C. F. HEINKEL.

BORING AND REAMING TOOL.

APPLICATION FILED NOV. 4, 1915.

1,337,015. **Patented Apr. 13, 1920.**

2 SHEETS—SHEET 1.

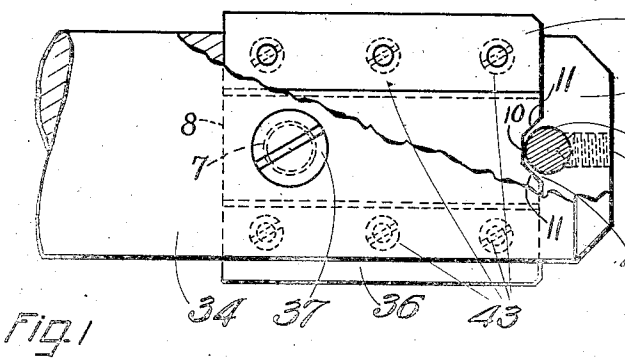


Fig. I

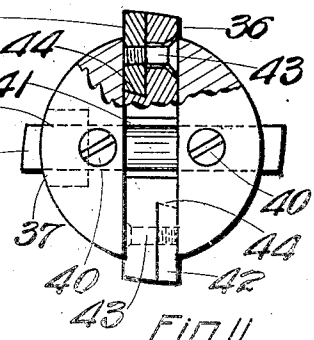


Fig. II

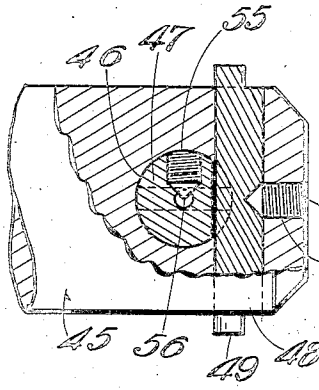


Fig. III

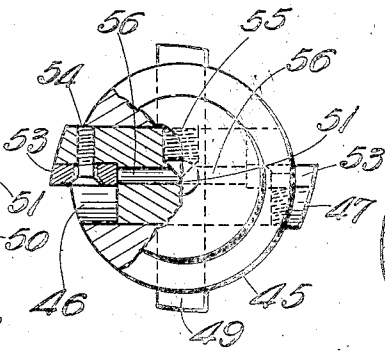


Fig. IV

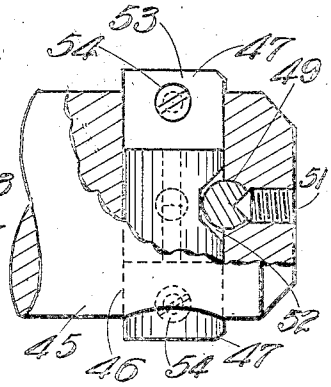


Fig. V

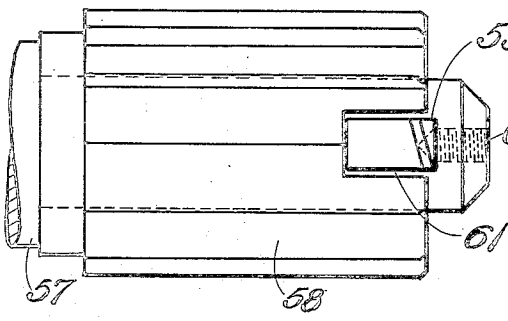


Fig. VI

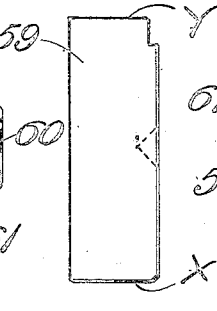


Fig. VII

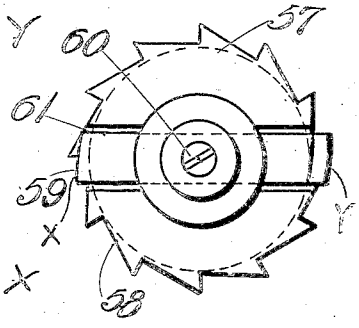


Fig. VIII

Witnesses:

John Kalesh

Lucas H. Dean

Inventor:

Christian F. Heinkel.

C. F. HEINKEL.

BORING AND REAMING TOOL.

