

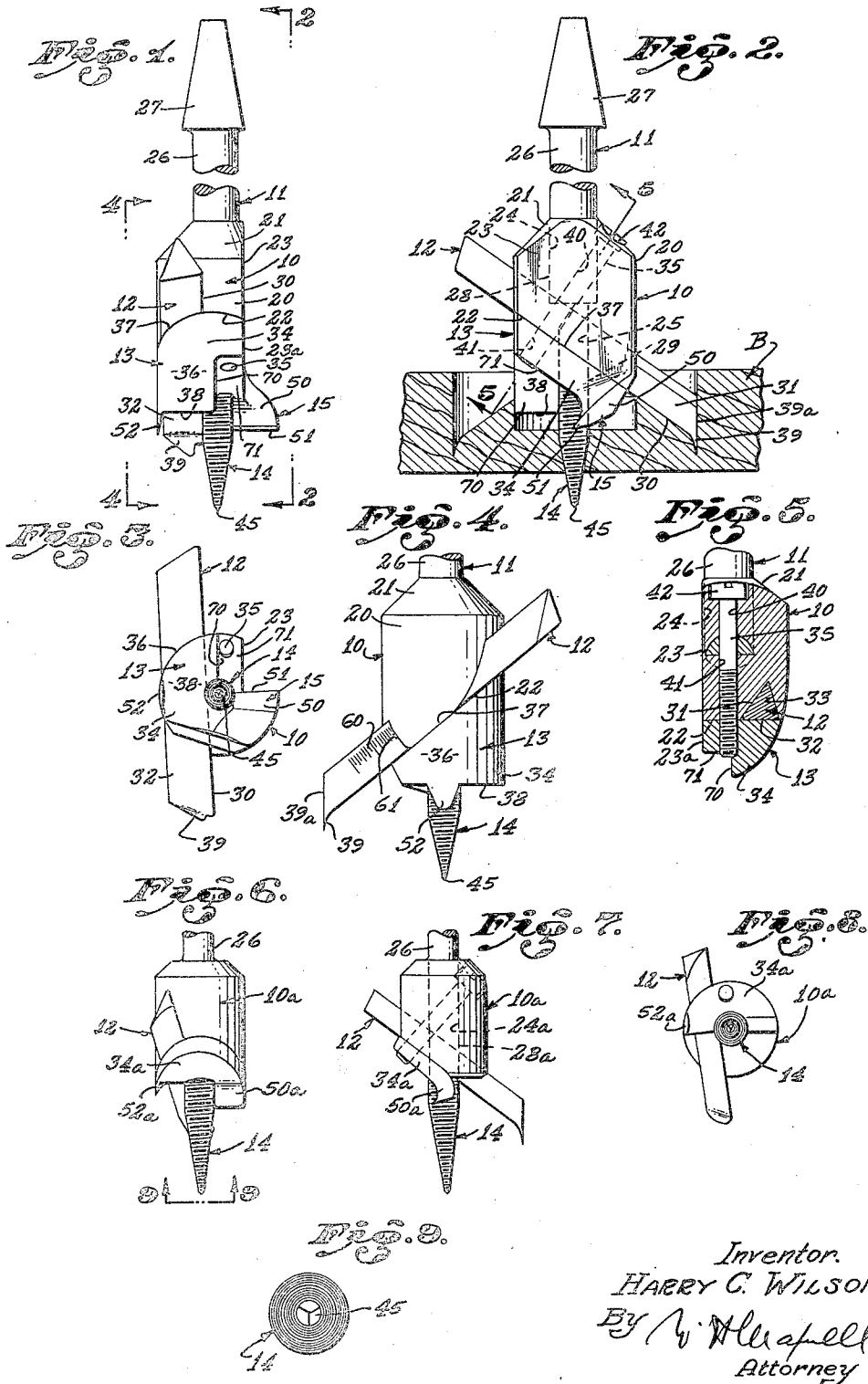
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EXPANSION BIT

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## EXPANSION BIT

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This invention relates to an expansion bit and has particular reference to a bit intended primarily for drilling or boring holes in wood, or the like. It is a general object of the present invention to provide an expansion bit, that is, a bit that is adjustable as to size, which is simple and inexpensive of manufacture and which has features of construction that give it an improved cutting action.

