

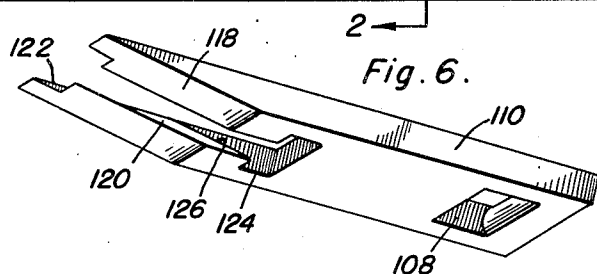
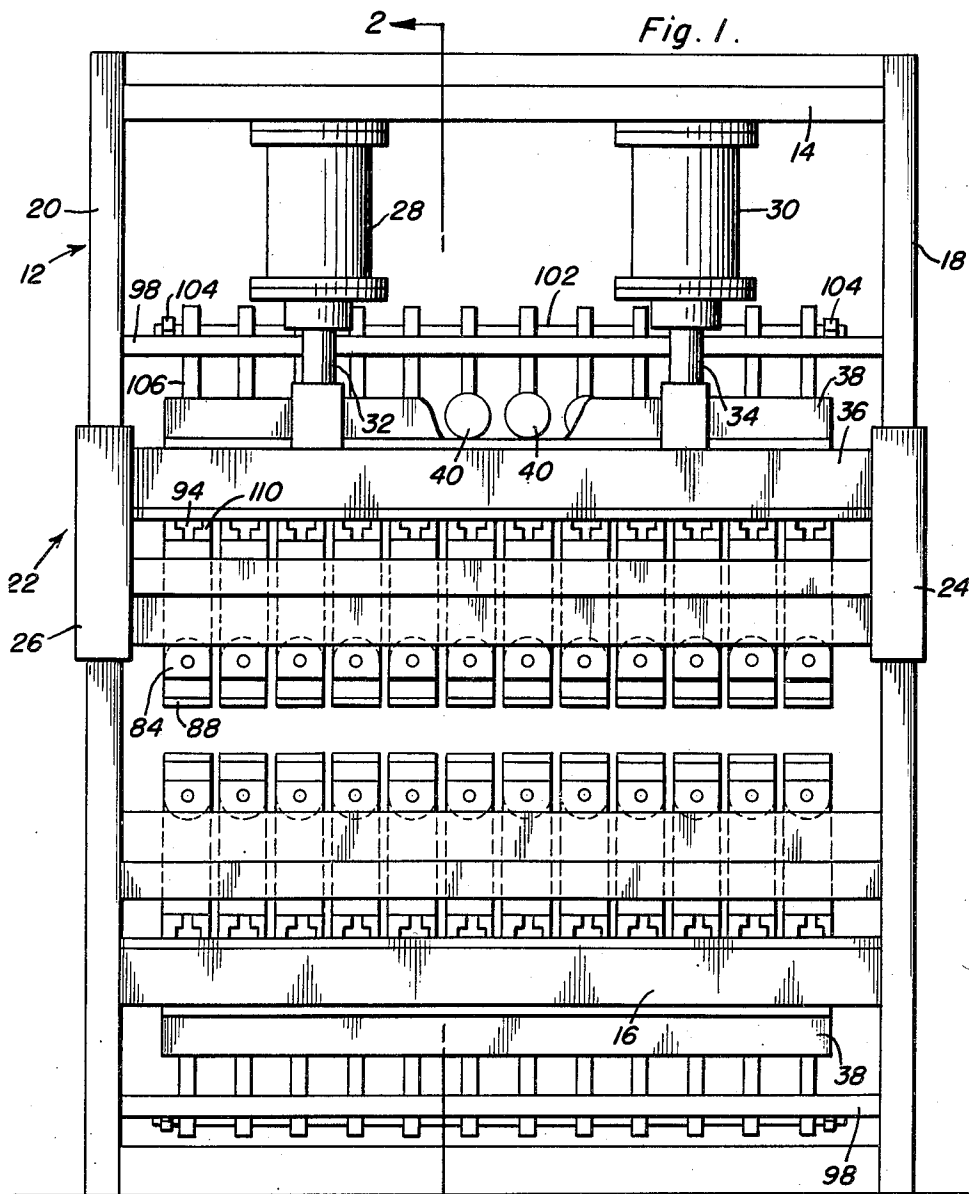
May 15, 1951

