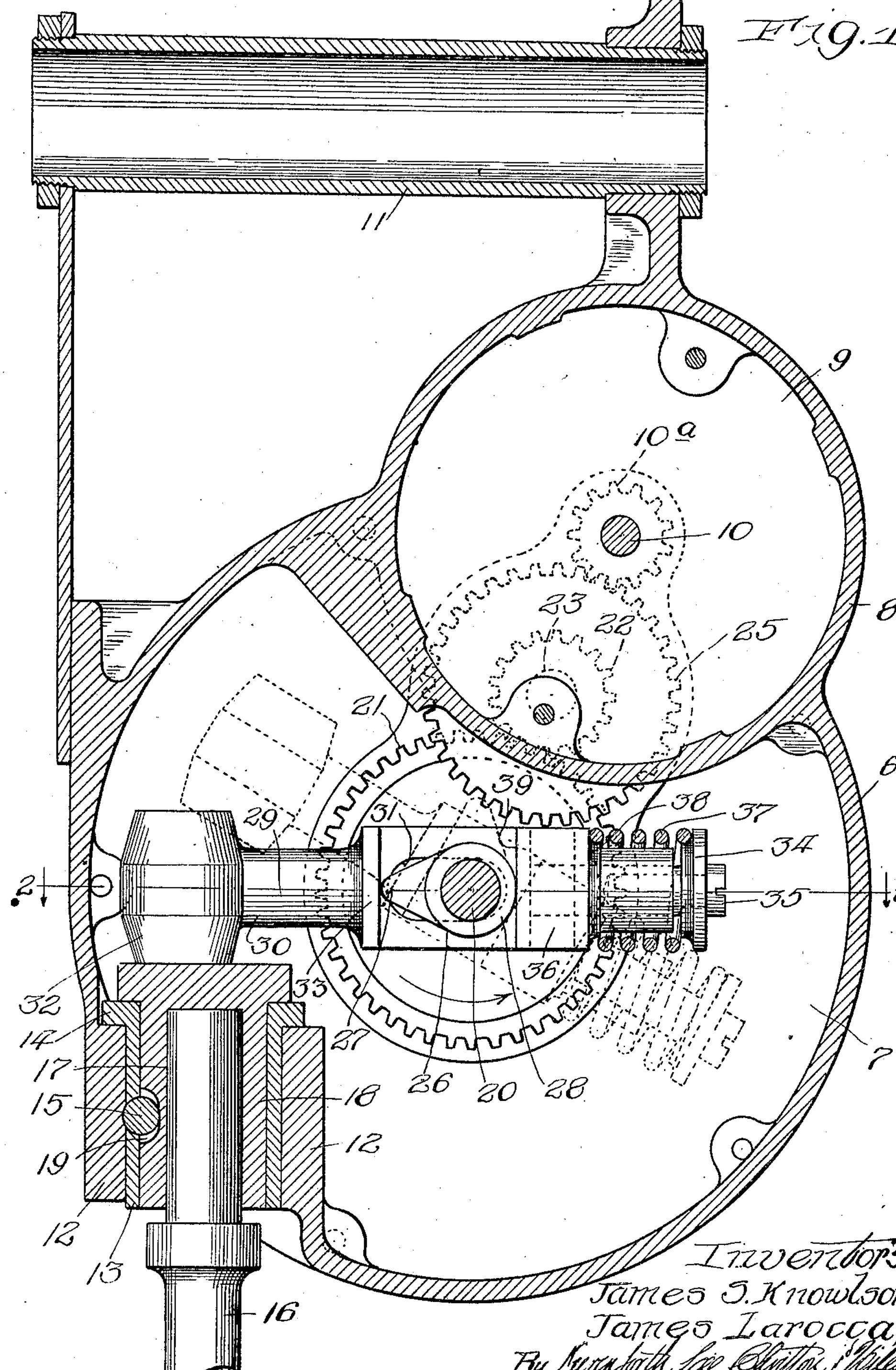
Aug. 31, 1926. 1,598,088

J. S. KNOWLSON ET AL

MECHANICAL MOVEMENT

Filed July 3, 1922 2 Sheets-Sheet 1

Fig. 1



Inventors:
James S. Knowlson,
James Larocca,
By Byrnforth, Lee, Chritton & Wiles,
Attys

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Fig. 2.

