(No Model.) 2 Sheets—Sheet 1.

A. BALL.

STONE CHANNELING MACHINE.

No. 541,221. Patented June 18, 1895.

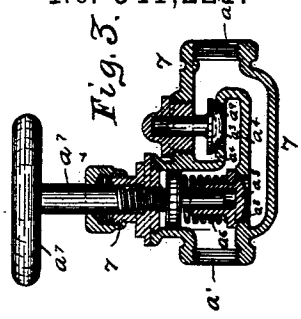

Fig. 3.

Fig. 1.

Witnesses:
L. de B. Little
Robt. C. Totten

Inventor.
Albert Ball
By Kay & Totten
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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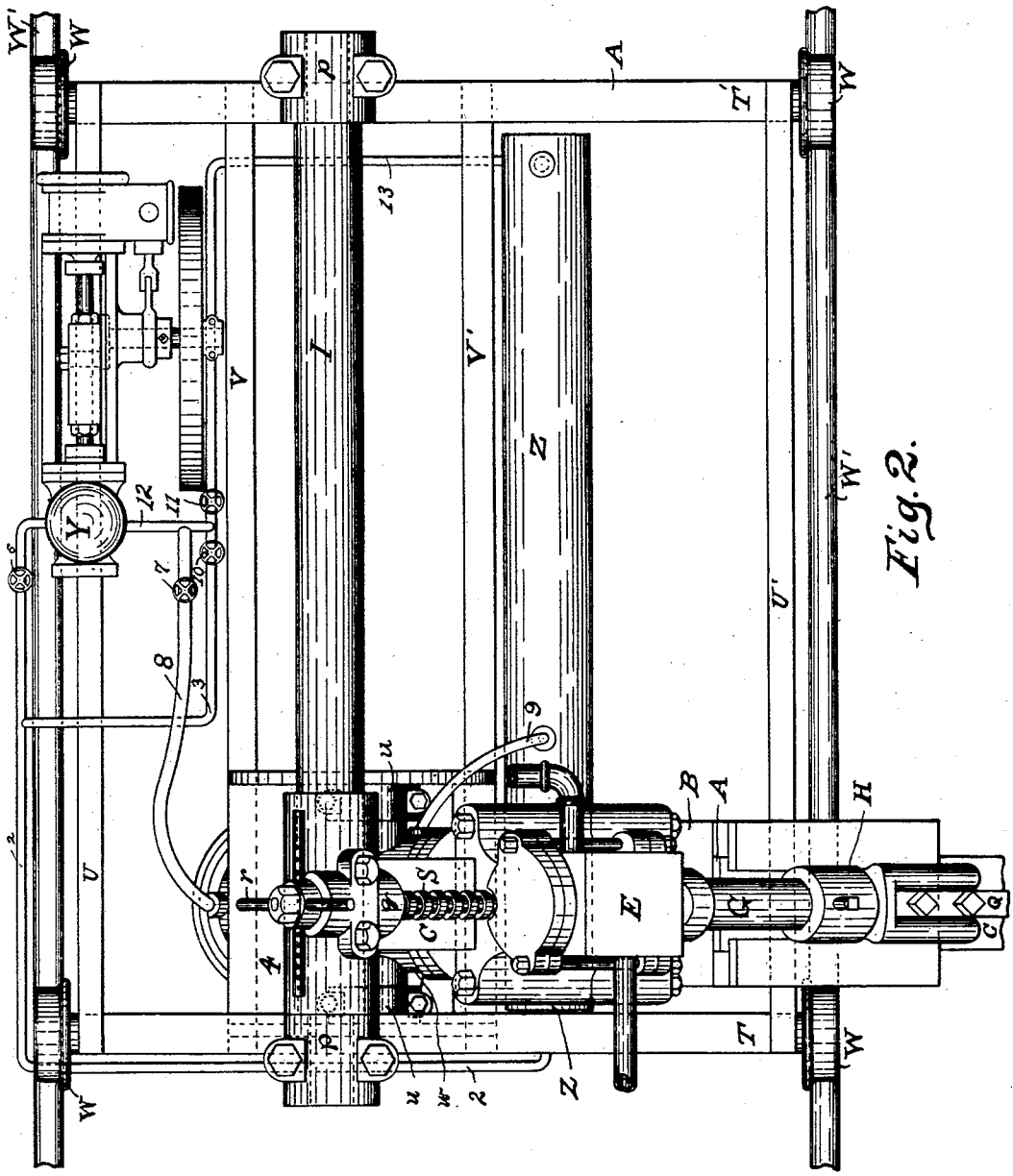

