

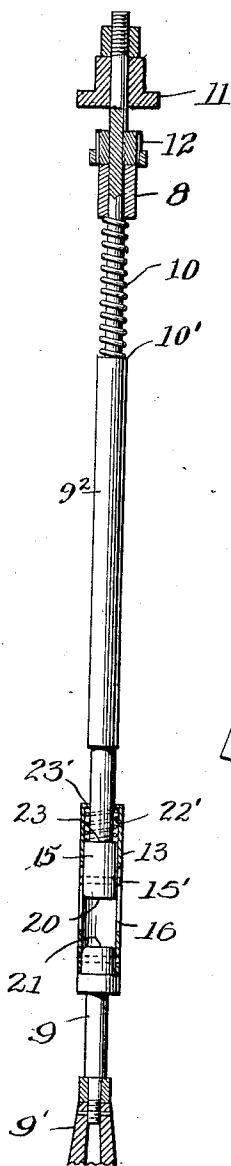
T. D. MOWLDS.
 STONE CHANNELING MECHANISM.
 APPLICATION FILED APR. 11, 1910.

1,062,790.

Patented May 27, 1913.

2 SHEETS-SHEET 1.

FIG. 3.



WITNESSES:
William Steel Johnson
A. Helen Appleton

FIG. 1.

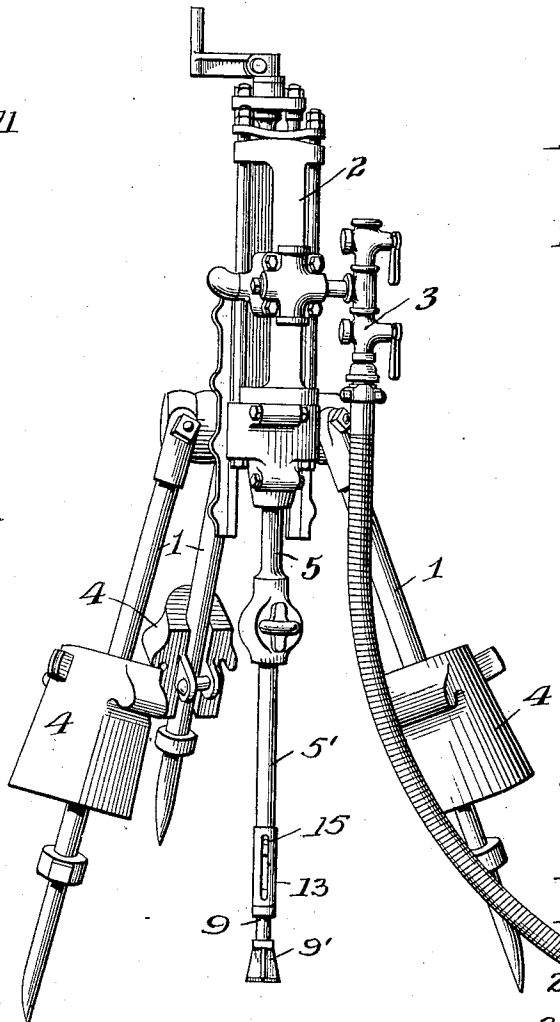
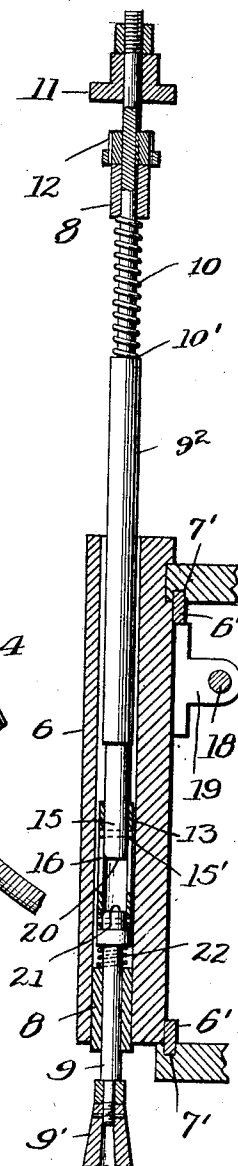


FIG. 2.



