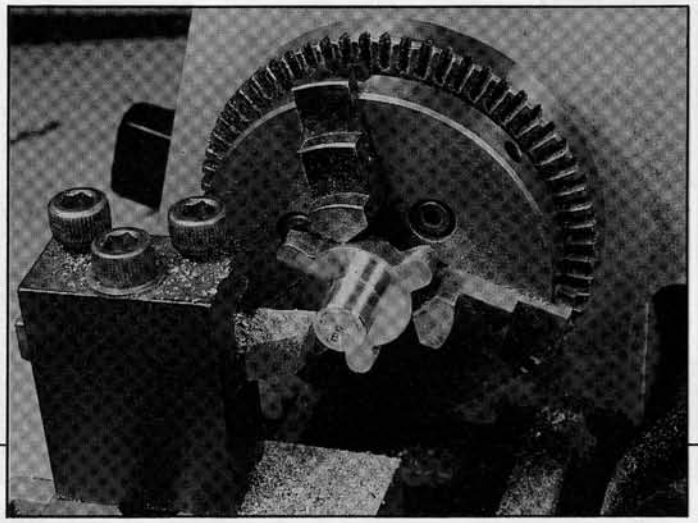


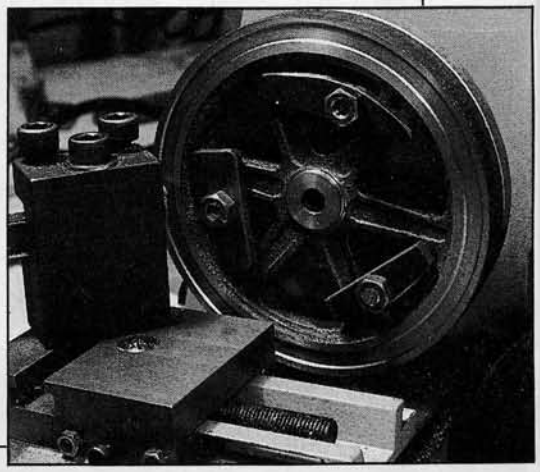


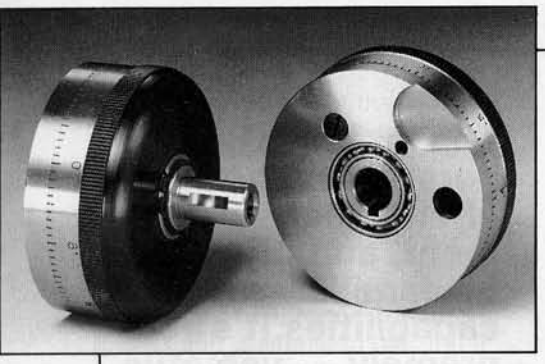






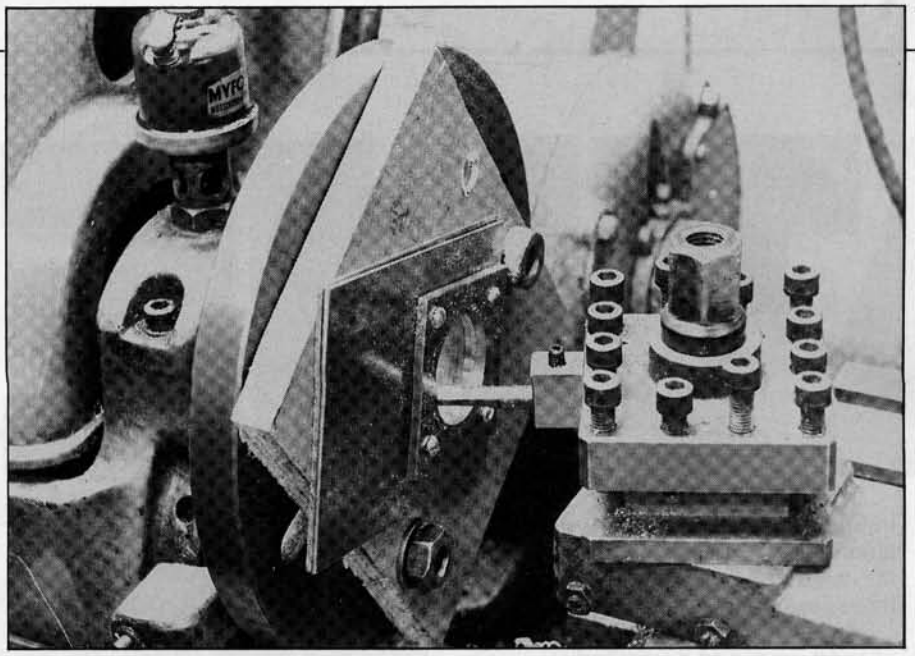




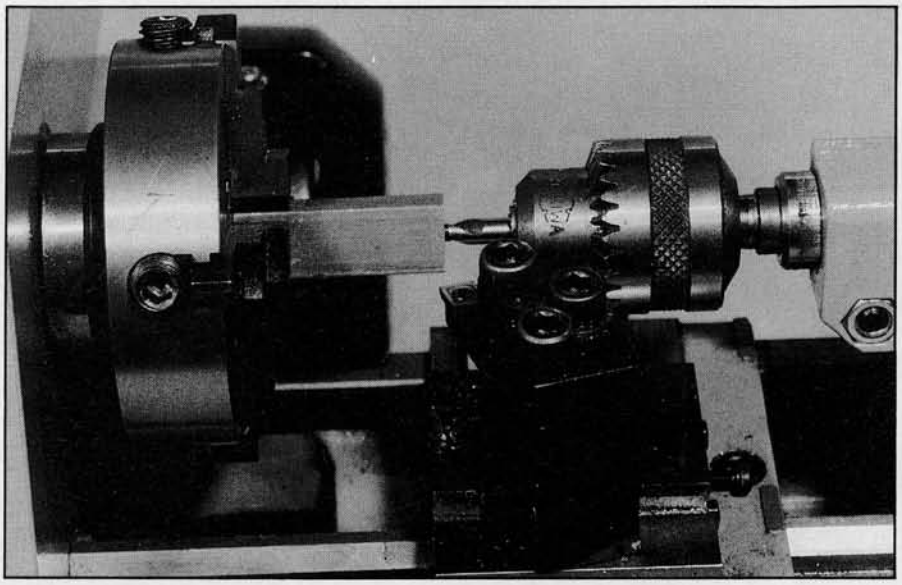


carbide tips but mostly a piece of high speed steel is ground to shape as required. The tool should, where possible, be ground with the correct angles for the work involved. For this purpose it is as well to make up small gauges. Some small discrepancy, whilst not giving perfect results, will do no noticable harm.

One of the most important things, as far as lathe tools are concerned, is to get the cutting edge at the exact centre height. For this purpose it is, without doubt, well worth spending half an hour or so making a centre height gauge. This simple device will enable the tool to be set easily to the correct height and the time taken in making it will repay itself a thousand times.



