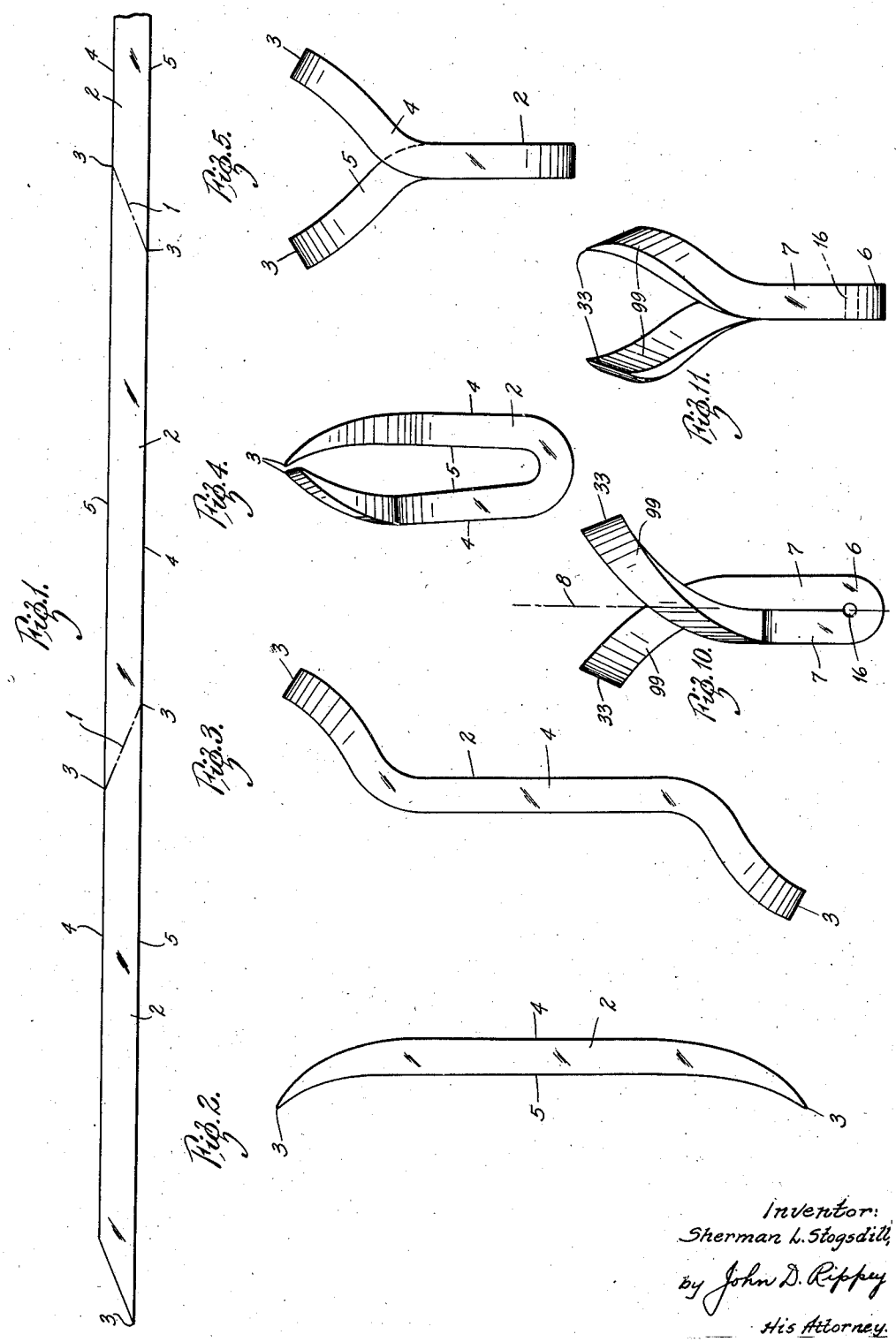
March 27, 1945. S. L. STOGSDILL 2,372,612