V. B. GRAHAM ET AL
SHEARING MACHINE

2,552,958

Filed Nov. 8, 1948

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

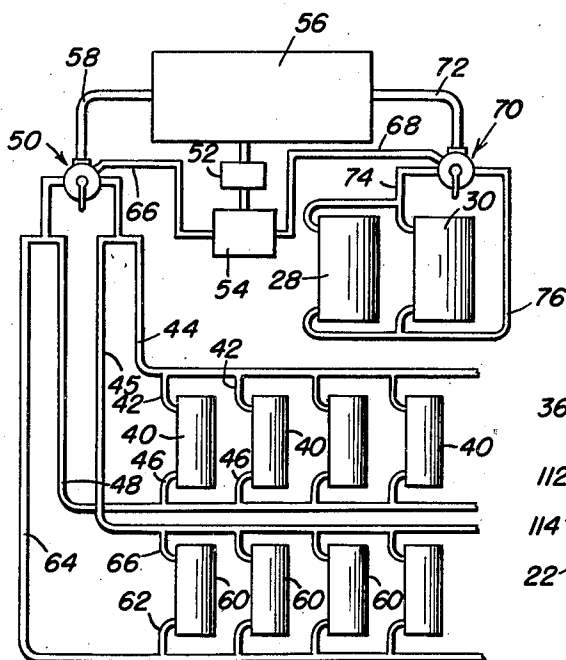


Fig. 2.

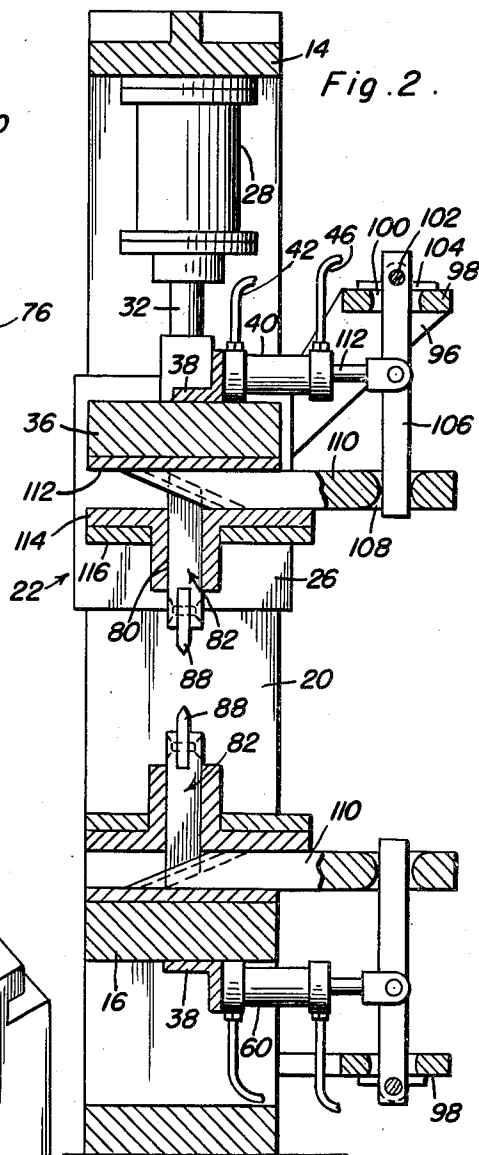


Fig. 4.

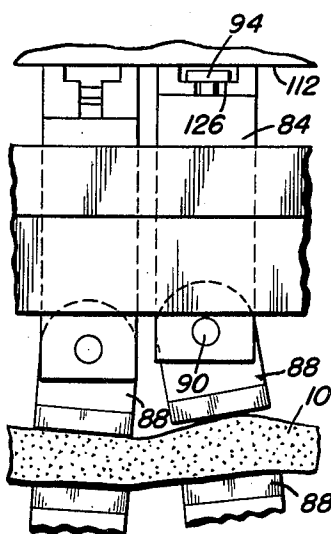
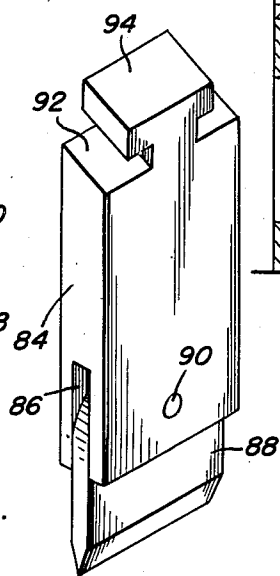


Fig. 5.