Fig. 2.

Witnesses:
L. McB. Poole
Robert. C. Fetten

Inventor:
Albert Ball.
By Kay & Totten
Attorneys.

UNITED STATES PATENT OFFICE.

ALBERT BALL, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO THE SULLIVAN MACHINERY COMPANY, OF SAME PLACE AND CHICAGO, ILLINOIS.

STONE-CHANNELING MACHINE.

SPECIFICATION forming part of Letters Patent No. 541,221, dated June 18, 1895.

Application filed December 14, 1892. Serial No. 455,189. (No model.)

To all whom it may concern:

Be it known that I, ALBERT BALL, a resident of Claremont, in the county of Sullivan and State of New Hampshire, have invented a new and useful Improvement in Stone-Channeling Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to machines for channeling stone, its object being to provide a machine for channeling the stone vertically at right angles to the movement of the machine; that is, to cut vertical channels in the vertical wall of a quarry.

The channeling machines heretofore employed have been arranged to cut vertical or inclined channels in the floor or wall of the quarry in a plane parallel to the line of track upon which the machine rests or travels.

In stone quarrying it is often desirable to cut a channel at right angles to the travel of the machine in the vertical face or breast of the quarry, and the present machine is adapted for that purpose.

The machine comprises, generally stated, a traveling frame, a vertically moving, or swinging, frame thereon and carrying channeling mechanism, and means for imparting a reciprocating motion to such vertically moving frame; the preferred means for accomplishing this result being a frame mounted in bearings on the main frame and swinging thereon, and reciprocated by means of a hydraulic cylinder, suitable valve devices for operating the same being provided.

The particular points of invention desired to be covered will be hereinafter particularly described and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is an end view of the wall-channeling machine. Fig. 2 is a top view of the same, and Fig. 3 is a view of the valve employed for controlling the movement of the hydraulic cylinder.

Like letters and figures of reference indicate like parts in each view.

The main frame A is composed of the end portions T T′ which are preferably triangular in shape and are provided with bearings at the upper ends for the support of the rock shaft, I, said end portions being connected by the outer longitudinal beams U U′ and the inner longitudinal beams V V′. The main frame is mounted on the wheels W which travel on the tracks W′ upon the floor of the quarry. The swinging frame C is secured to the rock shaft I mounted in the bearings *p*, the swinging frame being clamped to said rock shaft and being connected to the piston rod X of the hydraulic cylinder *w* by means of the bearing *n*, said cylinder *w* being mounted in the cylinder frame *u* by the trunnions *t*; the cylinder frame *u* resting upon the inner longitudinal beams V V′ and being adapted to slide thereon, as is the swinging frame C upon the rock shaft, so as to bring the swinging frame to either end of the main frame, according to the position in which it is desired to make the cut. The swinging frame carries the cylinder E and the traveling guide B, the piston rod G of the cylinder being connected to the combined cross head and clamp H which carries the gang of drills Q, the gang of drills being secured in the clamp by any suitable means.

I have illustrated the device in connection with the traveling guide B which moves with the cylinder in the main guides upon the swinging frame, this being the preferred construction, and such traveling guide and its connections being described in Letters Patent granted to me August 22, 1893, No. 503,691. The clamp shown also forms the subject matter of an application filed by me on the 14th day of December, 1892, Serial No. 455,190. A detail construction of such guide and the clamp for holding the drills is therefore not considered necessary. The cylinder is moved upon the swinging frame by means of the feeding screw S which is operated by the hand wheel *r*.