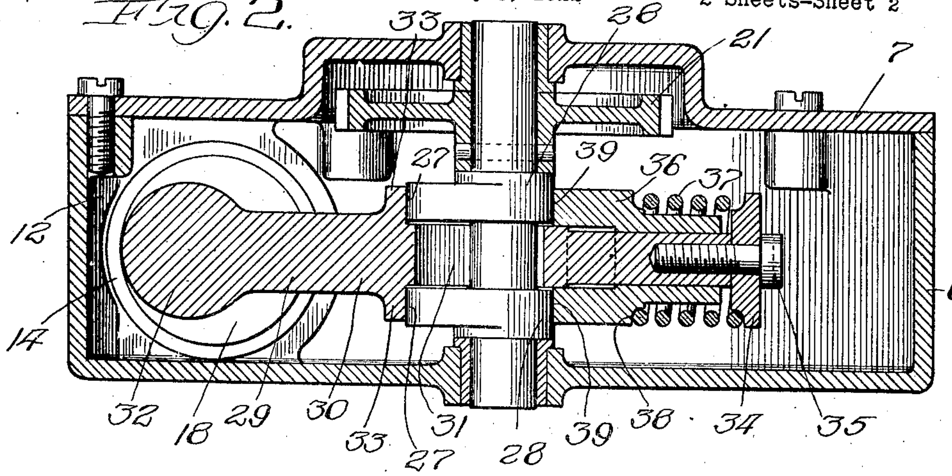


Fig. 3.

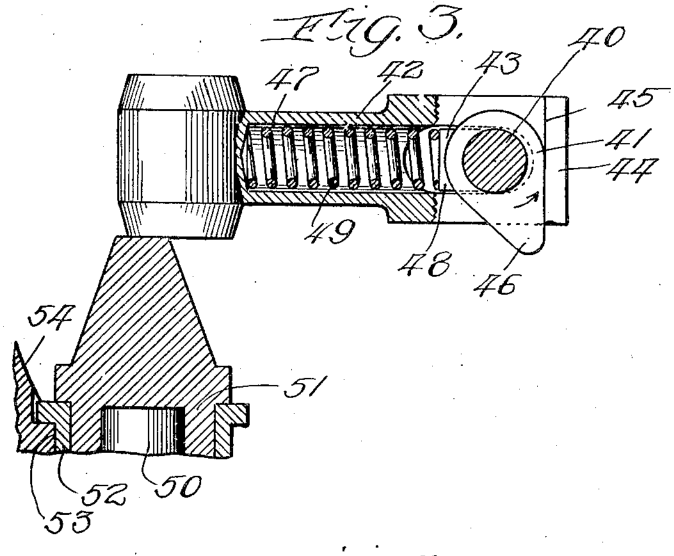
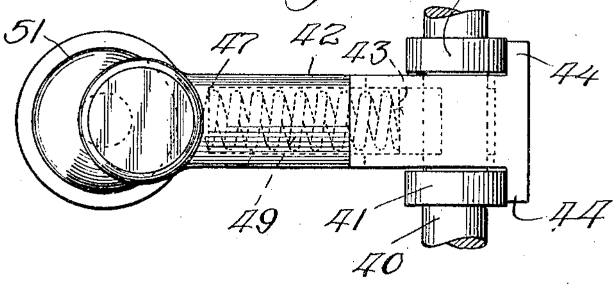


Fig. 4.



Inventors:
James S. Knowlson,
James Larocca,
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

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UNITED STATES PATENT OFFICE.

JAMES S. KNOWLSON, OF OAK PARK, AND JAMES LAROCCA, OF CHICAGO, ILLINOIS, ASSIGNORS TO ELECTRO-MAGNETIC TOOL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MECHANICAL MOVEMENT.