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2,552,958

SHEARING MACHINE

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Application November 8, 1948, Serial No. 58,922

17 Claims. (Cl. 125—23)

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This is a continuation in part of our co-pending application Serial No. 740,106, filed on April 8, 1947, and now bearing Patent No. 2,453,216, dated November 9, 1948.

An object of this invention is to shear or sever stones and other objects of similar characteristics, preferably those found in sheet-like formations or reduced to sheet-like formations, by means of a full fluid actuated mechanism, whereby a bank or series of cutters is raised and lowered by fluid actuated means and the cutters derive a fine adjustment from an independent fluid actuated means to conform with the irregular contour of the material to be cut.

Another object of this invention is to support and adjust the cutters by a single mechanism or means, whereby movement of a slidable element in a plane substantially transverse to the sliding movement of the cutters effects an adjustment of the cutters and also supports the cutters simultaneously.

Another object of this invention is to improve generally the class of apparatus for shearing stones and other similar material through the utility of a device which obviates the necessity of any lever adjustment or actuation in the full and efficient operation thereof.

Ancillary objects and features of novelty such as simplicity of structure will become apparent to those skilled in the art, in following the description of the preferred form of the present invention, illustrated in the accompanying drawings, wherein:

Figure 1 is an elevational rear view of the preferred form of the invention;

Figure 2 is a longitudinal sectional view taken substantially on the line 2—2 of Figure 1 and in the direction of arrows;

Figure 3 is a schematic fluid flow diagram showing the various cylinders, valves and the like and their relative arrangements;

Figure 4 is an enlarged fragmentary elevational view showing particularly the detail of the cutters and means supporting the cutters;

Figure 5 is a perspective view of one of the cutters; and,

Figure 6 is a perspective view of one of the bars or slide elements forming a major and important part of the present invention.

Devices for cutting stone, slabs of rock, and other similar materials are well known in the art. Such devices have however, various drawbacks in practical operation. One of the more serious drawbacks of conventional apparatus is the necessity for utilizing manually operative levers for

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effecting various adjustments. Accordingly, the instant structure has been devised in order to obviate this drawback or hardship in operation. Accordingly, the full operation of the machine may be effected remote from the actual machine, as from a control point which may be even protected by a shelter. Manipulation of certain valves is all that is necessary for performing a complete cutting operation on a portion of rock, stone or other igneous material.

Complex mechanisms for devices intended to perform the operation to which the present invention appertains must not be complex or complicated. Very fine adjustments and delicate mechanism is extremely impractical due to the very nature of the work to be performed. Tremendous impact loads may be recorded in the actual structure of the machine or other machines of this broad character in operation and during operational conditions. It has been found that screw threads and screw threaded elements are also objectionable in the working mechanisms since adjustment cannot be effected as rapidly as desired. Accordingly, the present device has utilized mechanisms exclusive of screw threads in the actual severing parts.

In the face of the need for a durable device, yet simplified, there must be sufficiency of adjustment so that a slab may be severed along a substantially straight line. Substantially none of the slabs which are utilized in devices of this nature have a smooth contour. Instead, they are generally replete with rises and swells as shown at 10 in Figure 4.

In our co-pending case, we have taught the utility of slidably disposed cutters which may be locked in place by a cam mechanism, the cutters being variously positioned in accordance with or responsive to the rises and swells of the object to be cut. The structure to be described below incorporates the same broad or general principle with certain added features for rendering the device easier to actuate and more satisfactorily operative, particularly in a machine which is slightly more refined in both operation and use.

A frame or support generally indicated at 12 includes a header 14, a bottom piece 16 and side tracks 18 and 20 respectively. A slide or slide member generally indicated at 22 is slidably disposed on the tracks 18 and 20 and includes various features.

