Oct. 20, 1959 P. A. VONADA 2,909,169

MULTI-PURPOSE LAPIDARY DEVICE

Filed July 17, 1957 3 Sheets-Sheet 1

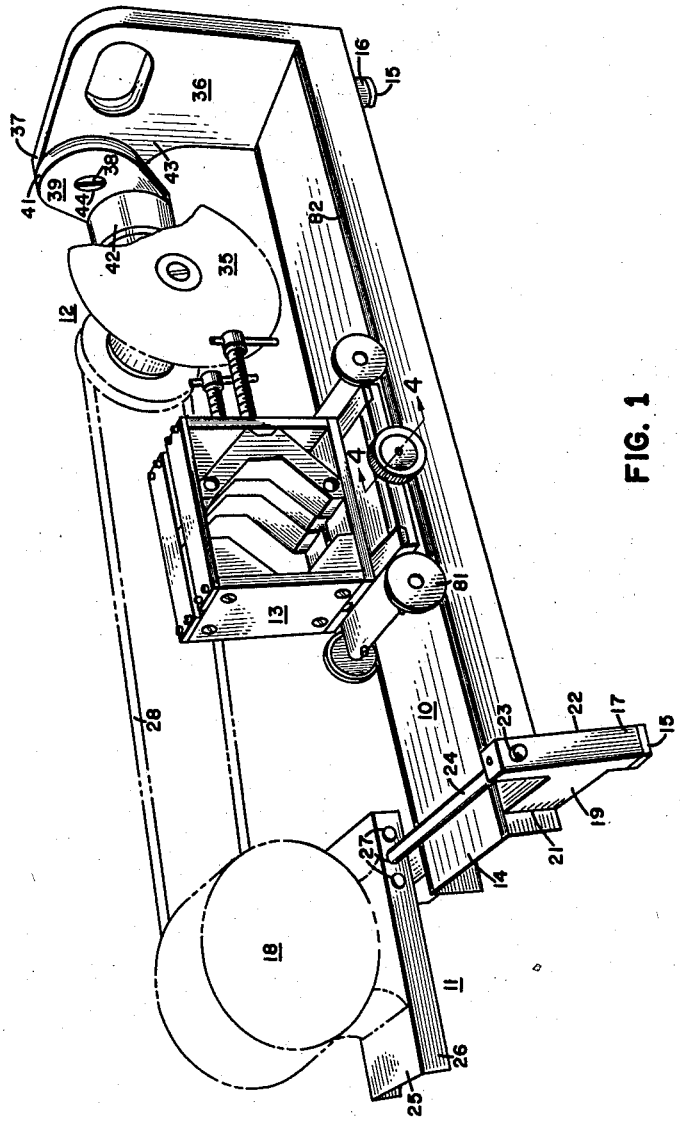

FIG. 1

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MULTI-PURPOSE LAPIDARY DEVICE