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2 SHEETS—SHEET 2.

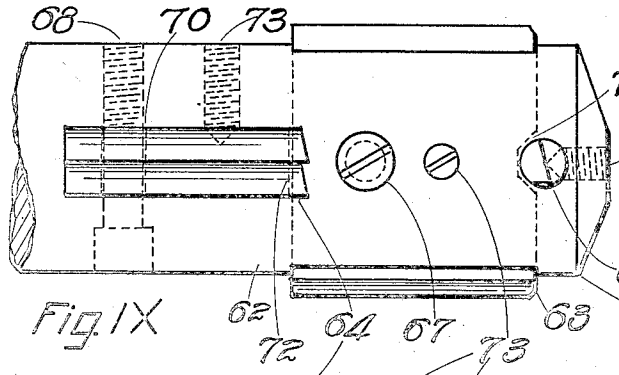


Fig. IX

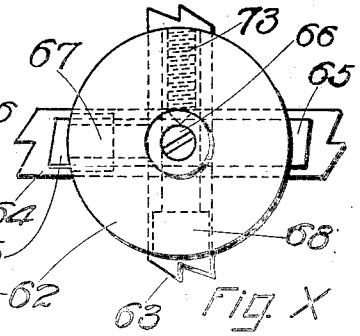


Fig. X

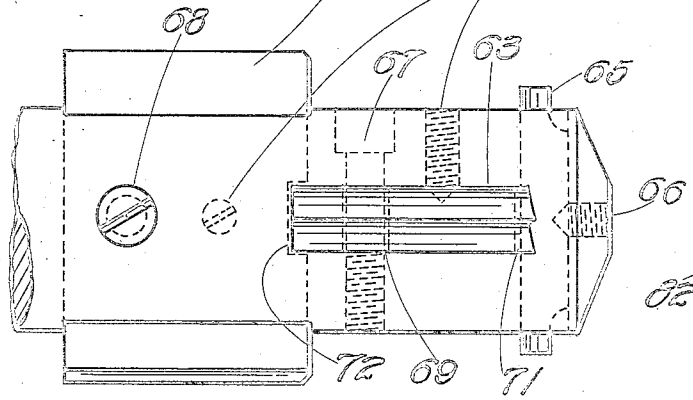


Fig. XI

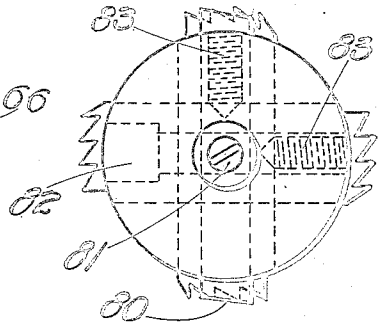


Fig. XII

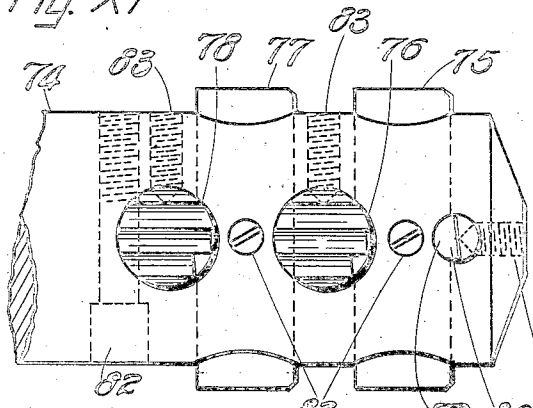


Fig. XIII

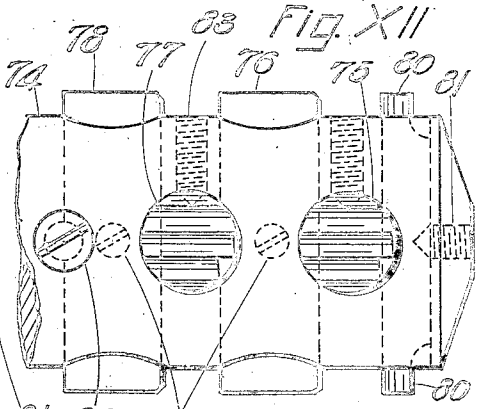


Fig. XIV

Witnesses:
John Kalsch
Oscar H. Dean

Inventor:
Christian F. Heinkel

UNITED STATES PATENT OFFICE.