The said slide includes runners 24 and 26 respectively which embrace the tracks 18 and 20, preferably for vertical sliding movement. Cylinders 28 and 30 respectively having pistons and

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piston rods 32 and 34 respectively slidable therein are provided. The cylinders react on the header 14 and have their piston rods attached to a cross member 36 of the said slide. This cross member is in turn secured to the members 24 and 26 respectively, being movable therewith. Any suitable means of attachment for the piston rods and cross member 36 may be utilized, such as welding, brazing, bolting, riveting, etc.

An angle iron or angle member 38 is fixed to the cross member 36 and has a plurality of pistons, each of which is indicated at 48 reacting thereon. The said pistons may be attached thereto in any suitable manner such as by the use of clamps, by spot welding, or other means.

Referring to the schematic fluid flow diagram seen in Figure 3, it is noted that the piston bearing cylinders 40 have inlet lines 42 attached thereto which terminate in a manifold pipe or conduit 44. Conduits 46 extend from the cylinders 40 and terminate in the manifold pipe 48. The said manifold pipes 44 and 48 respectively terminate in a valve casing of a valve schematically indicated at 50. Any fluid flow system may be utilized in conjunction with the present device, one being shown for illustrative purpose which includes a pump indicated at 52 connected with a reservoir 54 and a pressure chamber 56.

In operation, fluid (liquid in this instance) is taken from the reservoir 54 by the pump 52 and introduced into the pressure chamber 56. It is then transmitted to the valve 50 by means of a pipe 58, whence by means of the setting of the valve it is permitted of flow through the manifold pipe 44 and into the cylinders 40. At the same time however, it flows through the branch manifold pipe 46 and into the cylinder 60 which will be described more in detail subsequently. This urges the piston rods and pistons pertinent to each bank of cylinders 40 and 60 respectively in the down position. However, at the same time the fluid is exhausted through the narrow outlet conduits 46 and 62 respectively, thence through the manifold pipe 48 and the branch manifold pipe 64. At this time the valve 50 is so set that the fluid extends therethrough and into the reservoir 54 through the medium of a line 66. It is noted at this point that the structure of the valve permits these operations, it being conventional in nature and preferably of the type which includes a casing having a core therein with appropriate passages in the said core.

In operation of the device so that the pistons will be urged in the direction opposite from that described above, the valve 50 is set so that fluid is taken under pressure from the pressure chamber 56 and conducted through the manifold 48 and branch manifold 64 into the bottoms of the cylinders 40 and 60 respectively. Then, the said inlet conduits 42 become outlet conduits and the small conduits 66 of a similar function for the cylinders 60. Fluid flows through the manifold pipe 44 and the branch manifold pipe 46, through the valve construction seen at 50 and into the reservoir 54, for recirculation.

Also connected with the reservoir 54 is a conduit 68. This conduit 68 terminates in a valve structure schematically shown and indicated at 70 which is of the same general nature of the valve structure 50. Fluid is taken from the pressure chamber 56 through the line 72, whence it extends or flows through the valve structure 70 and then through the conduit 74 into the cylinders 28 and 30 respectively. The fluid in the

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cylinders issues through the line 76 and into the valve structure 70, whence it flows through the conduit 68 and into the reservoir 54.

To operate the piston rods in the reverse direction, a simple manipulation of the valve structure 50 is all that is necessary and the fluid flows through this sub-system in a direction directly opposite that described.

When the device is actuated by means of another fluid, such as air, it is unnecessary to utilize the reservoir 54, the lines 68 and 66 respectively as well as the pump 52. A compressor is substituted in order to apply a pressure into the pressure chamber 56 and the air is simply exhausted to the atmosphere when it has served its purpose. It will be noted that any fluid may be utilized in conjunction with the present device, as found desirable, such as liquid, and air.

With the fluid flow system as a background, the following structure shown in the drawings is put to use therewith, and in the light thereof.

A passage 80 is supplied in the slide or slide member 22 accommodating a number of cutters generally indicated at 82. These cutters 82 are disposed in the passage 80 for vertical movement in a plane substantially parallel to the path of travel of the actual slide.

The specific structure of the cutter may be seen best in Figure 5 and includes a tool holder 84 having a recess 86 therein with an arcuate top portion, serving the purpose of a cam. A tool 88 in the form of a chisel is mounted for pivotal movement in the recess 86 through the medium of a conventional pin 90. By this structure the tools 88 (see Figure 4) may pivot an amount for compensation of various recesses and raised portions in the slab 10.