Filed July 17, 1957 3 Sheets-Sheet 2

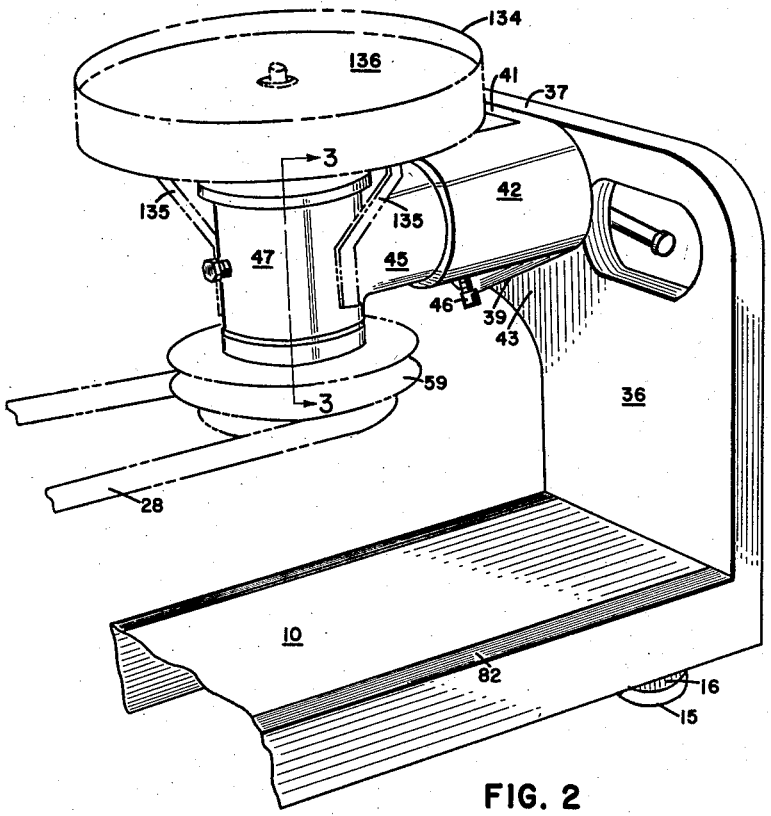

FIG. 2

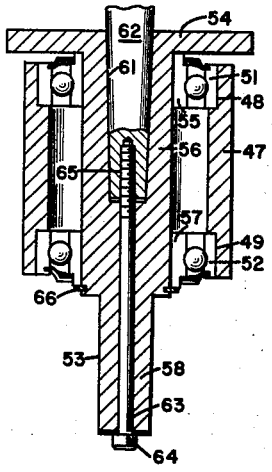

FIG. 3

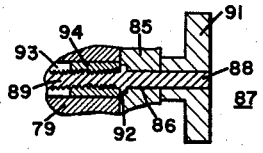

FIG. 4

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MULTI-PURPOSE LAPIDARY DEVICE

Filed July 17, 1957 3 Sheets-Sheet 3

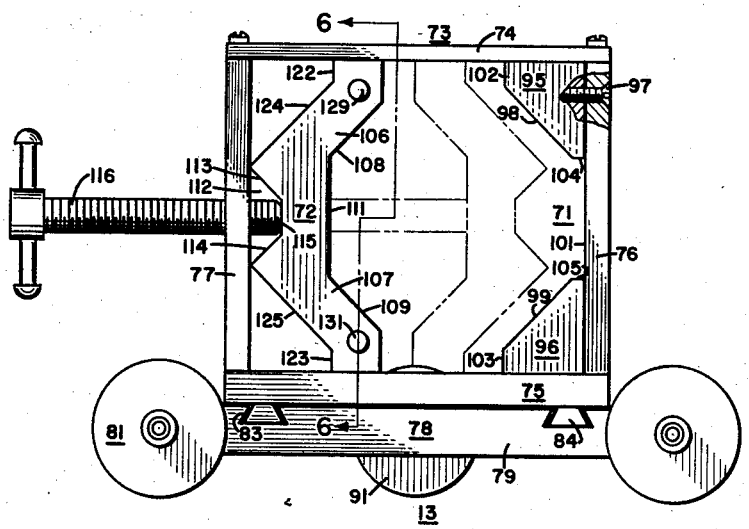

FIG. 5

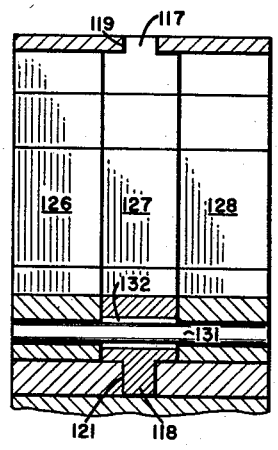

FIG. 6

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United States Patent Office 2,909,169 Patented Oct. 20, 1959

2,909,169

MULTI-PURPOSE LAPIDARY DEVICE

Phillip A. Vonada, State College, Pa.

