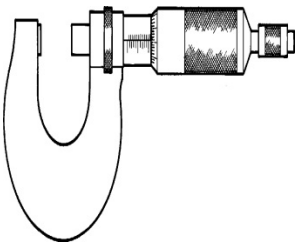
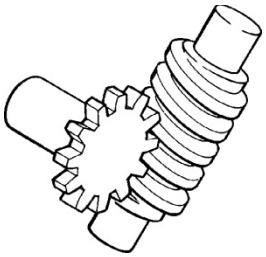


METRO DETROIT METALWORKING CLUB
April 2014



Club website: www.metrodetroitmetalworkers.com

Treasury report:

Balance: $929.43

Contacts:

President: Kurt Schulz

Vice Pres: Kevin Thomas

Treasurer: Ken Hunt

Secretary: Vacant effective May 14, 2014

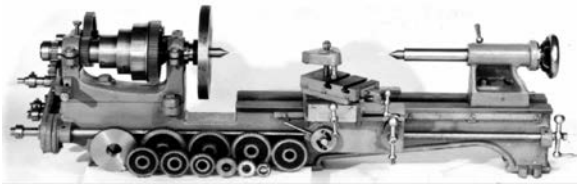
Webmaster: Steve/Doug Huck

Next meeting:
May 14, 2014 at 7p.m.
Macomb County Community College
Room R128

President's message: For all of the club members who volunteered at the NAMES expo, we greatly appreciate the help. It was a very good show and I look forward to next year.

We have a lot of items on the agenda for our next meeting. See everyone Wednesday night.

Kurt Schulz, President



Announcements: As of the May 14, 2014 MDMC meeting the secretary's position will be vacant. I have enjoyed nearly three years of service to the club in this position, but (as I mentioned a few months ago) I am ready for a break. I also feel that other members should have an opportunity to contribute something tangible to the Club. This will be my last newsletter.

Steve Huck forwarded this picture to me and asked that it be included in this newsletter. Mr. Bob Lorenz, one

of the founders and first President of the MDMC, made an apparently rare appearance at the NAMES 2014 show. Here he is visiting with Brian Lawson:

Carl Wright noted on the MDMC Yahoo group that the Glenn J. Reid Family Foundation, which operates a museum located at 2550 Auburn Ct., Auburn Hills, Michigan, telephone (248) 293-8662, will be auctioning off many mechanical models from its collection on May 28, 2014 via Heritage Auctions.

The Reid Family Foundation will also host a "Gala Event" (tickets $30 each / $50 per couple) at the museum on June 20, 2014 which will include a live auction, a silent auction, and a fixed price sale of the remainder of the on-site collection. On June 21, 2014 the Foundation will hold an "Open House Event" (no admission fee) anything remaining of the on-site collection will be sold. Contact the Foundation via their website or by telephone with any questions.

As covered in the March, 2014 MDMC newsletter, and mentioned in a few messages on the Club Yahoo email list, the family of late member Bill Snowhook donated his large library to the Club. Many of his tools were also kindly donated to individual members willing to pick them up. A big "Thank You" to Katherine and her family for your very generous gift!

There are presently about 18 boxes of books and magazines at Steve Huck's house, and about fifty boxes at my house (approx. three truckloads):

There are many boxes of magazines such as the Home Shop Machinist, Projects in Metal, Live Steam, Model Engineer, Model Engineer Workshop,

and similar publications. There are also several boxes of hobby related books like Elmer's Engines, the Bedside Reader series, hardbound compilations of Shop Notes from the early Practical Mechanics magazines, and many of the short books republished by Lindsey. Several boxes contain trade textbooks or manuals on topics such as metallurgy, metrology, casting, machining techniques, welding, and similar subjects. There are a few boxes of product catalogs for machinery and tools such as Starrett and Lufkin.

Then there are many boxes of magazines such as Popular Science, Popular Mechanics, and the Boy Mechanic dating back the 1920's through the 1990's. There are also boxes containing magazines such as Fine Woodworking and other wood-project magazines (and a few boxes of Radio Control Aircraft, which member Dave Clark has stored for the time being), which were gathered because our Club has several members who happen to be active in these hobbies.

Plans for this collection of materials will be discussed at the May, 2014 meeting. Please attend if you can.

Show & Tell: Brian Lawson picked up where the edge finder presentation of the February, 2014's meeting left off by bringing in a laser edge and center finder to demonstrate:

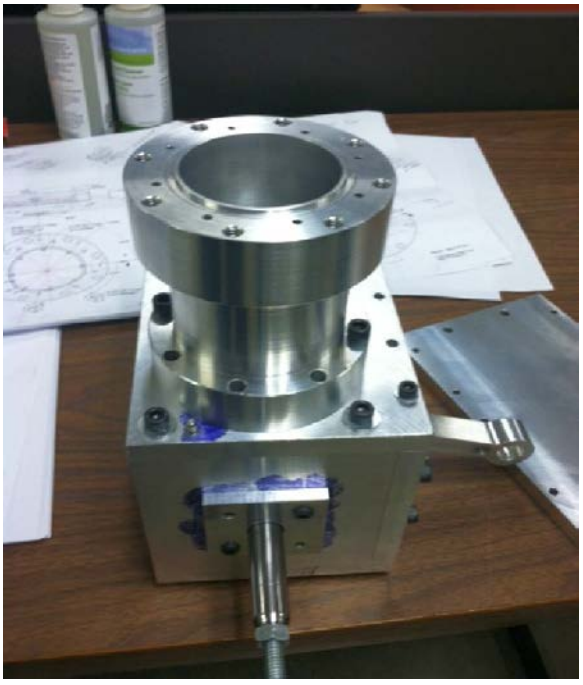
The unit projects a very bright red dot to assist in finding an edge or center, and can be ordered directly from the manufacturer for about $125 via their website, which also has a video demonstrating the unit in use.

Brian also shared information about a device used to grind the angles on HSS cutters. The patent for this multi-faceted block, including diagrams which should help construct one of your own, is attached at the end of this newsletter. Thanks to Brian for providing the link!

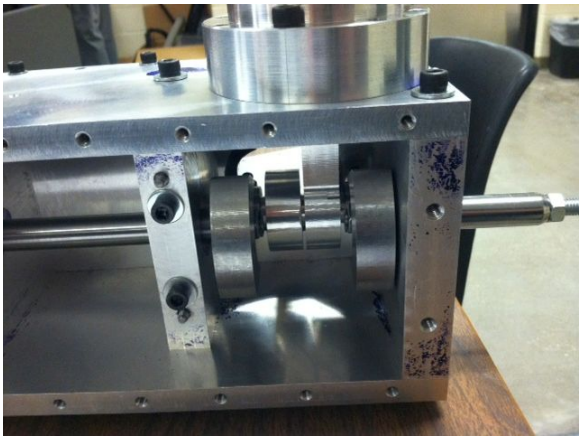
George Waterman continues to make progress on construction of the heat engine of his own design. He

displayed the assembled crank case, crankshaft, cylinder, rod and piston:

The design included tapered locating pins for accurate reassembly during his development of the engine, a choice which George reports caused some minor grief while cutting those tapered holes! A second cylinder is planned, to the right in this picture:



The crank case is pressurized while running and the design is built up from flat stock, requiring a very close fit. Nice work George!



Louis Knapp brought in some quick change mill tooling that we all were jealous of:

This particular unit was manufactured by Falcon, which is no longer in business. The upper “chuck” remains in the spindle, while the lower arbors remain with the cutters:

A quick twist of the knurled grip on the "chuck" releases or securely locks the arbor holding your cutter of choice by cam action. What a dream: thanks for sharing this Louie!

Ted Zillich had an interesting story and item to share which is the subject of a future project. While performing some work at the Detroit Arsenal Tank Plant, Ted struck up a conversation with one of the plant employees about his father working there. As a result, the employee gave Ted a segment of overhead railing used in the plant which was marked as having been installed in 1942!

Ted intends to use portions of this railing to make a set of bookends for his father. What a great gift Ted! Unfortunately, I failed to get any pictures of the railing during the meeting. However, as a tribute to Ted's father (and the many others who worked there in the world's "Arsenal of Democracy"), and as inspiration for Ted to this project underway, I offer these pictures as a temporary substitute. This one was taken in 1941 and, if I understand correctly, the plant was an Alfred Kahn design:

This picture was taken in 1942. Perhaps Ted's chain rail segment is in this view?