In order to support the drills at the forward ends of the machines, both during the operation of channeling and during the time when the drills are being secured in or removed from the clamp H, I provide the rest 14 which extends under the drills in front of the guide B and is provided with an extension 16, shown in dotted lines, fitting within

a seat in the swinging frame, the rest extending up in line with the drills and giving support thereto. This extension 16 is secured within this seat by means of the strap 15 and by suitable bolts, and it can be adjusted longitudinally in its seat according to the position of the drills, or longer rests may be substituted for the rest employed with the shortest drills, as drills of different lengths are secured in the clamp. The rest 14 is of no greater width than the drills, and such rest can therefore be arranged to extend within the channel cut by the drills and give support to the same some distance from the point where they are connected to the clamp H.

In order to operate the swinging frame, it is necessary to provide mechanism which will move the same at a practically uniform speed, both in the upward and downward stroke of the swinging frame, so as to provide for the cutting of the channel during both movements of the frame, and such mechanism can of course be operated by suitable gearing; but gearing connections have the disadvantage of difficulty in changing the speed, and though such gearing devices would be included in my invention, where they are the equivalent of the device described, yet I prefer to employ the hydraulic mechanism shown. For this purpose I employ the reservoir Z, for oil or other suitable fluid, and the pump Y, the reservoir Z having flexible hose or like connection 9 leading to the upper part of the hydraulic cylinder *w* above the piston. The reservoir has also the suction pipe 2 leading to the feeding end of the pump Y, and the pipe 12 is connected to the discharge end of the pump, while the by-pass or return pipe 3 leads from the pipe 12 back to the suction pipe 2, the return pipe 3 having the valve 10 therein. Leading from the discharge pipe 12 to the reservoir Z is the pipe 13 in which is located the regulating valve 11 to regulate the pressure brought upon the piston within the hydraulic cylinder, as hereinafter described. Extending from the pipe 12 is the pipe 8, part of which is made flexible, such as by a hose connection, and which leads to the hydraulic cylinder directly below the piston, or indirectly, such as through the trunnion, for supplying the fluid under pressure thereto. In this pipe is located the regulating valve 7 for the purposes hereinafter described. The suction pipe 2 has also the globe valve 6 for closing communication between such pipe and the pump.

The construction of the regulating valve 7 is shown in Fig. 3, the valve having the body portion *a*, the entrance port *a'*, the discharge port a^2, the check valve a^3 in the diaphragm a^4, and the pressure regulating valve a^5 in the same diaphragm, said valve having the spring a^6, the pressure of which is controlled by the handle a^7. The diaphragm a^4 within the valve is U-shaped in form and has the two openings a^8 a^9, the pressure valve a^5 being seated in the opening a^8, while the check valve a^3 is seated in the opening a^9. By such construction it will be seen that the liquid under pressure entering through the opening *a'* will flow past the regulating valve a^5 and lift the check valve and pass freely through the opening a^9, such being the course of the liquid flowing from the pipe 12 through the pipe 8 to the hydraulic cylinder; but when the liquid flows back from the cylinder it will close the check valve a^3 and can only pass through the valve by raising the regulating valve a^5, and this valve can be regulated by compression of its spring a^6 so as to exert the necessary force for regulating the descent of the piston within the cylinder. The valve 11 is a simple pressure regulating valve which is set to regulate the pressure of the liquid flowing into the reservoir, but which prevents the liquid flowing back from the reservoir into the pipe 12.