CHRISTIAN F. HEINKEL, OF CLEVELAND, OHIO.

BORING AND REAMING TOOL.

1,337,015. Specification of Letters Patent. Patented Apr. 13, 1920.

Application filed November 4, 1915. Serial No. 59,558.

To all whom it may concern:

Be it known that I, CHRISTIAN F. HEINKEL, a citizen of the United States, residing at Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Boring and Reaming Tool, of which the following is a specification.

My invention relates to boring and reaming tools in which a pilot cutter acts in conjunction with a second cutter.

The object of my invention is an efficient and inexpensive boring and reaming tool.

I attain this object by the mechanism illustrated in the drawing in which Figure I is a general side view of a boring and reaming tool partly broken away to show the relation of the pilot cutter to the finishing cutter; Fig. II is an end view of Fig. I partly broken away to show a method of adjusting the cutter blades; Fig. III is a general side view of a boring and reaming tool having a pilot cutter and a round and adjustable finishing cutter and being partly broken away to show relation between the pilot and finishing cutters and a method of adjusting the finishing cutter and locking the pilot cutter; Fig. IV is an end view of Fig. III; Fig. V is a side view of Fig. III partly broken away to show the relation of the cutters; Fig. VI is a side view of a usual shell reamer with a pilot cutter; Fig. VII is a side view of the pilot cutter shown in Fig. VI; Fig. VIII is an end view of Fig. VI; Fig. IX is a side view of a boring and reaming tool having a pilot cutter and two finishing cutters; Fig. X is an end view of Fig. IX; Fig. XI is a top view of Fig. IX; Fig. XII is an end view of a boring and reaming tool having a pilot cutter and four round finishing cutters; Fig. XIII is a top view of Fig. XII; and Fig. XIV is a side view of Fig. XII.

Similar reference characters refer to similar parts throughout the several views.

Referring now particularly to Figs. I and II. In this tool, the body 34 has the slot 35 into which the finishing cutter 36 fits slidingly. This body 34 also has an opening to receive the screw 37 as shown and also has an opening 38 into which the pilot cutter 39 fits rather snugly. In the end of body 34 are tapped openings to receive the pointed set screws 40 which accomplish the double purpose of holding the pilot cutter in place as well as preventing the front and divided end of the body 34 from spreading. The slot 35, in this instance, being cut in the end of the body 34; the body is therefore open at the front end thereof.

The finishing cutter 36 has the opening 7 which registers with the corresponding opening in the body 34 but is somewhat larger in diameter than the body of the screw 37 to permit the finishing cutter 36 to float on the screw 4. The face 8 of the cutter 36 should line up squarely with the bottom of the slot in the body 34 so that the cutter 36 may have a square seat to rest against when in action. At the front end, the cutter 36 has the notch 41 which is so positioned and of such contour that the cutter 36 may float on the pilot cutter 39 without much end motion; the flat surface 10 of the notch 41, preferably, touches the cutter 39 lightly while the two beveled faces 11 have some clearance over the cutter 39 so that the finishing cutter 36 may move radially without much end or longitudinal movement. This radial movement of the cutter 36 constitutes the float of the cutter and the distance or space between the circumferential surface of the pilot cutter and the faces 11 determines the amount of the float on each side of the longitudinal axis of the tool. The opening 7 in the cutter 36 may, conveniently, be sized so that the space on each side of the screw 37 equals the space between the pilot cutter and the faces 11 previously set forth, although this opening 7 may be larger than specified without interfering with the floating of the cutter. The cutter 36 floats between the faces 8 and 11 and the screw 37 performs no particular function as to floating of the cutter, but is provided as a safeguard to keep the cutter in the bar as when the pilot cutter is out of the bar for instance.