This is a 28-ton M3 Lee *medium* tank being placed on a rail car. I do not see any hard hats!

Jay Drouillard completed this model airplane engine and even shared a video of it running during the meeting:

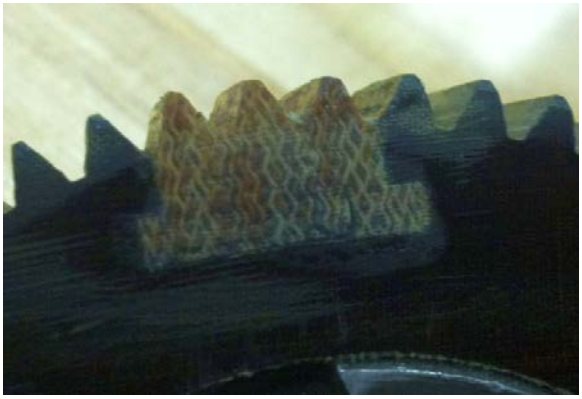
The engine cases were made with help from Steve Huck's expertise in milling the molds and casting the cases. Jay reports that the engine has a compression ratio of approx. 17:1 and runs on a fuel mixture of 1/3 ether, 1/3 castor oil, and 1/3 kerosene. He lapped the piston and cylinder using diamond compound for a good seal, and learned during the process that a cast iron piston can be made to "grow" if needed by heating it to a cherry red:

Although it blends in a bit in the above picture against the maple table surface, Jay's engine stand was also very nicely done and featured clamps designed much like those used for milling to hold the engine to the base.

Jay intends to put the engine in a 1936 Airchief model. Nice work Jay and congratulations on making a difficult to run engine operate so nicely!

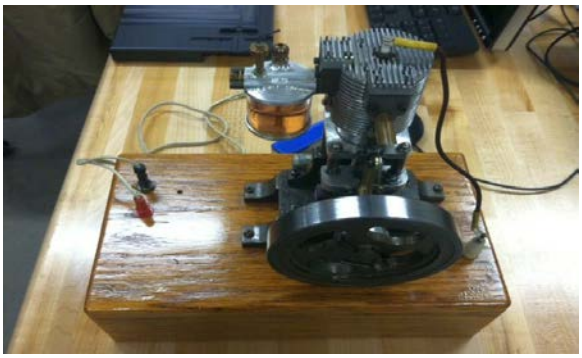
Karl Gross brought a few items in to share. This first one is a repair he performed to an EMCO lathe fiber gear using phenolic material donated by member Dick Triemstra. The objects in the gear bore are samples of the repair material, used to hold up the gear for photos. The repair is just to the left of the top of the gear:

Here is a close up of the repair. Karl machined out a "T" shaped slot and made a matching insert (note that the supporting fibers run radially for strength – nice attention to detail Karl!), then milled in the new gear teeth:

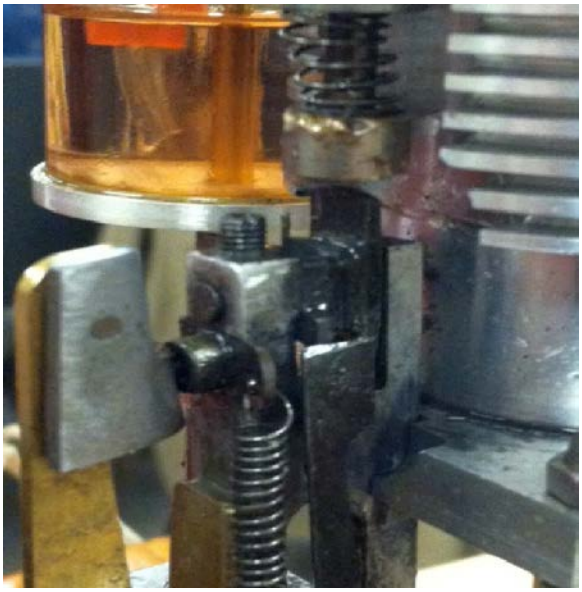


This gear has 61-teeth, a prime number distributing wear evenly along the gear train. Karl cut the gear using a universal dividing head that he *also* made. Karl didn't have the dividing head at the meeting, but I snapped this photo of it at NAMES at the Martin Models table. MM can supply castings and plans, if you're interested. Another example of "making a tool, used to make/repair another tool, used to" etc., etc.:

Jim Peters ran this nice gearless hit and miss model, which he built based on a design by the late Phillip Duclos:



It has a governor in the center of the flywheel but the exhaust valve triggering mechanism is unique. Jim graciously explained it to me during the meeting, but you may have to ask him for more details as my notes fail me as I write this:



And for comparison:

In short, the mechanism lacks the usual escapement gear (hence Mr. Duclos' "gearless" designation), which leads to an occasional double "hit." Jim runs the engine on a mixture of Coleman camp fuel and 20% castor oil. Nice work Jim, and thanks for toting it in to share with us.

Community information: Member James Howard shared with us some news which I can only describe as a "future show and tell." James grew up on a farm in western Michigan in the 1940's. That farm has remained in his family and the barn is (or was until recently) still proudly standing.

The barn is built in a manner, and with materials, which we do not often get to see anymore. James reports

that the beams are 10x10-inch hand hewn, and the trim boards are 16-inches wide. Just try finding *those* at Lowes!

James was considering how best to preserve the barn before it became a hazard. He recently traveled to the site with his son-in-law who (obviously, with his daughter) owns a successful restaurant in the New Center area of Detroit. As a result of some brain storming between them and a great deal of effort, the barn components were marked to record their proper place (during which a copy of *The Adventures of Tom Sawyer* given to James by his Grandfather was found!), carefully disassembled, and moved to a warehouse in Detroit.

James is happy to report that it now awaits reassembly on a plot of land also in Detroit's New Center area, where it will serve as the home for a new restaurant and event venue!

So, consider this a "show and tell *for the future*" that we can all enjoy for many years to come by patronizing James' barn when it opens for business.

James, congratulations for the fine job you have done preserving your heritage. And thank you for raising such great kids who will share it with us in the future!

Nametag prizes in April: Two *very* nice prizes were awarded during the April, 2014 meeting. Don Foren received a milling head tramming device when his nametag was drawn from among those members in attendance. And Steve Huck received a Fowler indicator. Thank you to Kurt and Kevin for providing these great attendance prizes.

Estate sale – Paul Jacobs: Mr. Paul Jacobs of Toledo, Ohio was an active model engineer and frequent exhibitor at NAMES and other shows.

Mr. Jacobs passed away and his son-in-law, Dennis O'Rourke (telephone number (419) 205-4905), is handling the disposition of his estate. Attached at the end of this newsletter is a spreadsheet summarizing the items that are available. Please contact Dennis by email at - dorourke1101@buckeye-express.com or at the phone number above.

Bob Farr

Oct. 2, 1945. H. C. WILSON 2,385,902

FIXTURE FOR GRINDING THREAD CUTTING TOOLS

Filed March 1, 1943 3 Sheets-Sheet 1

Fig. 1.

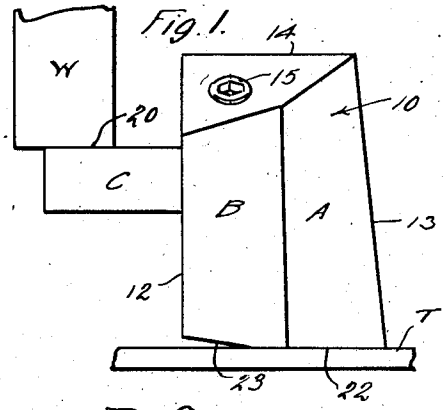


Fig. 2.

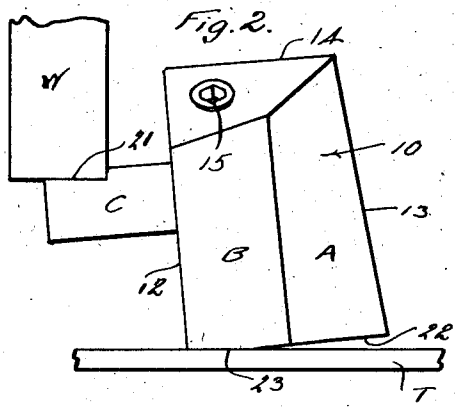


Fig. 3.

