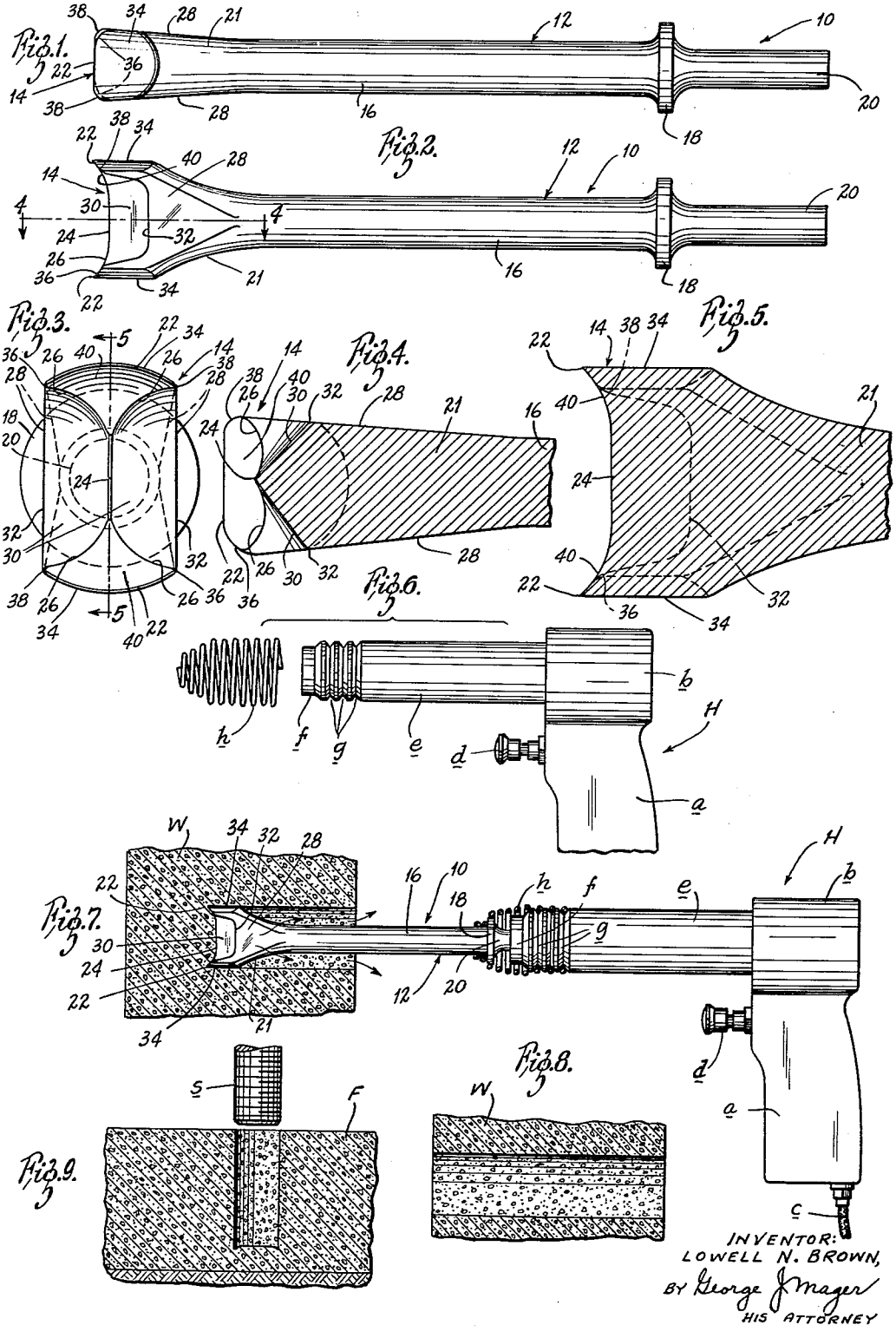
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MASONRY DRILL

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MASONRY DRILL

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The present invention relates generally to drills, and more particularly to drills that are driven by pneumatic powered means, and are employed to drill openings through, or holes into, concrete or similar materials in the masonry category.

