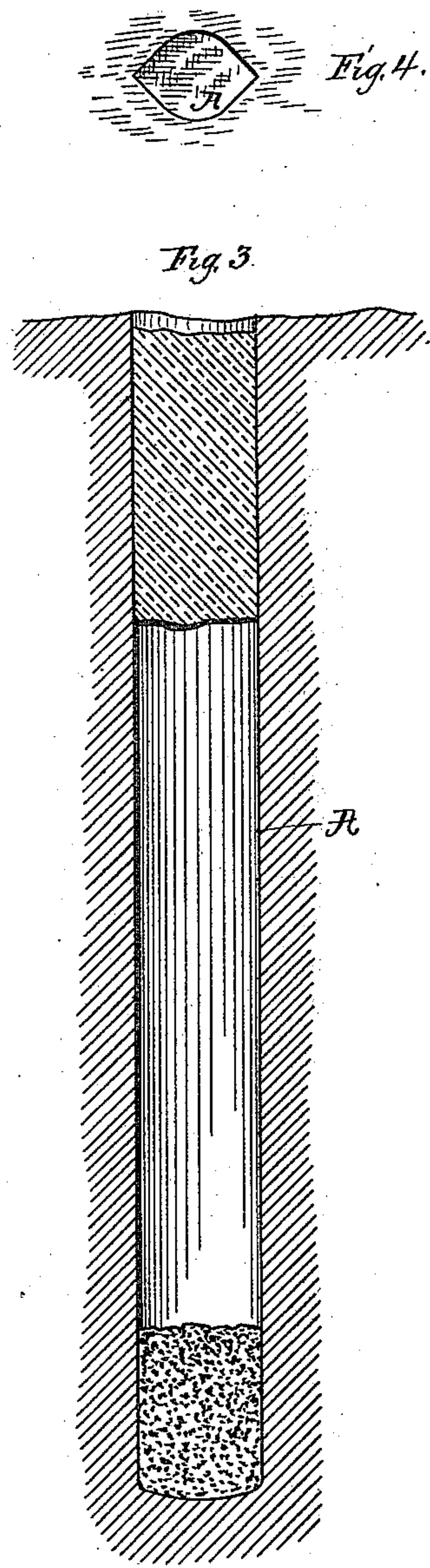
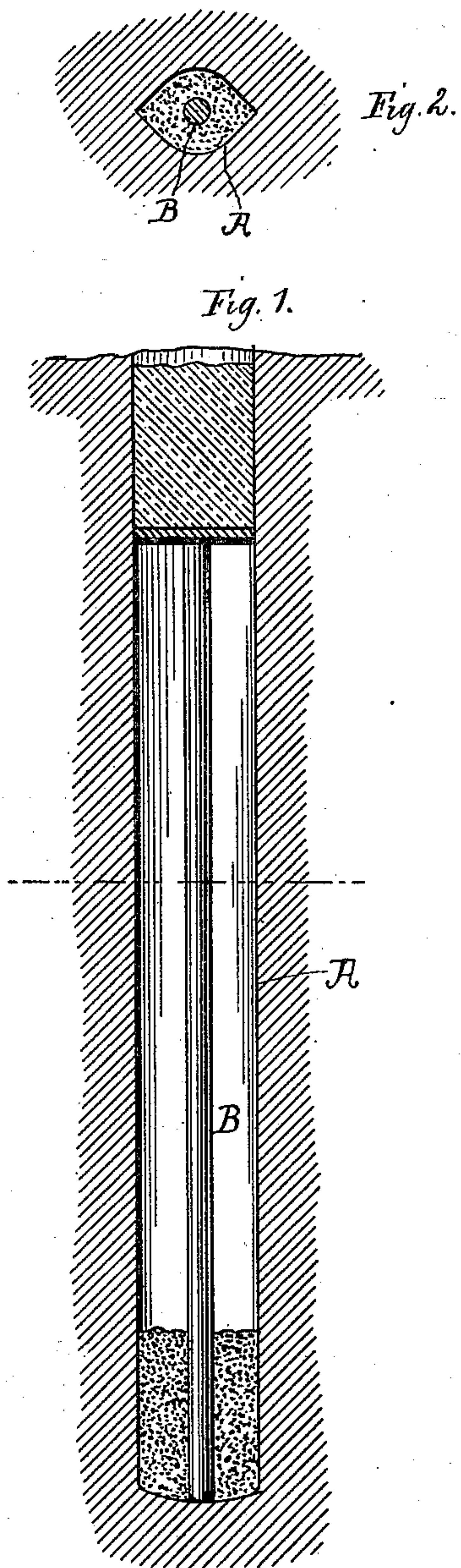


(No Model.)

J. L. L. KNOX.
METHOD OF BLASTING ROCK.

No. 465,410.

Patented Dec. 15, 1891.



Witnesses:
W. D. Thomas
Geo. Jones

Inventor
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UNITED STATES PATENT OFFICE.

JOHN L. L. KNOX, OF ALLEGHENY, PENNSYLVANIA.

