Aug. 14, 1923. 1,464,570

R. A. HAGE

RIVETING, CHISELING, AND ROCK DRILLING HAMMER

Filed May 17, 1920 3 Sheets-Sheet 1

Fig. 1.

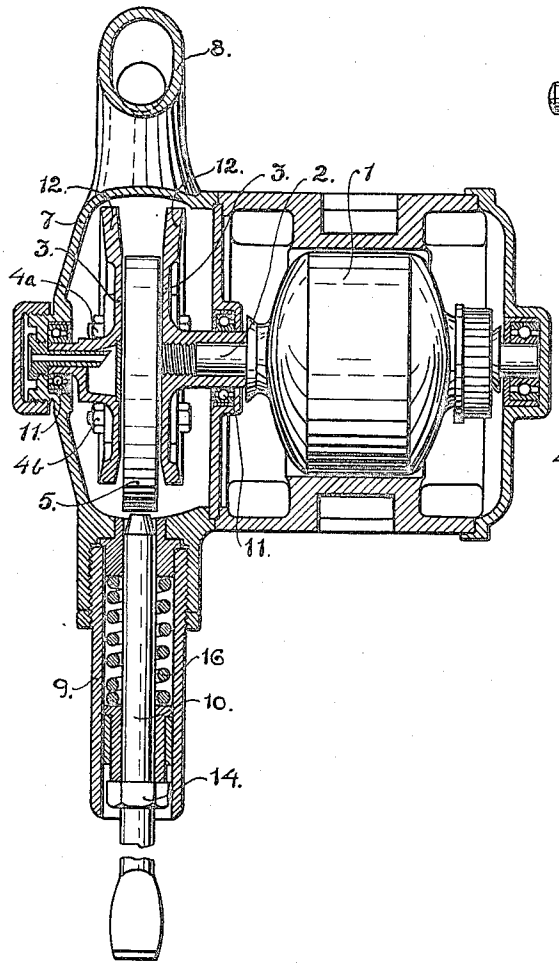
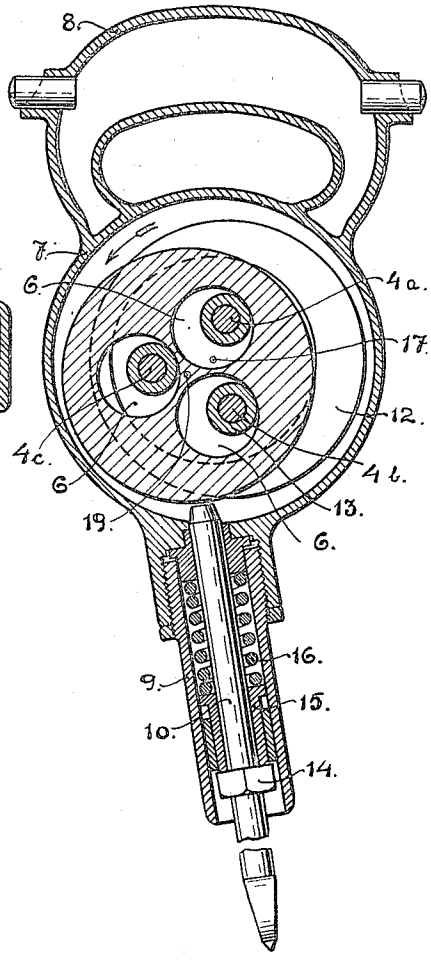


Fig. 2.



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Fig. 3.

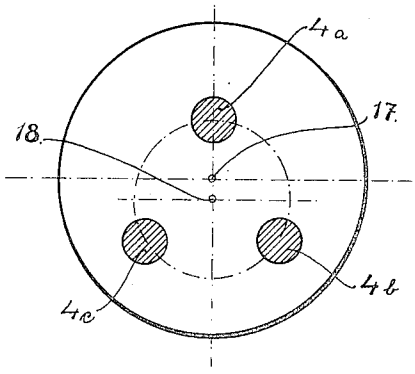


Fig. 4.

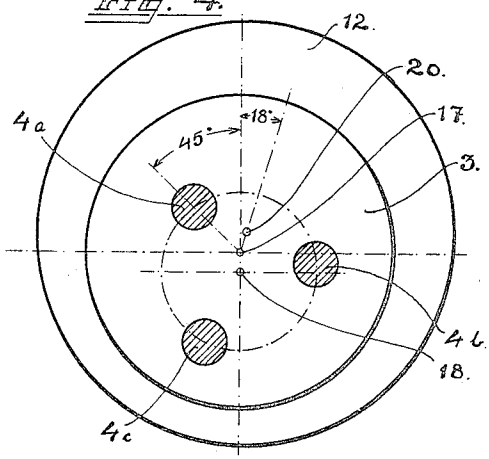


Fig. 5.