The usual or ordinary expansion bit is characterized by a body with a clamp at one side thereof holding a blade against one side of the body so that it projects laterally from the lower end portion of the body, adjustment being effected by shifting the blade relative to the body. The body of the usual expansion bit is formed with a feed screw integral with its lower end and its lower end portion is dressed to present a blade for cutting a core and the blade is commonly provided at its peripheral extremity with a downwardly projecting lip. With the usual construction such as I have referred to the main cutter is not always held as firmly as it should be and the construction of the body and the clamp for the blade is, generally, somewhat complicated and expensive. Further, the provision of an integral feed screw and core cutting blade on the body itself is a rather expensive construction and the combination of core cutting blade and depending lip is not altogether desirable as it makes it exceedingly difficult to sharpen the parts required to be sharp for effective cutting action.

It is a general object of this invention to provide a bit of the general character referred to in which the principal parts are arranged and related so that the main cutting blade is applied to or carried by the lower end of the body rather than by the side of the body. With the construction of the present invention the main blade is carried in a channel in the body so that the principal forces or pressures occurring during action of the tool are communicated by the blade directly to the body and are not communicated through a clamp applied to or acting at the side of the body.

It is another object of this invention to provide a bit of the character referred to wherein the lead or feed screw is formed separate from the body so that it can be readily manufactured and allowing the body proper to be of simple formation.

Another object of the invention is to provide a bit of the general character referred to wherein the core cutter is formed separate from the body making it practical and economical to form

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this part of high grade material suitable for the purpose while the body can be formed of a different material most advantageous for the service that the body has to perform.

Another object of this invention is to provide a bit of the general construction hereinabove referred to wherein the main cutter is retained at the lower end of the body by a clamp plate which has a blade formed integral with it serving as the core cutter. By providing a single element in the form of a plate to hold the main cutter and also to form the core cutter I have provided a very simple inexpensive construction.

Another object of the invention is to provide a bit of the general character referred to with a core cutter involving a radially projecting blade and a marginal lip which elements are widely separated so that they can be individually sharpened without interfering one with the other. In the preferred construction the core cutting blade and the lip are located substantially diametrically opposite each other making it very simple to form and sharpen each part entirely independent of the other.

It is another object of the present invention to provide a bit of the general character referred to in which the parts are arranged and proportioned so that the outer or peripheral part of the main cutter is the most advanced cutting part and is located axially so that it is opposite the feed screw. By arrangement that I have provided the feed screw maintains adequate engagement in the material being cut up to the time that the main cutter completes the cut, thus assuring adequate feed and preventing excessive biting into the material as the cut is completed.

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

Fig. 1 is a side elevation of the bit provided by my invention taken in a direction facing the core cutting blade. Fig. 2 is a side elevation of the bit taken facing the main cutting blade or in the direction indicated by line 2—2 on Fig. 1 and showing the bit in operating position making a cut through a sheet of material. Fig. 3 is an end view of the bit showing the bottom end thereof. Fig. 4 is a side view of the working end of the bit opposite the side shown in Fig. 2 being a view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is a detailed sectional view taken on line 5—5, Fig. 2. Fig. 6 is a view similar to Fig. 1 showing a

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modified form of construction. Fig. 7 is a view similar to Fig. 2 showing the form illustrated in Fig. 6. Fig. 8 is a bottom end view of the form of construction shown in Figs. 6 and 7, and Fig. 9 is an end view of the feed seen by a view taken on line 9—9 on Fig. 6.

The bit that I have provided is intended primarily for boring or drilling holes in wood, or the like, and in Fig. 2 of the drawings I have shown the bit in the process of drilling a hole through a board B of wood. It is to be understood, of course, that the invention is not in any way limited to the material to be drilled and that suitable variations from the details I am about to describe may be made in adapting the construction to drilling different materials in the most advantageous manner.

The bit embodying the present invention and shown in Figs. 1 to 5, inclusive, involves, generally, a body 10, means 11 for mounting the body in a machine or operating tool, a main cutter 12, means 13 for mounting the main cutter on the body so that it projects downwardly and outwardly therefrom, a lead or feed screw 14 projecting from the lower end of the body and a core cutter 15 at the lower end of the body.

The body may, in practice, be varied considerably as to size and proportioning and it is subject to some variation as to shape. In the preferred form of the invention the body is an elongate block of metal such as steel having an outer side 20 which is round or turned concentric with the longitudinal axis of the bit. The upper end 21 of the body is pitched to extend upwardly and inwardly at an angle such as I have clearly shown in Figs. 1, 2 and 5 of the drawings. The lower end 22 of the body is preferably a flat part or surface disposed in a plane pitched at a substantial angle relative to the axis of the bit or relative to a plane normal to the axis of the bit. In the preferred construction I pitch the bottom end 22 of the body at an angle of about 30° to a plane normal to the axis of the bit. One side of the body is cut away so that the body has a flat side 23 extending parallel with the axis of the bit. The cut in the side of the body is made rather deep so that there is a substantial opening or clearance at the side of the body at the flat face 23 for chip clearance.