The top portion of the tool holder 84 has an inclined surface 92 and a substantially T-shaped shoe 94 fixed thereto.

Means for supporting the tool holder 84 and consequently the cutter and for adjusting the vertical position of the cutter is provided. The preferable means is seen best in Figure 2. A suitable support 96 is fixed to the slide or slide member 22 and has a plate 98 extending thereacross. This plate has a number of openings 100 spaced along the top thereof, with an elongated pivot pin or bar 102 disposed thereover. This pivot pin or bar may be supported in suitable brackets 104.

Suspended from the pivot bar 102 is a number of links 106 which pass through the openings 100. It is the said openings 100 which have rounded faces serving the purpose of stops, limiting the travel of movement of the links 106.

The opposite ends of the said links are disposed in openings 108 formed in the sliding element or bar 110. The sides of the openings 108 are smoothly contoured to form cams.

The said pistons 40 having their piston rods 112 extending therefrom are fixed to the slide as described hereinbefore. The piston rods 112 have a path of travel parallel to the path of travel of the bars 110 which are disposed in the passage 112 formed in the various cross members 114 and 116 of the said slide. Accordingly, movement of the piston rods 112 forming a portion of the fluid actuated means for raising and lowering the cutters 82, will also slide the rods 110.

Viewing Figure 6, the specific structure of the bars 110 is shown. One end of the said bar 110 shown in Figure 6 is tapered at 118 in wedge-like fashion and has a central slot 120 formed

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therein, substantially parallel to the longitudinal axis of the said bar 110. A notch 122 is formed at the end of the tapered portion in order to allow a full stroke or travel of the T-shaped shoe 94 therein. A substantially T-shaped opening 124 is formed at the inner end of the said slot 120 for actual accommodation of the T-shaped member or shoe 94. Then, inclined slide surfaces 126, being formed on the upper surface of the bar 110 accommodates the bottom faces of the substantially T-shaped shoe 94, for sliding movement.

As the slidable element 110 is moved in a direction substantially transverse to or at least non-parallel with relation to the movement of the slide 22, the shoe 94 will ride in the passageway formed by the said slot 120 and inclined surfaces 126. Since the cutter 82 cannot move laterally due to the confines of the passage 80, it will be raised and lowered or moved in a direction parallel to the movement of the slide 22. This structure completes the structural portions of the means for not only raising and lowering the cutters 82 but also for actually supporting the said cutters.

An identical structure is supplied at the lower portion of the frame 12 and more specifically on the bottom 16, serving the exact function that the cross member 36 serves in the slide or slide member 22. By utility of this arrangement, the tools 88 will engage both the upper surface and the lower surface of the element or member 10 to be severed, contacting it in its rises and swells as well as valleys and recesses for insurance of a substantially straight line of severance or cleavage.

In summation, a brief description of the composite operation is as follows: The article or object to be severed is conveyed between the cutters 88 by any suitable conventional device such as an endless conveyor. The slide may then be moved to a position immediately above the object to be cut and the conveyor is so disposed with respect to the lower bank of cutters that the said lower bank of cutters is already disposed immediately adjacent the object to be cut. Then, the plurality of cylinders with their associated pistons are rendered operative, sliding the bars 110 (both upper and lower) so that the tools 88 contact the object to be cut as shown in Figure 4. The fluid in the operative system is then trapped by means of the conventional valve structure seen at 50 and the upper bank of cutters is moved sharply against the top surface of the object 10 to be cut through the utility and operation of the cylinders 28 and 38 with their associated pistons.

Many modes of operation of the actual device may be realized. This is the general operation, the specific movement of the parts being described in conjunction with the structure. If it is desirable the cutters 82 may be set in position for operation and the device then actuated further in accordance with and at the designs and the manner desired by the actual user of the device.

It is apparent that certain variations may be made without departing from the spirit of the invention.

Having described the invention, what is claimed as new is:

1. A shearing apparatus comprising a frame, a slide member carried by said frame, means for supporting a slab secured to said frame, means reacting on said frame for raising and lowering said slide member, cutters adjustably disposed

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in said slide member, means for supporting and adjusting said cutters, including bars having guideways with parts of said cutters disposed therein, and means for operating said bars.