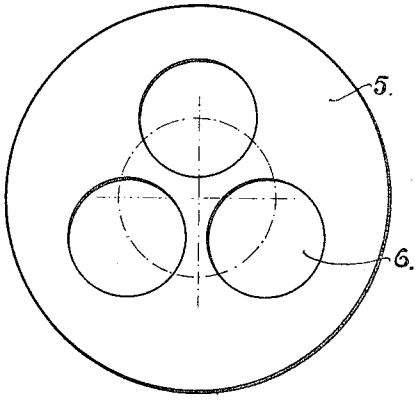


Fig. 6.

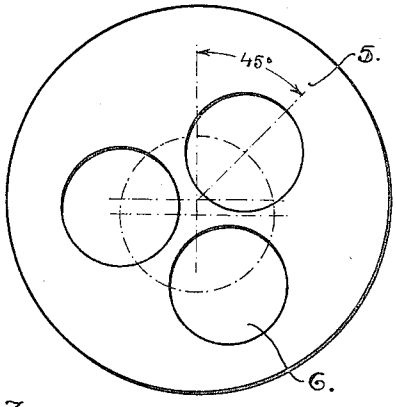
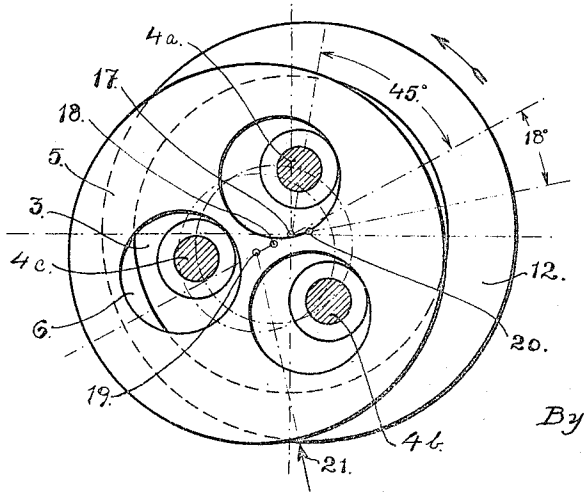


Fig. 7.



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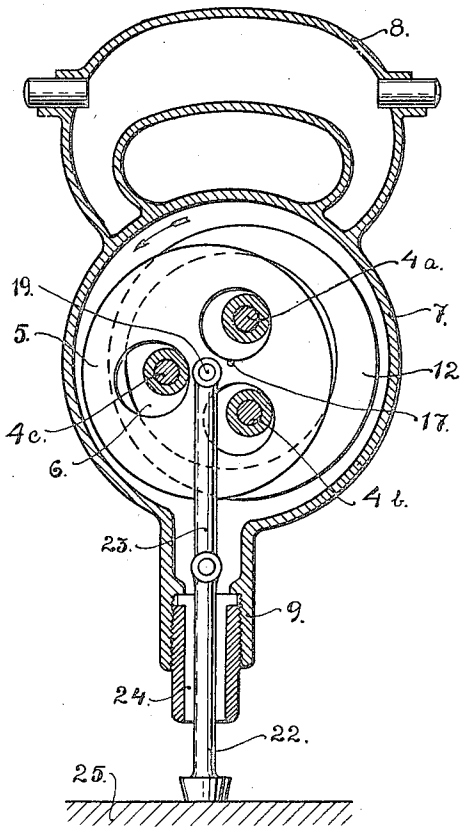
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Fig. 8.



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UNITED STATES PATENT OFFICE.

RUDOLF ALEXANDER HAGE, OF GOTTENBORG, SWEDEN.

RIVETING, CHISELING, AND ROCK-DRILLING HAMMER.

Application filed May 17, 1920. Serial No. 382,018.

To all whom it may concern:

Be it known that I, RUDOLF ALEXANDER HAGE, a subject of the King of Sweden residing at Gottenborg, in the county of Gottenborg and Bohus and Kingdom of Sweden, have invented new and useful Improvements in Riveting, Chiseling, and Rock-Drilling Hammers, of which the following is a specification.

This invention relates to mechanical hammers to be used especially for riveting, chiseling and rockdrilling. The object of this invention is to provide a useful and effectively operating tool, which can be used everywhere as a substitute for pneumatic tools, thus eliminating the troublesome and expensive apparatus for compressing and conducting air under high pressure.

The accompanying drawings show an electrically driven chisel hammer to be operated by hand. Fig. 1 is a longitudinal section of the hammer, Fig. 2 is a longitudinal section of the tool taken at right angles to Fig. 1, Figures 3–7 are diagrammatically drawn details of the tool, and Fig. 8 shows another embodiment of the invention.

