No. 703,302. Patented June 24, 1902.

A. W. PRATT.

METHOD OF RAISING SHEETS OF STONE.

(Application filed Sept. 26, 1901.)

(No Model.)

Fig. 1.

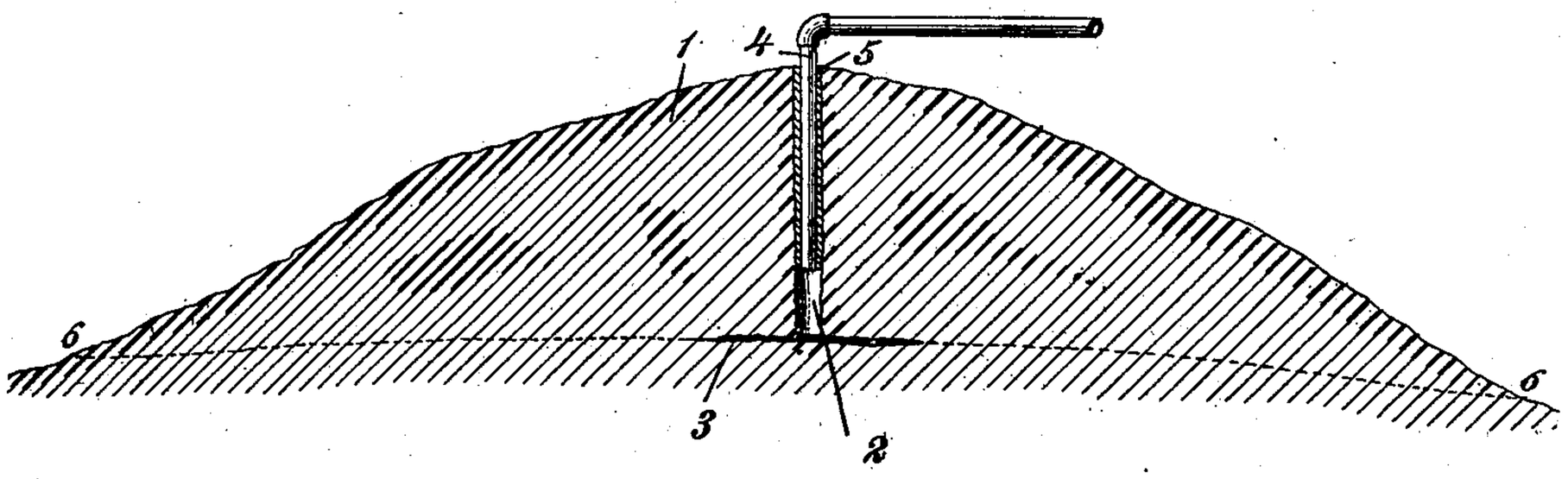
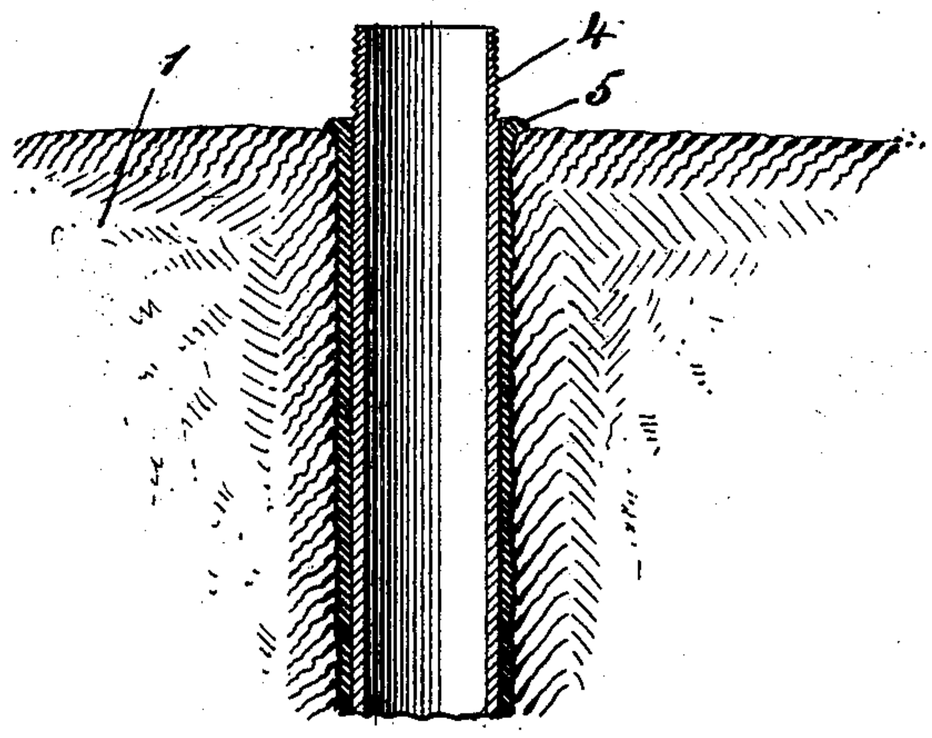


Fig. 2.



