March 16, 1943. L. M. BROWN 2,313,722

FORGING MACHINE

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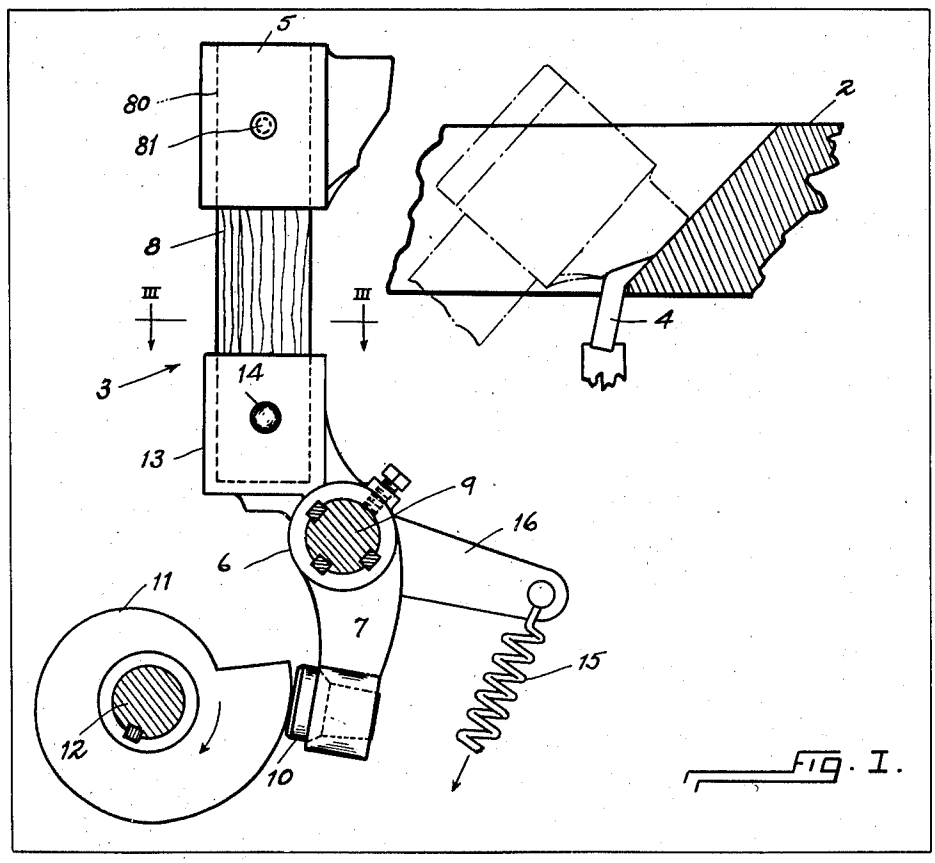


FIG. I.

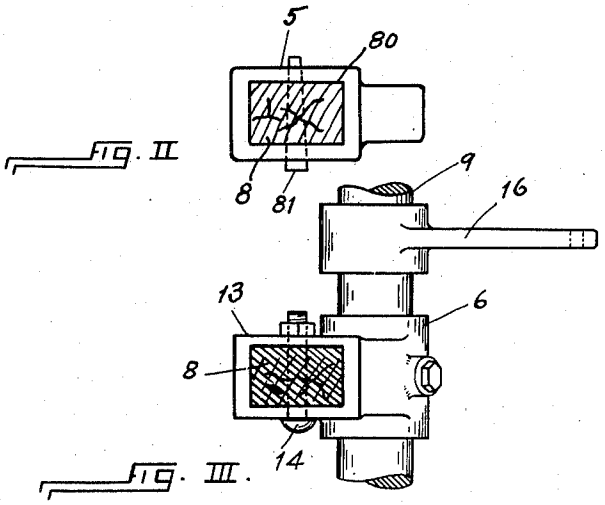


FIG. II.

FIG. III.

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FORGING MACHINE

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1 Claim. (Cl. 78—31)

My invention relates to forging machines, particularly to machines for forging points upon cutter bits that are used in mining machinery.