In the particular construction shown, the finishing cutter 36 is provided with the cutting blades 42 which are secured to the cutter 36 by the screws 43. These blades 42 have the beveled faces 44 which serve to hold the blades 42 more firmly to the cutter 36 as well as to provide better facility for holding the packing material which may be placed thereon when adjusting the same. The blades 42 are here shown adjustable. Such adjustment being accomplished by "packing out" or in other words, by placing a layer of paper or other material on the beveled faces 44 between the blades 42

and the cutter 36 whereby the blade 42 will be moved outwardly or adjusted to required size. In order to permit the blades 42 to move outwardly as stated, the holes for the screws 43 in the blades 42 should be elongated as shown. By providing these blades 42, the cutter 36 may be made of cheaper material and the blades 42 are rendered adjustable.

The pilot cutter 39 fits snugly into the body 34 and is so positioned that the front end of its cutting face or edge is only a short distance ahead of the front of the cutting edge of the finishing cutter 36; the depth of the notch 41 being gaged accordingly. This pilot cutter 39 has two countersunk openings to engage the points of the screws 40 whereby the pilot cutter 39 is rigidly held in position.

The several members of this tool are properly machined, hardened and ground where found necessary or convenient or advantageous.

It will be seen that this tool is economical of manufacture since it has few parts and no exact or close or time consuming fitting is necessary thereon and that this tool is efficient since the roughing and finishing is done in one operation whereby considerable time is saved in production of work. The pilot cutter, being rigidly secured to the body, trues up the opening to be finished while the finishing cutter, being floatingly mounted, finishes and sizes the opening immediately after the roughing and without change of tools or stoppage of machinery or other inconveniences or time consuming operations.

Referring now particularly to Figs. III, IV, and V.

In this tool, the body 45 has the opening 46 into which the round cutter 47 fits slidingly and also has the opening 48 into which the pilot cutter 49 fits snugly and also has the opening 50 in its end to receive the screw 51 which holds the pilot cutter 49 in place. This finishing cutter 47 has the notch 52 which bears the same relation to the pilot cutter 49 as the notch 41 bears to the pilot cutter 39 in Figs. I and II previously described but the notch 52 may also be formed so that the pilot cutter 49 will fit therein snugly when it is desired to hold the finishing cutter rigidly as shown in Figs. XIII and XIV for instance.

The finishing cutter 47 carries the cutter blades 53 which are secured thereto by the screws 54.

An adjusting means for the cutter blades 53 is here provided which consists of the pointed adjusting screw 55 located in the cutter 47 and the adjusting rods 56 located in the central opening in the cutter 47.

In this tool, as shown, the finishing cutter floats while the pilot cutter is held rigidly.

Adjustment of the cutter blades 53 is accomplished by turning the screw 55, the pointed end of which bears against the beveled ends of the adjusting rods 56 and forces the cutter blades 53 out as the screw is manipulated. This method of adjusting the cutter blades may also be employed on other types of cutters.

Referring now particularly to Figs. VI, VII, and VIII. In this tool, the shank 57 has its end reduced diametrically to receive the reamer 58 either floatingly or rigidly. This reduced part has a slot near its end into which the pilot cutter 59 fits snugly and also has a threaded opening in its end to receive the screw 60 which holds the pilot cutter 59 in place.

The reamer 58 has the slot 61 in its front end for the purpose of allowing the pilot cutter 59 to pass through and being located so that the cutting edge of the pilot cutter is only a short distance ahead of the cutting edge of the finishing cutter or reamer 58.

The pilot cutter 59, in this instance, has the cutting faces X and Y; the face X being slightly ahead of the face Y and being adapted to bore a hole somewhat smaller than the face Y while this face Y in turn is adapted to bore the hole somewhat smaller than the reamer 58. The object being to have the face X remove all surplus material and irregularities in the hole to be bored while the face Y sizes and trues up the hole after the face X so that the reamer 58 needs to finally size and smooth the hole only.

In this tool, the reamer may float by turning the reduced part of the shank 57 somewhat smaller than the bore of the reamer; or it may be held rigidly by fitting this reduced part snugly to the reamer bore.

The pilot cutter shown here serves the double purpose of a cutter and a means for driving the reamer near the front and cutting end.

Referring now particularly to Figs. IX, X, and XI. In this tool, the body 62 has openings into which the finishing cutters 63 and 64 fit slidingly, and also has an opening into which the pilot cutter 65 fits snugly, and also has an opening in its end to receive the screw 66 which holds the pilot cutter 65 in place, and also has openings to receive the screws 67 and 68 the purpose of which will appear later.