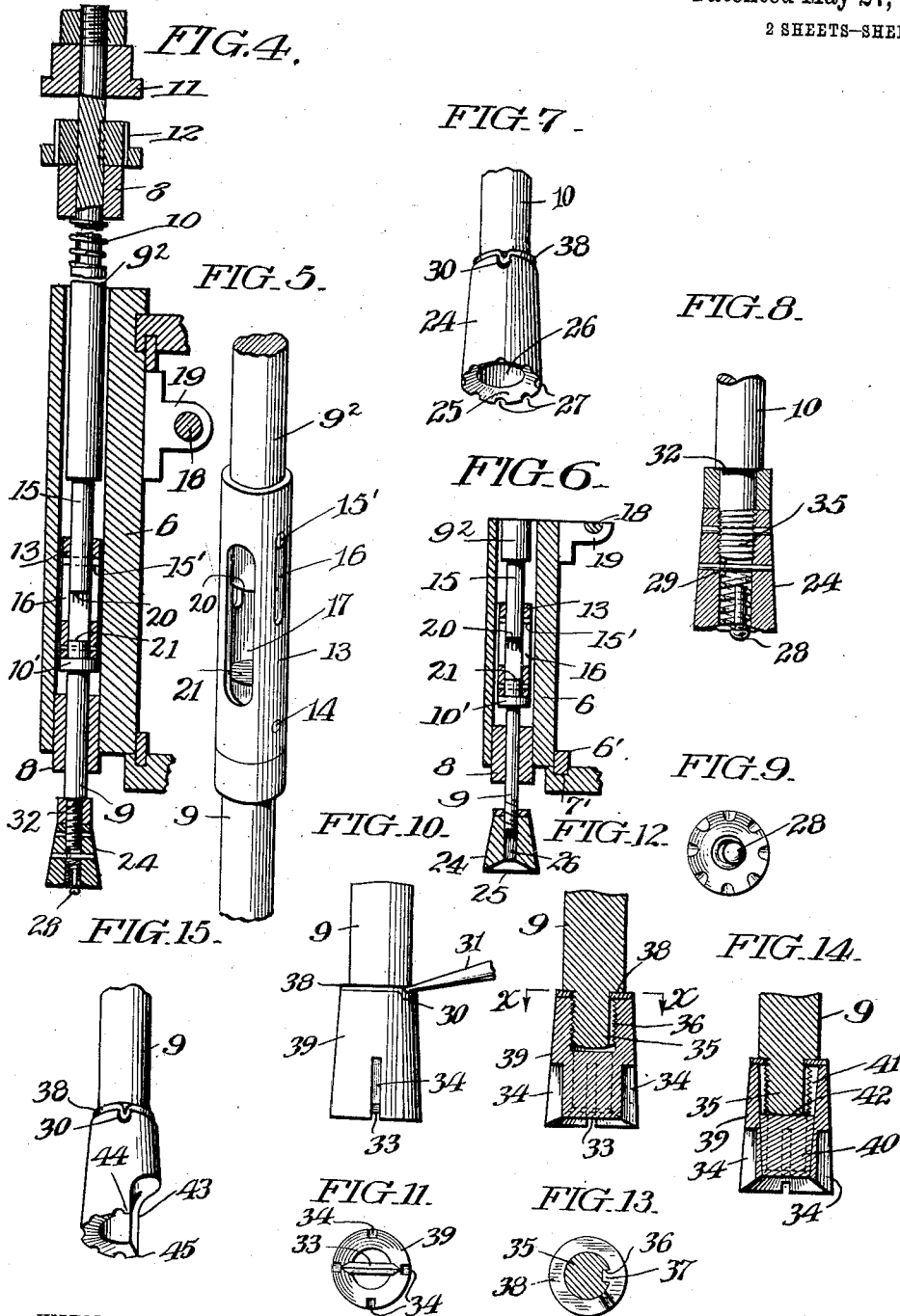
INVENTOR
Thomas D. Mowlds

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2 SHEETS-SHEET 2.



WITNESSES:

William Steel Jackson
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INVENTOR

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THOMAS D. MOWLDS, OF BALA, PENNSYLVANIA.

STONE-CHANNELING MECHANISM.