In the drawings 1 denotes an electric motor driving a shaft 2 connected to a pair of discs 3 bolted together with three bolts 4^a, 4^b, 4^c, going parallel to the shaft 2 at some distance therefrom. A disc shaped hammer 5 provided with three borings 6 is loosely hung upon the bolts 4^a, 4^b, 4^c, one such bolt extending through each boring 6. The bolts 4^a, 4^b, 4^c, are equally distanced from each other as are the borings 6, viz. their centres are located in the points of an equilateral triangle, which is of the same size for the bolts 4^a, 4^b, 4^c as for the borings 6. A casing 7 encircling the parts mentioned, is bolted to the casing of the motor (1), and is provided with a handle 8 at the upper end with a sleevelike projection 9 at the lower end designed to guide the reciprocating chisel 10.

In the casing 7 there are ballbearings 11 provided for the discs 3, which discs are preferably provided with counterweights 12 as described below. The bolts 4^a, 4^b, 4^c are provided with loosely fitted sleeves 13 to protect the bolts from wear against the walls of the borings 6. The chisel 10 is provided with a collar or nut 14 engaging with a stopbushing 15 in the sleeve 9 to limit the length of the up stroke of the chisel 10 so that the inner end of the chisel projecting into the casing 7, will be hit, by the hammer 5 in its most advantageous position relatively to the hammer 5. To avoid dead strokes between the nut 14 and the casing 7 the bushing 15 is made slidable and held in position by a helical spring 16.

In the following I will give an explanation how the tool operates and why the different parts are made in the particular manner here described.

When the bolts 4^a, 4^b, 4^c are rotated with the axle 2 in the direction shown by the arrow in Fig. 2 they bring the hammer 5 along with their rotation, and the hammer will then by the influence of the centrifugal force tend to keep as far off from the rotating centre as possible. If the upper end of the chisel 10 is within reach of the hammer 5 a blow is effected to the chisel at each revolution of the hammer.

These blows will become more powerful, if the bolts 4^a, 4^b, 4^c are located eccentrically around the centre line of the shaft 2 as shown in the figure, than if they were located concentrically to said shaft, viz. the centre of the circle drawn through the centres of the bolts 4^a, 4^b, 4^c might be located at some distance from the centre of the rotation. This will be clear by looking at Fig. 3 in the drawing. The centre of rotation of the shaft 2 and of the discs 3 is denoted by 17, the centre of the circle drawn through the centres of the bolts 4^a, 4^b, 4^c is denoted by 18. If the centre 18 were located in the same point as the centre 17, the hammer 5 would obtain a smaller swing and thus deliver less force at the blows than would be the case, if the centre 18 were displaced as shown in Fig. 3. In the Fig. 3 the bolts 4^b and 4^c are at the same distance from the centre of revolution 17, and the bolt 4^a at a smaller distance therefrom. On the other hand the efficiency of the blows will be still more increased, if the bolts 4^a, 4^b, 4^c according to this invention are located as shown in Fig. 4, viz. all the bolts at different distances from the centre of rotation 17, and furthermore so that said distances increase for the bolts reckoned in a direction opposite to the direction of revolution. If as in Fig. 4 the direction of revolution is that shown by the arrow, the distance from the centre 17 to the bolt 4^a is smallest, the distance to the bolt 4^b larger and the distance to the bolt 4^c largest. This will as found by actual tests, give the hammer 5 an

evenly accelerated velocity during each revolution and thus an increased effect of the blows.

Fig. 4 shows exactly the same design of the discs 3 with bolts 4^a, 4^b, 4^c and counterweight 12 as shown in Fig. 2, and the design has been laid out as follows. After drawing the circle through the centres of the bolts 4^a, 4^b, 4^c, a distance of about one fourth of the radius of said circle is set off from the centre 18 to the centre 17 and a line drawn from the centre 17 in an angle of some 45° to the extended radius from point 18 through point 17. The intersection between said line and said circle will give the approximate location of the bolt 4^a and thus also of the bolts 4^b and 4^c. When the hammer 5 as shown in Fig. 5 is mounted on the bolts 4^a, 4^b, 4^c and the system made to revolve, it has been found, that the blows are mose effective in the position shown in Fig. 2, which is the same as shown in the Fig. 7. Thus it is obvious, that the centre of gravity 19 of the hammer 5 during the working of the tool tends to stay at a certain distance from the centre 17 in Fig. 4 and has to be counteracted by a centre of gravity 20 of the revolving discs 3 on the opposite side of the centre of revolution 17. This centre 20 is to be located somewhat to the side of the line connecting the centres 17 and 19 and is preferably determined by a line making some 18 degrees to the line mentioned, in order to counteract the weight of the hammer 5, when it is thrown upwards at the blows. The form of the counterweights 12 is therefore designed accordingly so as to balance the weight of the hammer 5.

