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C. C. JENKINS ET AL

2,768,620

STONE SPLITTING PRESS

Filed Oct. 26, 1954

3 Sheets-Sheet 1

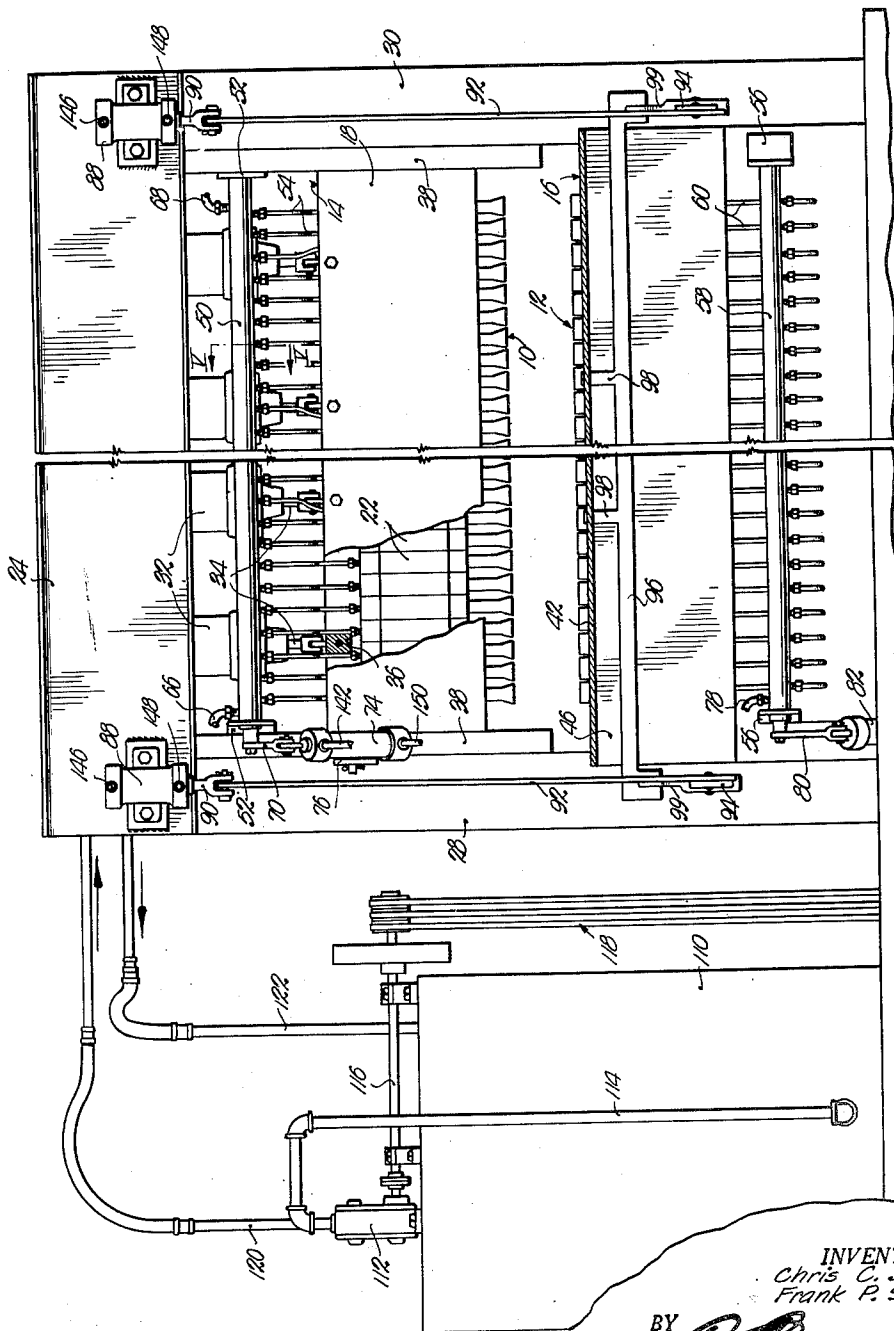


Fig. 1.