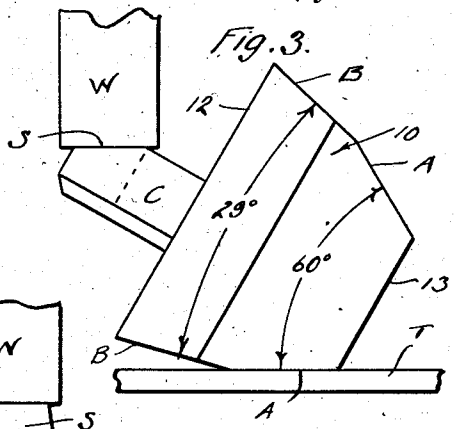


Fig. 4.

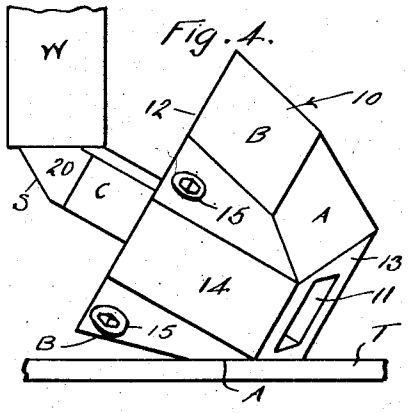


Fig. 5.

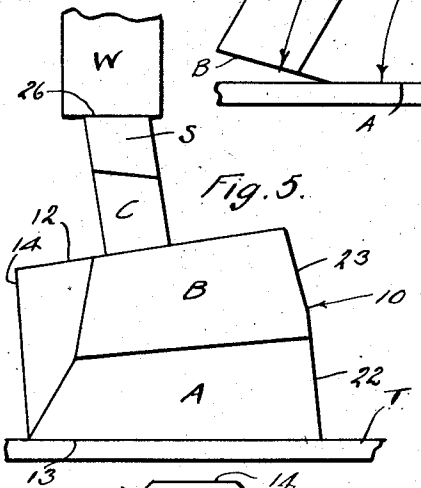


Fig. 6.

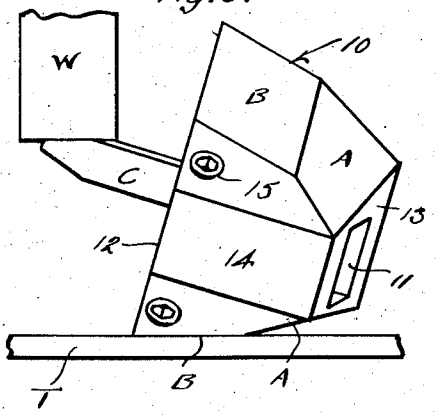
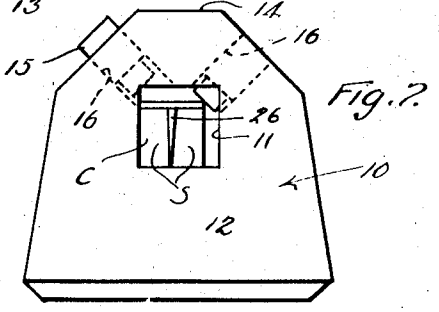


Fig. 7.



Inventor
Harry C. Wilson
by [signature]
Attorney

Oct. 2, 1945. H. C. WILSON 2,385,902

FIXTURE FOR GRINDING THREAD CUTTING TOOLS

Filed March 1, 1943 3 Sheets-Sheet 2

Fig. 8.

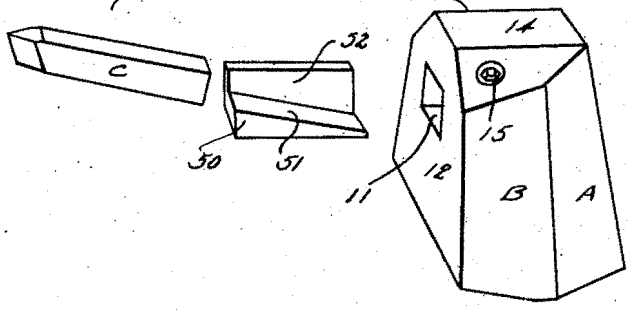


Fig. 9.

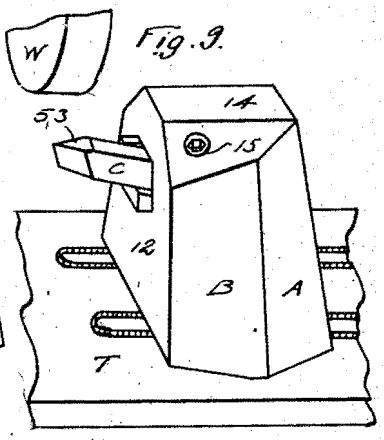


Fig. 10.

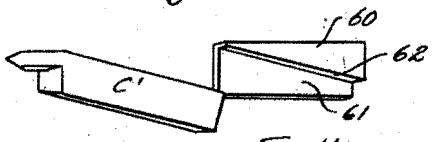


Fig. 11.

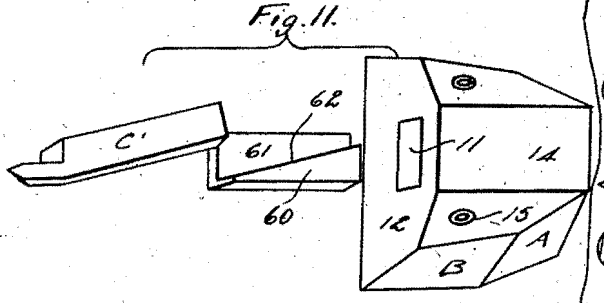


Fig. 12.

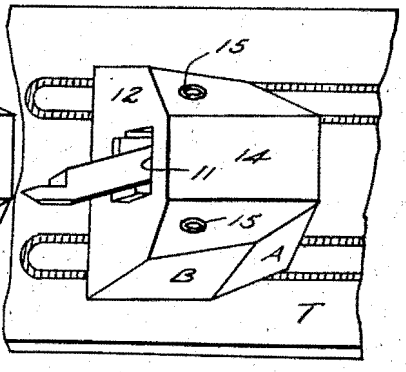


Fig. 13.

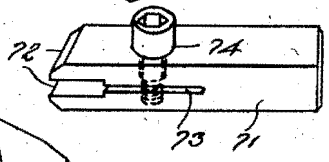


Fig. 14.

Inventor
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by A. Hallowell
Attorney

Oct. 2, 1945. H. C. WILSON 2,385,902

FIXTURE FOR GRINDING THREAD CUTTING TOOLS

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Fig. 15.

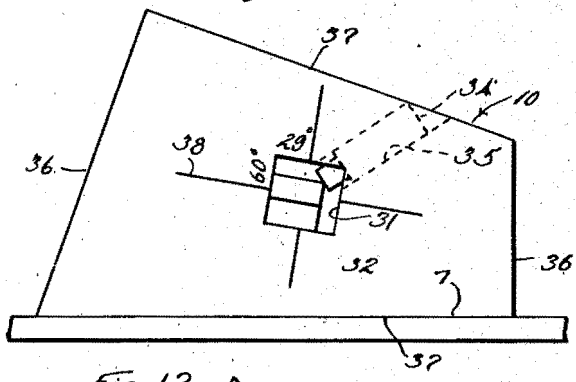


Fig. 16.

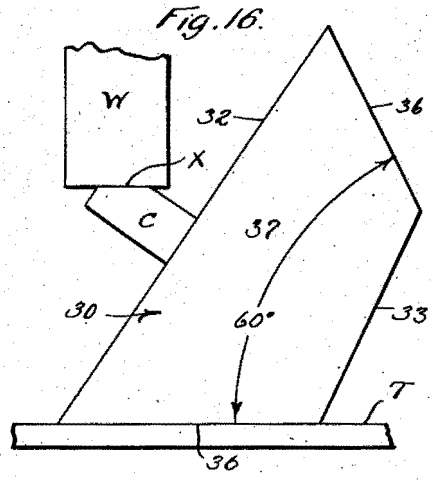


Fig. 12.

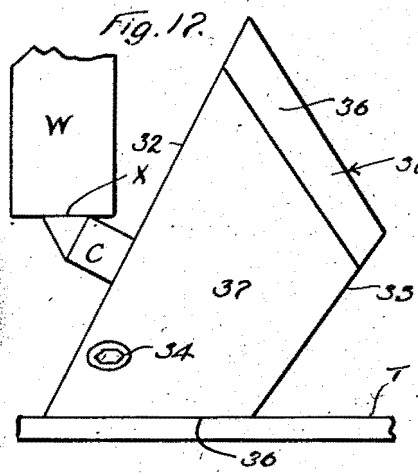


Fig. 18.