A few years ago it was discovered that, if the dies of a bit-forging machine were caused to strike the work with blows similar in character to the blows delivered by a blacksmith's hammer, the grain structure of the metal in the forged points was far superior to the grain structure of the bits whose points were forged between rolls, or between the dies of a press. Indeed, I have found the usual roll and press machines to be entirely inadequate for the pointing of bits that are formed of the hard and tough steels that have been developed in recent years, this being particularly true in the case of the steel alloy disclosed in United States Letters Patent No. 1,615,323, granted to me September 20, 1927, and reissued October 28, 1930. In the forging or pointing of bits of my steel alloy, it seems that the hammer type machine is the only machine that can do the job with entire satisfaction.

A hammer type machine of the sort I have in mind is illustrated and described in United States Letters Patent No. 1,818,601, dated August 11, 1931. The anvil of this machine is of L-shape in plan, and in the operation of the machine the heated bit blank to be pointed is positioned within the corner formed by the intersecting legs of the L. The machine includes two forging dies that are reciprocated alternately, one die being reciprocated in a plane normal to one leg of the anvil and the other in a plane normal to the other leg of the anvil, and the two so-reciprocated dies forge a point on the bit blank sustained in position in the corner of the anvil.

Each of the reciprocating dies is carried upon the upper end of a lever arm which is mounted, at a point intermediate its opposite ends, upon a pivot shaft; a rotated cam is organized adjacent to the lower end of each lever arm, and tension springs are arranged to exert rotative stress upon the lever arms, in such manner that the lower ends of the lever arms are held in contact with said cams severally. The rotating cams, thus engaged by the lower ends of the lever arms, operate alternately to swing the lever arms through a determined angular interval against the tension of the springs, and then to release the lever arms to the influence of such tension, with the consequence that the arms are angularly oscillated on their pivots. It will be understood that the angular movement of each arm in one of its alternate directions of oscillation is effected by positive action of its associate cam, while the movement of the arm in opposite direction is effected by spring tension. The structure and organization of the parts are such that the dies are alternately propelled against the anvil under the influence of spring tension, whereby the desired hammer action is obtained, and superior grain structure in the forged metal is realized.

In the operation of a machine of this sort, I have experienced great difficulty in providing lever arms that will withstand the violent shocks imparted thereto as the forging dies are repeatedly and rapidly driven against the anvil. The invention consists in a lever arm structure that is particularly effective in overcoming this difficulty, and in providing improved operation of the machine as a whole.

A die-oscillating lever arm of the invention is illustrated in the accompanying drawing, in which:

Fig. I is a view of the lever arm in side elevation, with certain of the essential elements of the forging machine (in which the lever arm will be assembled for service) shown schematically, partly in side elevation and partly in vertical section;

Fig. II is a view of the lever arm and the forging die carried thereby in plan from above;

Fig. III is a view of the lever arm in cross-section, on the plane III—III of Fig. I;

In the schematic illustration of Fig. I the L-shaped anvil 2 of a bit-forging machine appears fragmentarily and in vertical section through one leg of the L. Only one of the two dies 5 that cooperate with such anvil in forging a point on a bit 4 is shown, together with the lever arm 3 that carries the die, and the power-rotated cam 11 and spring 15 that effect reciprocation of the die. Inasmuch as the invention consists in improvements in the structure and organization of the die-carrying lever arms of such machine, the showing in the drawing herein will suffice, particularly in view of the fact that reference may be had to the above-noted Patent No. 1,818,601 for such features of general machine assembly as may be of interest. Before proceeding with the description of the lever-arm structure of the invention, it may be mentioned that, whereas each of the two forging dies of the machine of the patent is united to the distal end of its associate lever arm in a pin-and-slot connection, with the die arranged to reciprocate in a slideway, in the structure of my invention

each die is rigidly secured upon the distal end of its associate lever arm, and is adapted to operate without the need of a guiding slideway.