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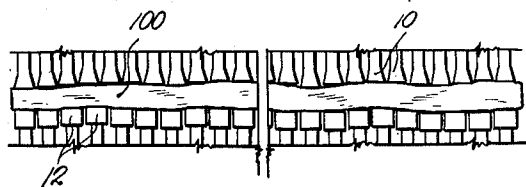
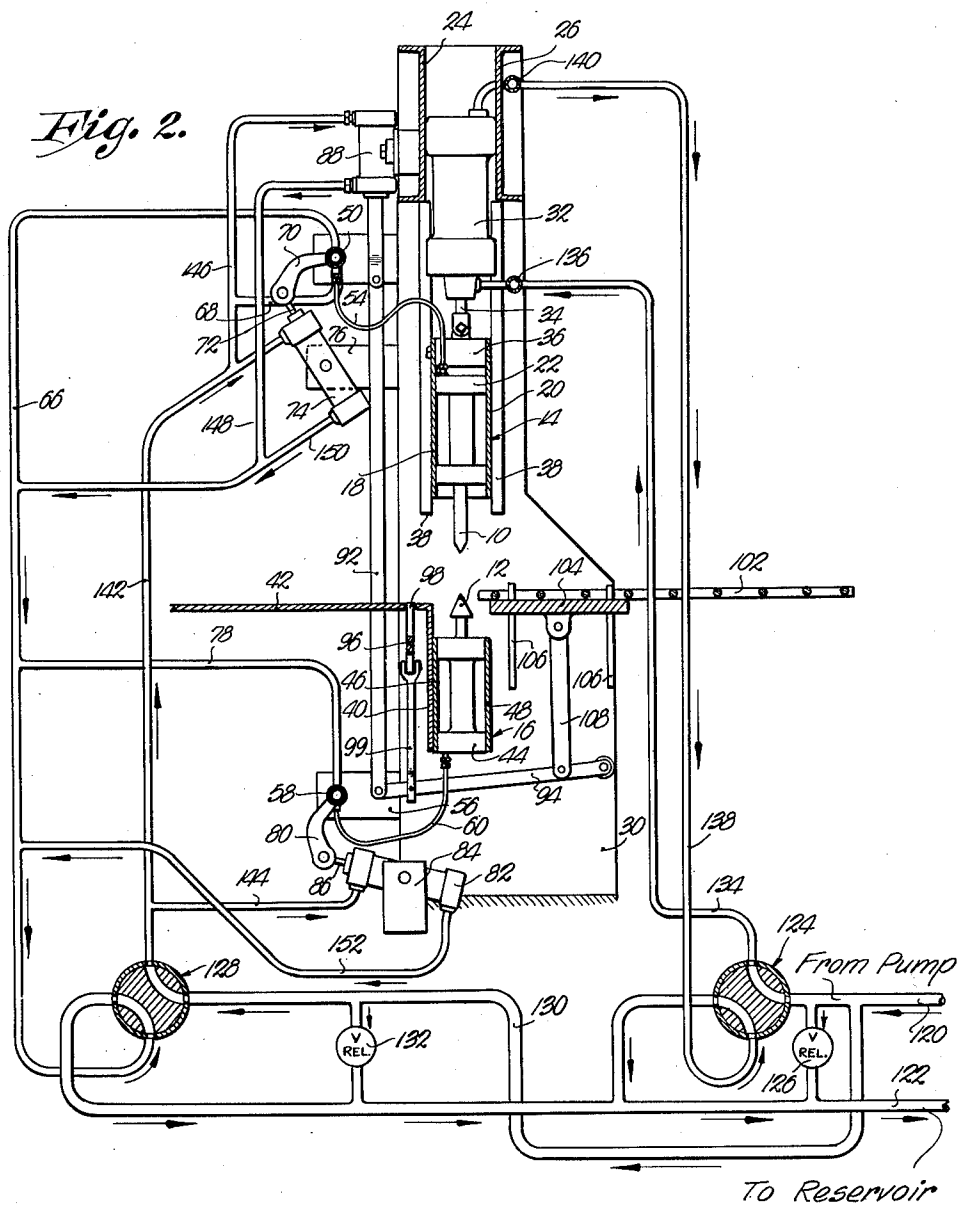
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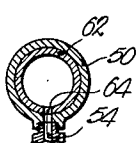