Specifically, the present invention is directed to a novel and improved bit end construction for integral incorporation in this type of drill.

Heretofore insofar as I am aware, the only tools available for attempting to produce circular openings that will extend through a masonry wall or the like are known in the trade as "star" drills. Similarly, the only tools available for attempting to produce circular sockets, or holes that do not extend all the way through a masonry wall or the like, are likewise known as "star" drills.

These star drills may have minor differences in the design of their bit ends, but all of them have one thing in common. That is to say, each bit end has a salient central point or tip that constitutes the first impact segment thereof, the wings or other cutting segments of said bit end being formed rearwardly of said tip. Consequently in operation, the initial series of hammer blows concentrate their effectiveness on the said central tip portion and cause it to be driven into the surface of the masonry in so to speak nail fashion. As a result, radial splits and crumbling develop about the drill point, so that when the cutting edges of the bit eventually advance to effective position, the surface thereabout will have been damaged considerably. Furthermore, inasmuch as these star drills are advanced bodily, the dislodged material usually tends to "clog," and thusly impair the planar advance of the drills. Consequently as should be apparent, the resulting openings and holes tediously produced by means of conventional star drills are seldom cylindrical, and are usually oversized and jagged internally.

Accordingly, the primary object of this invention is to provide a novel bit end concept adapted to overcome the disadvantages of present day star drills that have been set forth above.

It is also an object to provide a bit end of novel configuration adapted to be integrally formed on one end of conventional drill shanks whereby the production of circular openings and holes in masonry will be expedited considerably, and wherein the resultant internal diameters of said openings and holes will at least approximately correspond to the diameters selected.

It is another object of this invention to provide a bit end for a masonry drill having a pair of diametrically opposite tip formations so formed as to automatically effect rotary movements of the drill about its axis responsive to power blows directed axially against its bit opposed end.

It is a further object of the invention to provide a bit end portion for masonry drills that is so contoured as to expedite the escape of granular and pulverized material from the area being subjected to the drilling action.

The improved and ingeniously contoured bit end portion for drills of the category under consideration is illustrated on a sheet of drawings that accompanies this specification. It is believed that a more comprehensive understanding of the features of the invention may be had from the detailed description that follows relatively thereto with reference to said drawings wherein:

FIGURE 1 is a plan view of an exemplary masonry drill incorporating a bit end portion contoured in accordance with the concepts of the present invention;

FIGURE 2 is a side elevational view of the drill illustrated in FIGURE 1;

FIGURE 3 is a bit end elevational view of the drill, on an enlarged scale;

FIGURE 4 is a longitudinal sectional view on an enlarged scale, taken on the line 4—4 of FIGURE 2;

FIGURE 5 is a longitudinal sectional taken on the line 5—5 of FIGURE 3;

FIGURE 6 is an exploded side elevational view of a typical pneumatic hammer, and a complemental holder spring wherewith the exemplary drill of FIGURE 1 could be operatively connected to said hammer;

FIGURE 7 is a side elevational view illustrating a horizontal drilling operation through a vertical concrete wall, with the drill operatively connected to the hammer by means of said holder spring;

FIGURE 8 is a view showing the horizontal circular hole resulting in the wall, after the drilling operation illustrated in FIGURE 7 had been completed; and

FIGURE 9 is a vertical sectional view illustrating a socket produced in an exemplary concrete floor by means of the present invention, the threaded shank portion of a bolt being shown above the said socket in position to be driven thereinto.

With attention directed for the present particularly to FIGURES 1 through 5, a masonry drill incorporating the concepts of the present invention is designated as a whole by the numeral **10**. The drill **10** includes a shank portion generally designated **12** that terminates at one end in a bit portion generally designated **14**.