Turning to the structure in which the invention is centered: The lever arm 3 is formed of a rigid rocker member or hub 6, a rigid arm portion 7, and an elastic helve portion 8, all united in rigid assembly. The rocker member or hub 6 is keyed to a shaft 9 that is trunnioned at its opposite ends in the frame (not shown) of the forging machine, and such shaft provides the axis or pivot on which the lever arm is oscillated. The arm portion 7 is integrally formed of metal with the rocker hub 6; such arm portion 7, extending downward from the axis on which the lever arm 3 is adapted to oscillate, carries a wear-resisting block 10 that rides the periphery or face of the cam 11, which cam is keyed to the power-rotated shaft 12 of the forging machine. The helve 8 is secured to the rocker hub, by means of a socket portion 13 whose side walls are substantially parallel as shown—the lower end of the helve being driven into the bore of such socket portion under a pressure of several tons. While the resulting compression of the end of the helve in the socket portion affords absolute security of assembly, a bolt 14 is employed as an additional precaution against the helve becoming loose while the forging machine is in operation.

The forging die 5 is secured to the upper end of the helve, the body of such die including a bore 80 that receives the upper end of the helve. The end of the helve is secured with a force-fit in the bore of the die, and a tapered pin 81 is driven through the assembly to insure security.

As already indicated, the rocker hub 6, arm portion 7, and socket portion 13 are integrally formed of a rigid and sturdy material, such as forged or cast steel, while the helve is formed of suitable impact-absorbing material, preferably a wood such as hickory. The tension spring 15 exerts rotative stress upon the lever arm 3, and such spring, tending to swing the lever arm in clockwise direction, is effective to hold the block 10 at the distal end of arm portion 7 against the cam 11. The spring is tensioned between a fixed portion of the forging machine frame (not shown) and the end of an arm 16 secured to the pivot shaft 9 of the die-supporting lever arm.

As in the operation of the forging machine the cam is rotated, as indicated by the arrow, the lever arm is oscillated; the lever arm first moves in counterclockwise direction against the tension of spring 15 to the position shown in full lines in Fig. I, and then (as the crest of the cam passes from contact with the block 10) the lever arm swings in clockwise direction, under spring tension, and violently strikes the work upon the anvil, as indicated in broken lines. The continuous rotation of the cam manifestly will effect the continuous oscillation of the lever arm, repeatedly propelling the die 5 against the anvil.

It has been proved in service that the hickory helve 8, assembled as described between the hub 6, 7, 13 and the die 5, provides in the structure the desired combination of rigidity and elasticity—provides an elasticity effective to protect the metal parts from fatiguing and crystallizing, and yet affords adequate rigidity in the lever arm structure 3 as a whole. While I have specified hickory as the material to use, I do not limit the invention thereto. There may be other suitable materials that possess the peculiar combination of elasticity and sturdiness that is essential to the helve portion of my specific lever-arm construction.

It will be understood that, while the bore or socket in the rocker portion 13 is of substantially uniform cross section (i. e., the side walls of the bore or socket are substantially parallel, as indicated in Fig. I), the bore 80 within the die may be tapered, the divergence of taper being toward the top of the die. And in such case the upper end or head of the helve will be correspondingly tapered, snugly to fit the bore in the die.

Various modifications are permissible within the terms and intent of the appended claim, and it will be understood that in claiming the structure of the invention I use the words upwardly and downwardly as words of definition and not limitation.

I claim as my invention:

In a forging machine including a die mounted for powerful and rapid reciprocation under the effects of a spring and a rotating cam, the invention herein described consisting of a die-reciprocating lever that includes in structure a pivotally mounted rocker member formed of relatively rigid material, said rocker member having an upwardly extending portion with a socket whose side walls are substantially parallel, and a downwardly extending arm adapted to co-operate with said cam, and a helve formed of relatively compressible and elastic material, said helve at one end carrying said die and at opposite end being compressed under a pressure of several thousand pounds in said socket and thereby united with said socket member in a shock-enduring union.

LINWOOD M. BROWN.