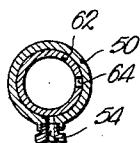
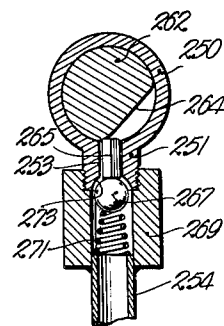
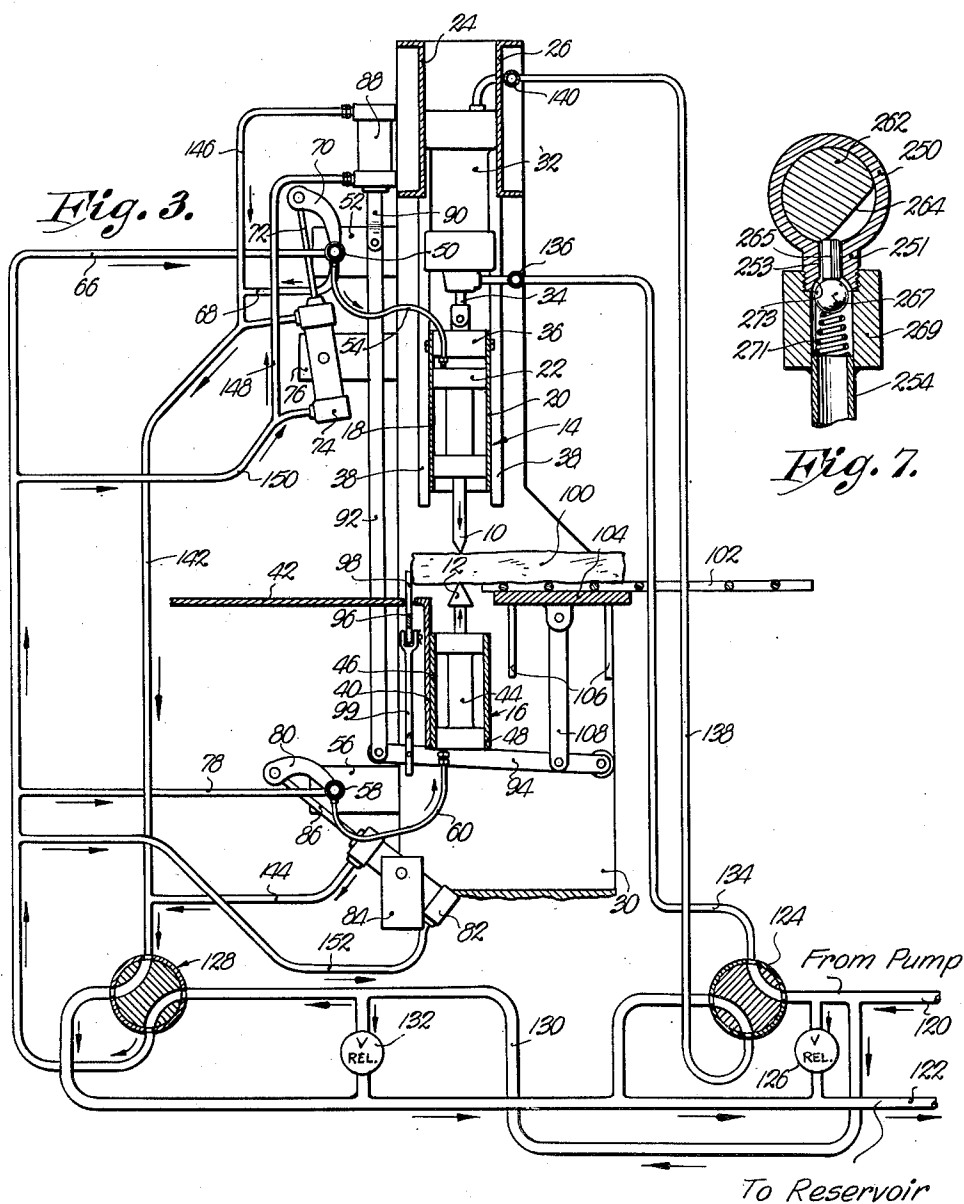
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STONE SPLITTING PRESS