Application July 17, 1957, Serial No. 672,503
8 Claims. (Cl. 125—13)

This invention relates to tool holding devices and more particularly to multi-purpose lapidary units.

In the processing and forming of stones, gemstones and the like the lapidary art utilizes seven basic rotary operations, i.e., sawing, grinding, sanding, polishing, lapping, and faceting. The order and number of operations varies with the particular stone, configuration and/or finish desired and in most cases all or substantially all of the aforementioned operations are required to obtain a stone having a suitable configuration and finish.

Obviously, in the processing and formation of stones and gemstones individual units especially adapted to perform each necessary operation may be used or one or more multi-purpose units may be used. The cost of procuring especially developed individual lapidary units is prohibitive for the amateur lapidist and considerable space is necessary to store such units. For these reasons substantial effort has been expended to develop multi-purpose lapidary units of maximum utility and minimum size and cost.

Notwithstanding the prior efforts mentioned hereinabove, the prior art multi-purpose lapidary units generally do not admit of the completion of all lapidary operations on a single unit, and the provision of means to satisfactorily perform one operation almost universally prohibits the performance of at least one other operation and seriously restricts the facility with which other operations may be carried out, quite often requiring that they be carried out in an inferior manner by inferior means. In addition to the disadvantages enumerated hereinabove, the position and location of the tools for performing the various rotary operations are not adjustable or adaptable for conventional operations, for specific operations of a more or less non-conventional nature, or for the tool holding position most suitable for the operation and convenient to the operator for carrying out one or more particular operations.

It is, therefore, a principal object of the present invention to provide a new and improved device for performing rotary operations.

It is another object of the invention to provide a new and improved multi-purpose lapidary unit.

It is another object of the invention to provide a new and improved lapidary unit whereby substantially all lapidary operations can be carried out in a more convenient and facile manner than heretofore.

A further object of the invention is to provide a new and improved lapidary unit for performing a plurality of rotary operations that is simple and inexpensive to manufacture.

Still another object of the invention is the provision in a lapidary device of a new and novel tool and work supporting arrangement of simple construction adjustable for performance of substantially every conventional lapidary operation whereby such operations may be carried out in a more facile and convenient manner and those operations as may be required or desired in special cases.

These and other objects and features of the invention, together with their incident advantages, will be more readily understood and appreciated from the following detailed description of the preferred embodiment thereof

selected for purposes of illustration and shown in the accompanying drawings, in which:

Figure 1 is a perspective view of the assembled invention showing the driving means and a saw blade in phantom.

Figure 2 is a partial perspective view showing the tool supporting means in position for grinding and showing the driving means, a grinding wheel and a splash guard in position.

Figure 3 is a sectional view of the housing taken on line 3—3 of Figure 2.

Figure 4 is a sectional view taken on line 4—4 of Figure 1.

Figure 5 is a side view of the vise forming a part of the invention.

Figure 6 is a sectional view of the vise taken on line 6—6 of Figure 5.