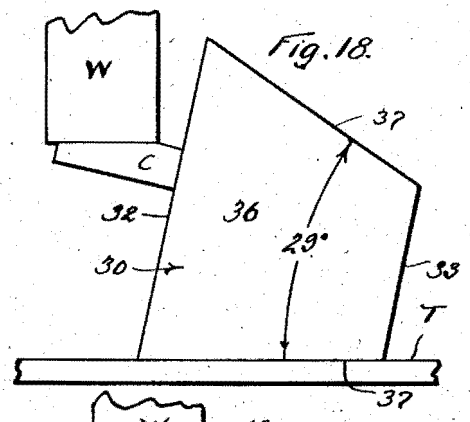


Fig. 19.

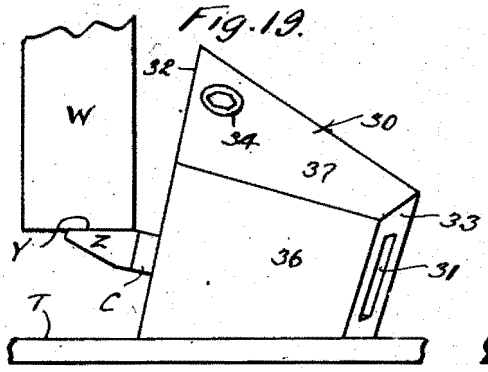
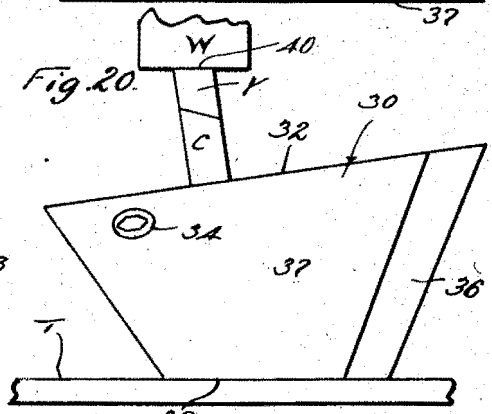


Fig. 20.



Inventor
Harry C. Wilson
by V. Hollowell
Attorney

Patented Oct. 2, 1945

2,385,902

UNITED STATES PATENT OFFICE

2,385,902

FIXTURE FOR GRINDING THREAD-CUTTING TOOLS

Harry C. Wilson, Huntington Park, Calif., assignor to Robert H. Clark, Los Angeles, Calif.

Application March 1, 1943, Serial No. 477,597

13 Claims. (Cl. 51—221)

This invention relates to fixtures or holders for holding cutting tools and relates more particularly to grinding fixtures for thread cutting tools. A general object of this invention is to provide a simple, practical fixture for holding a thread cutting tool on a grinder so that it will be presented to the grinding wheel to be accurately ground to the correct angles.

Thread cutting tools are usually formed from lengths of steel provided at one end with pitched side surfaces, a top surface, and sometimes a forward edge face, joining to form the cutting point. Holders or fixtures have been developed to hold the cutters so that they may be ground by a surface grinder. These prior fixtures are usually complicated and expensive and are constructed so that the cutters must be manually adjusted in order to grind surfaces thereon for the cutting of threads of different types.

Another object of this invention is to provide a fixture for thread cutting tools that is very simple and inexpensive, comprising a one-piece body and a simple screw or the equivalent for securing the bits or tools in the body.

Another object of this invention is to provide a fixture of the character referred to by means of which the bits or cutting tools may be accurately set or positioned relative to the grinding wheel of a grinder to be properly and accurately ground for the cutting of either one of two particular kinds of threads, without adjusting or changing the positions of the tools in the fixture and without the manipulation of any securing, adjusting or clamping parts. The fixture of the present invention is adapted to support a cutting tool at the correct angles whereby it may be ground for the cutting of either one of two selected forms or types of threads, for example, Acme threads or standard V-threads, and the simple positioning of the fixture on the table of the grinder determines the manner in which the tool is to be ground. It is unnecessary to loosen the tool in the fixture and shift or adjust it, and it is unnecessary to operate any mechanisms for shifting the tool so that it may be ground for the cutting of either type of thread. This is important as it expedites the grinding operation and eliminates the possibility of errors that may result from manual adjustments, etc.

Another object of this invention is to provide a fixture of the character mentioned in which the tool is supported so that its side surfaces are given the necessary clearance or rake when the fixture is arranged or positioned for the grinding of the tool in either of the alternative manners above referred to.

Another object of the invention is to provide a tool holder or fixture of the character mentioned that is operable to support the tool to have its upper surface ground truly parallel with the longitudinal axis of the tool or to have this surface ground to slope downwardly and rearwardly relative to said axis to give the point its clearance or rake. The fixture is shaped to permit the optional grinding of the upper face in either of the two manners just referred to without the necessity of adjusting, shifting, or disturbing the tool, the setting of the tool for grinding in either of the two ways being accomplished by merely engaging the fixture on the table of the grinder to have either one of two surfaces contact the face of the table.

Another object of the invention is to provide a fixture of the class referred to that may embody blocks or holders to mount the tool, when it is to be ground for use in various classes of tool holders, when it is to be used for grinding offset thread cutting tools, and when it is to be used for grinding thread chasers.

A further object of this invention is to provide a holder or fixture of the character referred to that embodies no delicate parts liable to be made inaccurate through use and does not have calibrations or scales that are liable to get out of adjustment or to be misread.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of the fixture provided by the invention arranged in position on the table of a grinder so that a parallel or axial surface is formed on the upper side of the tool. Fig. 2 is a view similar to Fig. 1 showing the fixture positioned so that a sloping surface is formed on the upper side of the tool. Fig. 3 is an end elevation of the fixture in position on the table positioned so that the grinder forms one side of the cutter for cutting a V-thread. Fig. 4 is an elevation of the other end of the fixture with the fixture positioned on the table so that the other side of the cutter is ground to cut a V-thread. Fig. 5 is a side view of the fixture positioned so that the point or forward edge of the cutter is ground to form the root of the thread. Fig. 6 is a view similar to Fig. 4 showing the fixture positioned so that one side of the

cutter is ground to cut an Acme thread. Fig. 7 is a front elevation of the fixture. Fig. 8 is a perspective view illustrating the manner in which a tool and a block may be assembled in the fixture to grind the tool so as to be useful in an angularly disposed tool holder. Fig. 9 is a perspective view of the fixture on the grinder table with the tool engaged in the block illustrated in Fig. 8. Fig. 10 is a perspective view of a tool and a block for supporting the tool in the fixture for righthand offsetting. Fig. 11 is a perspective view similar to Fig. 10 showing the block and tool arranged for lefthand offsetting of the tool and in position for engagement in the fixture. Fig. 12 is a perspective view of the fixture arranged on the grinder table with the tool supported to be ground for lefthand offsetting. Fig. 13 is a perspective view of a holder for mounting a thread chaser in the fixture. Fig. 14 is a perspective view of the fixture on the grinder table showing the thread chaser supported by the holder of Fig. 13. Fig. 15 is a front elevation of another form of fixture of the invention. Fig. 16 is a side view of the fixture of Fig. 15 showing one side of the tool being ground. Fig. 17 is a side view of the fixture in position to grind the other side of the tool. Fig. 18 is a side view of the fixture positioned to grind the tool for cutting a different angle or type of thread. Fig. 19 is a side view of the fixture positioned to grind the other side of the tool and Fig. 20 is a side view of the fixture in position to grind the end of the tool.

The fixture of the present invention is primarily intended to hold a tool bit for presentation to the wheel of a grinder for the purpose of grinding the bit for the cutting of threads. The fixture is suitable for use on a surface grinder having a magnetic table although the fixture may be used in a grinder having a non-magnetic table, in which case it is to be clamped or otherwise secured to the table. The fixture of the invention may be formed to receive or hold tool bits of different types and sizes and may be constructed to support the bits in the grinder to be ground for the cutting of different styles of threads. In the drawings I have shown typical preferred forms of the invention adapted to support tools in a grinder to be ground so that they are conditioned to cut either standard V-threads or Acme threads at the will or option of the operator, it being understood that the fixtures may be formed to support tools to be ground so as to cut threads of other forms or styles and the invention is not to be construed as limited or restricted to the specific embodiment of the invention herein disclosed.