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3 Claims. (Cl. 125-23)

This invention relates to the art of stone masonry and has for its primary object the provision of a novel machine for splitting stone.

It is the most important object of the present invention to provide a stone splitting press wherein a plurality of chisels are brought into tight engagement with the stone on opposed sides thereof and subsequently by a separate and distinct step pressed against the stone in such a manner as to cause it to split along a substantially straight plane between the opposed series of chisels.

Another important object of the present invention is to provide in a stone splitting press of the aforementioned character, power means for first moving the chisels against the stone with equal force, notwithstanding the unevenness of the stone, together with power means for pressing the chisels toward each other so as to cause it to split into a pair of sections.

A further object of the instant invention is the provision of a stone splitter of the kind having a pair of opposed series of chisels, each chisel being individually mounted and movable with force against the stone so as to accommodate for unevenness thereof and to assure cooperation among the chisels in the ultimate pressing step which causes the stone to split into two parts.

A still further object of this invention is the provision of a stone splitting machine wherein the individually mounted and separately reciprocable chisels are in turn mounted on carriers, one of which is reciprocable toward and away from the other carrier for the purpose of applying force and causing the stone to split after the chisels become positioned in engagement with the stone, there being included means to lock the chisels in the positions which they have assumed prior to relative movement of the carriers to effect the splitting operation.

Other objects include the way in which fluid pressure means, including a plurality of pistons and cylinders are utilized for mounting the chisels; the way in which manifolds are employed to equalize fluid pressure directed to the cylinders of the chisels; the way in which fluid means, including cylinders and pistons, are used to reciprocate one of the carriers; the way in which valve means is provided in the manifolds for controlling the flow of fluid pressure to the cylinders of the chisels; the manner of providing controls for the valves and many more important details of construction, all of which will be made clear as the following specification progresses.

In the drawings:

Figure 1 is a side elevational view of a stone splitting press made pursuant to my present invention, parts being broken away and in section to reveal details of construction.

Fig. 2 is a vertical, schematic, cross-sectional view showing the various parts of the machine in a position for receiving a stone to be split.

Fig. 3 is a view similar to Fig. 2 illustrating the various positions of the parts of the machine immediately prior to applying pressure to one of the carriers to effect the splitting operation.

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Fig. 4 is a fragmentary, side elevational view similar to Fig. 1 illustrating the way in which the chisels conform to the unevenness of the stone when the chisels are initially moved into engagement therewith.

Fig. 5 is an enlarged, detailed, cross-sectional view taken on line V—V of Fig. 1.

Fig. 6 is a cross-sectional view similar to Fig. 5 illustrating the position of the valve for the uppermost manifold when fluid is being directed to the cylinders for the upper series of chisels; and

Fig. 7 is a cross-sectional view showing a modified form of valve arrangement, said view being similar to Figs. 5 and 6.

As shown in Figs. 1 to 4 inclusive, the stone splitting press forming the subject matter of this invention contemplates the use of an uppermost, horizontally aligned series of chisels 10 and an opposed, horizontally aligned series of lowermost chisels 12 mounted on carriers 14 and 16 respectively, the former of which is mounted for reciprocation toward and away from the carrier 16.

The carrier 14 includes a pair of spaced, elongated plates 18 and 20 having a row of side-by-side cylinders 22 therebetween and secured rigidly thereto in any suitable manner. Each cylinder 22 is provided with a vertically reciprocable piston (not shown) and each of the chisels 10 is secured to one of the said pistons for vertical reciprocation therewith.

A pair of spaced, elongated frame members 24 and 26 at the uppermost end of the machine spanning the distance between end walls 28 and 30 and secured directly thereto, receive a number of cylinders 32 therebetween. The cylinders 32 secured rigidly to the frame members 24 and 26 are each provided with a vertically reciprocable piston (not shown) terminating in a stem 34 that is connected to block 36 between the plates 18 and 20 above the cylinders 22. The blocks 36 are rigidly attached to the plates 18 and 20 and it is thus seen that the carrier 14 is supported solely by the piston stems 34. Suitable guides 38 on the inner faces of the walls 28 and 30 may be provided to limit the carrier 14 to vertical reciprocation when power is applied to the pistons within the cylinders 32.