1,062,790.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed April 11, 1910. Serial No. 554,687.

To all whom it may concern:

Be it known that I, THOMAS D. MOWLDS, a citizen of the United States, residing at Bala, Montgomery county, State of Pennsylvania, have invented certain new and useful Stone-Channeling Mechanisms, of which the following is a specification.

The channeling mechanism, which I here describe and claim, is capable of use in a machine of the character shown and described and claimed by me in my pending application Serial No. 499,841, filed June 3, 1909, and in my Patent No. 1,012,569, issued December 19, 1911 and forming a continuation, as to this subject matter, of the said application 499,841, but is of broader application than for use only in the form of structure there illustrated and is capable of very general use where stone channeling tools are required.

The purpose of my invention is, to protect the cutting edge of the tool against excessive wear due to reciprocation.

A further purpose of my invention is, to provide for reciprocation of a plunger in an impact channeling tool while properly supporting it laterally and relieving the tool of excessive movement.

A further purpose of my invention is, to provide for reciprocation of all of the other parts of an impact mechanism down to and in close proximity to the cutting tool, while avoiding the same extent of reciprocation of the tool, thus gaining the advantage of freedom from wear upon the tool. If the parts not reciprocated or but slightly reciprocated be small there will be little trouble from inertia.

A further purpose of my invention is to provide for sufficient lifting of the tool to permit its rotation, without lifting it to the entire height of the movement of the plunger.

A further purpose of my invention is to provide a tool of substantially annular cutting face with means for cutting or breaking the core.

A further purpose of my invention is to provide a tool of substantially annular cutting face with internal cutting or breaking means for breaking up the core and with means of egress for the material cut.

A further purpose of my invention is to provide an impact tool having annular cutting means with internal means for lifting the tool slightly after each impact.

A further purpose of my invention is to provide a substantially annular cutting surface having internal clearance.

A further purpose of my invention is to provide a tool having a serrated edge of substantially circular form with internal clearance of the same general character as that included in my previous application and Patent 1,012,569, in that it presents constantly and substantially sheer front cutting edge with clearance toward the part cut, permitting the cut to be taken clear into the end of the channel.

A further purpose of my invention is to provide quickly applied inexpensive and effective means for preventing the loosening of a thread-attached cutting point.

I have illustrated my device in the forms in which it has proved to be most practicable but without suggestion that these are the only forms in which it might be used to advantage.

Figure 1 is a side elevation of an ordinary rock drill using one form of my invention. Fig. 2 is a vertical section of a structure involving my invention, and which is similar to that illustrated in my pending application and patent aforesaid, and is applied to my present invention. Fig. 3 is a vertical section of a modification of the structure shown in Fig. 2. Fig. 4 is a longitudinal section similar to that shown in Fig. 2 with one form of my invention in place. Fig. 5 is an enlarged perspective view of a portion of a structure similar to that shown in Fig. 2. Fig. 6 is a vertical section similar to Fig. 4 of another form of my invention. Fig. 7 is a perspective view of one form of tool made use of by me. Fig. 8 is a longitudinal section of a tool similar to that shown in Fig. 7 with internal tool-lifting means. Fig. 9 is a bottom plan view of the structure shown in Fig. 8. Fig. 10 is a side elevation of another form of tool with means for preventing it from loosening. Fig. 11 is a bottom plan view of the structure shown in Fig. 10. Fig. 12 is a longitudinal section of a structure similar to that of Fig. 10. Fig. 13 is a section upon the line $x-x$ of the structure shown in Fig. 12. Fig. 14 is a longitudinal section of a modification of structures shown in Figs. 10-13. Fig. 15 is a perspective view of a form of cutter having a cutting edge not forming a complete annulus.

One feature of my invention is to avoid the weakness of corners or projecting edges

in cutting tools and to overcome the objectionable side rubbing upon the cutting edges of all impact tools.

I provide a joint for impact tool purposes, close to the cutting edge and capable of passing within the hole or channel. I show this in Fig. 1 as applied to an ordinary rock drill which is not designed for any channeling function. I would point out that the invention is of great value in such structures, especially where the internal lifting feature is present or where the stroke of the tool is slightly longer than the play allowed by the joint, and that the impact joint permissibly passes within the hole made.