With reference now to the drawings and particularly to Figure 1 the invention is comprised of a narrow horizontally disposed metal base **10** of sufficient thickness to render it rigid, an adjustable constant tension motor mount **11** removably attached above and at one end of the base **10**, adjustable tool supporting means **12** carried by and disposed above the opposite end of the base and a removable vise **13** carried by the upper surface **14** of the base **10** and continuously movable toward and away from the tool supporting means **12**. The base **10** is preferably supported by three legs provided with rubber tipped lower surfaces **15** to reduce vibration and slipping, one leg **16** being disposed below the tool supporting means **12** and the remaining two legs **17** forming a part of the motor mount **11** and being oppositely spaced transversely away from the base **10** as will be more fully described hereinafter. The motor mount **11** is preferably of the constant tension type to support a conventional electric motor **18** (shown in phantom). As shown in Figure 1 there is provided at one end of the base two horizontally and transversely extending T-shaped arms **19** attached at the foot **21** of each T to the base as by welding or the like such that the lower portion of each cross arm **22** extends vertically in a downwardly direction to form one leg **17** and the upper portion of each cross arm **22** extends vertically in an upwardly direction, each upper portion being provided with oppositely disposed axial passages **23** located above the base **10** and adapted to removably receive a rod **24** for pivotally supporting a motor base plate **25** having two downwardly extending sides **26**. The motor base plate **25** is adjustably journalled on the rod **24** as by holes **27** adjacent one end of the longitudinal downwardly extending sides **26** forming an integral part of the motor base plate **25**. Further, in a like manner, the motor base plate **25** may be rendered adjustable in a vertical plane if desired. The particular means of pivotally supporting the motor base plate **25** above the base need not necessarily be accomplished in the manner shown and described, but it is considered essential for maximum utilization of the invention and to prevent excessive wear on the pulley belt **28** (shown in phantom) that the motor base plate **25** be transversely adjustable with respect to the base **10**. In this respect it will be readily appreciated that the provision and combination of the rear legs **17** and the support for the rod in the manner shown and described provides an exceptionally simple and stable base and support for the motor **18** while allowing a maximum amount of transverse adjustment of the motor base plate **25**. As will also become apparent, they cooperate with the tool holding means **12** to result in an operable device.

Tool supporting means **12**, referred to generally hereinbefore, are provided at the end of the base **10** opposite the motor mount **11** to provide universal adjustment of a working tool as for example a saw blade **35** as shown in

phantom in Figure 1. As used herein the term "working tool" includes lapidary forming tools such as, for example, rotary grinding wheels, tumblers, faceting wheels, diamond saws and the like, and also includes other rotary driven tools. As most clearly shown in Figure 1 and Figure 2 there is provided a vertical main supporting member **36** comprised of cast iron, aluminum or the like and fixedly attached as by welding or the like at the end of the base oppositely disposed from the motor mount. A rearwardly extending ear **37** integral with the main supporting member **36** is provided with a passage to freely receive a bolt **38** adapted for removably attaching an L-shaped first tool locating member **39** comprised of a flat back plate **41** and a cylindrical sleeve **42** perpendicular thereto. The back plate **41** is in abutting relationship with the inner surface **43** of the ear **37** and is preferably formed such that it is generally wedge-shaped in form but semi-circular at both ends, the larger end having an axial passage **44** to freely receive a bolt **38** and the smaller end being of substantially the same diameter as the cylindrical sleeve **42** extending rearwardly from, perpendicular to and integral with the back plate **41**. A second cylindrical tool supporting element **45** is adapted to telescopically and rotatably fit in the cylindrical sleeve **42**. Set screws **46** or the like may be provided on the sleeve **42** to securely lock the second tool supporting element **45** in any desired position. With reference now to Figure 2 and Figure 3 there is shown rigidly attached perpendicular to the second cylindrical element **45** as by welding or the like a cylindrical housing **47** having grooves **48—49** at each of its inner extreme ends to receive respectively ball bearing races **51—52**. Axially disposed within the housing **47** is a spindle **53** having a flat circular upper portion **54** spaced away from one end of the housing **47** by the inner ball bearing race **55**, a cylindrical middle portion **56** extending through the housing **47** and in abutting relationship with the inner ball bearing races **55—57**, and a cylindrical lower portion **58** extending exteriorly of the opposite end of the housing and adapted to receive and support a pulley wheel, such as for example a step-cone pulley wheel **59** as shown in phantom in Figure 2. A conically shaped recess **61**, such as for example a two or three Morris taper, extends from the upper portion **54** into the middle portion **56** of the spindle **53** to receive and securely grip a similarly tapered mandrel **62** adapted for attachment to the particular working tool being used. If desired, an axial passage **63** extending through the lower portion **58** of the spindle **53** may be provided to freely receive a bolt **64** threaded at its upper end **65** for threaded engagement with the tool supporting mandrel **62** to insure its retention in the spindle **53** when being used and to allow easy removal of the tool supporting mandrel **62** from the spindle **53**. Suitable means such as for example a retaining ring **66** may be provided on the middle portion **56** of the spindle below the lower ball bearing race **57** to retain the spindle in the housing in a substantially fixed axial position.