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Our primary object is to provide a novel, simple, economical and positively-operating mechanical movement adapted for use in a great variety of situations, as for example in drilling machines, chiseling machines and the like, of the type involving the driving of the tool against the work, and which is the type of machine for embodiment in which our invention was more particularly devised; and another of our objects is to provide a novel, simple, positively operating and economical construction of tool driving machine of the type referred to. We have illustrated our invention as incorporated in a drilling or chiseling machine of the type referred to, showing two embodiments of the invention, not with the intention, however, of being understood as intending to limit it in any way thereto, but merely by way of example of certain situations in which it may be used.

Referring to the accompanying drawings:

Figure 1 is a view in vertical sectional elevation of a drilling machine of the type above referred to and in which our invention is embodied. Figure 2 is a section taken at the line 2—2 on Fig. 1 and viewed in the direction of the arrows. Figure 3 is a fragmentary view of a drilling machine constituting another embodiment of our invention, certain portions thereof being shown in in elevation and others in section; and Figure 4, a plan view of the structure shown in Fig. 3.

Referring to the construction shown in Fig. 1, the machine comprises a body member presenting the substantially cylindrical portion 6 which is closed at its opposite ends and presents a substantially cylindrical inner wall, the body member also comprising a substantially cylindrical casing portion 8 located adjacent the upper end of the casing portion 6, but laterally offset therefrom and affording a substantially cylindrical space 9 therein in which a motor (not shown), the shaft of which is represented at 10, is mounted, the construction of the body member, as above described, being in accordance with common practice and provided, as is common in practice, at its upper end with a handle 11 to be grasped by a hand of the operator in using the machine. The casing portion 6 is provided, to one side of its center, with a tubular thickened portion 12, the aperture in which is disposed substantially vertically and opens through the peripheral wall of the portion 6 as shown. The portion 12 contains a bushing 13 flanged at its upper end, as represented at 14, at which it overlaps the top of the tubular portion 12 to prevent displacement therein. The bushing 13 contains a cross-pin 15 extending tangentially thereof and projecting into the interior of the bushing. The tool to be operated, such as, for example, a reciprocating drill or chisel, is represented at 16 and is shown as fitting upwardly into a socket 17 in a slide member 18 located within the bushing 13, the member 18 at the portion thereof opposing the pin 15 containing a recess 19 into which this pin extends, this recess being of such length as to permit the member 18, together with the tool 16, to slide in the bushing 13 to the extend necessary for the proper operation of the tool. The tool 16 is caused to operate against the work by the delivering of blows, in succession, against the upper end of the member 18, the means for thus operating the tool comprising, in the particular illustrated embodiment of our invention, a shaft 20 journaled at its opposite ends in the sides of the casing portion 6 and driven, as through the medium of the gear mechanism comprising a gear 21 secured to the shaft 20, a pinion 22 fixed on a shaft 23 journaled in the sides of the body member and meshing with the gear 21; a gear 25 fixed on the shaft 23 and meshing with a pinion 10^a on the shaft 10 of the motor referred to. The shaft 20 has rigidly secured thereto a cam device formed of a pair of cams 26 the noses 27 of which project radially from the shaft 20 from cylindrical sleeve portions 28 of the cam device. The machine also comprises a hammer 29 through the distal end of which the shaft 20 at its cam-equipped portion extends, the hammer comprising the section 30 slotted at 31 where it surrounds the cam device and provided at its outer end with a head 32 adapted to deliver blows to the tool 16 through the member 18. The section 30 is provided at opposite sides thereof to one side of the shaft 20 with laterally-extending shoulders 33 so disposed as to be engaged by the cams in the operation of the machine, and at the opposite side of the shaft is of reduced width to extend wholly within