As the apparatus is so arranged, the valve 11 is so set as to give the necessary pressure upon the piston within the cylinder when the swinging frame is raised, and the valve 7 is so set as to regulate the pressure of the fluid passing from the cylinder as the swinging frame is lowered. Suitable steam or air connections are made with the pump Y and with the steam cylinder E, and the pump is set in operation, the valve 10 in the pipe 3 being open. The cylinder E is drawn back until it bears against the shoulder *q'* in the frame and the valve 10 is closed sufficiently to cause the raising of the swing frame C to a horizontal position, that is, to such position as forms the shortest line between the rock shaft I and the face to be cut. The swinging frame C is then operated through the hydraulic cylinder *w* so as to cause the drills to travel in an arc-course cutting above and below the point at which they start, the swinging action being given by the hydraulic mechanism above described. It is evident that to channel the rock successfully, this swinging movement of the frame must be steady, uniform and equal, and while the upward movement can be regulated for this purpose, the weight of the frame and the parts carried thereon has a tendency to accelerate the downward rate of travel. It is also extremely desirable to operate the pump at a uniform speed or pressure so as to relieve the operator from any care as to the pressure maintained by the pump. It is to accomplish this result that the valve mechanism shown is employed. The regulating valve 11 in the pipe 13 leading from the pipe 12 to the reservoir is set so that it exerts such pressure as to force the oil or other liquid through the pipe or hose 8 and the check valve a^3 into the hydraulic cylinder in such regulated quantity as to move the swinging frame at the proper speed for the upward channeling action, any surplus liquid from the pump passing through the valve 11 back into the reservoir. This is continued until the swinging frame reaches its highest point of movement, when the operator opens the valve 10 in the by-pass pipe

3 and the liquid discharged by the pump then flows around through such by-pass into the suction pipe 2, the pressure upon the cylinder being thus relieved, and the liquid passing from the cylinder flowing through the by-pass into the suction pipe. The weight of the swinging frame will, of course, cause the piston within the hydraulic cylinder to descend and the oil flows back through the pipe or hose 8 to the valve 7. Its only escape through such valve is through the opening a^8 controlled by the regulating valve a^5, as the pressure upon the check valve a^3 closes that means of escape. This regulating valve a^5 is set to permit the passage of oil at such rate of speed as to properly regulate the lowering action of the swinging frame and drills, the result being that the upward movement of the swinging frame is regulated by the valve 11, while the downward movement thereof is regulated by the valve 7. As the movement of the swinging frame is thus regulated by the valves which can be set by the operator, his only duty, so far as the movement of the frame is concerned, is to open and close the valve 10 so as to impart the upward or downward movement to the swinging frame. For the operation of the entire machine the only further duty is the feeding forward of the cylinder E and the clamp and gang of drills connected thereto by turning the feeding screw S. The operation of vertical channeling is continued by the swinging of the frame above and below its rock shaft or point of pivoting, until the cylinder E and the drills are fed out for the full distance of their movement, when it is necessary for the operator to insert a longer set of drills, and the operation may then be repeated. To insert the longer set of drills, the swinging frame is raised to a horizontal position, the clamp H opened and drills Q removed, the rest 14 giving support to the drills and holding them in line both when the old set is removed and the new set inserted. In case the gang of drills is of such length as to require a longer rest 14, that is, a rest which would extend farther out from the swinging frame, such rest will be secured in place before the gang of drills and will act to hold them in line while they are being secured within the clamp. The channeling is then continued as before, the valves 7 and 11 being again set or regulated in case the speed of the swinging frame is to be reduced as the length of the cut is increased. During the entire channeling operation the rest 14 will, if necessary, pass within the channel cut and give support to the drills within such channel, so relieving the clamp from the heavy strain of supporting the drills against their natural downward movement and providing a guide for the drills within the channel cut and some distance in front of the point of connection thereof to the clamp.

In case it is desired to cut a channel at the corner of the quarry opposite to that part of the machine where the swinging frame is mounted, the swinging frame can be loosened from the rock shaft and the swinging frame and hydraulic cylinder moved on the rock shaft, and on the longitudinal beams V V′, to the other end of the main frame, the flexible or hose connections of the different parts permitting such movement. For ordinary channeling at different points along a breast or wall of considerable length, the swinging frame may be secured about at the center of the main frame so as to distribute the strain evenly throughout the main frame.

