S1.2 Basic Hand Tool List

This document was written by 'The Wagon Man' and was written for the FMES on line readership. 'The Wagon Man' is a Committee Member of FMES and has as his speciality producing scratch-built models of Railway Wagons in 5-inch gauge. This series of Articles includes his personal perspective on this fascinating branch of the hobby.

Supplement 1.2

Introduction

In this, the second Supplement in the set of three, I will address the basic hand tools which it is suggested the beginner should consider at the outset. It is also where the Metric vs Imperial considerations become important and unfortunately may lead to a necessity for duplication.

No matter what is being purchased, get them from a reputable source. (I will deal with sources later in this note as the topic is common to both hand and machine tools). Quality tools will last a lifetime, and I still have items purchased 60+ years ago and used continuously ever since. They are as good as they ever were.

As ever, I can only offer you my suggestions, and explain why I made the particular choices I did, but I hope that they form a sound basis for your own decision making.

(Note:- Throughout this Note, reference is made to tools by their common name, eg 12" Rule, even though it may be Metric. Old habits die hard I guess.).

The Basic List.

Warning - Tool collecting can be addictive and ruin your wallet, but as you acquire more and different types you will wonder how you ever managed without! But I would almost guarantee that every model engineer has purchased at least one item that seemed like a good idea at the time but never ever used. In my case (and several other of our fraternity that I have spoken with) the top item was the Travelling Steady for a lathe.

The Foundations. Just as you can't build a house on shaky foundations, neither can you build any form of model. A firm **Workbench** is a must, as is a solid **Metal Workers Vice.** One with 5" jaws will do all that you will ever need. I actually have a second vice, one with 2" jaws, which I have mounted on a base plate. The base plate has a bar underneath it whose orientation can be parallel to the jaws or at right angles to them. It can then be clamped into the fixed 5" vice with the jaws athwartships (the usual way) or with its jaws at right angles to the bench front face, and additionally elevates the jaws to the correct working height, ie the jaws are at the same level as your elbow.

The jaws are normally serrated for a better grip, but these can leave marks on the work unless you remember to fit blinders (traditionally of leather). Jaws can normally be removed and replaced by Blind Jaws easily if you intend to have a session on visible items. Strictly speaking they should br ground and hardened, but for our comparitively light duty I use normal Bright Mild Steel.

Steel Rule. You can't have too many of these, but a 12" narrow flexible rule calibrated in both Metric and Imperial and the normal wider rigid version are a good start, and I would get both. The next popular size is a 6" version, but it is really just that little bit too short for 5-inch gauge work. However, there are 8" ones around, and well worth keeping an eye open for. At a later date, a 2 m rule will do most Wagon work. A 1 metre rule will be needed for the longer models, eg the Well Wagon previously described. These tend to be cumbersome, and I have both - remember you don't need to buy everything at once.

Marking Out – The Scriber and Centre Punch.

Closely associated with the Rule for marking out purposes is the Scriber which comes in a variety of shapes and sizes. Choose one that feel comfortable in your hand – you will be using it a lot.

The principal use of the Centre Punch in marking out is to locate the position of holes with high accuracy eg shafts, bearings, and datum points. Traditionally this was done with a centre punch, a hammer and a magnifying glass. Initially a light tap is used (make sure the punch is at right angles to the material). The position is then checked. If OK all well and good. If not, it is possible at this stage to drift the indent by a small amount. When satisfied the coup de grace is administered, again ensuring that the punch is at right angles, by ONE smart blow. And that's it for all time – any drill will then follow that crater.

More recently, the automatic punch, a single-handed weapon, became popular. One hard push and the indent was there. I persevered for a number of years, but I never mastered the technique. In a good many of my attempts I found that the punch skipped, and I finished up with two marks, one of which may have been in the correct position. I have since gone back to the traditional method which I find just as quick.

The essential feature for both scriber and centre punch is that they have a hard correctly angled point, and the manufacturer has spent a long time to get the best compromise. I would dissuade the amateur from "sharpening" either; some have replaceable points as a feature of their design and I would try to obtain one of these.

Callipers. There are three types, inside, outside and odd leg (Jenny). There is also the closely related dividers. All three are useful for lathe work, and a Jenny and a pair of dividers for marking out. I would get the dividers and Jenny initially.

Vernier Calliper. I have two, a 6" and 150 mm dial type. These are purely manual in use, as opposed to the electronic versions now available. Whilst I can see the advantages of the latter, an adjustable zero and dual calibration in particular, I find I cannot get the same "feel" as I do with the mechanical version. (I have heard this from other modellers too, so I guess it's down to what you are used to). Their main vulnerability is that the zero on the dial can jump from the 12 o'clock position, normally caused by a small piece of swarf stuck in the rack. This can happen without warning in use. I check the zero on mine, when in use regularly, having more than once having an anomaly suddenly appear, so keep an eye out and perform what I call sanity checks regularly. The problem is easy to cure and there are a number of videos on the Internet showing you how.