2. A shearing apparatus comprising a frame, a slide member carried by said frame, means secured to said frame for supporting a slab, means reacting on said frame for raising and lowering said slide member, cutters adjustably disposed in said slide member, means for supporting and adjusting said cutters, including a plurality of bars arranged in said slide member for transverse movement with respect to said slide member, guideways in said bars, shoes secured to said cutters and disposed in said guideways for supporting said cutters, and means for sliding said bars.

3. A shearing apparatus comprising a frame, a slide member carried by said frame, means secured to said frame for supporting a slab, means reacting on said frame for raising and lowering said slide member, cutters adjustably disposed in said slide member, means for supporting and adjusting said cutters, including a plurality of bars arranged in said slide member for transverse movement with respect to the movement of said slide member, guideways in said bars supporting said cutters, said bars having cam openings therein, links disposed in said openings, and means reacting on said slide for moving said links to actuate said bars.

4. In a shearing apparatus, a frame having a slide attached thereto, means engaging said slide and reacting on said frame for actuating said slide, the improvement which comprises cutters carried by said slide, and means secured to said slide and keyed to said cutters both supporting said cutters and adjusting said cutters to conform substantially with the contour of an object which is to be severed.

5. In a shearing-apparatus, a frame having a slide attached thereto, means engaging said slide and reacting on said frame for actuating said slide, the improvement which comprises cutters carried by said slide, means secured to said slide and keyed to said cutters both supporting said cutters and adjusting said cutters to conform substantially with the contour of an object which is to be severed, said last mentioned means including elements, each having a guideway therein and movably disposed in said slide member with said cutters carried in said guideway, and means for actuating said elements.

6. In a shearing apparatus, a frame having a slide attached thereto, means engaging said slide and reacting on said frame for actuating said slide, the improvement which comprises a cutter carried by said slide, means secured to said slide both supporting said cutter and adjusting said cutter to conform substantially with the contour of an object which is to be severed, said last mentioned means including an element having a guideway therein movably disposed in said slide member with said cutter carried in said guideway, a link slidably connected with said element, and means reacting on said slide and secured to said link for operating said link thereby moving said element and said cutter.

7. In a shearing apparatus, a frame having a slide attached thereto, means engaging said slide and reacting on said frame for actuating said slide, the improvement which comprises a cutter carried by said slide, means secured to said slide both supporting said cutter and adjusting said cutter to conform substantially with the contour

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of an object which is to be severed, said last means including an element having a guideway therein and movably disposed in said slide member with said cutter carried in said guideway, fluid actuated means for actuating said element, said cutter including a tool holder, a recess in said holder, and a cutting member pivotally mounted in said recess.

8. In a shearing apparatus, a frame having a slide attached thereto, means engaging said slide and reacting on said frame for actuating said slide, the improvement which comprises a cutter carried by said slide, means secured to said slide both supporting said cutter and adjusting said cutter to conform substantially with the contour of an object which is to be severed, said last means including an element having a guideway therein and movably disposed in said slide with said cutter carried in said guideway, fluid actuated means for actuating said element, said cutter including a tool holder, a recess in said holder, a cutting member pivotally mounted in said recess, said holder having a shoe fixed at the end thereof opposite said cutting member, and said shoe being slidably disposed in said guideway.

9. The combination of claim 8 and means for introducing fluid into and returning fluid from said fluid actuated means, and a valve disposed in said fluid introducing and returning means.

10. A severing apparatus comprising a frame, a slide carried by said frame, means for actuating said slide, a passage in said slide, a cutter including a shoe disposed in said passage for movement in a plane parallel to the path of movement of said slide, a wedge bar having a guideway and disposed in said slide for movement in a plane transverse to the movement of said cutter, said shoe being movably disposed in said guideway, a piston carried by said slide, and means connected with said piston for transferring movement of said piston to movement of said bar.

11. A severing apparatus comprising a frame, a slide carried by said frame and arranged for vertical movement, means for actuating said slide, a passage in said slide, cutters, each including a shoe disposed in said passage for movement in a plane parallel to the path of movement of said slide, wedge bars, each having a guideway disposed in said slide for movement in a plane transverse to the movement of said cutters, said shoes being movably disposed in said guideway, a plurality of fluid actuated pistons carried by said slide, and means connected with said pistons for transferring movement of said pistons to movement of said bars, in substantially parallel planes including a plurality of links, means carried by said slide supporting said links for pivotable movement adjacent one end of each, and said links being slidably and operatively connected with said bars adjacent the opposite end of each bar.