The shank portion **12** is conventional, and includes a cylindrical shank **16** that merges into the bit portion **14** at one end, into an integral collar portion **18** at its opposite end, and terminates in an extension **20** of reduced diameter, said extension also merging at one end into the collar portion **18** as shown.

It is again noted at this point, that the present invention is concerned primarily with the forward or bit end portion **14** of the drill illustrated. Thus the shank portion **12** may be of any desired length, and may be provided with other appropriate means than the collar portion **18** and extension **20** for connecting it to a power operated driving tool.

Said bit end **14** has the novel contour illustrated, and is integrally formed with the shank **16** of the drill. It comprises a cutter head including: a main body **21**, a pair of diametrically opposite salient cutting tip formations **22**; a diametric cutting edge **24** that is disposed rearwardly of the tip formations **22**; two pairs of arcuate cutting edges **26** that merge at one end into the tip formations **22** and at the other end into the cutting edge **24**; opposed flat sides **28**; and a pair of oblique rearwardly sloping faces **30** that define the diametric cutting edge **24** at their juncture and merge into the sides **28** at their rear or trailing ends **32**. As seen to best advantage in FIGURE 3, the salient cutting tip formations **22** are arcuately formed concentric with the shank **16**, and the cutting edge **24** extends diametrically between said tip formations from its mergence at one end into the first pair of arcuate cutting edges **26**, to its mergence at the opposite end into the second pair of arcuate cutting edges **26**. And as seen to best advantage in FIGURES 2 and 4, the opposed flat sides **28** of the main body **21** merge into the cylindrical shank **16**, and flare therefrom toward the drilling end of the bit to merge also into the trailing ends **32** of the oblique faces **30**.

The outer peripheral surface of each of the tip formations **22** is designated **34**, and is formed on a radius considerably greater than the radius of the shank **16**, so that as should be apparent, these tip formations in operation

will produce and define a hole wherein said shank would be axially and concentrically disposed but out of contact with the wall of said hole as will appear.

The pair of tip formations **22** each merge into the flat sides **28**, said mergence junctures being defined by arcuate edge segments **36** and **38**. For reasons to be explained, these arcuate edge segments of each tip formation vary slightly. That is to say, as best seen in FIGURE 1, and with reference also to FIGURES 3 and 4, the diametrically opposite arcuate edge segments **36** are formed on corresponding radii that are greater than the radii whereon the diametrically opposite arcuate edge segments **38** are formed.

As best seen in FIGURE 3, the arcuate cutting edges **26**, the salient tip formations **22**, and the arcuate edge segments **36** and **38** thereof, define a pair of opposed generally triangular faces **40** that are connected by the diametric cutting edge **24**. Each face **40** is curved from the point of its mergence into one of the tip formations **22** to its mergence into the adjacent end of the diametric cutting edge **24**, and the sides of each face (constituting the arcuate cutting edges **26**), converge to a point at the end of said diametric edge.

The opposed sides **28** of the cutter head main body **21**, are flat as stated, and flare forwardly from the shank **16**. As best seen in FIGURES 2 and 5, the peripheral surface of the main body **21** of the bit also flares forwardly from said shank and merges into the arcuate surfaces **34** of the tip formations **22**.

As hereinbefore indicated the drill shank with its bit end thus far described comprises the present invention. The kind of pneumatic hammer or other power device for rapidly reciprocating the drill would obviously depend on the resultant circular opening or hole contemplated.

An exemplary power means is illustrated in FIGURES 6 and 7, and comprises a pneumatically operable hammer H of the gun type. It includes: a handle *a* depending from a cylindrical section *b*; a flexible line *c* for supplying power to the hammer from a source of compressed air; an appropriate manually operable air pressure control device designated *d*; and a barrel *e* projecting from the cylindrical section *b*.