In Fig. 1 I have shown an ordinary fluid-operated impact tool having legs 1, cylinder 2, supply connections 3, weights 4, and plunger 5 connected to rod 5'.

In the channeling machine form of my invention, where a two part rod is used, the joint is located within a frame 6 which is laterally movable along the channel length, being supported by and laterally guided in machine frame members 7 by guides 6' traveling within ways or channels 7' so as to give the same character of support and provide for movement in the same manner as in my application and patent aforesaid. For convenience I have followed the reference numerals in the patent in Fig. 2 herein and, prefer to construct and operate my channeling machine, here illustrated in part, in the same manner as is illustrated and described in the patent. One suitable means for laterally moving the frame 6 will be found in my Patent 1,012,569 and need not be set forth here.

Within the frame 6 I mount a vertically movable frame 8, 8, which I prefer to support upon the channel bottom as in my patent, and which is intended, as there to follow down into the cut and support the impact tools 9' close to the work by guiding and laterally supporting the lower portions of the tool rods 9 close to the tool.

The upper part 9² of the divided rod is guided in the upper end of the frame 8 and the lower end of the rod 9² passes downwardly and is so guided (as by a sleeve) as to strike upon the upper or anvil end of the part 9 which is supported and guided within the lower end of the frame 8. The rod 9² thus acts as a plunger or hammer having relatively large mass, giving blows to a tool-carrying member having relatively small mass and whose inertia is consequently relatively low.

I prefer to move each plunger downwardly by means of a spring 10 surrounding the plunger and extending between the lower edge of the upper part of the frame 8 and a shoulder 10' on the plunger, as in my patent, and capable of being compressed by the upward movement of the head 11.

No lifting means for the head is here shown but one form may be seen in my Patent 1,012,569 (Fig. 7). When the head is released the reaction of the spring 10 causes the plunger to deliver its blow.

The portion of the head engaged to lift the plunger, is circular in horizontal section so that the plunger may be rotated freely without interfering with the engagement of the lifting mechanism.

Provision is made for turning the plunger 9² by means of a ratchet wheel or gear 12, splined on the plunger 9² and capable of operation in the same way and by the same means shown in my Patent 1,012,569 aforesaid, to which I refer for any further explanation desired. Preferably so close to the tool as to lose little of the force of the blow by reason of inertia of the tool and connecting parts, I insert a joint of which I have illustrated one form in Fig. 1. I place this joint within the connection between the tool and the plunger, or, with some constructions, within the plunger itself.

In the form of joint shown in Fig. 5 a sleeve 13 is preferably rigidly connected to one of the parts, here to the tool-carrying rod 9, as by rivet 14 though it could slide upon both parts. It is connected to the other part, here 9², by means of a pin 15' capable of sliding movement in slot 16, though preferably incapable of angular movement therein.

The sleeve construction shown is intended to give sufficient side support to keep the shafts or rods in line, to prevent relative angular movement between the parts except where some angular feed is desired by this means, and to permit the tool to rest upon the bottom of the cut until the pin 15' has reached the upper end of its slot. The length of the slot 16 and the stroke of the plunger may evidently be so proportioned as to cause no lifting of the tool if desired, or, by an excess of the stroke over the slot length, to provide for any desired amount of tool lift at the upper end of the stroke.

I have shown the sleeve 13 as open at 17 to allow free egress of water, mud or other material which may get into the joint. At 18, in Fig. 2, I have shown the same lifting shaft for the frame 8 as is shown in Fig. 7 of my Patent 1,012,569 and have placed the shaft within the same ears 19 as there shown. I prefer to effect the lifting of this frame in the same way as in my patent but have considered detailed illustration of the further connections here to be unnecessary. The frame follows the channel cut by gravity.

The head 20 of the plunger member is adapted to make driving contact with the anvil 21 of the tool-supporting rod, with the result that the blow so given is communicated to the cutting tool. In Fig. 2 the tool carrying rod is supported from the guide

frame 8 by resilient means 22. In Fig. 3, I have shown resilient means 22', pressing against the shoulder 23 and internal flange 23' for lifting the tool slightly even though the stroke be not in excess of the slot length. This begins to act near the upper end of the stroke, and may be used for buffer purposes even where the stroke is in excess of the slot length.