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METHOD OF RAISING SHEETS OF STONE.

SPECIFICATION forming part of Letters Patent No. 703,302, dated June 24, 1902.

Application filed September 26, 1901. Serial No. 76,657. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER WILLIAM PRATT, a subject of the King of Great Britain, and a resident of North Jay, in the county of Franklin and State of Maine, have invented a new and Improved Method of Raising Sheets of Stone, of which the following is a full, clear, and exact description.

My invention relates to an improved method of quarrying or raising sheets of stone from the mother ledge or solid mass where there is no natural bed or seam; and its object is to raise a sheet of stone from the solid mass, said sheet to be of a required thickness and raised or separated without flaw or fracture and brought to an edge, so that it can be cut up into blocks or slabs of suitable dimensions for use in the erection of buildings, monuments, &c.

Where the rock is one solid mass with no bed or seam, the usual method of raising sheets of stone for quarrying is to start a rift or seam by drilling a hole the depth of the sheet required, putting a small quantity of some high explosive at the bottom of the hole, and tamping with stone-dust or the like so hard that when the explosion takes place there will be a bed-seam started from the bottom of the hole at right angles to its axis. This is followed by continued blasting to extend the bed-seam as far as possible, after which the heat of summer is allowed to work on it and still further extend the rift or seam. The hole may not, however, in all cases be perpendicular, but may slant more or less, and the bed-seam may not in all cases start exactly at right angles to its axis, and the bed-seam may start at a point a few inches up the hole and not exactly the bottom of the hole.

I propose to raise a sheet of stone in an improved manner, which possesses numerous advantages over the old method.

In carrying my invention into practice I first proceed to drill a hole perpendicular in the rock, the depth of the hole being equal to the desired thickness of the sheet of stone which it is required to raise from the solid rock. The next step is the initial formation of a bed-seam at the bottom of the hole and at right angles to its axis. This is carried out by placing a small quantity of explosive at the bottom of the hole and tamping the latter in any suitable way, preferably by the employment of stone-dust, such tamping being so solid and hard that it cannot be blown out. The charge of explosive is then exploded, and the bed-seam is started by the disruptive force of the explosion. The seam thus initially started at the bottom of the drilled hole may be extended by light charges of an explosive, and by using light charges I avoid fracturing of the rock, the object of this initial step being the extension of the bed-seam over a great area. After the bed-seam has been started sufficiently the explosive is discarded, and connection is made to the drilled hole, and pressure is maintained in the bed-seam by the operation of a hydraulic pump, an air-compressor, or some other suitable means of maintaining fluid-pressure in the bed-seam. It will be understood that this fluid-pressure is maintained steadily in the seam, and this bed-seam is gradually extended in all directions until it makes out or emerges at the surface of the stone, thus ending the operation.

It will be seen that by my process the sheet of stone is separated from the solid rock without flaw or fracture in the sheet, such a sheet being very valuable.

The advantage of my method of using the disruptive force of an explosive charge and subsequently applying fluid-pressure to the initial bed-seam started by the explosive is that by using charges of explosive as described the bed-seam is started at the depth required and in the direction that will give the greatest possible area of stone, the direction of the bed-seam being substantially parallel with the surface. Furthermore, by using light charges of the explosive the rock or stone is not fractured around the drilled hole and the bed-seam is extended in a straight line and at right angles to the hole, whereas if a heavy charge of explosive is employed the bed-seam will have a tendency to incline toward the surface.

The starting of the seam is an all-important feature of the process, because I have found that if the seam is forced too rapidly by heavy charges of the explosive it will have

a tendency to run in an inclined direction; but by starting the bed-seam as described the application of the fluid-pressure has an enormous lifting effect, the whole area of the seam receiving an equal pressure that has the effect of extending the seam evenly and without damage of flaw or fracture to the sheet of stone. By obtaining a large area of the bed-seam before applying the fluid-pressure it is possible to use a low-pressure fluid, and in some instances I may employ compressed air, which is often desirable when a compressed-air plant is employed in or about the quarry.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both figures.

Figure 1 represents a vertical section through a ledge of solid rock which is to be operated upon by my improved method to form a bed-seam, and Fig. 2 is an enlarged view of the parts shown in Fig. 1 and illustrating the means used by me in forming a tight connection between the fluid-carrying pipe and the hole in the rock.

1 represents the rock, 2 the hole which has been drilled therein, and 3 a rift or seam in the rock which has been started therein by means of an explosive.