The fixture illustrated in Figs. 1 to 7 comprises a body **10** for carrying the bits or tools C and shaped to be arranged on the table T of a grinder to present the cutters to the grinding wheel W. In accordance with the invention the fixture body **10** is a simple, integral block-like part. It is preferred to form the body **10** of steel or other suitable paramagnetic material. The fixture body **10** is provided with simple means for receiving and releasably holding the bits or tools. This means includes an opening **11** extending through the body **10** from its front **12** to its rear surface **13**. The opening **11** is preferably square in transverse cross section and is of substantial size to receive both round and square cutters or tools C varying greatly in size. The opening **11** is spaced midway between the opposite sides of the body **10** but is considerably closer to the top than to the bottom of the body. The longitudinal axis of the opening **11** and the upper and lower walls of the opening extend parallel with the top surface **14** of the body.

The tool holding means further includes clamp screws or set screws **15** screw-threaded in openings **16** in the body **10** and adapted to enter the opening **11** to cooperate with the cutting tool C. The upper corners of the body **10** are preferably bevelled off and the openings **16** extend downwardly and inwardly from the bevelled corner surfaces to join the opening **11**. The openings **16** carrying the clamp screws **15** extend in diagonal relation to the opening **11** and join the opening **11** at its corner (see Fig. 7). The active inner end of the screws **15** are adapted to engage upper corner edges of the tool C and the screws serve to hold the tool downwardly and inwardly against the lower wall of the opening **11**. Thus the sides of the tool C are perpendicular relative to the body surface **14**. The body surface **12** which forms the front of the fixture, when positioned as illustrated in Figs. 1 and 2, is plain and flat and occupies a plane perpendicular to the surface **14**. The cutter or tool C projects from the surface **12** and its longitudinal axis extends at 90° to said surface.

In accordance with the invention the body **10** is shaped so that it may be set on the table T to present the tool C to the wheel W at either of two angles, one where the wheel W grinds a surface **20** on the top of the tool T that is parallel with the longitudinal axis of the tool, and the other where the wheel W grinds a surface **21** on the top of the tool which slopes downwardly and rearwardly relative to said axis. The end of the body **10** opposite the surface or end **14**, that is, the lower end of the body as viewed in Figs. 1 and 2 of the drawings, has two angularly related surfaces **22** and **23**. The surfaces **22** and **23** are each flat and regular to evenly bear on the surface of the table T. The surface **22** is parallel with what I have termed the top surface **14** and is parallel with the longitudinal axis of the opening **11** and the cutting tool T. Accordingly, when the surface **22** is engaged on the table T, as illustrated in Fig. 1 of the drawings, and the cutting tool is presented to the wheel W, the wheel grinds a surface **20** on the top of the tool that is parallel with the longitudinal axis of the tool. This is clearly evident from an inspection of Fig. 1.

The surface **23** is pitched with respect to the surface **22**. The direction of inclination of the surface **23** is such that when the surface is engaged on the face of the table T the cutting tool C slopes downwardly and forwardly with respect to the grinding wheel W. Accordingly, when the tool C is presented to the wheel W the wheel grinds a surface **21** on the top of the tool which slopes downwardly and rearwardly from the point of the tool. This is apparent from an inspection of Fig. 2. The grinding of the top surface **20** or **21** may be the first grinding operation and is readily performed by engaging either the surface **22** or the surface **23** on the table T so that the cutting tool C is presented to the wheel W to be provided with either the surface **20** or the surface **21**, as selected.

As pointed out above, the fixture may be arranged on the table T of the grinder so that the bit or tool T will be ground to cut V-threads or Acme threads. Each side of the fixture body **10** has two angularly related surfaces A and B. The corresponding surfaces A and B on the opposite

sides of the body are of equal width and of corresponding inclination and pitch. The surfaces A and B are flat and smooth and extend from the bevelled corners of the body to the end of the body formed by the surfaces 22 and 23. The surfaces A and B occupying the opposite sides of the body are convergent in the direction of the surface 14 as will be evident from an inspection of Figs. 4 and 6, to give the bit or tool C the required clearance, as will be more fully described.

The surfaces A, which occupy the sides of the body 10 between what I have termed the rear surface 13 and the surfaces B, are employed when it is desired to grind the tool T for the cutting of V-threads. As best illustrated in Fig. 3 of the drawings, the angle between these corresponding side surfaces A is 60°. This angle corresponds to the desired angle between the ground side surfaces S of the bit or tool C. To grind the surfaces S the body 10 is set on the table T so that one surface A bears on the table and the tool C is presented to the wheel W so that the wheel grinds one of the surfaces S. This operation is illustrated in Fig. 3 of the drawings. The body 10 is then released from the table T and is turned over side for side and is re-engaged on the table with its other surface A bearing on the face of the table. When the tool C is presented to the wheel W the wheel grinds the other surface S, as seen in Fig. 4. It will be apparent that the surfaces S of the bit or tool C formed in the manner just described bear the same relation to one another as the surfaces A, that is, there is an angle of 60° between them and they diverge downwardly or toward the under side of the tool.

The surfaces B occupy the sides of the body 10 between the surfaces A and the front 12 of the body. The surfaces B are employed when it is deisred to grind the bit or tool C for the cutting of Acme threads. The angle between the surfaces B is approximately 29° as is clearly shown in Fig. 3. When the tool C is to be ground to cut Acme threads the body 10 is arranged on the table T so that one surface B bears on the surface of the table and the tool C is presented to the wheel W so that one side surface 25 is ground on the tool. The body 10 is then released from the table T and is turned over or turned side for side and is positioned so that its other surface B bears on the table T. When the tool C is presented to the wheel W the wheel grinds the other side surface 25. The two side surfaces 25 thus ground on the tool C bear the same angular relation as the surfaces B of the body 10 having an angle of about 29° between them and converging downwardly toward the lower side of the tool.

When the bit or tool C is ground to cut Acme threads it is provided with a front surface 26 for forming the roots of the threads. The surface 26 occurs between the converging side surfaces S, and extends between the top surface 20 or 21 and the lower face of the tool. In accordance with the invention the body 10 is formed to support the tool C on the table T to present it to the wheel W for the grinding of the surface 26. To position the tool C for the grinding of the surface 26 the body 10 is arranged on the table T as illustrated in Fig. 5 to have what I have termed its rear face 13 rest on the table. The surface 13 is flat and regular to evenly bear on the face of the table T. The rear body surface 13 is pitched with respect to the longitudinal axis of the tool-carrying opening 11. Accordingly, when the surface 13 is engaged on the table T the tool C is pitched or inclined with respect to the grinding wheel W. As a result the surface 26 ground on the top of the tool C is pitched with respect to the longitudinal axis of the tool to have the required clearance. Fig. 5 of the drawings illustrates the manner in which the grinding wheel W forms the surface 26 and clearly illustrates the clearance or downward and rearward inclination of the surface.

It is believed that the use or operation of the fixture illustrated in Figs. 1 to 7, inclusive, of the drawings will be readily understood from the foregoing detailed description. It is to be noted that there is no necessity to adjust or shift the tool C during the grinding operations. The tool C is firmly fixed in the body 10 and remains in its original position in the body throughout the series of grinding operations. It is to be particularly noted that it is unnecessary to adjust or shift the tool C to make either of the top grinds 20 or 21 as may be selected, and that the tool C is secured in the same position in the body 10 when it is to be ground to cut either V-threads or Acme threads. The use of the holder or fixture assures the accurate grinding of the bit or tool C and because there is no need for manual adjustment or regulation of any parts the grinding operations are materially expedited and there is no chance for error.

In producing or machining the fixture of Figs. 1 to 7, inclusive, I prefer to first form the opening 11, as by broaching. An arbor or other support is then engaged in the opening 11 to support the body 10 for the other machining operations. As a result of this procedure the several surfaces of the body may be readily machined to bear the correct relationship to the longitudinal axis of the opening 11 and are, therefore, correctly related to the longitudinal axis of the thread cutting tools that are later engaged in the opening 11 for the grinding operations.