the space between the cams 26, the extremity of this portion of the section 30 being provided with a separate disk 34 secured to the section 30 by a screw 35. The hammer also comprises a sleeve-like member 36 which surrounds the reduced portion of the section 30, the section 30 and member 36 being relatively lengthwise movable, and a coil spring 37 surrounding the outer, reduced, end of the member 36 and confined between a shoulder 38 thereon and the disk 34, the opposite end of the member 36 presenting, at its opposite sides, surfaces 39 forming shoulders so disposed as to be engaged by the cams 26. The operation of the machine of Figs. 1 and 2 is as follows: The shaft 20 is rotated by the motor referred to, through the gearing 10[a], 25, 22 and 21, in counter-clockwise direction in Fig. 1. When the noses 27 of the cam device engage the shoulders 33, the hammer 29 is driven downwardly by a swinging movement, against the member 18, it being understood that in the operation of the machine the operator bears down on the latter in a direction toward the object to be drilled, in the drilling operation, the drive of the hammer thus being effected through the spring 37 which presents a yielding resistance to the turning of the shaft 20 relative to the hammer. As the movement of the hammer in swinging, as stated, is resisted by the member 18, the force exerted by the cam device in its continued rotation forces the hammer section 30 to the left in Fig. 1 against the yielding resistance of the spring 37, and passes by the shoulders 33, thereby relieving the driving pressure against the hammer, whereupon the latter rebounds upwardly, one of the positions assumed by the hammer in rebounding being represented by dotted lines in Fig. 1. In the movement just described, the section 36 in engaging the circular portions of the cams, is held against movement to the left in Fig. 1, thereby forming an abutment for the left hand end of the spring in this figure. As the shaft 20 continues its rotation, the noses 27 of the cams engage the surfaces 39 of the section 36 thereby forcing the latter to the right in Fig. 1 against the tension of the spring 37 which is compressibly forced against the disk 34 which is held against movement to the right in this figure by the engagement of the section 29 with the portion of the shaft 20 between the cams 26, at the left hand side of this shaft in Figs. 1 and 2. There is thus established a driving connection between the hammer 29 and the shaft 20, through the medium of the spring 37 for directing a blow against the member 18, the hammer rebounding as hereinbefore stated, when the resistance of the spring 37 is overcome by the action of the cams 26 against the shoulders 39 during engagement of the head 32 of the hammer, with the member 18. Thus with each rotation of the shaft 20 the hammer 29 is caused to strike two blows against the member 18 for driving the tool.

It may be further stated that in the operation of the machine the cams will engage the shoulders referred to with which they cooperate, while the hammer is out of engagement with the member 18 and thus the hammer will be forcibly driven against this member.

Referring now to the construction illustrated in Figs. 3 and 4, this construction differs from the one just described, as to its general characteristics, in that the hammer is driven against the member through the medium of which the tool is forced against the object to be drilled, once every two rotations of the driving shaft, and the hammer instead of rebounding after each blow delivered thereby, is caused to continue its rotary movement about the driving shaft, the arrangement being such that the cam is in engagement with the hammer for driving it, throughout a much greater length of travel of the hammer than in the construction first described. In the arrangement now referred to, the driving shaft represented at 40, and which would correspond with the shaft 20 of the preceding figures, is driven in any suitable way as, for example, described of the shaft 20, and carries a pair of cams 41 spaced apart and corresponding with the cams 26. The hammer in this construction, represented at 42, is shown as formed of a single section, it being slotted, as indicated at 43, through which portion the shaft 40, between the cams 41, extends to be rotatable therein. The distal end of the hammer 42 is provided with laterally-extending ribs 44 affording shoulders 45 which oppose the cams 41 and with which the noses 46 of the latter cooperate generally as explained of the construction shown in Fig. 1. The hammer 42 is shown as formed with a socket 47 containing a sliding block 48 having a surface adapting it to conformingly fit against the shaft 40 at the left hand side in Fig. 3, there being confined between this block 48 and the bottom wall of the socket 47 a coil spring 49. The tool in this construction is represented at 50 and is shown as fitting into a hollow member 51 vertically movable in a bushing 52 secured in an opening 53 in the wall of the casing 54, this casing being of the same general construction as that of Figs. 1 and 2.