In the preferred form of construction the body has a central longitudinal opening formed through it. The upper end portion 24 of the opening is somewhat larger than the lower end portion 25 so the opening will accommodate parts of different diameters as will be hereinafter described. The body 10, as thus far described, may be formed and finished complete with the characteristics I have referred to and with the blade carrying channel that I will later describe. The body thus formed is simple and inexpensive of manufacture and lends itself to being produced economically in large quantities.

The means 11 provided for mounting the body in a machine or operating tool preferably includes a stem 26 concentric with the body 10 and projecting upwardly therefrom and a head 27 on the upper end of the stem. In practice the stem and head are formed integral with each other, the length of the stem being determined by the character of the work to be performed and the shape of the head being such as to cooperate with the chuck or gripping device provided on the operating machine or tool to be used.

The stem may be formed integral with the body in the manner common to bits of this general

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character, although I prefer to form these parts separately and to provide the stem with a finished lower end portion 28 which fits tightly into the upper end portion 24 of the opening through the body. Further, I prefer to provide the stem with an extension 29 of reduced diameter fitting the small or reduced lower end portion 25 of the body opening, the said extension being such as to project below the lower end of the body to form the lead screw 14. In practice the parts just described can be secured together in any suitable manner, for instance it is practical and economical to sweat them together with silver solder so that they, in effect, form a solid rigid unit.

The main cutter 12 is an elongate blade-like part preferably triangular in cross sectional configuration. The said main cutting blade is carried by the body 10 to project downwardly and outwardly therefrom and the mounting means that I have provided is such as to hold the blade in position so that one of its corners forms a forward or leading cutting edge 30 while one of its sides 31 forms a front or leading side and another forms a bottom or trailing side 32. In practice I dress or finish the blade so that the edge 30 is a cutting edge or is sharp. I have found it practical to sharpen the edge 30 by providing a slightly concave grind on the leading face or side 31 of the blade.

In the preferred form of my invention I provide a depending lip 39 on the extreme outer end of the main cutting blade which lip cuts somewhat ahead of the edge 30 and defines the wall of the bore made by the tool. In practice the outer side of the lip 39 and the end 39<sup>a</sup> of the blade may be dressed or finished to be curved and the curvature is made such as to allow clearance when the cutting blade is in its innermost or most contracted position.

The means 13 for mounting the main cutting blade involves, primarily, a V-shaped channel 33 formed in or across the bottom end 22 of the body, a clamp plate 34 to be arranged at the lower end of the body to hold the blade in the channel and a screw 35 for joining the plate and body. The V-shaped channel is formed in the bottom of the body to extend in the direction in which the bottom of the body is pitched and it is located slightly off center or so that it is removed to one side of the center of the bit. The two walls of the groove 33 are related to each other at the same angle that prevails between adjacent sides of the triangular main cutting blade and they are formed in the bottom of the body so that when the main cutting blade is seated in the groove its bottom side 32 is pitched slightly from a plane normal to the axis of the bit or so as to extend upwardly and rearwardly to form clearance behind the cutting edge 30 of the blade.

The channel provided for the main cutting blade is preferably made deep enough to all but completely receive the main cutting blade so that the blade is embraced by the body causing the principal strains that occur during operation to be communicated directly from the blade to the body. The blade projects slightly from the channel 33 or from the lower end 22 of the body so that the clamp plate 34 which is applied to the lower end of the body engages the blade to hold it tight in the groove.

The clamp plate 34 has an outer curved or turned surface 35 concentric with the axis of the bit and of the same size or curvature as the outer

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side 20 of the body. The upper end or face 37 of the clamp plate is pitched or angularly disposed at the same angle as the bottom 22 of the body and these two parts are adapted to fit together or coincide except for the slight amount that they may be held apart by reason of the slight projection of the main cutting blade from the channel 33. The bottom end 38 of the clamp plate may be substantially flat and may be in a plane normal to the longitudinal axis of the bit. In accordance with the preferred form of the invention one side of the clamp plate is cut away so that the clamp plate has a flat side 23<sup>a</sup> registering with and corresponding to the flat side 23 of the body.