A plate 40 spanning the distance between the walls 28 and 30 and secured thereto, depends from a horizontal platform 42 and forms a part of the carrier 16. A plurality of cylinders 44 are rigidly secured to a pair of plates 46 and 48 therebetween and in turn attached rigidly to the walls 28 and 30 and to the plate 40. Each cylinder 44 is provided with a vertically reciprocable piston (not shown) to which are attached the lowermost chisels 12.

An elongated, tubular manifold 50, common to the cylinders 22 and carried by the walls 28 and 30 by means of brackets 52, has connection with each of the cylinders 22 respectively, by a fluid pressure pipe 54. Similarly, brackets 56 on the walls 28 and 30 carry a tubular manifold 58 common to the cylinders 44 and coupled therewith by pipes 60.

Manifold 50 has a rotatable, tubular valve 62 therewith in (Figs. 5 and 6) provided with a port 64 for each pipe 54 respectively and registrable therewith when the valve 62 is rotated to the position shown in Fig. 6 of the drawings. A fluid inlet line 66 registers with the manifold 50 at one end thereof and a fluid outlet line 68 communicates with the manifold 50 at its opposite end (Fig. 1). Openings (not shown) similar to ports 64 and alternately registrable with the inlet and outlet lines 66 and 68, are provided in the valve 62.

A laterally extending arm 70 on the valve 62 is pivotally connected to a piston stem 72 connected with a piston (not shown) reciprocable within a cylinder 74 swingably mounted on a bracket 76 carried by the wall 28.

The manifold 58 is of the same character as manifold

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50 in that the same has a valve such as at 62 rotatable therewithin and provided with ports as at 64 registrable with the pipes 60. Manifold 58 has a fluid pressure inlet line 78 at one end thereof that is brought into communication with the manifold 58 on proper rotation of its valve through the medium of a laterally extending arm 80. A cylinder 82 swingable on a bracket 84 carried by the wall 28, has a reciprocable piston therein (not shown) provided with a stem 86 pivotally connected to the arm 80.

The frame member 24 has a pair of cylinders 88 secured thereto, each of which is provided with a vertically reciprocable piston (not shown) terminating in stems 90. Elongated arms 92 depending from the stems 90 and pivotally connected thereto are pivotally joined to bars 94 swingable on walls 28 and 30 respectively. An elongated bar 96 beneath the platform 42 is provided with stops 98 extending upwardly through the platform 42. Bar 96 has pivotal connection at the ends thereof with the two bars 94 by means of links 99.

A stone block 100, shown in Figs. 3 and 4, to be split through use of the machine now being described, may be moved to a position between the chisels 10 and 12 by use of a flexible roller conveyor 102 which is supported at its innermost end by a platform 104. Platform 104 is carried by the walls 28 and 30 therebetween for vertical reciprocation through use of guides 106 and is in turn supported by arms 108 depending therefrom and pivotally interconnecting the platform 104 and the bars 94.

The fluid pressure system for the cylinders 22, 32, 44, 74, 82 and 88 includes a fluid supply reservoir 110 (Fig. 1), a pump 112 having its inlet connected with the reservoir 110 by pipe 114 and means for operating the pump 112 which includes a prime mover (not shown) operably coupled with shaft 116 for the fluid pump 112 by pulley and cable means 118. A primary line connected with the outlet of the pump 112 is designated in Figs. 1 to 3 inclusive by the numeral 120, and the line for return of fluid to the reservoir 110 is designated broadly by the numeral 122.

A 4-way valve 124 is interposed in the line 120 and a pressure relief valve 126 interconnects the lines 120 and 122 between the valve 124 and the pump 112. A second 4-way valve 128 is interposed in the line 122 and within a branch 130 from the line 120 and connecting therewith between the valves 124 and 126 and pump 112. A second pressure relief valve 132 interconnects the branch 130 and the line 122 between the reservoir 110 and the valve 128 and between the latter and the line 120.

When the valve 124 is positioned as shown in Fig. 2 of the drawings, fluid pressure developed by the pump 112, is directed through line 120 and valve 124, to the lowermost ends of cylinders 32 by way of conduit 134 coupled with manifold 136 and fluid emanating from the cylinders 32 is returned to the reservoir 110 by way of line 122, through the medium of conduits 138 interconnecting the upper ends of the cylinders 32 by way of manifold 140 with the line 122 through valve 124. When the carrier 14 is thus raised to the uppermost end of its path of travel and so held by pressure in the conduit 134, fluid flowing in the line 120 and emanating from the pump 112, returns to the reservoir 110 by way of valve 126 and line 122.