The operation of the machine of Figs. 3 and 4 is as follows: In the rotation of the shaft 40 in counter-clockwise direction in Fig. 3, the noses 46 of the cams engage the shoulders 45, with the result, by reason of the resistance afforded by the spring 49, of swinging the hammer 42 in the same direction and delivering a blow against the up-

per end of the member 51 for driving the tool 50. The engagement of the hammer with the member 51, as stated, the shaft 40 continuing to rotate, results in the shifting of the hammer 42 to the right in Fig. 3, the spring 49 compressing, to a point where the head of the hammer is withdrawn from the opposing surface of the member 51 substantially simultaneously with the movement of the extremities of the noses 46 of the cam into the horizontal plane occupied by the axis of the shaft 40, with the result that the noses 46 of the cams 41 move across the surfaces 45 in the continued rotation of the shaft 40 and the hammer 42 resumes movement in counter-clockwise direction in Fig. 3. During this last-referred-to movement of the hammer, the noses of the cams again engage the surfaces 45 and, in the continued rotation of the shaft 40, effect the delivery of another blow by the hammer against the member 51, these operations being repeated so long as the shaft 40 continues to rotate.

It will be noted that the hammer 47 is caused to deliver a blow once every other revolution of the shaft 40 and that the cams engage the shoulders 45 soon after the hammer 42 has been drawn out of engagement with the member 51 and resumes rotation. Thus the hammer is caused to swing, in driving engagement with the cams 46, throughout the greater portion of 360° whereby very effective blows against the tool are effected.

While we have illustrated and described certain particular constructions embodying our invention, we do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered and the invention embodied in other forms of constructions without departing from the spirit thereof.

What we claim as new, and desire to secure by Letters Patent, is:

1. In a machine of the character set forth, the combination of a drive member, a swinging hammer adapted to strike a tool to be actuated, and means for producing positive drive of said hammer from said drive member toward the tool, said hammer being also reciprocated crosswise of said drive member by said drive means.

2. In a machine of the character set forth, the combination of a drive member, a swinging hammer adapted to strike a tool to be actuated, and means for producing positive drive of said hammer from said drive member toward the tool comprising a cam on said drive member adapted to engage said hammer and spring means yieldingly resisting disengagement of said cam from said hammer, said hammer being also reciprocated crosswise of said drive member by said cam.

3. In a machine of the character set forth, the combination of a drive member, a swinging hammer adapted to strike a tool to be actuated, and means for producing positive drive of said hammer from said drive member toward the tool comprising a cam on said drive member, said hammer having surfaces, engageable, in succession, by said cam in a single rotation of the latter, and spring means yieldingly resisting disengagement of said cam from said hammer, said hammer being reciprocable crosswise of said drive member.

4. In mechanism of the character set forth, the combination of a rotary member, a cam thereon, a hammer mounted to swing for striking an object and having a surface at one side of said rotary member and engaged by said cam, a second member slidable upon said hammer and having a surface at the opposite side of said rotary member engageable by said cam, and a spring operatively engaging said hammer and said second member and operating to yieldingly force said hammer and said second member toward each other and against rotary member.

5. In a machine of the character set forth, the combination of a drive member, a swinging hammer adapted to strike a tool to be actuated, means for producing positive drive of said hammer by said drive member toward the tool comprising a combined cam and driving element on said drive member adapted to intermittently engage said hammer, and resilient means to resist the camming action yieldable to allow rebound of the hammer.

6. In a machine of the character set forth, the combination of a drive member, a swinging hammer adapted to strike a tool to be actuated, means for producing positive drive of said hammer by said drive member toward the tool comprising a combined cam and driving element on said drive member adapted to intermittently engage said hammer, and spring means to resist the camming action yieldable to allow rebound of the hammer.

7. In an impact machine, the combination of a drive shaft, an impact-delivering member associated with said drive shaft and movable crosswise thereof, an impact-receiving abutment extending into the path of movement of said impact-delivering member, driving means on said shaft for producing positive drive of said impact-delivering member toward and against said abutment together with movement of said impact-delivering member crosswise of said drive shaft, and means yieldingly resisting crosswise movement of said impact-delivering member by said driving means.

JAMES S. KNOWLSON.
JAMES LAROCCA.