The electronic type with its obvious advantages is probably the way to go from the outset, but they have one serious vulnerability - they do not like liquids, eg cutting fluid. Unfortunately for us such ingress is normally fatal. Deluxe versions with more efficient sealing are about twice the price of the standard variety.

Micrometer. These are definitely lower priority – a good vernier will do most of the same work. They are a nice to have, but not yet. Over the years I have collected 1" to 6" and 25 mm versions, but probably use the 1" and 25 mm ones for 99% of what I do.

Squares. I have four. I would start with a 4", and get 6" and 2" ones sooner rather than later after, I also have a real brute, a 12"version which I think probably came from a tool room, and which I am sure would be most useful if only I could lift it!

Drills, Taps and Dies. We have all seen the attractive sets of the full range of the various Taps, Dies and Drills. The truth is that only a few of the set will ever be used. Much better to spend the money on high quality (eg HSS Ground Dies) of the sizes you need regularly as you go along. You will need HSS later anyway when you start playing with Stainless Steel. What sizes will become self-evident, and again will be influenced by your Imperial/Metric choices.

Reamers, D Bits. These two devices are used to ensure that hole diameters are to a high accuracy, and used primarily to finish bearings. Very useful, but not yet. Wait until you really need them.

Files. To start you will need good files, and 9" medium cut will do most jobs. This is one tool that I must recommend be purchased new, and stored individually to keep them sharp. They come in a variety of cross sections, but I would get Round, Half Round and Flat initially. Furthermore, I would recommend buying two sets, one conspicuously marked and used for Brass (and other "soft" materials). When it has lost its keen edge, it can be relegated to general work (after about 20 years in my case). Other files can be obtained on an as and when basis – you will learn what you want as you go along.

Important safety note: -

NEVER EVER USE A FILE WITHOUT A PROPERLY FITTED HANDLE.

Smaller size (needle) files come in handy packs of assorted shapes, but of course you get what you pay for. For the extra cost it is worth getting better quality, and if you can, already fitted with handles.

Spanners. Spanners are of many different type, open-ended, ring, box (aka nut spinners) and socket being the most common. The choice of size is obviously dependent on the fastenings you use. These are an item which I would recommend buying in sets in the smaller sizes. Loose ones are available at shows, so try to pick up any open-ended ones in the size that you commonly use. Q. Why? A. Because open ended ones can have large jaws overall and may not fit into the space you have. Don't be afraid to take the Grinder to them!

The Hacksaw. Somebody a long time ago gave me a simple tip to take the effort out of filing – learn to cut close to the line. The hacksaw is the weapon of choice, and exists in two types, large and small. Beyond this there is not much to say other than get one of each, based on what feels comfortable in your hand. I must also state the obvious that to buy cheap blades is a false economy.

Screwdrivers. These too come in all shapes and sizes, and with a variety of tips. Choose what you want for the bigger sizes, but in the smaller sizes there are nice sets which are probably the best way to buy them.

Hammers. Last but not least, the (not so) humble hammer. These come in a variety of weights and heads. The favourite head is the **Ball Pein,** which describes the shape of the head on the other side to the flat head. Weights vary from a few ounces to a couple of pounds or more. I would get a light and a heavy one, and one that feels comfortable in your hand. Its main use of the ball pein is for setting or closing rivets.

The second type is the **Cross Pein**, where the pein is rectangular in shape and at right angles to the axis of the handle. For us it is a general all-purpose persuader, but its more legitimate use is for pins

etc where one has to hold them with the fingers and tap them gently to get them started. The cross pein can also be very useful where access is limited.

The third main type is the well-known **Claw Hammer.** These are normally heavy and used to pull out nails etc.

Heating and Joining Methods

Though not strictly a hand tool as such, all workshops require a variety of methods of heating and media during construction work. The following paragraphs discuss these in more detail.

Oxy-acetylene. This used to be a favourite method some years back, and I used it in early days or. for frames etc,using flux coated rods as the joint material. It requires the work to be firmly clamped during the process or it will go everywhere. And as someone once said, “is a very hot flame with no heat in it”. Sounds a strange statement, but if you ever try it, you will completely understand.

I am not sure that the general public can buy/rent it anymore, and probably quite rightly so. In any case, I would not recommend the use of the technique

Electric Arc Welding. I have never mastered the art of this method, so cannot comment on it, other than to say that I am impressed with the results that I have seen using the Inert Gas type.

Silver Soldering. Strictly speaking this is Silver Brazing, but no matter. Silver Solder forms a hard strong joint, and melts in the 600 ^{o}C region. It is a good as an all-round structural joint, and requires a flux. It has only two drawbacks, which are inter-related. Firstly, it requires a gap of about 0.1 mm between the parts to be joined, requiring some ingenuity with holding the work pieces, but unfortunately it is not a good gap filler, so requiring a lot of solder. This brings us on to the second problem, price. It’s not cheap, purely due to the amount of silver in its formulation. The lower the melting point, the more the silver in it. Silver bearing solder can be obtained with a range of melting points, so can be most useful if work is required in stages. The first stage uses the highest and progresses through to the lowest. For **heating,** propane is a good all-round gas, and torches come in a variety of types.