When valve 128 is positioned as shown in Fig. 2 of the drawings, fluid from the branch 130 is directed to the uppermost end of cylinder 74 by conduit 142, to the uppermost end of cylinder 82 by a branch 144 coupling with conduit 142 and to the uppermost ends of cylinders 88 by branches 146, one only of which is shown in Figs. 2 and 3 and coupling with the conduit 142.

The outlet 66 for the manifold 50 couples directly with the line 122 when valve 128 is positioned as shown in Fig. 2, and cylinders 88, 74 and 82 are evacuated of fluid by means of branches 148, 150 and 152 respectively, all coupled with the outlet line 66. The fluid pressure in the

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branch 130 therefore, holds the platform 104 and the bar 96 normally at the lowermost ends of their paths of travel and holds the valve 62, as well as the valve in manifold 58, normally closed with respect to pipes 54 and 60 respectively and also holds the valve 62 so as to normally close the ports of valve 62 which are registrable with inlet pipe 66 and outlet pipe 68.

After the pistons of cylinders 88, 74 and 82 reach the innermost ends of their paths of travel and the valve 62, as well as the valve in manifold 58, close by virtue of the retraction of stems 72 and 86, fluid in line 120, which does not return to reservoir 110 by way of valve 126, passes to the line 122 and thence to the reservoir 110 from branch 130, past valve 132.

When the machine is to be placed in use to split the stone 100, the latter is moved on the conveyor 102 to the position shown in Fig. 3 of the drawings and valve 128 is positioned as shown in said Fig. 3. Fluid then flows from pump 112, through line 120, branch 130, pipe 66 and branches 150 and 152, to position the valve 62 as well as the valve within manifold 58, as shown in Fig. 6. Fluid then is also free to flow from the inlet pipe 66 into the manifold 50, as well as into the manifold 58 by way of line 78. This fluid is thereupon directed to the cylinders 22 and 44 by way of pipes 54 and 60 respectively, it being understood that the carrier 14 remains held at the uppermost end of its path of travel because of valve 124 still being positioned as shown in Fig. 2. Simultaneously, fluid is directed to the cylinders 88 by way of branches 148 to raise the arms 92 and, therefore, the bars 94. This projects the stops 98 as shown in Fig. 3 so as to limit the extent of inward movement of the stone block 100, and also raises the platform 104 to elevate the flexible conveyor 102 slightly and thereby present a firm support for the stone block 100.

Fluid emanating from the cylinders 88, returns to the reservoir 110 by way of branches 146, conduit 142, valve 128 and line 122. Fluid from the upper ends of cylinders 74 and 82 returns to the line 122 by way of conduit 142 and branch 144, through valve 128.

By virtue of the fact that equalized pressure is applied to all of the cylinders 22 and 44, all of the chisels 10 and 12 will come into firm engagement with the stone block 100 in the manner illustrated by Fig. 4 of the drawings, and as soon as the chisels 10 and 12 press tightly against the stone 100, any excess fluid pressure produced by the pump 120 will flow from the manifold 50, through outlet 68, thence to conduit 142 and to the line 122 by way of valve 128. It is understood that sufficient fluid pressure is produced by the pump 112, that the same will also by-pass to the line 122 by way of valves 126 and 132 when the chisels 10 and 12 are initially held tightly against the block 100, and while the carrier 14 is being held at the uppermost end of its path of travel.

The operator thereupon manipulates the valve 128 to reposition the same as shown in Fig. 2 so that the arms 70 and 80 are swung downwardly and the fluid within the pipes 54 and 60, as well as within the cylinders 22 and 44, will be trapped, preventing upward movement of the chisels 10 and downward movement of the chisels 12.