MINING DRILL AND BIT

Filed March 7, 1942 2 Sheets-Sheet 1



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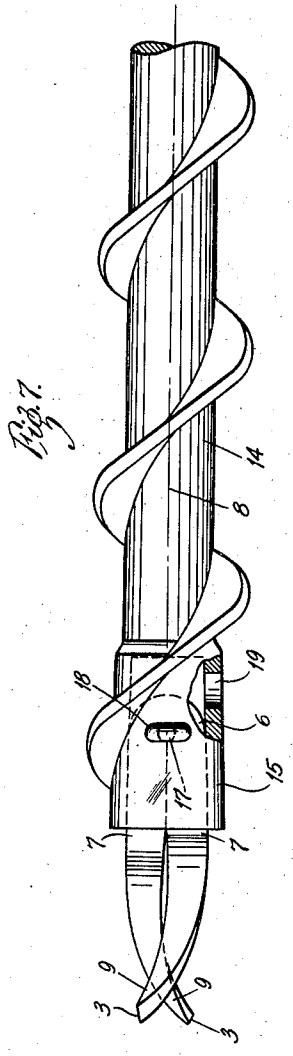

Fig. 7.

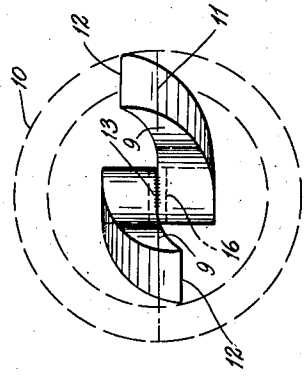

Fig. 9.

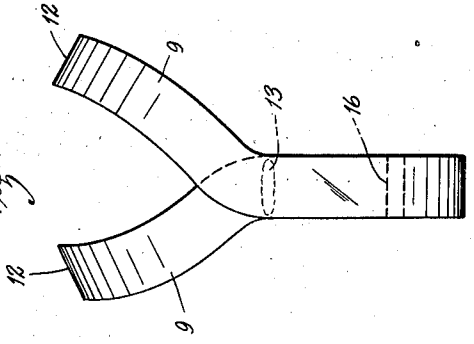

Fig. 8.

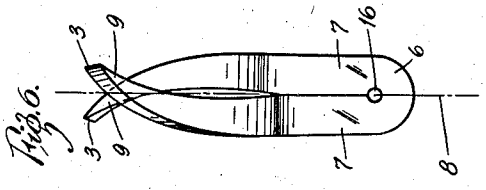

Fig. 6.

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UNITED STATES PATENT OFFICE

2,372,612

MINING DRILL AND BIT

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Continuation of application Serial No. 298,183, October 6, 1939. This application March 7, 1942, Serial No. 433,743

3 Claims. (Cl. 255—69)

This invention relates to mining drills and bits therefor.

Objects of the invention are to provide an improved unitary or one-piece bit for a mining drill made from a blank cut from bar stock and thereafter heated and bent to form a pair of cutting portions integrally connected at their rear ends, and which diverge forwardly and are twisted or bent while heated to space their forward cutting ends according to the diameter of the hole to be drilled thereby; to provide a bit of this character having portions of the two arms thereof, which are rearwardly beyond the twisted or bent forward cutting ends, very close together and integrally united in order to withstand the tendency to break at or near the bend of the bit when subjected to the great stresses, strains and resistance to which the bit is subjected when in use; to provide a bit made from a blank cut from bar stock and bent near its middle while heated to form two closely adjacent or approximately abutting portions having the cross-sectional dimensions of the bar stock and which have their forward ends twisted or bent and diverging to form the cutting points of the bit; to provide a bit of the general character and type mentioned which can be placed in a socket having less width than must be provided for bits having the two arms spaced more widely apart and substantially in U-formation; to provide a bit of doubled bar stock which will withstand tendency to break at or near the doubled or folded portion thereof even when subjected to great strains and stresses in use and which, as a unitary element, will distribute or apportion from one side of the socket to the other side thereof the severe twisting or torsional strains when in operation and each arm in coaction with the other arm will distribute said severe strains or stresses across the entire width of the drill head socket instead of across one side thereof, as occurs in the use of bits having a single arm, or in U-shaped bits which become broken; to provide an improved mining drill having a bit socket of relatively narrow width to receive the permanently attached rear ends of the arms of a bit of the type herein disclosed; to provide means for retaining the bit in the socket in the drill head; and to provide an improved biramous bit cut from bar stock without loss or waste of material and then heated and bent or formed to shape for removable attachment to a drill head.