The screw provided for joining the clamp plate and body extends between these parts and has a head on one end engaging one of these parts and is threaded to the other end to thread into the other of these parts. In the particular arrangement illustrated a bore 40 is provided in the body 10 to extend in a direction normal to the bottom end 22 of the body and to intersect the central axis of the bit. The lower end of the bore 40 opens at the lower end 22 of the body while the upper end of the bore 40 opens at the beveled top end 21 of the body. The clamp plate has a corresponding or registering bore 41. The bore 40 is a plain bore while the bore 41 is threaded. The screw 35 has a head 42 in its upper end to bear on the beveled upper end 21 of the body or to seat in a counterbore at the upper end 21 of the body while the lower end of the screw is threaded to thread into the opening 41.

By tightening the screw the clamp plate 20 is drawn toward the body and into pressure engagement with the plate 12 so the blade is held tight in the groove 33.

The feed screw 14 is preferably formed by continuing the projection 29 beyond the lower end of the body. The principal portion of the feed screw 14 is tapered and screw threaded while the extreme tip or point of the screw 14 is made diamond shaped or is dressed to present several small flat sides 45 as shown in Fig. 9. Through this construction the tool can be handled without danger of injuring the feed screw in that the flat sides at the pointed end of the screw are not hurt or injured by ordinary use or handling of the tool. In the ordinary adjustable bit with a feed screw the tip of the feed screw is a delicate part that frequently becomes injured or damaged by mere ordinary handling of the tool along with other tools.

The core cutter 15 includes a blade 50 formed on the plate 34 to have a cutting edge 51 facing forward or in the direction of rotation of the bit and extending radially a suitable distance outward from the feed screw. In accordance with my invention the blade 50 is formed as a projection on the plate at the flattened side thereof so that it projects from the flat face 23 of the plate at the lower end thereof. In the preferred construction the edge 51 extends at right angles to the plane of the flattened side 23<sup>a</sup> of the clamp plate. The blade 50 extends not only from the flat face 23 of the clamp plate but also extends downwardly and forward so that the edge 51 is located somewhat ahead of the bottom 38 of the clamp plate, as will be seen in Figs. 1 and 2 of the drawings.

The core cutter includes, in addition to the blade 50 with the sharpened edge 51 a depending sharp lip 52 located to cut the marginal wall of the core opening. In the preferred arrangement the lip 52 is formed on the clamp 34 to depend from the bottom 38 thereof as a continuation of

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the curved side wall of the plate, and it is located around the clamp plate to be substantially diametrically opposite the cutting edge 51 of the blade 50. The parts are proportioned so that the blade 50 or at least the edge 51 of the blade 50 extends outwardly from the feed screw to join the cut made by the lip 52. By locating the edge 51 and the lip 52 far apart around the lower end of the tool I make it possible for these parts to be sharpened or dressed when necessary, independently of each other, and without one interfering with the dressing of the other.

To assure proper clearance of chips or cuttings made by the edge 51 I may notch or cut away the clamp plate 34 at 70 immediately above and forward of the edge 51 as clearly shown in the drawings. This cut is preferably formed so that its upper wall 71 extends upwardly and forward. In fact, it is preferably pitched to correspond with the pitch or angularity of the bottom 22 of the body and upper end 37 of the clamp plate, as clearly shown in Figs. 2 of the drawings.

It is desirable, in practice, to provide the tool with means enabling a user to determine the extent to which the main cutter is projecting from the body. This may be done by providing a scale 60 on one side or face of the main blade to cooperate with the end edge 61 that occurs where the channel 33 intersects the curved exterior 20 of the body, which edge may be straightened for the purpose of proper cooperation with the scale.

With the construction that I have provided the body 10 is permanently assembled with the means 11 whereupon the bore 40 is provided through the body and also through that portion of the parts of the stem within the body as may be within the path of the bore. The main blade is arranged in the groove 33 which establishes the proper angle of the cutting part of the blade and which supports the blade at the proper angle extending downwardly and outwardly from the body. The plate 34 is secured to the body by the screw 35 establishing the cutting edge 51 and the lip 52 in the desired position and clamping the main blade in its supporting groove. When the main blade has been adjusted to the desired position the screw 35 is made tight so the blade is clamped securely.

When the parts are in normal working position, such as is shown in Fig. 2, the feed screw 14 is first to enter the work and serves to feed or advance the bit into the work. The main blade with its cutting edge 30 and lip 39 makes the outer portion of the cut and defines the wall of the bore while the edge 51 and lip 52 cut away the inner portion or core. It will be observed from an examination of Fig. 2 that the cut made by the lip 39 of the main blade precedes by a substantial distance the core cut and it will be observed that the feed screw has a substantial bite in the material even when the bit has advanced to the point where the lip 39 of the main blade is through the material, so that the cut or bore is complete. As the tool operates the curved outer wall or side of the clamp plate bears in the bore made by the core cutter so the tool is effectively braced to handle the forces or thrust set up by the acts of the main cutter.