Figs. 8 and 9 of the drawings illustrate the manner in which the fixture of Figs. 1 to 7, inclusive, may be utilized to grind a thread-cutting tool that is to be carried by a tool holder, such as an Armstrong holder, in which the tool is at an angle when presented to the work. The invention provides a block 50 adapted to support the tool C in the opening 11 of the fixture. The block 50 is designed to mount the tool in the opening 11 at an angle with respect to the longitudinal axis of the opening, which angle corresponds to the angle at which the tool may be supported in the tool holder. The block 50 is an elongate part having a flat bottom surface and flat parallel sides. The bottom surface of the block 50 and a side surface of the block are adapted to engage with the bottom wall and a side wall, respectively, of the opening 11. The block 50 is substantially L-shaped in transverse cross section, having a longitudinal groove or recess in an upper corner. The lower wall 51 of this recess is flat and is pitched with respect to the longitudinal axis of the block. The inclination of the wall 51 corresponds to the angle at which the tool is to be supported in the tool holder. A vertical side wall 52 rises from the inclined wall 51 and is parallel with the external side surfaces of the block 50. The recess or groove defined by the walls 51 and 52 is proportioned to receive the tool C.

Fig. 8 illustrates the manner in which the tool C is set in the block 50 to be engaged in the fixture and Fig. 9 shows the block 50 and the tool C

clamped in the opening 11 by one or both of the clamp screws 15. It will be seen that a clamp screw 15 may engage against the tool C to tightly secure both the tool and the block 50 in the opening 11 where the tool is held against the walls 51 and 52 to project from the side face 12 of the fixture. The tool C mounted in the opening 11 by the block 50 slopes upwardly and outwardly when the body 10 of the fixture has its surface 22 engaged on the table T. Fig. 9 shows the fixture arranged in this position with the tool C presented to the wheel W for the grinding of the top surface 53 of the tool. The tool C mounted in the opening 11 by the block 50 is ground by carrying on the above described series of grinding operations to be shaped or formed for the cutting of the selected or required type of thread, it being understood that the tool and the block 50 remain engaged in the opening 11 and remain clamped in position throughout the series of grinding operations.

Figs. 10, 11 and 12 illustrate the manner in which an offset thread-cutting tool C' may be ground in the fixture. The invention includes a block 60 for mounting the tool C' in the fixture opening 11 to be disposed at the required "offset" angle to the longitudinal axis of the opening 11 and the vertical plane of the fixture body 10, assuming the body to be in the position shown in Figs. 11 and 12. The block 60 is like the above described block 50, having a flat bottom surface for bearing on the bottom wall of the opening 11 and having flat parallel sides. One upper corner portion of the block 60 is cut away by a recess so that the block is substantially L-shaped in transverse cross section. This recess has a flat bottom wall 61 parallel with the bottom surface of the block 60 and a side wall 62 that lies in a vertical plane but which is pitched with respect to the longitudinal axis of the block. The tool C is adapted to be engaged in the block 60 to have its lower side bear on the face 61 and to have one side surface bear against the surface 62.

Fig. 10 illustrates the manner in which the tool C' may be engaged with the walls 61 and 62 of the block 60 so as to be ground as a righthand offset thread cutter. Fig. 11 illustrates the manner in which the tool C' may be engaged in the block 60 to be ground as a lefthand offset thread cutter. A block 60 is adapted to support the tool C' for righthand or lefthand offset grinding. The block 60 is readily positioned to support the cutter for righthand offsetting or lefthand offsetting, or grinding. The block 60 and the tool C' are engaged in the opening 11 in the relation illustrated in Fig. 11 of the drawings and are clamped therein by one or both of the screws 15 so that the tool projects from the forward face 12 of the body 10 at an angle to the longitudinal axis of the opening 11. With the tool C' secured in this manner the above-described series of grinding operations may be carried on to provide the tool with the offset thread-cutting part.

Figs. 13 and 14 illustrate the manner in which a thread chaser 70 may be ground in the fixture of the invention. The invention provides a holder 71 for the thread chaser 70. The holder 71 is an elongate block proportioned to be readily entered into the opening 11 of the fixture. The holder 71 is sufficiently long to project a substantial distance from the forward face 12 of the body 10 and to rather accurately fit the opening 11. The holder 71 may be securely clamped in the opening 11 by the screws 15. The forward portion of the holder 71 is provided with jaws 72. The jaws 72 are formed by providing a longitudinal slot 73 in the forward portion of the holder. The forward part of the slot 73 is increased in width to receive the thread chaser stock. A clamp screw 74 passes through a transverse opening in one of the jaws 72 and is threaded into a similar opening in the other jaw. The screw 74 is operable to actuate the jaws 72 to tightly retain the thread chaser 70.

Fig. 14 illustrates the manner in which the thread chaser 70 may be secured in the holder 71 and carried by the fixture for the grinding operations. It will be observed that the holder 71 is secured in the opening 11 so that the longitudinal plane of the thread chaser 70 is coincident with the vertical or longitudinal plane of the fixture body 10. In grinding the thread chaser 70 the body 10 is first positioned to have its surface A or its surface B at one side rest on the table T. Thus, as illustrated in Fig. 14 of the drawings, the body 10 is arranged so that a surface A engages the table T. One surface 75 is then ground on the forward edge of the thread chaser 70. The body 10 is released from the table T and is turned side for side so that its other surface A is engaged on the table. The other active surface 75 is then ground on the thread chaser. It is believed that it will be apparent how the thread chaser 70 may be ground for use with either Acme or standard V-threads by successively engaging either the surfaces A or the surfaces B of the body 10 with the table for the successive grinding operations.

The embodiment of the invention illustrated in Figs. 15 to 20 of the drawings includes a body 30. The body 30 is a block-like member preferably formed of steel or other paramagnetic material so that it may be held on the magnetic table T of the grinder. The body 30 is an integral or one-piece member and is shaped to support the bits or thread-cutting tools in various angular positions with respect to the grinding wheel W for the grinding operations.

An opening 31 extends through the body 30 from what I will term the front face 32 of the body to the rear face 33. The opening 31 is preferably square in transverse cross section and is sufficiently large to receive round or square bits or tools C ranging greatly in size. The means for securing the bits or tools C in the opening 31 comprises a set screw threaded in an opening 35 in the body 30. The opening 35 joins the opening 31 and the inner end of the screw 34 is engageable with the tool C to lock or clamp the same in the opening 31. The opening 35 is in diagonal relation to the polygonal opening 31 and joins the opening 31 at the line of joinder of two of its walls so that the screw 34 is adapted to cooperate with a corner of the cutter or tool C. Accordingly, the screw 34 is adapted to clamp the tool C against two walls of the body opening 31. The bit or tool C is fixed in the opening 31 to project from the forward face 32 of the body 30 so that it may be engaged with the wheel W. The tool clamping screw 34 is inset or received entirely within the opening 35 so that it does not interfere with the engagement of the body 30 with the table T.

The body 30 is provided with two sets of external surfaces 36 and 37 for engagement on the table T, one set of surfaces being employed when it is desired to grind the bit or tool C to cut one form of thread, say a standard V-thread, and the other set of surfaces being employed when it

is desired to grind the tool to cut another form of thread, say an Acme thread. The surfaces 36 which are used when the tool C is to be ground to cut standard V-threads constitute opposite side surfaces of the body 30. The surfaces 36 may occupy the entire sides of the body. The surfaces 36 are flat and smooth to evenly bear on the face of the table T. As best illustrated in Fig. 16 of the drawings the angle occurring between the two surfaces 36 is 60°, each surface 36 being at 30° to the longitudinal axis of the opening 31. In addition to the 60° angular relation just described the surfaces 36 are in convergent relation to give the side surfaces X of the tool C the required downward convergence or clearance. Thus, assuming the body 30 to be in the position illustrated in Fig. 17 of the drawings, the surfaces 36 diverge rearwardly or toward the background.

To grind the bit or tool C to cut V-threads the bit is first provided with a flat upper surface. This surface may be ground manually or in any other manner. The tool is then inserted in the opening 31 and clamped in place by the screw 34. The forward face 32 of the body 30 is provided with the notation or mark "60°" and a line 38 extends to the opening 31. The ground upper face of the bit or tool T is arranged to face the mark or notation "60°" and to be normal to the line 38. The tool C is clamped in the body when in this relationship and when projecting a suitable distance from the forward face 32 of the body. The body 30 is then arranged on the table T with one of its surfaces 36 bearing on the table T and the tool C is presented to the wheel W to have one of the surfaces X ground thereon. This is illustrated in Fig. 16 of the drawings. When this operation has been completed the body 30 is released from the table and is turned side for side so that the other surface 36 rests on the table T. With the magnetic table energized the tool C is presented to the grinding wheel W so that the other surface X is ground on the cutter. This completes the grinding of the cutter for the cutting of standard V-threads.