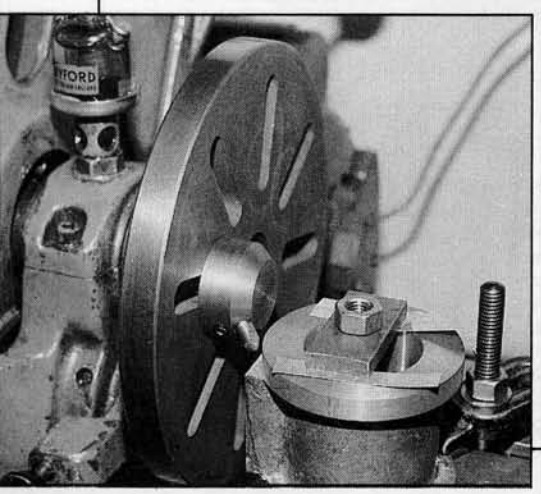
Above: This complicated piece of work involves three separate plates being bored to size at one setting. The heavy plate which supports them is a quick means of mounting the work on the faceplate, and allows the boring bar to go right through the work. Above left, these Hemmingway handles are highly accurate, and can be used as replacements for the often far from precision markings on original handwheels. Drilling can be performed with greater accuracy on the lathe than is possible with a drilling machine (below) and using a tap in lathe (bottom right) ensures the thread will be at exactly 90° to the face of the work. A fly cutter mounted on the faceplate (bottom left) can generate large flat surfaces.