The elements comprising the tool supporting means may be comprised of any suitable material such as, for example, steel, cast iron and the like and formed with such dimensions as may be appropriate for the size of object to be formed, but they must be formed and adapted to provide a rugged and fixed support for the working tool once it has been placed in the desired working position. It is, therefore, to be understood that although specific and preferred tool supporting structure has been shown and described to obtain substantially rigid and universal location of the working tool, the invention is not so limited; other means, although less satisfactory, will occur to those experienced in the art and may be used, such as for example, a telescopically adjustable double-ended ball and socket joint, non-axially adjustable tool supporting means individually adjustable in one direction or plane resulting in adjustability in a plurality of directions, and the like. Although all lapidary operations except sawing can be satisfactorily performed by the components forming a part of the invention and constructed and formed in the manner hereinbefore described, maximum utility of the invention is obtained by the provision of a vise **13** cooperatively carried by the base **10** and movable toward and away from the housing **47** in the manner hereinafter described. As best shown in Figure 5 and Figure 6 the vise is comprised of a fixed jaw **71** and a movable jaw **72** carried in a vertically disposed open ended frame **73** having a top wall **74**, a bottom wall **75** and two oppositely disposed side walls **76—77**, and a carriage **78** adapted for longitudinal movement on the base **10** and transverse adjustment of the frame **73**. The carriage **78** is comprised of a rectangular base plate **79** having four wheels **81**, one each rotatably carried at each corner of the base plate **79** and adapted to roll in tracks or guides **82** formed in the base such that the carriage **78** will move easily in a longitudinal direction but such that transverse movement of the carriage is prevented. Transverse wedge-shaped guide slots **83** are provided adjacent and inwardly of each oppositely disposed pair of wheels **81** to slidably receive similarly formed guide bars **84** connected to the bottom wall **75** and connected at two corresponding ends by a connecting bar **85** disposed adjacent one side of the base plate **79** intermediate the wheels and having a centrally located transverse passage **86**. Transverse adjustment of the frame **73** is secured by an adjusting screw **87** having an unthreaded outer portion **88** and a threaded inner portion **89**, the outer portion **88** extending through the passage **86** in the connecting bar **85** and held against transverse movement with regard to the connecting bar **85** by a knob **91** and an annular lip **92**, the threaded inner portion **89** extending into a recess **93** in the carriage base plate **79**. The outer portion **94** of the recess is internally threaded for engagement with the threaded portion **89** of the adjusting screw **87** whereby as the knob **91** is rotated the connecting bar **85** and hence the frame **73** will be continuously transversely adjusted with regard to the carriage base plate **79** as the threaded portion **89** of the adjusting screw **87** is advanced into or out of the recess **93**.

The vise **13** is provided with a fixed jaw **71** formed by the center portion of one side wall **76** and two work engaging members **95—96** extending the width of the frame **73** and having a more or less triangular cross section. Each work engaging member **95—96** is fixedly attached to the side wall **76** as by screws **97** or the like such that the exposed surfaces **98—99** of each member **95—96** and the exposed inner surface **101** of the wall **76** form a vertically disposed transverse recess formed by vertically disposed surfaces **102—103**, flat inwardly extending surfaces **98—99**, horizontally disposed surfaces **104—105** and the inner wall surface **101** adapted to cooperate with the inner surfaces of the movable jaw **72** to securely grip large stones of substantially any configuration.