METHOD OF BLASTING ROCK.

SPECIFICATION forming part of Letters Patent No. 465,410, dated December 15, 1891.

Application filed March 27, 1886. Serial No. 196,803. (No model.) Patented in Canada March 24, 1886, No. 23,627.

To all whom it may concern:

Be it known that I, JOHN L. L. KNOX, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Blasting Rock, of which the following is a full, clear, and exact description.

In the operation of blasting as now practiced much damage is done and many lives sacrificed by the flying fragments of rock or spalls. Many valuable quarries lying in the vicinity of cities are necessarily abandoned on account of danger to passers-by from said flying fragments.

It is the object of this invention to avoid these dangers and to blast the rock without throwing a single fragment.

The invention consists in arranging the tamping and explodent within a blast-hole having sides angled to regulate the line of cleavage, so that an equalizing air-chamber shall remain between the tamping and explodent, whereby when the charge is fired the force of the expanding gases is confined to a single line of cleavage and equalized and diffused throughout the length of the hole and its initial energy materially reduced.

In the drawings, Figure 1 represents a longitudinal section of a blast-hole in which a stick is employed, showing the manner of arranging the explodent and tamping. Fig. 2 is a top plan view of same. Fig. 3 is a longitudinal section of a hole in which the stick is dispensed with, the tamping being held in place in the ordinary manner. Fig. 4 is a top plan view of same.

Similar letters of reference indicate corresponding parts.

A is the blast-hole, in which equilateral oppositely-located grooves are formed by driving a hexagonal-faced reamer through it. If the hole be of considerable depth, so that ample space may be allowed for the tamping and but a small proportion of the total depth of the hole be occupied by same, I tamp in the ordinary manner, but in such position in the hole as to leave an air-space between the charge and tamping—that is to say, I first tamp loosely and gradually increase the force applied to the material used for tamping until the latter is securely fixed in place. This

tamping now occupies, perhaps, a fourth or less of the hole, the charge a still smaller space, and the space between the two is left vacant. If the hole be shallow, so that the space necessary for tamping in the ordinary manner would form a considerable proportion of the total depth of the same, I employ the stick B. (Shown in Fig. 1.) This stick is as slender as will serve to support the tamping, the latter being rammed hard directly upon its top. By the use of the stick I am enabled to tamp solidly within the limits of a few inches, thus leaving a large portion of the hole unoccupied. The charge is placed at the bottom of hole A and occupies but a small space. The gases evolved when the charge is exploded expand and fill the whole of hole A before exerting their full force upon the sides of the grooves. The expansive force of said gases is diminished by contact with the cold sides of the hole, by which it is partially condensed. Furthermore, said expansive force is equalized throughout the length of the grooves and confined in its effect, thus preventing any possibility of pulverizing or breaking into fragments any portion of the rock. The grooves in the hole enable the operator to produce the maximum practical effect with the minimum of powder, and the space between the powder and tamping enables the force of said minimum amount of powder to be diffused equally throughout the length of said grooves, thereby allowing for expansion of the gases, and thus weakening their primary rending effect. In other words, when the hole is charged, tamped, and fired according to my method the whole effect is confined to and equalized throughout the length of a plane bisecting the grooves. It is therefore a physical impossibility that any fragments or spalls can be disengaged and thrown from the main body of the rock. This result can be produced in no other manner known to the trade. If a grooved hole be used and the tamping driven directly upon the powder, the rock in the immediate vicinity of said powder is rent into fragments before the surrounding rock has had time to yield. If a cylindrical hole be used, whether the tamping be placed immediately upon the powder or not, the rock is split in innumerable directions and fragments must necessarily be thrown. The grooves and

the large space lying between the powder and tamping are essentially necessary to obtain a successful blast without throwing spalls or fragments.

5 In Letters Patent No. 291,606, issued to me the 8th day of January, A. D. 1884, a method of blasting rock was described and claimed in which a blast-hole having oppositely-located
10 equilateral grooves was employed. In Letters Patent No. 314,585, issued to me the 31st day of March, A. D. 1885, a method of blasting was described and claimed in which, in combination with a blast-hole having oppositely-located equilateral grooves, a tamp-rod
15 equal or nearly equal in diameter to the short diameter of the blast-hole was employed in order to distribute the powder as nearly as possible throughout the length of the grooves. I do not therefore claim, broadly, in this ap-
20 plication the use of a blast-hole having oppo-

sitely-located grooves, nor do I claim the use of the stick for holding the tamping, both of these features having been previously patented by me. Furthermore, I do not claim that it is broadly new to leave an unoccupied
25 space between the powder and the tamping; but—

What I do claim is—

An improvement in the art of blasting rock, which consists in forming a blast-hole with
30 oppositely-located grooves for directing the line of cleavage, charging the hole with an explosive charge, and applying to the hole a tamping separated from the explosive by an
35 equalizing air-chamber, substantially as and for the purposes described.

JNO. L. L. KNOX.

Witnesses:

LENOX SIMPSON,
W. D. THOMAS.