The surfaces 37 are employed when the fixture is utilized to grind the tool C for the cutting of Acme threads. The surfaces 37 are on opposite sides of the body 30 and may completely occupy two sides of the body. The surfaces 37 are flat and regular to evenly bear on the face of the table T. The surfaces 37 are pitched with respect to the longitudinal axis of the opening 31 so that surfaces Y bearing the correct angular relation for the cutting of Acme threads will be ground on the opposite sides of the tool C. The surfaces 37 are disposed so that there is an angle of about 29° between them and are convergent toward one of the sides 36 of the body 30. The 29° angular relation and the convergence of the surfaces 37 provide for the grinding of the surfaces Y on the tool C at 29° to one another with the required downward convergence or clearance.

When the tool C is to be ground to cut Acme threads it is first provided with a ground surface Z at its upper side adjacent its active end. This initial grinding action may be manually performed. The tool C is arranged in the opening 31 to project from the forward face 32 of the body 30 and is positioned so that its ground upper surface Z faces a notation or mark "29°" formed on the forward face 32 of the body and so that the upper face Z is normal to a line 39 extending inwardly to the opening 31. When the tool C has been positioned in this manner it is secured in place by the screw 34. The body 30 is then arranged on the table T so that one of its surfaces 37 bears on the face of the table. When this has been done the tool C is presented to the wheel W to have one of the side surfaces Y ground thereon. At the completion of this operation the body 30 is released from the table T and is turned side for side so that its other surface 37 may bear on the table T. The tool C is then presented to the wheel W so that its other surface Y is ground thereon.

The body 32 is shaped or formed to mount the tool C on the table T for the grinding of a forward face 40 on the tool so that the tool will be operable to give the threads the desired root configuration. The rear surface 33 of the body 30 is pitched with respect to the longitudinal axis of the opening 31 and is adapted to be employed to position the body when the end surface 40 is to be ground on the tool C. In practice the rear surface 33 of the body 30 may be pitched at about 10° to the longitudinal axis of the opening 31. When the forward face 40 is to be ground on the tool C the rear surface 33 of the body is engaged on the face of the table T and the tool C is presented to the wheel W so that the surface 40 is ground thereon. This is clearly illustrated in Fig. 20 of the drawings.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a unitary body having an opening for receiving the tool so it projects from the forward end of the body, and means carried by the body to engage and clamp the tool in the opening, the body having two adjoining bottom surfaces on its under side, one bottom surface occupying a plane parallel with the longitudinal axis of the tool engaged in said opening so that it may be engaged on the table to have the wheel grind a surface on the top of the tool which lies in a plane parallel with said axis of the tool, the other bottom surface of the body occupying a plane inclined with respect to said axis of the tool to extend upward and forward from the first mentioned surface so that it may be engaged on the table to have the wheel grind a surface on the top of the tool which lies in a plane pitched rearwardly and downwardly relative to said axis of the tool.

2. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having a forward end and an opening extending into it from its forward end for holding the tool so it projects from the forward end of the body, and means for securing the tool in said opening so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening, two opposite sides of the body each being provided with two surfaces for supporting the body while a tool is being ground at the end projecting from the forward end of the body, one surface of each of said sides being pitched with respect to said axis of the opening so that it may be engaged on the table to have said

wheel grind a surface on a side of the tool having a given pitch, the other surface of each of said sides of the body being pitched with respect to said axis of the opening to have said wheel grind a surface on a side of the tool having a pitch different from said given pitch.

3. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having a forward end and an opening extending into it from its forward end for receiving the tool, and means for securing the tool in said opening so that the longitudinl axis of the tool is parallel with the longitudinal axis of the opening and so the tool projects from the forward end of the body, two opposite sides of the body each being provided with two surfaces each for supporting the body with the tool projecting from its forward end presented to the wheel, said surfaces being in directly opposite sets, one set of surfaces having an angle of about 60° between them, the other set of surfaces having an angle of about 29° between them.

4. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having a forward end and an opening for receiving the tool, and means for securing the tool in said opening so that the tool projects from the forward end of the body and so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening, the under side of the body having a surface adapted to be engaged on the table and disposed in parallel relation to said axis of the opening so that the wheel may grind a top surface on the tool parallel with its longitudinal axis, the under side of the body further having a surface adapted to be engaged on the table and pitched downwardly and rearwardly relative to said axis on the end of the tool projecting from the forcorrespondingly pitched surface on the top of the tool, the opposite sides of the body each having two surfaces angularly related to said axis of the opening and adapted to be successively engaged with the table so that said wheel may grind forwardly convergent side surfaces on the end of the tool projecting from the forward end of the body, the rear side of the body having a surface disposed at a non-normal angle to said axis of the opening and adapted to be engaged with the table so that said wheel may grind a correspondingly disposed surface on the forward edge of the tool.

5. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having a forward end and an opening for receiving the tool, and means for securing the tool in said opening so it projects from the forward end of the body and so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening, two opposite sides of the body bearing an angular relation to said axis of the opening and adapted to be successively engaged on the table so that said wheel may grind forwardly convergent side surfaces on the end of the tool projecting from said forward end of the body, said sides being disposed at an angle of 60° to one another, and two other opposite sides of the body substantially equal in area to those first mentioned and bearing an angular relation to said axis of the opening and adapted to be successively engaged on the table so that said wheel may grind forwardly convergent side surfaces on the tool, the last named sides being disposed at an angle of 29° to one another.

6. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having an opening for receiving the tool, means supporting the tool and insertable in the opening for mounting the tool in the opening so that the longitudinal axis of the tool is vertically pitched with respect to the longitudinal axis of the opening, and means for releasably securing the tool in the opening and on the first mentioned means, two opposite sides of the body each being symmetrical relative to the opening and each provided with two surfaces, one surface of each side being pitched with respect to said axis of the opening so it may be engaged on the table to have said wheel grind a surface on a side of the tool having a given pitch, the other surface of each of said sides of the body being pitched with respect to said axis of the opening to have said wheel grind a surface on a side of the tool having a pitch different from said given pitch.

7. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having an opening for receiving the tool, means supporting the tool and insertable in the opening for mounting the tool in the opening so that the longitudinal axis of the tool is pitched laterally with respect to the longitudinal axis of the opening, and means for releasably clamping the tool on the first mentioned means in the opening, two opposite sides of the body each being provided with two surfaces, one surface of each side being pitched with respect to said axis of the opening so it may be engaged on the table to have said wheel grind a surface on a side of the tool having a given pitch, the other surface of each of said sides of the body being pitched with respect to said axis of the opening to have said wheel grind a surface on a side of the tool having a pitch different from said given pitch.

8. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having an opening for receiving the tool, a supporting block for mounting the tool in the opening so that the longitudinal axis of the tool is vertically pitched with respect to the longitudinal axis of the opening including a block for engagement in said opening having a pitched surface against which the tool bears, and a set screw carried by the body to engage the tool to clamp it on the block in the opening, two opposite sides of the body each being provided with two surfaces, one surface of each side being pitched with respect to said axis of the opening so it may be engaged on the table to have said wheel grind a surface on a side of the tool having a given pitch, the other surface of each of said sides of the body being pitched with respect to said axis of the opening to have said wheel grind a surface on a side of the tool having a pitch different from said given pitch.

9. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having an opening for receiving the tool, means supporting the tool and insertable in the opening for mounting the tool in the opening so that the longitudinal axis of the tool is vertically pitched with respect to the longitudinal axis of the opening including a block adapted to be arranged in said opening and having a vertically pitched surface against which the tool bears, and a set screw carried by the body for clamping against the tool to hold it on the block in the

opening, two opposite sides of the body each being provided with two surfaces, one surface of each side being pitched with respect to said axis of the opening so it may be engaged on the table to have said wheel grind a surface on a side of the tool having a given pitch, the other surface of each of said sides of the body being pitched with respect to said axis of the opening to have said wheel grind a surface on a side of the tool having a pitch different from said given pitch.

10. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body having a forward end and an opening for receiving the tool, the opening being polygonal in cross section, and means for securing the tool in said opening so that the tool projects from the forward end of the body and so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening including a set screw carried by the body to directly engage the tool and clamp it between adjacent sides of the opening, the under side of the body having a surface adapted to be engaged on the table and disposed in parallel relation to said axis of the opening so that the wheel may grind a top surface on the tool parallel with its longitudinal axis, the under side of the body further having a surface adapted to be engaged on the table and pitched downwardly and rearwardly relative to said axis of the opening so that the wheel may grind a correspondingly pitched surface on the top of the tool, the opposite sides of the body having surfaces angularly related to said axis of the opening and adapted to be successively engaged with the table so that said wheel may grind forwardly convergent side surfaces on the end of the tool projecting from said forward end of the body, the rear side of the body having a surface disposed at a non-normal angle to said axis of the opening and adapted to be engaged with the table so that said wheel may grind a correspondingly disposed surface on the forward edge of the tool.

11. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a unitary body having a forward end and an opening with angularly related surfaces for receiving the tool, and means for securing the tool in said opening in direct bearing engagement with said surfaces so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening and so the tool projects from the forward end of the body, two opposite sides of the body each having a surface to be engaged on the table to support the body with the tool projecting from its forward end presented to the wheel, said surfaces being disposed at substantially 60° to one another so that upon being successively engaged with the table the sides of the tool may be ground by said wheel to have surfaces separated by about 60°, each of said sides of the body having a second surface to support the body with the tool presented to the wheel, said second surfaces being disposed about 29° to one another so that upon being successively engaged with the table the sides of the tool may be ground by said wheel to have side surfaces separated by about 29°.

12. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a body in the form of a unitary block of magnetic material having a forward end and an opening substantially square in cross section for receiving the tool, and a set screw carried by the body to directly engage the tool for securing the tool in said opening so that the tool bears against two adjacent sides of the opening and projects from the forward end of the body and so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening, the under side of the body having a surface bearing a given angular relation to said axis of said opening and adapted to be engaged on the table so that said wheel grinds a surface on the top of the tool bearing the same angular relation to its longitudinal axis, the opposite sides of the body each having two surfaces angularly related to said axis of the opening and adapted to be successively engaged with the table so that said wheel may grind forwardly convergent side surfaces on the end of the tool projecting from the forward end of the body, the rear side of the body having a surface disposed at a non-normal angle to said axis of the opening and adapted to be engaged with the table so that said wheel may grind a correspondingly disposed surface on the forward edge of the tool.

13. A fixture for supporting a tool on the table of a grinder having a wheel, the fixture including a unitary body in the form of a block of magnetic material having a forward end and an opening with adjacent sides disposed in a definite relation to other parts of the body and for receiving the tool, and means for securing the tool in said opening in bearing engagement with said sides of the opening so that the tool projects from the forward end of the body and so that the longitudinal axis of the tool is parallel with the longitudinal axis of the opening, the opposite sides of the body having surfaces angularly related to said axis of the opening and adapted to be successively engaged with the table so that said wheel may grind forwardly convergent side surfaces on the end of the tool projecting from the forward end of the body, each of said sides of the body having two of said surfaces bearing different angular relations to said axis of said opening so that the angular relation of said convergent side surfaces of the tool may bear different angular relations, the rear side of the body having a surface disposed at a non-normal angle to said axis of the opening and adapted to be engaged with the table so that said wheel may grind a correspondingly disposed surface on the forward edge of the tool.

HARRY C. WILSON.

	A	B	C	D	E	F	G	H
1	**ITEM**	**Qty.**	**sold**	**ID#**	**DESCRIPTION**	**MODEL/SN**	**PRICE**	**SOLD**
2	Lathe	1		1	South Bend. 19" X 24". Comes with 3 jaw universal chuck, 4 jaw independent chuck, face plate, follower rest, collet spindle with draw tube, live centers, dead center, misc. cutters. Change gears and custom cabnet.		$1,800.00	
3	vice	1		4	Emco 4" vice		$50.00	
4	rotory table	1		7	5 1/2" home made indexing rotory table, vice mount		$15.00	
5	indexer	1		8	Phase II. 5C collet. 24 index heavy duty	235-6200	$50.00	
6	indexing head	1		9	6" indexing head w/ 3 hole plates		$75.00	
7	height cage	1		10	18" genaric brand w/ scribe and adaptor new in foam box		$50.00	
8	gas tourch set	1		11	oxygen accetaline w/ regulators and gages		$100.00	
9	transfer punches	1		16	generic set. 3/32" to 1/2"		$5.00	
10	angle plates	2		17	aluminum. 3 3/4" X 4 5/8" X 8"		$10.00	
11	angle plate	1		18	iron 5" X 5" X 5"		$10.00	
12	number stamps	1		19	genaric brand		$5.00	
13	letter stamps	1		20	genaric brand		$5.00	
14	number/letter stamps	1		21	genaric brand		$10.00	
15	arbor press	1		22	mechanical 12"		$75.00	
16	jack	1		24	fine adjustment round/flat stock		$10.00	
17	surface plate	1		26	cast iron w/ cover		$15.00	
18	pointer edgefinder	1		28	wiggler/poimter type w\ 3 attachments		$3.00	
19	indicator holder	1		29	homade Indicol type spindle attachment w/ indicator		$5.00	
20	bore gages	1		30	genaric bore gages (not used) in organiser case		$25.00	
21	digital calipers	1		32	Mittitoyo 8" electronic in case		$20.00	
22	dial calipers	1		33	6" dial calipers generic type used		$10.00	
23	radius gage set	1		34	Starrett gage 3/64" to 1/4" in case (not used)	S167A	$20.00	
24	vernier calipers	1		35	VIN brand13.8" 34.5mm (used)		$25.00	
25	dial indicator	1		36	Fowler 1" dial indicator (used)		$5.00	
26	dial indicator	1		37	Federal .010 range (used)		$5.00	
27	test indicator	1		38	Starrett test indicator .020 range (used)		$10.00	
28	micrometer	1		39	0"-1" unknown brand (used)		$5.00	
29	micrometer	1		40	1"-2" unknown brand (used)		$5.00	
30	micrometer	1		41	2"-3" unknown brand (used)		$10.00	
31	micrometer	1		42	2"-3" unknown brand (used)		$10.00	
32	micrometers	1		43	Fowler brand 0"-3" micrometer set (used		$30.00	
33	protracting square	1		44	unknown brand (used		$5.00	
34	indicator caliper	1		45	Starrett indicating adjustable caliper referance type (used)		$10.00	

	A	B	C	D	E	F	G	H
35	scribe compass	1		46	small rad. Circle type unknown brand (used)		$5.00	
36	caliper	1		47	referance caliper unknown brand (used)		$5.00	
37	small square	1		48	diemakers adjustable square (used)		$5.00	
38	depth scale	1		49	6" depth scale (used)		$2.00	
39	shim gages	1		50	small shim gages (used)		$1.00	
40	shim gages	1		51	thick gage		$1.00	
41	drill gage	1		52	wire gage (used)		$2.00	
42	drill gage	1		53	fractional gage (used)		$2.00	
43	digital scale	1		56	4" digital quill scale new in box		$30.00	
44	RPM indicator	1		57	spindle RPM indicator (used)		$5.00	
45	bore mic.	1		58	internal bore mic (used)		$5.00	
46	thread tool	1		59	thread setting tool		$3.00	
47	thread gage	1		60	thread gage english		$3.00	
48	v blocks	1		65	set of two small v blocks (used, good condition)		$35.00	
49	1X2X3 blocks	1		66	1 set of 1X2X3 blocks (used, good condition)		$10.00	
50	square	1		67	small Craftsman machinist square (used)		$5.00	
51	scale	1		68	6" General (used)		$1.00	
52	scale	1		69	6" unknown brand (used)		$1.00	
53	scale	1		70	6" unknown brand (used)		$1.00	
54	scale	1		71	12" flexable unknown brand (used)		$2.00	
55	scale	1		72	12" flexable unknown brand (used)		$2.00	
56	scale	1		73	6" unknown brand (used)		$2.00	
57	indicator	1		74	.050 range unknown brand (used)		$10.00	
58	labeler	1		75	punch tape labeler (used in good condition)		$10.00	
59	taps	1		78	larger used taps in tray		$15.00	
60	taps	1		79	smaller used taps in tray		$15.00	
61		59	0				$866.00	$0.00