A movable jaw **72** is disposed oppositely to the fixed jaw **71** and is provided with a flat upper portion **106** disposed at an angle to and integral with a similarly formed lower portion **107** whereby the inner surfaces **108—109** of respectively the upper and lower portions **106—107** are integral with a vertically disposed surface **111** having a width substantially equal to the width of the exposed inner surface **101** of the wall **76** forming a part of the fixed jaw **71**. A vertically disposed transverse groove **112** formed by similar outwardly extending flat surfaces **113—114** and a vertically disposed inner surface **115** is provided intermediate the inner end portions **106—107** and opposite the vertically disposed surface **111** to receive in abutting relationship the ends of two clamping bolts **116** threadably carried by the side wall **77** for advancing the movable jaw **72** and also to cooperate with the fixed jaw **71** in the manner hereinafter described. The movable jaw is held against transverse movement by two ears **117—118** integral with respectively the outermost surfaces of the upper portion **106**

and the lower portion **107** and adapted to slidably fit respectively in guide slots **119—121** formed in the center portion of the upper wall **74** and the lower wall **75**. The length of the frame **73** and the length and depth of the guide slots **119—121** should be such that the movable jaw **72** may be tipped sufficiently to disengage the ears **117—118** from the guide slots **119—121** so that the movable jaw **72** may be removed from and reinserted in the frame **73** in a reverse position (shown in phantom in Figure 5) for gripping relatively small stones and the like. In the reverse position for clamping small stones and the like the flat surface **111** is disposed for operative and abutting engagement with the clamping bolts **116** and the wedge shaped groove **112**, previously disposed for operative and abutting engagement with the clamping bolts **116**, and the vertically disposed surfaces **122—123** integral with respectively the outer portion of the angularly disposed surfaces **124—125** are movable into abutting and operative relationship respectively with the exposed surfaces of the fixed jaw.

It may now be obvious that when the movable jaw is in one position the exposed surfaces of the movable jaw and the exposed surfaces of the fixed jaw cooperate to effectively grip a large stone or the like of substantially any configuration, and when the position of the movable jaw is reversed the now exposed surfaces of the movable jaw and the exposed surfaces of the fixed jaw cooperate to effectively grip relatively small stones or the like of substantially any configuration in a plurality of available and different positions as may be convenient or desired.

Although the movable jaw may be formed in one solid piece if desired greater versatility may be obtained by forming the movable jaw in three separate transverse sections **126—127—128** as most clearly shown in Figure 6 such that the clamping bolts **116** engage the two outermost sections **126—128** and connecting the three sections together such that the center section **127** is movable forwardly and rearwardly with respect to the end sections **126—128**. To maintain the middle section **127** in the desired relationship with regard to the end sections **126—128** pins **129—131** passing through and securely held by the extremities of the end sections **126—128** are provided that also pass through similar passages **132** in the extremities of the center section **127** that are of a diameter or size greater than the pin passing therethrough such that the middle section **127** may independently move a limited distance in a forwardly and rearwardly direction.

In performing one of the lapidary operations referred to hereinbefore, such as for example grinding, polishing, tumbling and the like, the vise may either be removed or positioned out of the way near the motor mount. By way of example and particularly with reference to Figure 2 a guard or splash guard **134** (shown in phantom) of conventional and suitable configuration having an axial opening in its lower surface (not shown) may be attached to and supported by the housing **47** in any convenient manner as by braces **135** or the like. The work tool, such as for example a grinding wheel **136** shown in phantom in Figure 2, axially mounted on a mandrel adapted to fit in the recess **61** in the spindle **53**, may now be placed in position. The tool supporting means **12** may thereafter be adjusted to position the work tool and the guard in the most desirable position for the tool being used and as may be most convenient for the operator. The motor **18** may now be adjusted transversely and/or longitudinally to insure minimum wear on and proper operation of the pulley belt **28**, the most suitable position being one wherein the motor drive pulley (not shown) is in alignment with the pulley **59** carried by the spindle **53**.

Faceting may be performed easily and accurately by mounting a suitable grinding wheel and splash guard in a horizontal position on the spindle such as for example as shown in Figure 2 and attaching the faceting tool to either the base **10** or the vertical main supporting member **36** as may be most convenient or desired.