In the form of the invention shown in Figs. 6 to 9 inclusive, the parts are similar, generally, to those hereinabove described except that the body 10<sup>a</sup> has a bore 24<sup>a</sup> of uniform diameter carrying a continuation 28<sup>a</sup> of the stem 26. The clamp plate 34<sup>a</sup> in this form of the invention is somewhat simpler than that above described in that

it is simply a flat plate with a part turned to form the blade 50<sup>a</sup>. The clamp plate 35<sup>a</sup> may have a lip 52<sup>a</sup> diametrically opposite the blade 50<sup>a</sup>.

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 and fall within the scope of the following claims.

Having described my invention, I claim:

1. A bit of the character described including, an elongate body, a stem projecting from the upper end of the body, a main cutter engaging the body to project laterally therefrom, a core cutter bearing on the lower end surface of the body and on the main cutter to retain it in place relative to the body, means securing the core cutter to the body, and a downwardly tapered feed screw projecting from the lower end of the body, the lower end surface of the body being pitched and having a downwardly facing channel carrying the main cutter, the main cutter being retained in the channel by the core cutter.

2. A bit of the character described including, an elongate body having an inclined lower end surface with a downwardly facing channel therein, a stem projecting from the upper end surface of the body, a main cutter triangular in cross section and engaged in the channel in the lower end surface of the body to project laterally from the body, a core cutter separable from the body and applied to the lower end of the body over the channel and bearing on the said inclined end surface of the body, means releasably securing the core cutter to the body, and a downwardly tapered feed screw projecting from the lower end surface of the body, the main cutter being retained in the channel by the core cutter and having a depending lip at its outer end.

3. A bit of the character described including, an elongate body having an inclined lower end surface with a downwardly facing channel in it offset from the central axis of the bit and extending in the direction in which the end is inclined, a main cutter engaged in the channel to project laterally from the body, a clamp plate separable from the body and arranged opposite the lower end surface of the body bearing on said surface and engaging the cutter to hold it in the channel, means releasably securing the clamp plate to the body, a core cutter on the plate, and a feed screw projecting from the lower end surface of the body beyond the core cutter.

4. A bit of the character described including, an elongate body having an inclined lower end surface with a downwardly facing V-shaped channel in its laterally offset from the central axis of the bit and extending in the direction in which the end surface is inclined, a main cutter triangular in cross section and entered in the channel to project laterally from the body and having a side substantially in the plane of the said end surface of the body, a clamp plate separable from the body and arranged opposite the lower end surface of the body bearing against said surface and engaging the cutter to hold it in the channel,

means releasably securing the clamp plate to the body, a core cutter on the plate, and a feed screw projecting from the lower end surface of the body beyond the core cutter.

5. A bit of the character described including, an elongate body with a central opening extending through it from one end to the other and having an inclined lower end surface with a downwardly opening V-shaped channel in it, the channel being laterally offset from the central axis of the bit, a stem projecting above the body and having an extension held fast in the opening and continuing below the body and forming a feed screw, a main cutter triangular in cross section engaged in the channel to project downwardly and outwardly from the body and having a lower side projecting slightly beyond the end surface of the body, a clamp plate opposite the lower end surface of the body bearing on the end surface and engaging the cutter to hold it in the channel, a single screw extending in a direction normal to the lower end surface of the body and intersecting said extension and joining the plate and body, and a core cutter on the plate including a blade with a forwardly facing cutting edge.

6. A bit of the character described including, an elongate body with a central opening extending through it from one end to the other and having an inclined lower end surface with a downwardly opening V-shaped channel in it, the channel being laterally offset from the central axis of the bit, the body having a flat side diametrically opposite the channel, a stem projecting above the body and having an extension held fast in the opening and continuing below the body and forming a feed screw, a main cutter triangular in cross section entered in the channel to project downwardly and outwardly from the body and having a lower side projecting slightly beyond the end surface of the body, a clamp plate opposite the lower end surface of the body bearing on the end surface and engaging the cutter to hold it in the channel, the plate having a flat side in line with the flat side of the body, a screw joining the plate and body and extending at right angles to the lower end surface of the body and through the center of the body to the upper end portion of the body, and a core cutter on the plate including a blade with a forwardly facing cutting edge.

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