An appropriate mechanism for automatically reciprocating a piston responsive to manipulations of the control device *d* is located partially in the barrel *e* and partially in the cylindrical section *b*. However, it is not deemed necessary to illustrate and describe this piston reciprocating mechanism, nor the air passageways associated therewith. Reference may be had if desired, to United States Letters Patent No. 2,655,901 issued to me on October 20, 1953, for a comprehensive disclosure of means for effecting reciprocal piston movements in a pneumatic hammer.

Formed externally in the free end portion *f* of the barrel *e* is a plurality of annular grooves each designated *g*. These grooves serve, with the aid of a suitable holder spring, to operatively connect tool shanks such as that illustrated, to the barrel in proper position to receive intermittent power blows directed thereagainst by the reciprocating piston of the hammer, as is understood. A suitable holder spring *h* of the beehive type is illustrated per se at the left in FIGURE 6. By means of the spring *h*, or one of similar nature, the drill **12** may be operatively connected to the hammer as is well understood, and is demonstrated in FIGURE 7. As a general rule, it has been found advantageous to incorporate in pneumatic hammers of this type, means for directing the air exhaust forwardly past the barrel and away from the hand of the operator.

Although it is believed apparent that the novel configuration of the bit end **14** disclosed herein is adapted to achieve the primary objectives of the invention in a highly efficient manner, a brief explanation will be given, with particular attention being directed first to FIGURES 7 and 8.

Shown in FIGURE 7 is a fragmentary portion of a vertical wall W that is indicated to be of concrete, although it could just as well be of brick or of stone. It will now be assumed that it were desired for example, to form a horizontal circular opening through the wall W in order to accommodate the slidable passage therethrough of a conduit having an external diameter of one and one half inches. In accordance with the concepts of the present invention, a drill **12** provided with a bit end portion **14** that has its salient tip formations **22** formed on a three quarter inch radius would be selected, and operatively connected to the pneumatic hammer H by means of the holder spring *h*. Thereupon, with the hammer in readiness for operation via manipulation of the control device *d* as is understood, the drill **12** would be directed against the wall W in the selected horizontal plane. The first hammer blow would cause the salient tip formations **22** to penetrate the wall surface followed by further penetration as the hammer blows continue in rapid succession. Concurrently with its advance, the drill would automatically be caused to rotate about its axis in consequence of the described arcuate dissimilarity of the edges **36** and **38**.

In other words, following the initial and the immediately succeeding hammer blow, the drill **10** would automatically begin to rotate in a clockwise direction as viewed from the standpoint of the operator. At first, the rotation would be slight, perhaps five or ten degrees, dependent on the density of the material into which the drill is being driven. The rapidity wherewith the hammer blows are delivered make it difficult to define the precise degree of drill rotation. In the case of an ordinary concrete wall for example, the rotary movements of the drill, once initiated and continued for a short time, would approximate forty-five degrees. In the case of a stone wall however, such rotary movements could be of a lesser degree. At any rate, the degree of drill rotation would be incremental until a complete circular cavity had been produced.

When the drill is driven into a partially formed opening, it has a tendency to rotate, and will rotate in the direction of least resistance. Inasmuch as the cutting edges **38** are formed on smaller radii than the cutting edges **36**, their mergence into the adjacent flat sides **28** is in advance of the mergence of the cutting edges **36** into said sides. Furthermore with respect to the centerline, the expanse of cutting surfaces that obtain along the salient tip formations **22** between the mergences thereinto of the cutting edges **38** is greater than the similar surfaces that obtain along said formations between the mergences thereinto of the arcuate cutting edges **36**.

Consequently, as the salient cutting tip formations **22** repeatedly impinge against the material, the reaction forces against the larger diametered arcuate edges **38** overcome the reaction forces against the smaller diametered arcuate edges **36**, thus automatically effecting a rotational movement of the drill toward the latter edges.