Sawing operations, such as for example slab and trim sawing stones and the like, are performed by attaching to the housing as in the manner hereinbefore described a suitable guard or splash guard adapted to cover the upper portion of the saw blade, mounting a saw blade of any convenient or desirable diameter on the spindle and adjusting the tool supporting means whereby the saw blade is disposed at the desired position and angle (see Figure 1) with regard to the vise. For slab sawing the stone may be clamped in the vise and the vise adjusted transversely as described hereinbefore to the desired position. The actual cutting operation may be performed by advancing the vise toward the saw blade either manually or by any suitable automatic means adapted to advance the vise at a constant rate and maintain constant pressure between the stone and the saw blade.

For trim sawing, a rigid plate (not shown) having a slot adapted and located to freely receive the saw blade may be affixed to the top wall of the vise and the stone manually held on or clamped to the plate and over the slot such that the desired cut will be made as the vise is advanced toward the saw blade.

In view of the foregoing discussion it may now be apparent that the present invention provides a rugged and compact device especially adapted for performing lapidary operations, that occupies a minimum amount of space and that can be easily carried from one place to another and stored when not in use. The invention also allows the performance of all lapidary operations in a more facile and convenient manner than heretofore by the simple expedient of changing the working tool and any parts associated therewith or necessary for convenient and/or safe operation of the working tool and adjusting the tool supporting means to the required and most convenient position for the operation being performed and the operator using the tool.

In addition, the provision of tool supporting means as shown and described herein provides a base for removably supporting a guard or splash guard for every type of working tool.

While there has been shown and described a particular embodiment of the invention and particular methods for use of the invention, it is obvious that various minor changes may be made and will readily suggest themselves to others skilled in the art without departing from the spirit and scope of the invention.

It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed and desired to protect by Letters Patent of the United States is:

1. In a device for performing rotary operations the combination comprising: a base; a rotatable tool supporting element; a housing adapted to rotatably receive said tool supporting element; a first tool locating element adjustable about a first axis parallel to and above said base; a second tool locating element connecting said first tool locating element and said housing in spaced relationship whereby said housing is adjustable about a second axis parallel to and above said base; transversely adjustable motor support means carried by said base opposite of said supporting means; and means carried by said base for supporting said first tool locating element above said base, said first and second tool locating elements being disposed between said means and said housing whereby said housing is located at a point further distant from said means than either of said first or second tool locating elements.

2. In a device for performing rotary operations the combination comprising: a base; a rotatable tool supporting element; a housing adapted to rotatably receive said tool supporting element; a first tool locating member

adjustable about a first axis parallel to and above said base; a second tool supporting member carried by said first tool locating member connecting said housing and said first tool locating member whereby said housing is adjustable about a second axis parallel to and above said base; transversely adjustable motor support means carried by said base opposite of said supporting means; and main support member means disposed at one end of said base for adjustably supporting said first tool locating member about said first axis and above said base whereby the axis of said housing may be rotated to any desired position about said second axis and said housing may be rotated to any desired position about said first axis, said first tool locating member and said second tool supporting member being disposed between said main support member and said housing whereby said housing is located at a point substantially perpendicular to and further distant from said main support member than either of said first or second members.

3. In a device for performing rotary operations the combination comprising: a base; a rotatable tool supporting element; a housing adapted to rotatably receive said tool supporting element; a first tool locating member having a substantially flat end plate and a first sleeve substantially perpendicular thereto; a second sleeve fixedly connected to said housing and carried by said first sleeve and radially adjustable with respect to said first sleeve; an upstanding main support member disposed at one end of said base adapted for abutting engagement with said flat end plate for supporting said first tool locating member above said base; means connecting said flat end plate and said main support member whereby said first sleeve is radially adjustable about an axis transverse to said main support member and above said base; and means for supporting a motor at the other end of said base and transversely adjustable therewith.