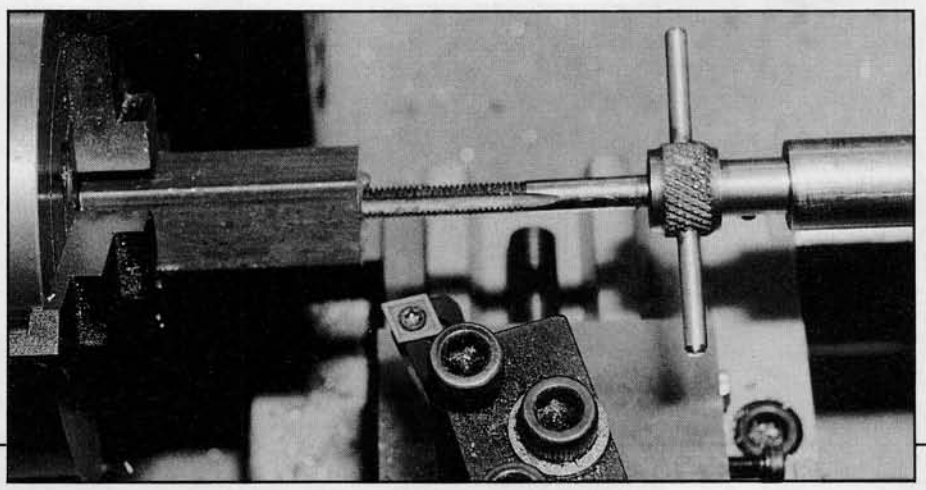


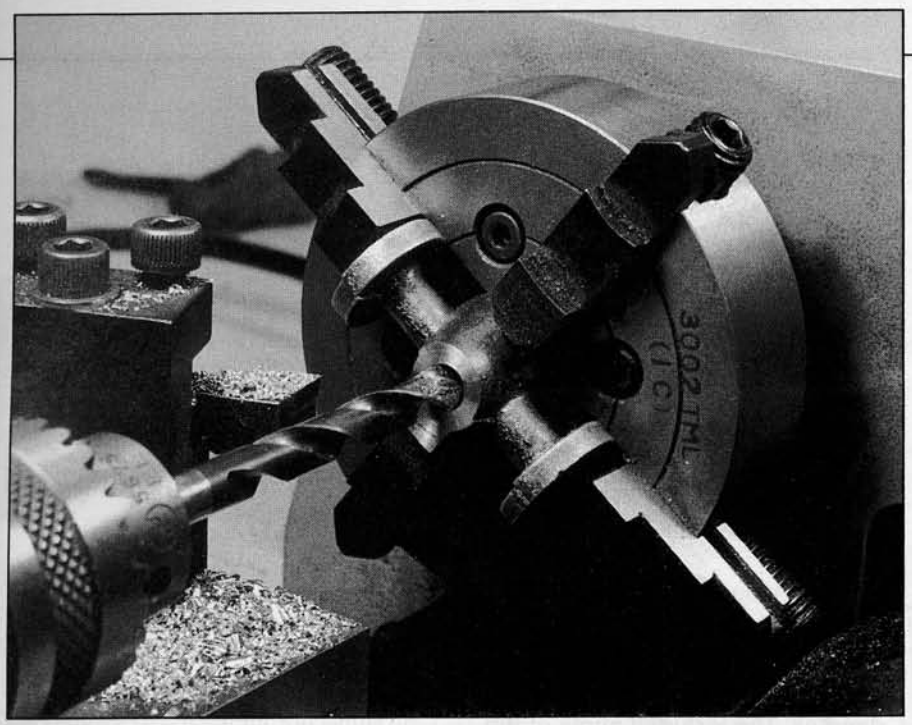
The speed of rotation of the work for cutting is important and the speed should be as near as possible correct. The speed will vary according to diameter and the material being machined.

In a volume such as this the full potential of the lathe could not possibly be discussed. I would therefore suggest to readers that one or more of the many books on the subject be read if more knowledge is required. It is certainly well worth thoroughly getting to know how to use the machine properly, if one wants to get the best from it.

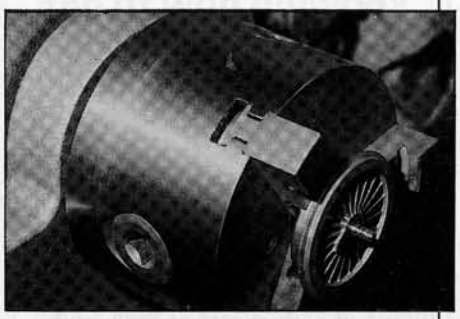
The two pictures right show a cylinder block, a common item for which the modeller must know the correct techniques.