The next step is manipulation of the valve 124 so as to couple conduit 138 with line 120, and conduit 134 with line 122. Fluid at the lowermost ends of the cylinders 32 is evacuated to the reservoir 110 and the pump 112 forces fluid pressure into the cylinders 32 at the uppermost ends thereof. This moves the entire carrier 14 downwardly while the chisels 10 and 12 are locked against movement away from each other and sufficient force is applied to the carrier 14 to cause the block 100 to split along a plane extending between the lowermost series of chisels 12 and the uppermost series of chisels 10. Return of the valve 124 to the position shown in Figs. 2 and 3, raises the carrier 14 so that the innermost section of the block 100 may be removed along platform 42 and

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so that the block 100 may be shifted inwardly on the conveyor 102 to a position for further sub-division thereof.

In Fig. 7 of the drawings there is shown a modified rotatable control 262 within manifold 250, comparable to valve 62 in manifold 50, and cut away to present a flat face 264 extending throughout the length thereof along manifold 250.

Each pipe 254 respectively (which connect with corresponding cylinders 22) is coupled with the manifold 250 by a hollow valve body 269 that is in turn screw-threaded on a radial coupling 251 communicating with manifold 250.

A spring 271 in body 269 yieldably biases ball valve 267 toward a seat 273 formed in coupling 253, and holds a floating pin 265 biased against control 262. Pin 262, which is held between ball valve 267 and control 262 by spring 271, is polygonal in cross section for flow of fluid through cylindrical bore 253 of coupling 251 when valve 262 is unseated.

Thus, when control 262 is in the position shown in Fig. 7, it holds valves 267 open for flow of the fluid of manifold 250 toward or from the cylinders 22. After fluid is directed into cylinders 22 to force the pistons thereof downwardly and hold the chisels 10 against the block 100, control 262 is rotated to turn the flat face over the bores 253. The pin 262 is then free to move upwardly and the valves 267 are seated by the action of springs 271. Any tendency for chisels 10 to move upwardly will only increase the pressure in cylinders 22 above their pistons, in pipes 254, and in bodies 269 to seal the valves 267 even tighter against their seats 273. There can be no escape of fluid from the cylinders 22 back into the manifold 250 until control 262 is again rotated to the position shown for unseating valves 267.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a stone splitting press, a frame; a single hydraulic pressure unit; a pair of opposed series of chisels adapted to receive a stone therebetween; a carrier on the frame for each series respectively; a vertical cylinder for each chisel respectively, each cylinder being mounted on a corresponding carrier and having a reciprocable piston therein, the chisels being rigidly secured to their respective pistons for vertical reciprocable movement relative to each other and relative to the carriers toward and away from the stone; a manifold for each carrier respectively having a plurality of openings, there being a pipe connected to each cylinder respectively and communicating with a corresponding opening in the respective manifold; conduit means interconnecting said unit and the manifolds for directing fluid under pressure to the manifolds for moving the chisels against the stone with substantially equal force whereby all of the chisels engage the stone notwithstanding unevenness of the latter; a valve in each manifold respectively and

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rotatable to and from a position closing all of the openings whereby the chisels are locked against the stone; mechanism connected to each of said valves respectively for rotating the same, said mechanism being coupled with said conduit means for actuation by the fluid upon reversal of the direction of flow of the fluid through said conduit means; valve means in said conduit means for reversing the direction of flow of fluid therethrough; means mounting one of the carriers on the frame for reciprocable movement toward and away from the other carrier; and hydraulic structure carried by the frame and coupled with said unit, said structure being connected with said one carrier for moving the latter and the chisels carried thereby toward said other carrier, while the chisels are locked, whereby to split the stone along a plane between one series of chisels and the other series thereof.

2. In a stone splitting press as set forth in claim 1 wherein said valves in the manifolds each include a hollow, rotatable, tubular element having a port registrable with each of the corresponding openings respectively for controlling the flow of fluid to and from the respective cylinders upon rotation of said elements.

3. In a stone splitting apparatus as set forth in claim 1 wherein said valves in the manifold each include an elongated, rotatable element having a longitudinally-extending flat portion; a radial, hollow valve body coupling each of said pipes to the corresponding manifold in communication therewith, each body having a seat, a ball valve, a spring normally biasing the ball valve toward the seat, and an elongated pin, said pins engaging the corresponding elements and their ball valves to normally hold the latter out of engagement with their seats, whereby when the elements are rotated and the pins engage said flat portions, the ball valves engage the seats to interrupt flow of liquid to the cylinders.

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