12. A severing apparatus comprising a frame, a slide arranged for vertical movement and carried by said frame, means for actuating said slide, a vertical passage in said slide, a cutter including a shoe disposed in said passage for movement in a plane parallel to the path of movement of said slide, a wedge bar having a guideway and disposed in said slide for movement in a plane transverse to the movement of said cutter, said shoe being movably disposed in said guideway and in engagement with said wedge bar, a fluid actuated piston carried by said slide, means

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connected with said piston for transferring movement of said piston to movement of said bar, in substantially parallel planes including a link, means carried by said slide supporting said link adjacent one end thereof, said bar having an opening therein, and said link having its opposite end disposed in said opening so that movement of said link is transferred to said wedge bar.

13. A severing apparatus comprising a frame, a slide arranged for vertical movement and carried by said frame, means for actuating said slide, a passage in said slide, a cutter including a shoe disposed in said passage for movement in a plane parallel to the path of movement of said slide, a bar having a guideway and disposed in said slide for movement in a plane transverse to the movement of said cutter, said shoe being movably disposed in said guideway, a fluid actuated piston carried by said slide, means connected with said piston for transferring movement of said piston to movement of said bar in substantially parallel planes including a link, means carried by said slide supporting said link adjacent one end thereof, said link being operatively connected with said bar adjacent the opposite end thereof, a cylinder for said piston, conduits for conducting fluid to said cylinder, and valve means connected with said conduits for controlling fluid flow through said conduits.

14. In a stone severing apparatus, a stationary frame, a slide mounted on said stationary frame, a cylinder with a piston therein, said cylinder and piston reacting on said frame, said slide respectively and a control valve for said cylinder to operate said slide, said slide having a vertical passageway therein, a plurality of tool holders disposed in said passageway, a plurality of wedge bars mounted for sliding movement in said slide and movable in a plane transverse to the movement of said slide, a plurality of fluid actuated devices mounted on said slide and movable therewith, a plate forming a part of said slide and having openings therein, links passed through said openings and means mounting said links for pivotal movement on said plate, the lower ends of said links being operatively connected with said wedge bars to operate said wedge bars, said fluid actuated devices being secured to said links intermediate the ends of said links for pivotally operating said links thereby moving said wedge bars transversely of the movement of said slide, and means connecting said wedge bars with said tool holders to retain and to actuate said tool holders.

15. In a stone shearing apparatus, a frame with a slide mounted on said frame and means for operating said slide, a vertical passageway formed in said slide and having a plurality of tool holders mounted for movement therein, a plurality of wedge bars mounted for movement in said slide in a direction transverse to the movement of said tool holders, means including slots with shoes disposed in said slots for connecting said holders with said wedge bars thereby supporting said holders, a plate forming a part of said slide, said plate having a plurality of openings therein, links passed through said openings and a pivot for said links retaining said links for pivotal movement on said plate, said wedge bars having openings therein with cam surfaces forming walls of said last mentioned openings, said links being passed through said last mentioned openings to operate said wedge bars thereby actuating said tool holders, and means reacting

on said slide and said links for pivotally operating said links.

16. The combination of claim 15 and said last mentioned means including a plurality of piston-cylinder assemblies, a pump for supplying fluid to said assemblies, a plurality of conduits connecting said assemblies with a control valve and a pipe extending from said control valve to said pump so that the quantity of fluid entering said assemblies is dependent upon the resistance to movement of said tool holders.

17. In a machine for dividing slabs which includes a frame and a movable cutter support carried by said frame, cutter assemblies carried by said support, one of said assemblies including a bar having a guideway, a cutter element, means operatively connected with said cutter element and disposed in said guideway for holding said element connected with said bar, means including a link connected with said bar for actuating

said bar in a horizontal plane, said guideway having a longitudinal axis at an angle to said horizontal plane, and said element holding means comprising a shoe slidably disposed in said guideway so that said element is moved vertically in response to horizontal movement of said bar.

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