I am thus enabled to provide a vertical channeling machine which can cut vertical channels in the walls of the quarry at any point desired; which is simple in construction; and the operation of which can be easily regulated as to the speed of movement of the frame carrrying the cutting mechanism, both in the upward and downward stroke thereof, and which requires only the opening and closing of the valve to reverse the movement of the swinging frame.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a main traveling frame, a swinging frame carrying suitable drilling mechanism, and mounted on and longitudinally movable along the main frame, and power operated reciprocating mechanism carried by the main frame and connected to the swinging frame, and acting to reciprocate the swinging frame in an ascending and descending course while the drilling mechanism is in operation, substantially as set forth.

2. The combination of a main traveling frame, a power operated ascending and descending frame adapted to reciprocate at right angles to and longitudinally movable on the main frame, said ascending and descending frame having a guideway thereon, and a reciprocating engine mounted on said guideway and carrying one or more drills, substantially as set forth.

3. The combination of a main frame having end bearings extending up therefrom, a horizontal rock shaft mounted on said end portions, a swinging frame mounted on said rock shaft, and cutting mechanism mounted on the swinging frame, said swinging frame having a bearing fitting around the rock shaft and adapted to slide thereon, and reciprocating mechanism carried by and longitudinally movable on the main frame, and connected to the swinging frame, substantially as set forth.

4. The combination of a main frame having end bearings extending up therefrom and longitudinal beams V V′, a rock shaft mounted on said end bearings, a swinging frame mounted on the rock shaft by means of a sleeve or bearing and carrying drilling mechanism, a hydraulic cylinder or like reciprocating mechanism connected to the swinging frame and mounted on the longitudinal beams V V′, said swinging frame and hydraulic cylinder being adapted to slide on their supports, substantially as set forth.

5. The combination of a main or traveling frame, an ascending and descending frame thereon carrying cutting mechanism, a hydraulic cylinder on the main frame and connected to the moving frame, a reservoir, a pump, and connections between the reservoir, pump, and hydraulic cylinder, and a pressure regulating valve in and controlling the connection from the cylinder to the reservoir, substantially as and for the purposes set forth.

6. The combination of a main or traveling frame, an ascending and descending frame, a hydraulic cylinder mounted on the main frame and connected to the moving frame, a pump, a reservoir, pipes leading from the reservoir to the suction and discharge openings of the pump, a pressure regulating valve in the discharge pipe from the pump, and a branch pipe or hose leading from the discharge pipe in the front of said pressure regulating valve to the hydraulic cylinder, said pipe having a pressure regulating valve, substantially as set forth.

7. The combination of a main or traveling frame, an ascending and descending frame, a hydraulic cylinder mounted on the main frame and connected to the moving frame, a pump, a reservoir, pipes leading from the reservoir to the suction and discharge openings of the pump, a branch pipe or hose leading from the discharge pipe to the hydraulic cylinder, said pipe having a valve case provided with a check valve and a pressure regulating valve, and a pressure regulating valve in the discharge pipe, substantially as set forth.

8. The combination of a main or traveling frame, an ascending and descending frame thereon, a hydraulic cylinder mounted on the main frame and connected to the moving frame, a pump, a reservoir, pipes leading from the reservoir to the suction and discharge openings of the pump, a branch pipe or hose leading from the discharge pipe in the front of said pressure regulating valve to the hydraulic cylinder, said pipe having a pressure regulating valve, and a by-passage pipe leading from the discharge pipe of the pump to the entrance or suction pipe thereof, said by-passage pipe having a valve, substantially as set forth.

In testimony whereof I, the said ALBERT BALL, have hereunto set my hand.

ALBERT BALL.

Witnesses:
GEO. O. BALL,
GEO. E. WOLCOTT.