I have only just scratched the surface, and I would direct you to the specialist suppliers who will give you good advice based on their many years’ experience.

Soft Soldering. This is the lowest temperature process (approximately 200 to 300^{0}C), having had its background in plumbing and electronics work. The solders were lead/tin mixtures, and had different melting points depending on the proportions of each. Plumbers’ solder had a higher temperature and once melted became pasty over a reasonable temperature range enabling plumbers to wipe the joint to tidy it up before the solder set. In the electronics industry, the solder was of a lower melting point, and a so-called eutectic mixture. This went from liquid to solid without a pasty stage – the joint set immediately. Both required flux – painted on for plumbing, but pre-cored for electronics work. These solders have been phased out because of the lead content, but there are modern equivalents available. The only drawback I have found with soft soldering is that the flux can be acidic. Even if only a small amount is used, you will wake up the following day to find that some items in the workshop even several metres away will have surface rust, as will the frames you are working on. Out with the wire brushes I’m afraid. For **Heating,** Plumbers traditionally used blow lamps, but in the electronics industry the electric soldering iron was almost universal. These are available in a range of powers, from precision temperature-controlled types of a few Watts to those with a capacity of 125 Watts or more. For us a 25 W and a 65 W will fulfil most of our needs, but if you see one of 125 W or more snap it up immediately. It will be invaluable for brass sheet sides, which take a lot of heat. I keep looking at modern equivalents, but not found one that has the other important virtue, a big bit. In addition to the temperature, an essential feature is heat capacity. It’s no good having a 125 W heating element if the tip is so small that it goes cold in a few seconds.

Soft solder seems to be neglected by us for structural work. I don’t know why: I use it a lot, as it is easy to work with and to clean up joints after. There is one proviso. Do not use it if the joint is subject to vibration, as it will fail sooner rather than later.

Finally, **A Calculator.** Though not strictly a hand tool, you will find it invaluable to have a calculator at close hand. This need only be a simple 4 function type. I have had a big button/big display one for 30+ years in a transparent polythene bag for protection from oil etc, but still easily legible.

That's all Folks!

No, not really. Even after this marathon there are a lot more odds and ends which you will find useful. You will discover them yourself, or by watching others, or at shows. Keep your eyes open!

Sources of Supply.

I promised a comment on where you might obtain suitable tools. The following paragraphs suggest possible sources. They are applicable to both hand and machine tools.

We are now in the land of potentially large expenditure and correct choice of sources can result in significant cost savings.

To repeat, join a Club! In the early Many clubs have workshops which you may be able to use, or a fellow member might be willing to help with their own set ups. I know I do, simply because it is good to see my own facilities being used by others. It will also give you a good feel for what you will eventually be acquiring. This is particularly true of turning and milling work. Club members can also advise where they got a good (or bad) deal. Sooner or later however you will want your own independence, and there are a number of routes you can take on the road to procurement

First and foremost, avoid what I call the car booters except for "agricultural" items like spanners, hammers and pots of nuts and bolts, any type, for internal consumption. You might be lucky, but caveat emptor.

The next port of call is the model press – second hand dealers who advertise therein have their own reputations to protect, and word gets around quickly.

Although they are becoming fewer and fewer, the are still reputable tool shops and suppliers in some towns – contact/visit them.

Finally, there is the option of buying new direct from the Manufacturers or their Agents. This approach is a very serious one and nowadays it could imply a commitment to go Metric for all the other tools you might need later - however see the caveat in Part 3, dealing with Power Tools.

Remember, you do not have to buy everything at once – most model engineers have a lifetime's investment in their workshop and when they finally depart for the big workshop in the sky they leave this behind. Their Club is frequently the first port of call of the bereaved for advice on how to dispose of the estate, and usually give as much help and advice as they can. The most common suggestion is that they will offer items to the membership, any proceedings going to the Club Funds. This can be a source of anything from books via materials to quality tools. You may find this to be distasteful, and I would apologise if you do, but it can be a great comfort to those left behind that they are maintaining the memories of a life that has been part of their life too.

Your Comments, Suggestions and Questions.

As was intimated in the Introduction to the series this Section is for your feedback, experiences, what gave you the most satisfaction and anything else to help and encourage the next generation of model engineers of whatever discipline.

We would be extremely interested to receive your reactions and suggestions regarding the Supplement, and any questions you may have as a result of these and the Wagon series.

If you have any suggestions for future Supplement Topics, please let me know.

I can be contacted via info@fmes.org.uk. There is no closing date for submissions.

Many thanks in advance.

The Wagon Man

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