Another main objective is to provide an improved biramous cutting bit for mining drills comprising a bar section having two forwardly extended arms integrally connected at their rear ends by a curved portion which holds the rear portions of said arms close together or, if preferred, in contact with each other, for rotation of the bit about the longitudinal axis of the drill extended between and approximately parallel with the rear portions of said arms, the forward end portions of both of said arms curving and diverging laterally from said axis and also curving forward generally in the direction of rotation of the bit about said axis, and a cutting edge at the forward end of each of said curved portions extending the full width thereof. When desired, the arms may be curved forwardly across the diametrical plane of the bit, or across a plane of the diameter of the hole drilled by the bit, although bits may be made according to the invention having the arms curving forwardly in a manner in which they do not extend across said planes.

Another object is to provide a mining drill comprising a shank rotative about its longitudinal axis and having a socket at its forward end, in combination with the biramous rotary bit including two finally integral and juxtaposed arms engaged in and substantially filling the cross-sectional area of said socket and extending longitudinally at opposite sides of said axis of rotation and having laterally and forwardly bent end portions extending generally in opposite directions from said axis of rotation considerably beyond the plane of the periphery of said shank and said socket and also curving generally in the direction of rotation of the bit.

Other objects of the invention will be apparent from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a plan view of a portion of bar stock having indications of diverging or angularly disposed cuts by which the bit blanks may be formed for making bits with cutting edges on the same side of the arms.

Fig. 2 is a side elevation of a bit blank after the ends thereof have been bent toward the same side of the blank and oppositely from inclined cut ends.

Fig. 3 is a side elevation of the blank after it has been subjected to the second bending operation.

Fig. 4 is a side elevation of the blank after a third bending operation and before the integrally united rear portions of the arms have been pressed close together.

Fig. 5 is a side edge elevation of the bit after it has been completed.

Fig. 6 is a side elevation of the completed bit looking at right angles to the bit of Fig. 5.

Fig. 7 is a side elevation of an auger and drill head having my improved bit mounted therein.

Fig. 8 is a side edge elevation of a bit similar to Fig. 5 having the cutting edges at different distances from the axis of the bit.

Fig. 9 is an end elevation of the bit of Fig. 8.

Fig. 10 is a side elevation of another form of completed bit differing from the completed bit of Fig. 6 in the curvature of the arms of the bit.

Fig. 11 is a side edge elevation of the bit shown in Fig. 10.

This is a continuation of and substitute for my prior application for Mining drill and bit, filed October 6, 1939, Serial No. 298,183.

In making the bits of the present invention, I prefer to use metallic bar stock that is polygonal and rectangular in cross-section. The bar stock is preferably of approximately uniform cross-sectional dimensions throughout its length. I have found bar stock of nearly uniform rectangular cross-sectional area and form suitable for making my improved bits, although stock of other shapes may be used if desired. The stock shown in Fig. 1 is a metallic bar rectangular in cross-section, and of nearly uniform cross-sectional area, which may be cut along diverging lines 1 to form bit blanks 2 of equal length. The edges 3 formed by intersection of the cuts 1 with opposite sides of the bar constitute the cutting edges of the respective bits formed from the blanks. After the blanks are cut, they are heated to a bright red heat, and each blank is then bent into a particular or specific shape. The end portions of each blank while heated are bent or curved by pressure from the short side 4 thereof across and beyond the plane of the long side 5. A blank bent to this form is shown in Fig. 2 of the drawings.

While the blank is still heated to a bright red heat, or after it is reheated, the curved end portions are bent transversely in opposite directions to the general form shown in Fig. 3. As shown, the axes of the bends shown in Fig. 3 are at right angles to the axes of the bends shown in Fig. 2. The angles of the axes of these bends may be varied from 90° angles when bits of other shapes are desired.

While the blank is still heated, or after it has been reheated, it is bent transversely about midway of its length substantially to U-formation or shape, as shown in Fig. 4. In this bending, the long side 5 of the bit constitutes the inner wall of the U-shaped blank while the shorter side 4 of the blank constitutes the outer wall thereof. This bending of the blank to U-shape places the two sharp edges 3 toward each other, that is, at and across the adjacent sides of the two arms of the bit blank.