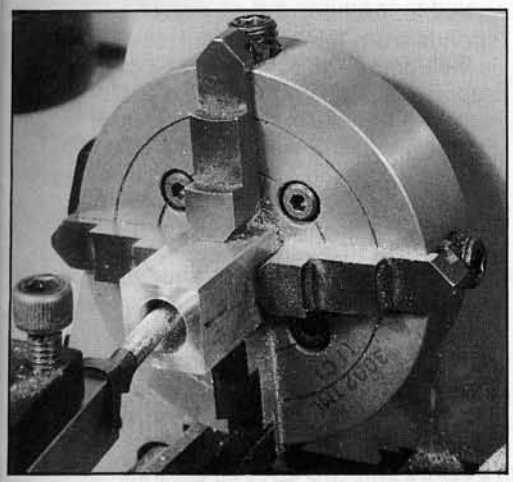


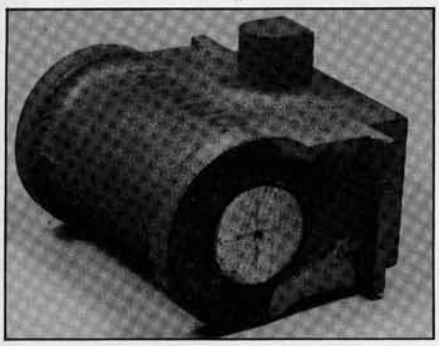


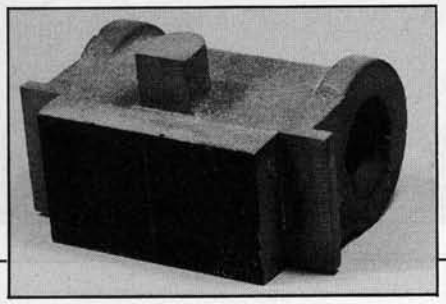


Left, a very irregular shaped casting being drilled in a lathe whilst held secure in a four jaw chuck and, below, a small locomotive wheel is being turned on a special mandrel. Centre left, a square bar is bored, to give an absolutely accurate hole, and below this a cannon barrel shows just how high a standard can be achieved.









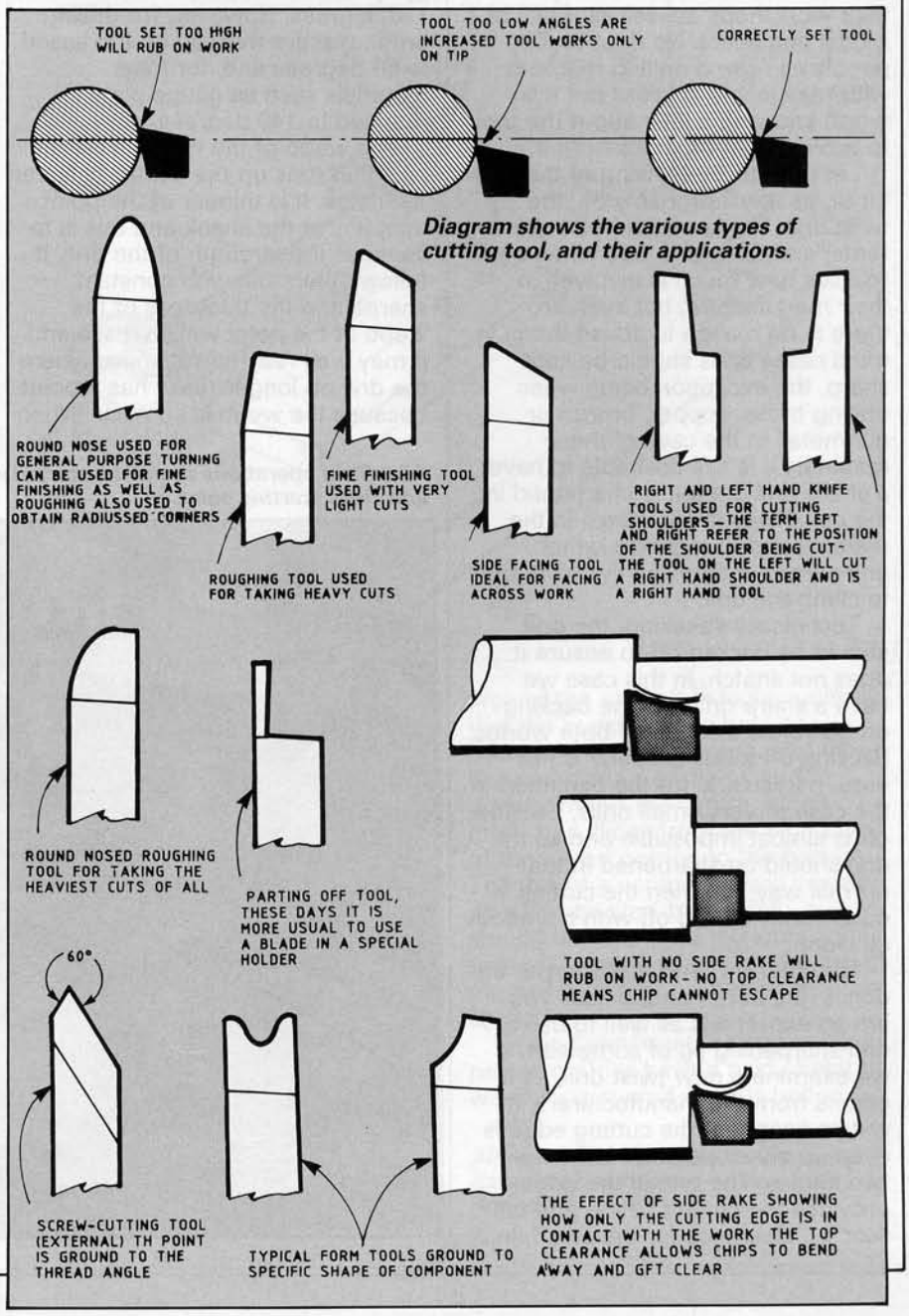


Diagram shows the various types of cutting tool, and their applications.