4. In a device for performing rotary operations the combination comprising: a base; a spindle adapted to be rotatably driven; a housing for rotatably receiving said spindle; an L-shaped tool locating member having a flat end plate and a first sleeve substantially perpendicular thereto; a second sleeve fixedly connected perpendicular to said housing and radially adjustably carried by said first sleeve; a main supporting wall fixedly attached to one end of said base for supporting said L-shaped tool locating member above said base; and means for adjustably connecting one end of said flat end plate and said main supporting wall whereby at least a portion of said flat end plate and said wall are maintained in abutting engagement and said first sleeve is radially adjustable about an axis transverse to said main supporting wall and above said base; and means for supporting a motor at the other end of said base and transversely adjustable therewith.

5. In a device for performing lapidary operations the combination comprising: a base having a first end portion and a second end portion; means for supporting a motor at said base first end portion, said means including outwardly extending first and second T-shaped arms fixedly attached to and transverse of said base whereby said motor is movable transversely of said base and a portion of said T-shaped arms form two oppositely disposed legs for supporting said base first end portion; a spindle adapted to be rotatably driven; a housing for rotatably receiving said spindle; an L-shaped tool locating member having a flat end plate forming one leg and a first sleeve forming the other leg; a second sleeve perpendicular to said housing and fixedly connected thereto, said second sleeve being carried by said first sleeve and radially adjustable with respect to said first sleeve; a main supporting wall fixedly attached to said base second end portion for rigidly supporting said L-shaped tool locating member above said base; and means for adjustably maintaining one end of said flat end plate and said main supporting wall substantially in abutting engagement whereby said first sleeve is rotatably adjustable about an axis transverse through said main supporting wall.

6. In a device for performing lapidary operations the combination comprising: a base having a first end portion and a second end portion; means for pivotally supporting a motor at said base first end portion, said means including two T-shaped arms extending outwardly from and fixedly attached to said base first end portion whereby said motor is movable transversely past the sides of said base first end portion and a portion of said T-shaped arms form two oppositely disposed support legs; a spindle adapted to be rotatably driven by said motor; a housing for rotatably receiving said spindle; a flat upstanding main supporting member rigidly carried by said base second end portion; an L-shaped tool locating member having a first leg adapted for abutting engagement with said main supporting member; means connecting the end of said tool locating member first leg and said main supporting member and in abutting engagement therewith whereby said tool locating member is radially adjustable about a fixed axis; and means connecting said housing and said tool locating member whereby said housing is radially adjustable with respect to said tool locating member.

7. In a device for performing rotary operations the combination comprising: a base having a first end portion and a second end portion; means for supporting a motor at and transversely adjustable with said base first end portion including two legs for supporting said base first end portion; a rotatable tool supporting element; a housing adapted to rotatably receive said tool supporting element; a first tool locating element adjustable about a first axis parallel to and above said base; a second tool locating element connecting said first tool locating element and said housing in spaced relationship whereby said housing is adjustable about a second axis parallel to and above said base; and means carried by said base second end portion for supporting said first tool locating element above said base, said first and second tool locating elements being disposed between said means and said housing whereby said housing is located at a point further distant from said means than either of said first or second tool locating elements.

8. In a device for performing rotary operations the combination comprising: a base having a first end portion and a second end portion; means for supporting a motor at said base first end portion and transversely adjustable therewith; a rotatable tool supporting element; a housing adapted to rotatably receive said tool supporting element; an L-shaped tool locating element having a first leg and a first sleeve substantially parallel to said base forming the other leg; a second sleeve integral with said housing and radially adjustably carried by said first sleeve; a main supporting wall integral with said base second end portion for rigidly supporting said L-shaped tool locating element above said base; and means for adjustably attaching the free end of said first leg to said supporting wall whereby said first sleeve is rotatably adjustable about an axis substantially parallel to said base.

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