The spring 10 gives an impact blow through the tool when the head 11 is released, but, as this particular feature, as well as the rotation of each tool through ratchet wheel 12 is not intended to be claimed by me here independently, but is described and claimed in my pending application and patent above referred to. I will not further describe it at this point, but make reference to that patent therefor. The capabilities shown by the structure of the patent will be ascribed herein to the structure here shown intended to cooperate.

In Fig. 7 I have shown a tool of nearly cylindrical shape at 24, having just sufficient exterior clearance to prevent clogging and to make sure of the edge continuing to perform its proper cutting function, showing a main clearance at 25, internally, and, in the form shown, normally toward the part of the material already cut whichever way the tool is advancing. I have made this tool hollow at 26, to provide space for the material cut. I have thus provided a tool, similar to that shown in my previous application, having a circular cutting face and clearance internally and upwardly, and have notched this face in this form shown, as at 27, in order to slightly break the continuity of the cutting edge without injuriously affecting its general circular character.

In the form shown in Fig. 8 I have made use of the hollow part of the cutting tool to receive a preferably eccentric point 28, resiliently supported as at 28, and designed to press against the stone inside the cut, so that the tool will be lifted and the face of the tool relieved from wear when the tool is turned, permitting the tool to pass over any chips in the cut. This form of tool may be used instead of the tool 9', in the combination shown in Figs. 2 and 3 and as best shown in Fig. 7.

In the forms shown in Figs. 10, 11, and 12 I have formed a transverse chisel cutting edge 33 entirely across the center of the cutting tool and preferably slightly back of its annular cutting face. In this form the chisel may be integral with the tool. In these figures I have also shown external clearing channels 34 to give the material cut free egress. These preferably communicate with the interior of the tool.

In the form shown in Fig. 8 I have secured the cutting tool to the shaft 9 by means of a pin through the threaded con-

nection shown, and have screwed the tool against shoulder 32 on said rod.

In Figs. 10, 11 and 12 I have shown quickly applied means to retain the cutting tool on the rod 9, preventing its rotation thereon. This is accomplished by means of any suitable irregularity in the circular continuity of the end 35, such as the slot 36, a washer having a part as 37 Fig. 13, cooperating with this irregularity to prevent relative rotation of the end and the washer and any suitable means for engagement between the washer 38 and the cutting tool 39 to prevent their relative rotation. Evidently the members could be reversed.

The means of engagement which I have shown is by a transverse groove 30 in the upper surface of the cutting tool and any suitable center punch or tool 31 by which, after the cutting tool has been screwed into place, the washer is forced down into this groove. Other means of providing for engagement of this washer with both parts will, of course, occur to any one skilled in allied arts. The angular engagements of the tongue of the washer with the threaded end, and the side of the washer with the groove in the cutting tool make a quick and effective stop or check between them.

In the form shown in Fig. 14 the cutting member 40 is inserted from the top of the cutting tool through a tapered opening 41 and is held in place by the extreme end 42 of the threaded part of the rod 9. This tool is otherwise similar to that shown in Figs. 10, 11 and 12.

The form shown in Fig. 15 provides the same effective cutting edge for the channeling movement of the tool with the convex surface of the cutting tool forward. In order to be fully effective the tool must be turned a half turn at each end of its lateral movement. It then cuts into the extreme end of the cut and is afterward turned to present the same cutting edge for the return cutting movement. The portion which is cut away, at 43, is preferably slightly less than half of the annulus so that the sharp edges 44, 45 shall not engage the side of the channel.

It will be seen that I have provided means for preventing excessive vertical movement of the tool with the injurious rubbing of the edges thereof along the side of the cut, permitting any desired or required lifting of the tool from the bottom of the cut during feeding, rotation, or through part of the operation; that I have presented highly desirable types of cutting tool providing for the cut by means of the circumference of the tool as well as for the reduction or removal of the core effect; and that I have supplied quick, inexpensive and effective means for securing a tool angularly with respect to its support.