The finishing cutters 63 and 64 have openings 69 and 70, respectively, which are somewhat larger than the diameter of the screws 67 and 68, and also have the notches 71 and 72, respectively. The notch 71 being arranged and serving the same purpose as the notch 41 in Figs. I, II, and III previously described, while the notch 72 is somewhat wider than the thickness of the finishing cutter 63 and sufficiently deep to permit the cutter 63 to slide endwise on the cutter 64 so

that the cutter 63 may float on the pilot cutter 65 and the screw 67 without much end play longitudinally of the body while the cutter 64 may float on the cutter 63 and the screw 68 likewise without much end play. The screws 67 and 68 assist in holding the cutters 63 and 64 in place similar to the screw 37 in Figs. I and II.

In a step cutter of the kind shown here, as for instance a boring tool and counterbore or a boring and facing tool, as well as in a tool which has no such steps, it may be advisable in some cases to hold one or more cutters rigidly and centrally which is accomplished in the present instance by providing openings in the bar 62 to receive the pointed screws 73 and by providing conical openings in the cutters 63 and 64 to receive the points of the screws 73 so that either one or both of the cutters 63 and 64 may be held firmly and centrally when the screws 73 are tightened.

In order to produce a better hole than the usual two face cutters produce, each outer face of the cutters 63 and 64 is provided with two cutting teeth, which plurality of cutting teeth also tends to prolong the life and cutting capacity of the tool.

In the tool shown here, the finishing cutters may be used either floatingly or rigidly and centrally.

Referring now particularly to Figs. XII, XIII, and XIV. In this tool, the bar 74 has a series of round openings, preferably at right angles with each other as shown, into which the round finishing cutters 75, 76, 77, and 78 fit slidingly, and also has the opening 79 into which the pilot cutter 80 fits snugly, and also has an opening in its end to receive the screw 81 which holds the pilot cutter 80 in place, and also has an opening for the screw 82 which assists to hold the cutter 78 in place as previously described.

In this instance, the sides of the notches in the cutters are arranged to fit snugly over the adjacent cutters and screw and the cutters are all held rigidly and centrally; they may however be arranged as shown in Figs. III, IV, and V. The pointed screws 83 are provided to hold the cutters more firmly than the notches when so desired, or to hold one or more of them firmly when they are otherwise mounted floatingly. Without considering the screws 83, the cutter 75 is held in place by the pilot cutter 80 and the cutter 76, the cutter 76 is held by the cutter 77, the cutter 77 is held by the cutter 78, and the cutter 78 is held by the screw 82.

Each end of the finishing cutters shown here has a plurality of cutting teeth which tends to prolong the life of the tool and produces a better hole and does so quicker than a single cutting edge.

It will be seen that this particular construction provides a comparatively inexpensive tool which is efficient in action and maintenance. The plurality of finishing cutters provided here produce a better and more round hole than a single cutting edge at each end could do and this plurality of teeth serves the further purpose of increasing the efficiency of the tool by being able to maintain its size longer than the usual two edge tool.

It is thought that the practical applications of the present invention as shown and described will enable others to apply this invention to other forms of tools and in other combinations of elements.

I claim:

1. A tool of the character described comprising a body, a pilot cutter held against movement in said body, and a finishing cutter floatingly held in said body by said pilot cutter.

2. A tool of the character described comprising a body, a pilot cutter held against movement in said body, a finishing cutter floatingly held in said body by said pilot cutter, and means for rigidly holding said finishing cutter in said body when so desired.

3. A tool of the character described comprising a body, a pilot cutter held against movement in said body, a plurality of finishing cutters held one by the other in said body, and the first of said finishing cutters held in said body by said pilot cutter.

4. A tool of the character described comprosing a shank, a pilot cutter held against movement in said shank, and a finishing cutter held on said shank by said pilot cutter and driven thereby at the front end thereof.

5. A tool of the character described comprising a body which is divided at its front end, a pilot cutter held against movement in said body, the said front and divided end of said body held in position by said pilot cutter and its holding means, and a finishing cutter floatingly held in said body by said pilot cutter.

CHRISTIAN F. HEINKEL.

Witnesses:
JOHN KALSCH,
OSCAR F. DEAN.