While the blank is still heated, or after it has been reheated, and during the same or a subsequent operation, it is bent and distorted to the shape and form shown in Fig. 6, whereby is provided a biramous cutting bit made from a single bar section having two forwardly extended arms integrally connected at their rear ends by a curved or arcuate portion 6 which holds the parallel straight rear portions 7 of said arms close together or, if preferred, in contact with each other, for rotation of the bit about an axis 8 which represents the longitudinal axis of the drill extended between and approximately parallel with the parallel straight rear portions 7 of the two arms. The parallel straight rear portions 7 and the curved connection 6 constitute the attaching part of the bit. The forward end portions 9 of said arms curve and diverge laterally from said axis 8 and also curve generally in the direction of rotation of the bit about the axis 8. The cutting edges 3 are at the forward ends of the curved portions 9 and extend the full width thereof. The end portions 9 of the arms may, if desired, curve across a diametrical plane 11 of the orbit 10 of rotation of the bit; that is to say, across the plane 11 of the diameter of the hole drilled by the bit. Or said arms may be curved forwardly without crossing said plane 11.

The cutting edges 3 may be located the same radial distance from the axis of rotation 8 of the drill; or, as shown in Figs. 8 and 9, the blank may be bent to provide arms of different lengths having their cutting edges 12, analogous to the cutting edges 3 and similarly formed, located and operating at different radial distances from said axis 8. In this bit the forward end portions 9 of the two arms also curve and diverge laterally from the axis 8 and curve forwardly. This latter type of bit is of desired uniform cross-sectional area and is heated and otherwise processed as before described. It is designed and adapted specially for cutting into very hard minerals, or for cutting a hole of larger diameter by a biramous bit by making one arm cut or subscribe the outside diameter and the other arm cut a smaller diameter, thereby reducing the uncut or cored area between the axis and the inside cutting point. After all bending operations are completed in making the bit, the two arms may optionally be attached by a weld 13 to cooperate with the union 6 in holding said arms in rigid relationship.

In Fig. 7, a portion of a rotary auger drill shank 14 is shown provided with an attached socket 15 at its forward end designed and adapted to receive the attaching part consisting of the parallel straight rear portions 7 and connection 6 of the biramous bit. The two parallel straight rear portions 7 of the bit arms together form an attaching portion which is oblong in cross-section or end elevation. That is, the width of said attaching portion along either of two parallel sides is twice the width of said attaching portion along either of the other two parallel sides (Figs. 10 and 11). The opening in the socket 15 is also oblong in cross-section and has approximately the same cross-sectional dimensions as the cross-sectional dimensions of the attaching portion of the bit comprising the two parallel straight rear portions 7 of the two bit arms. By forming the bit with the parallel straight portions 7 of the two arms thereof close together or in contact and at opposite sides of the longitudinal axis 8 about which the two arms are rotated, a much narrower and smaller socket 15 may be provided. This has special advantages because, when the socket 15 is of relatively small cross-sectional dimensions, it does not block as much of the cross-sectional area of the drill hole as do sockets of larger cross-sectional area. This has been and still is a cause of lower efficiency and an objection to auger drills. By this improved bit the waste material may be fed rearwardly more freely and easily with the result that the drilling operation may be performed faster because of the easier and freer flow of said waste material past the forward end of the bit.

The bit shown in Figs. 10 and 11 is generally of the same form as the bit shown in Fig. 6. It consists of a biramous cutting bit made from a single bar section having two forwardly extended arms integrally connected at their rear ends by a curved portion 6. The integral connection 6 holds the rear attaching portions 7 of said arms close together or, if preferred, in contact with each other for rotation of the bit about the axis 8 representing the longitudinal axis of the drill. This form of bit is interchangeable with the bit shown in Fig. 6 and has the forward end portions 99 of its arms curving and diverging laterally from the axis 8 and also curving generally in the direction of rotation of the bit about the axis 8. The forward curvature of the end portions 99 of the bit arms is on shorter radii of curvature than the end portions 9 of the bit arms, as shown in Fig. 6. Furthermore, the cutting edges 33 at the extreme ends of the curved portions 99 are longer than the cutting edges 3 and extend rearwardly at more acute angles relative to the axis 8 about which the bit rotates. The end portions 99 of the arms are flattened and widened during the bending thereof to provide the wider portions for the longer cutting edges 33. The blanks from which the bit is formed are cut from bar stock like that shown in Fig. 1 of substantially uniform cross-sectional dimensions throughout its length.