The tool supplied is highly effective in my process of cutting by successive crescent shaped cuts along the length of a channel and slightly lifting the tool with each impact movement, if desired. Thus the tool can be properly rotated, and fed without excessive rubbing along the bottom of the cut, at the same time preventing the reciprocation of the tool beyond that desirable for feeding purposes.

The structure shown in my application and patent aforesaid provides for the horizontal movement of the frame 6, vertical movement of the frame 8, lifted through operation of the shaft 18 and following the cut downwardly by gravity, and also provides reciprocation for the plunger 9², with rotation of the plunger to turn the tool. I have illustrated the parts so horizontally and vertically moved, reciprocated and rotated, without, however, considering it necessary to show the cooperating means. My preferred cooperating form is set forth in the published patent. However, I have shown a portion of the channeling machine frame in which the laterally movable frame slides with the guides therefor; the guide for the vertically movable frame 8, *i. e.*, the laterally movable frame 6; the head 11, capable of engagement by means shown in the patent to compress the spring 10, which upon release of the head, causes the downward movement of the plunger; and the ratchet wheel or gear 12 which cooperates in the patent with a rack and other structure to cause rotation of the plunger and consequently of the tool.

In Fig. 6 the annular cutter, here also shown without serrations, is shown without lifting mechanism for the tool, unless the stroke of the plunger or striker be made to exceed its play in sleeve 13, which sleeve is included in this view.

It will be evident that a slight lifting of the tool will be desirable in all cases where the tool is separated from the striker and that this lifting will be necessary where the cut at each impact is sufficiently deep to leave a substantial ledge ahead of the tool to be engaged by the tool in its lateral travel along the channel.

While avoiding the excessive wear due to reciprocatory movement of the tool corresponding with the full movement of the plunger, I prefer to have a partial movement of the tool, whether caused by the plunger lifting it during a portion of the stroke or other means within, or about the tool or tool rod pressing against the bottom of the channel, or against the feeding guide or frame.

Where the stone is hard, the cut with each impact will be very light and the tool might easily ride over the ledge formed, without any lifting or by reason of the rebound of

the tool. Where soapstone, or other softer stone is cut, the chance of uniformly riding over the ledge is much reduced and the advantage of slight lifting is correspondingly increased. This lifting is also desirable to free the interior of a cylindrical tool from the refuse cut and to reduce the wear upon the cutting face of the tool which would otherwise occur if it were dragged laterally along the channel bottom.

Having thus described my invention what I regard as new and desire to secure by Letters Patent is:

1. In an impact stone channeling machine, a cutting member of relatively small weight, a laterally movable frame supporting said cutting member down in the channel and adapted to move lengthwise therein, a plunger, projecting outside of the channel and adapted to extend within the channel and means outside of the channel for causing the plunger to deliver impact blows to the cutting member.

2. In an impact stone channeling machine, a frame adapted to enter the channel and guided to move into and out of the channel and laterally therein, a drill carrying rod mounted in the lower part of said frame, a plunger having one end projecting outside of the channel but adapted to extend within the channel and strike upon the drill carrying rod and means for guiding the plunger in line with the drill carrying rod.

3. In an impact stone channeling machine, a guiding frame movable laterally within the channel, a drill-carrying rod mounted in the lower part of said frame, a guide surrounding the rod, and a vertically movable plunger guided to deliver a blow upon said rod and adapted to enter the channel but having one end always projecting outside of said channel.

4. In an impact stone channeling machine, a laterally movable guide capable of entering the channel and a two part impact device movable horizontally therein, separated to provide relative movement between the parts and having one of the parts at all times extending outside of the channel.

5. In an impact stone channeling machine, a drill-carrying rod, a longitudinal guide therefor below the top of the rod, a lateral guide for the longitudinal guide, a sleeve surrounding the top of the rod and a plunger movable within the said sleeve.

6. In an impact stone channeling machine, a drill carrying rod, a laterally movable guide for said rod adapted to enter the channel, a plunger adapted to deliver a blow upon the top of the rod, and projecting at all times beyond the channel and a guide for said plunger.

7. In an impact stone channeling machine, a drill-carrying rod, a guide for said rod

adapted to enter the channel and engaging the rod below its top, a plunger, a guide for said plunger, and means connected with the rod whereby the rod is adapted to be turned.