4 is a pipe which is to be connected to a pump by means of which water, air, or other fluid may be forced into the hole 2 and rift 3 under a suitable pressure. In order to secure a tight connection between the pipe 4 and the hole in the rock, which will prevent any leakage of the fluid, a pipe 5, of lead or other soft metal, is inserted in the hole 2, and the pipe 4, whose external diameter is somewhat greater than the internal diameter of the pipe 5, is driven into the latter pipe, thereby expanding the same and causing it to bear tightly against all portions and irregularities of the walls of the hole 2. Fluid-pressure is then applied through the pipe 4 and hole 2 to the seam 3, and the rock above the seam 3 is thereby subjected to an enormous lifting power, which expands the bed-seam. By continuing this process a sufficient length of time the bed-seam will sooner or later approach the surface, whence the water, air, or other fluid will escape. In Fig. 1 dotted line 6 6 represents a bed-seam which has been formed according to this method and which extends entirely to the outer surface of the rock.

It is obvious that a few square feet of bed-seam operated upon by a considerable fluid-pressure will subject the rock surrounding the seam to an enormous stress, and thereby rend the rock and lift that portion which is above the seam. The lifting power increases as the area of the bed-seam increases and as the pressure applied at the hole increases. The starting of bed-seams by an explosive is the usual procedure; but in my method this is resorted to in order to give a surface sufficient when a pressure is applied thereto to rend the rock. According to the old method the bed-seam was started by explosives and extended by a repetition of this means. According to my method, however, it is only necessary to start a bed-seam a few feet around the hole, which is generally done with one charge, whereupon the fluid-pressure is applied in the manner described, and a large area of stone may be rifted from the solid mass.

My invention possesses numerous advantages. It requires but little blasting and is therefore less dangerous. There are no flaws started, as is usually the case with continued blasting. The seam is bound to come to the surface of the rock at some point, which is very advantageous in quarrying stone, as it gives an opening at which to start work on the sheet, whereas a bed-seam which does not extend to the surface necessitates considerable expense and labor in making an opening. All bed-seams formed according to my method come to the surface, as the direction taken by the seam is never exactly parallel to the curvature of the surface of the rock, but is more nearly horizontal, and therefore they are bound to meet. According to the old method of raising stone by continued blasting the bottom of the hole or the rock within a few inches of it received the full force of the explosion, and the further the seam extended from the hole the less effect the explosive would have at the farthest portions of the seam. According to my method all portions of the seam receive an equal pressure and the rock is rifted and raised without any danger of fracture. The time required to raise a sheet by my method is a great deal less than according to the old method, which allows the heat of summer to work on the stone and, together with the blasting force of explosives, gradually raise the sheet, thereby consuming considerable time. According to my invention the sheet can be raised very speedily, and the greater the pressure at the hole the quicker the bed-seam will be made.

There are important advantages secured by my method of fracturing rock, which consists, first, in initially starting a bed-seam by an explosive blast, and, secondly, extending the bed-seam by fluid-pressure. The first step in the process by exploding a blast produces a bed-seam of quite an area in practically all directions from the drilled hole, the area of the bed-seam extending radially ten feet or more from the hole, and this secures a great purchase in the mass of rock for the pressure fluid. I have found by extensive experience that it is practically impossible to start a bed-seam by fluid-pressure alone in some kinds of rocks—as, for example, in granite, to which my process is especially applicable—and I therefore find that it is necessary to initially start the bed-seam by the blast from an explosive charge in order to give the pur-

chase for the subsequently-employed fluid-pressure. I have also found that the initial blasting is advantageous in that it enables me to use fluid under a comparatively low pressure, owing to the lifting power which may be exerted by such low-pressure fluid, due to the large area of purchase in the bed-seam afforded by the initial blast of the explosive. This fluid-pressure may be easily obtained from an ordinary hydraulic pump or an air-compressor, thus obviating the employment of expensive machinery.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The method of raising a sheet of stone as herein described, consisting in drilling a hole to the depth necessary to secure the desired thickness of the sheet of stone to be raised; then initially starting a bed-seam in the rock by the explosion of a blasting charge, and subsequently extending the bed-seam by subjecting a strata or layer of the rock to fluid-pressure which is maintained in the initially-formed bed-seam, whereby said initial blast produces an enlarged area affording great purchase for the subsequently-effective fluid-pressure.

2. The method of raising a sheet of stone as herein described, which consists in drilling a hole in the rock; introducing a fluid-pressure pipe therein; sealing said hole around the pipe against the escape of fluid-pressure by interposing a soft-metal packing between the wall of the hole and the pipe; initially starting a bed-seam in the rock by the explosion of a blasting charge; and subsequently extending the bed-seam by introducing fluid-pressure through the pipe and into the initial bed-seam, as set forth.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDER WILLIAM PRATT.

Witnesses:
CYRUS N. BLANCHARD,
HERMAN SANBORN.