In these bits, the straight portions 7 of the arms brace, strengthen and support the other arm; and all portions of the socket walls cooperate to sustain each arm in position. This is because there can be no relative movement between the arms of the biramous bit and because any pressure or resistance against either arm is resisted by both arms and by the supporting walls of the socket for both arms.

The bit may be formed with a hole 16 between the parallel straight attaching arm portions 7 and at the curved union 6 which integrally unites the two arms. When the bit is in the socket, the hole 16 is in registration with two diametrically opposite holes 17 formed in the side walls of the socket 15 to receive a cotter pin or other fastener 18 passing through the holes 16 and 17 to hold the bit securely in and prevent its detachment from the socket. One socket wall may also be provided with an opening 19 to receive a lever or other implement beyond and against the curved portion 6 to force or pry the bit unit from the socket after the fastener pin 18 has been detached. Thus, one bit may easily be removed and another substituted therefor in case of need for such substitution.

It is now apparent that a mining drill and bit made in accordance with the present invention attains all of the advantages and objects thereof. The drill head having the bit holding socket may be made of smaller cross-sectional area and dimensions than is possible where the bits are separate and require separate sockets, or where the arms of the bit are more widely spread apart and require larger sockets to receive them. The two arms of the bit are integrally united and are rotated about an axis constituting an extension of the longitudinal axis of the drill. When made from bar stock in the manner described, there is no loss or waste of material and the cuts 1 provide the edges 3 which become the cutting edges of the finished bit. Practically all of the bar stock remains embodied in the blanks from which the bits are made, and practically all of the material contained in the respective blanks remains embodied in the finished bits. The bits are made specially for use and operation in the manner described.

I claim:

1. A biramous rotary bit composed of a bar section, the arms of said bit including two side-by-side parallel straight rear portions which together form a straight attaching portion oblong in cross-section having two opposite sides approximately twice the width of the other two opposite sides, an arcuate portion of said bar section integrally connecting the rear ends of said two straight portions of said two arms and rigidly holding said portions parallel and close together for rotation of the bit about an axis extending longitudinally between said portions when said attaching portion is attached to the end of a rotary drill, and laterally and forwardly bent end portions integral with said respective straight portions of said arms and extending generally in opposite directions from said axis of rotation of the bit and also curving generally in the direction of rotation of the bit.

2. A detachable biramous rotary bit for a rotary auger drill having a socket coaxial in one end that is oblong in cross-section, composed of a bar section, the arms of said bit including two side-by-side parallel straight rear portions having an arcuate integral connection at their rear ends whereby said portions are held parallel and close together and constitute an attaching portion for the bit that is oblong in cross-section and is adapted to engage in said socket for rotation of the bit about an axis extending longitudinally between said straight portions of said arms, and laterally and forwardly curved end portions integral with the forward ends of said respective straight portions of said arms and extending generally in opposite directions from said axis of rotation and also curving generally in the direction of rotation of the bit.

3. A detachable biramous rotary bit for a rotary auger drill having a socket coaxial in one end that is oblong in cross-section, composed of a bar section, the arms of said bit including two side-by-side parallel straight rear portions having an arcuate integral connection at their rear ends whereby said portions are held parallel and close together and constitute an attaching portion for the bit that is oblong in cross-section and is adapted to engage in said socket for rotation of the bit about an axis extending longitudinally between said straight portions of said arms, laterally and forwardly curved end portions integral with the forward ends of said respective straight portions of said arms and extending generally in opposite directions from said axis of rotation and also curving generally in the direction of rotation of the bit, and walls extending from the rear sides of said curved end portions to intersection with the front sides thereof and forming cutting edges substantially across the widths of said arms, respectively.

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