Immediately following the initial succession of hammer blows, the diametric cutting edge **24** will disintegrate the annular body of concrete about which the tip formations **22** are cutting a circular groove. Concurrently, the pairs of arcuate cutting edges **26** that constitute the sides of the faces **40** combine with the diametric cutting edge **24** in the complete disintegration and pulverization of the material as they come into contact therewith. All of the disintegrated and simultaneously pulverized material is directed angularly outwardly from the axis of the bit via the rearwardly sloping faces **30**. As the granular and pulverized material is deflected rearwardly by the sloping faces **30**, it flows past the sides **28** and into the annular space about the shank **16** in that portion of the circular opening already drilled and leading rearwardly to atmosphere. This is an important feature of the invention. In other words, these flat sides together with the flared surfaces **21** provide ample space rearwardly of the actual cutting edges for facilitating the escape of the material. The escape of the granular and pulverized material is further facilitated by the turbulence created

in the opening in consequence of the exhaust air blasts directed thereinto from the hammer, as should be apparent.

FIGURE 7 demonstrates a stage wherein the drilling operation with respect to the circular opening in contemplation has been partially completed. The path of the expelled pulverized material is suggested by the arrows. The final drilled opening is shown in FIGURE 8. As there illustrated, the internal peripheral surfaces of the opening are smooth, and the diameter of said opening is of the desired size.

With attention directed to FIGURE 9, it will be assumed that the concrete floor F there fragmentarily illustrated represents a floor in a manufacturing plant or the like. It will also be assumed that it is desired to bolt the legs of a lathe or other piece of machinery to said floor. It will further be assumed that the threaded shanks *s* of the bolts to be employed for the purpose have diameters of one and one-eighth inches.

In order to drill suitable holes for engagement by said shanks, a drill **10** provided with a bit end portion **14** that has its salient tip formations **22** formed on a one-half inch radius would be selected, and operatively connected to the pneumatic hammer H by means of a holder spring *h*.

Thereupon with the drill **10** directed vertically downwardly, the circular socket or hole illustrated in said FIGURE 9 would be drilled to an appropriate depth.

From the foregoing description augmented by an inspection of the drawings, it should be apparent that the present invention provides a novel masonry drill bit end that achieves its objectives in a highly efficient manner. It should further be evident that angularly disposed circular openings and holes may be drilled, and that the shank construction may be varied and per se comprises no part of the present invention.

What I claim is:

A bit end for a power operated drill wherewith to drill a circular opening through or into masonry, said bit end being integrally formed therewith on the head end of the cylindrical shank of said drill and comprising in

combination: a main body having opposed flat sides each merging into said shank and flaring forwardly from its mergence thereinto, said body terminating in a pair of diametrically opposite salient cutting tip formations concentric with said shank, the peripheral surfaces of the tip formations being formed on a radius considerably greater than that whereon the shank is formed; two pairs of circumferentially spaced diametrically opposite arcuate edge segments forming the extremities of said salient tip formations and merging into the flat sides of said main body, one of each pair of circumferentially spaced edge segments being formed on a radius larger than that whereon the other is formed, with the diametrically opposite edge segments being formed on corresponding radii; a diametric cutting edge disposed rearwardly of the salient tip formations and extending longitudinally between them; two pairs of arcuate cutting edges, each of said arcuate cutting edges merging at its outer end into one of the salient tip formations and at its inner end into one extremity of the diametric cutting edge, each pair of arcuate cutting edges converging to a point at the mergence of them into said diametric cutting edge; a pair of opposed generally triangular faces that are connected by the diametric cutting edge and merge into the salient tip formations, each of said faces being curved rearwardly from the point of its mergence into one of said tip formations to its mergence into the adjacent end of said diametric cutting edge, the sides of said faces being defined by the arcuate cutting edges aforesaid; and a pair of oblique rearwardly sloping faces that converge to define the diametric cutting edge at their forward juncture and merge at their rearward ends into the flat sides aforesaid of the main body.

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