5 8. In an impact stone channeling machine, a drill-carrying rod, a rotatable plunger operating thereon, and a joint therebetween permitting relative longitudinal movement, but preventing independent rotary move-

10 ment.
9. In an impact stone channeling machine, a drill-carrying rod, a rotatable plunger striking thereon, a guide within the channel for the rod, and a guide for the plunger maintaining rotary connection and permit-

15 ting longitudinal movement between the rod and the plunger.
10. In an impact stone channeling machine, a two part cutting device comprising a cutter, a mechanically operated plunger

20 separate therefrom, said plunger being actuated by means outside of the channel, in combination with means on one of the parts whereby the cutter may be turned.
25 11. In an impact stone channeling machine, a cutting member having relatively low inertia, a guide having its axis in line with the center of the cutting face presented by the cutting member and supporting it

30 laterally, means for moving the guide and cutting member laterally and a striker having relatively large mass delivering blows upon the end of the cutting member.
12. In an impact stone cutting machine,

35 a drill-carrying rod, a drill thereon, resilient means carried by the drill for supporting it from the stone clear of the surface being cut and a plunger, for overcoming the resilient support and delivering a blow upon

40 the stone.
13. In an impact stone cutting machine, a drill-carrying rod, a drill thereon, resilient means carried by the drill for supporting the drill from the stone clear of the surface

45 being cut, a plunger to overcome the resilient support and deliver a blow, and means whereby the drill carried by the rod may be turned.
14. In an impact stone cutting machine,

50 a drill-carrying rod of relatively small size, a drill thereon, means carried by the drill for supporting it normally away from the stone, a plunger of relatively large size and a guide for said plunger, guiding it to strike

55 said drill-carrying rod.
15. In an impact stone channeling machine, a two part cutting device comprising a relatively heavy striker and a relatively light cutter, maintained in alinement, a

60 horizontally movable frame supporting the cutter and a guide for the frame adapting it to move lengthwise of the channel.
16. A stone cutting impact tool having a cutting face, means whereby the tool may

65 be rotated and means pressing against the

work for lifting the face of the tool from the work.

17. In a channeling machine, a cutting member having relatively low inertia, a guide for the cutting member guiding it to move in a direction parallel with the direction of downward feed into the channel, means for laterally moving the cutting member and a striker having relatively large mass delivering blows upon the end of the cutting member.

18. In an impact stone channeling machine, a cutting member having relatively low inertia, a striker having relatively high inertia, extended outside of the channel and adapted to deliver blows upon the cutting member, means outside of the channel acting upon the striker to cause it to deliver a blow, and connections alining the cutting member and the striker including a guide adapted to follow the cutting member into the cut and to move lengthwise therein.

19. In an impact stone channeling machine, a cutting member, a support for said cutting member down in the channel, adapted to be moved lengthwise in the channel, a plunger and means upon the plunger outside of the channel whereby it may be made to deliver impact blows to the cutting member.

20. In an impact stone channeling machine, a laterally movable reciprocable plunger extending outside of the channel, a laterally supported vertically movable tool impelled thereby and means for lifting the tool a distance less than the stroke of the plunger between blows of the plunger.

21. In a stone channeling machine, a vertically movable cutting member having relatively low inertia and adapted to enter the channel and pass wholly within it, a support for the cutting member adapted to enter the channel, a vertically movable striking member of relatively high inertia, the lower end being adapted to enter the channel and guided to strike upon the top of the cutting member, the upper end of said striking member always extending outside of the channel and means exterior to the channel for giving impulse to the striking member.

22. In a stone channeling machine, a reciprocable cutting member adapted to enter the channel and rest upon the bottom of the channel, an independently supported guide frame for said cutting member adapted to enter the channel, a striking member terminating outside of the channel at one end and adapted to enter the channel at the opposite end, said striking member being guided to strike the cutting member, and means outside of the channel for causing reciprocation of the striking member.

23. In a stone channeling machine, a cutting member adapted to wholly enter the

channel, a support for said cutting member
also adapted to enter the channel, a striker
entering the channel and having its lower
end guided to strike the cutting member and
5 the opposite end always extending outside
of the channel and means operating upon

the striker outside the channel for giving
impulse to the striker.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."