If the bolts are arranged as described above, and as shown in Figs. 4 and 7, and a hammer 5 according to Fig. 5 is used in connection therewith as shown in Figs. 2 and 7, the chisel has to be located in a direction shown by the arrow 21 in Fig. 7 in order to receive the most effective blows. The arrow 21, that is the centre line of the chisel 10 has to point towards the centre of gravity 19 of the hammer 5, when it is struck, so as to avoid any sliding friction between the rim of the hammer and the chisel head Furthermore the direction of the arrow 21 is determined by a line drawn through the centre 19 somewhat at right angle towards another line connecting the centre of rotation 17 and the bolt 4^c.

In the case described here above the borings 6 in the hammer 5, see Fig. 5, are located symmetrically and the centre of gravity of the hammer located in its geometrical centre, and the bolts 4^a, 4^b, 4^c are located nonsymmetrically in order to obtain a greater effect as set forth. However the said bolts can instead be arranged symmetrically around the centre of gravity 17 and the borings 6 nonsymmetrically in the hammer 5 as shown in Fig. 6 to obtain the same effect, as will be understood from the above description. A further arrangement can be obtained by placing both the bolts 4^a, 4^b, 4^c and the borings nonsymmetrically.

Instead of using the chisel 10 shown in the drawings a rockdrill or a rivet hammer or similar tool can be inserted and used to the same improved effect.

The embodiment shown in Fig. 8 is an application of the described motion to a positively reciprocated tool 22 connected to the centre 19 of the hammer 5 by means of a link 23 the outer disk 3, in this instance being removed. The movement of the tool 22 is guided by a sleeve 24, and the tool is illustrated as acting upon an object 24. In this case also the most powerful blow is obtained, when the hammer stands in the position shown in the Fig. 7, viz, when the direction of the link 23 and of the tool 22 at the moment the blow is effected is the one corresponding to the arrow 21 in Fig. 7. The position shown in Fig. 8 illustrates the moment when the blow is effected.

Having now particularly described and ascertained my invention, what I claim as new is:

1. In a hammer a rotatable shaft, a plurality of bolts connected and arranged parallel to the shaft and disposed around the axis of rotation of said shaft, an implement actuating member with borings in number and location corresponding to and receiving said bolts whereby said member is suspended upon said bolts, and a reciprocable implement co-acting with said hammer so as to receive a reciprocating motion when the member is rotating.

2. In a hammer a rotatable shaft, a plurality of bolts connected and arranged parallel to the shaft and disposed around the axis of rotation of said shaft, an implement actuating member with borings in number and location corresponding to and receiving said bolts, suspended upon said bolts, and a reciprocating implement co-acting with said member so as to be struck by the rim of the member when rotating.

3. In a hammer a rotatable shaft, a pair of disc shaped members supported by said shaft, a plurality of bolts connecting said disc shaped members, disposed parallel to said shaft around its axis of rotation, a disc shaped hammer suspended upon said bolts by means of borings in number and location corresponding to said bolts and a reciprocating chisel facing said hammer so as to be struck by the rim thereof when the hammer rotates.

4. In a hammer a rotatable shaft, a plurality of bolts connected and arranged parallel to the shaft and disposed around the axis of rotation of said shaft, a disc shaped hammer with borings in number and location

corresponding to said bolts, suspended upon said bolts by means of said borings, a reciprocable implement co-acting with said hammer so as to receive a reciprocating motion when the hammer is rotating, and a spiral spring provided to keep the chisel in a yielding position towards the rim of said disc shaped hammer.

5. In a hammer a rotatable shaft, a plurality of bolts connected and arranged parallel to the shaft and disposed around the axis of rotation of said shaft, a disc shaped hammer with borings in number and location corresponding to said bolts, suspended upon said bolts by means of said borings, a reciprocable implement co-acting with said hammer so as to receive a reciprocating motion when the hammer is rotating, an electrical motor operating said shaft, a casing enclosing all the parts mentioned and a handle to make the machine operative by hand.

6. In a hammer a rotatable shaft, a plurality of bolts connected and arranged parallel to the shaft and disposed around the axis of rotation of said shaft, a disc shaped hammer with borings in number and location corresponding to said bolts, suspended upon said bolts by means of said borings, and a reciprocable implement co-acting with said hammer so as to receive a reciprocating motion when the hammer is rotating, said bolts located nonsymmetrically around the axis of rotation of said shaft as and for the purpose set forth.

In testimony whereof I affix my signature.

RUDOLF ALEXANDER HAGE.