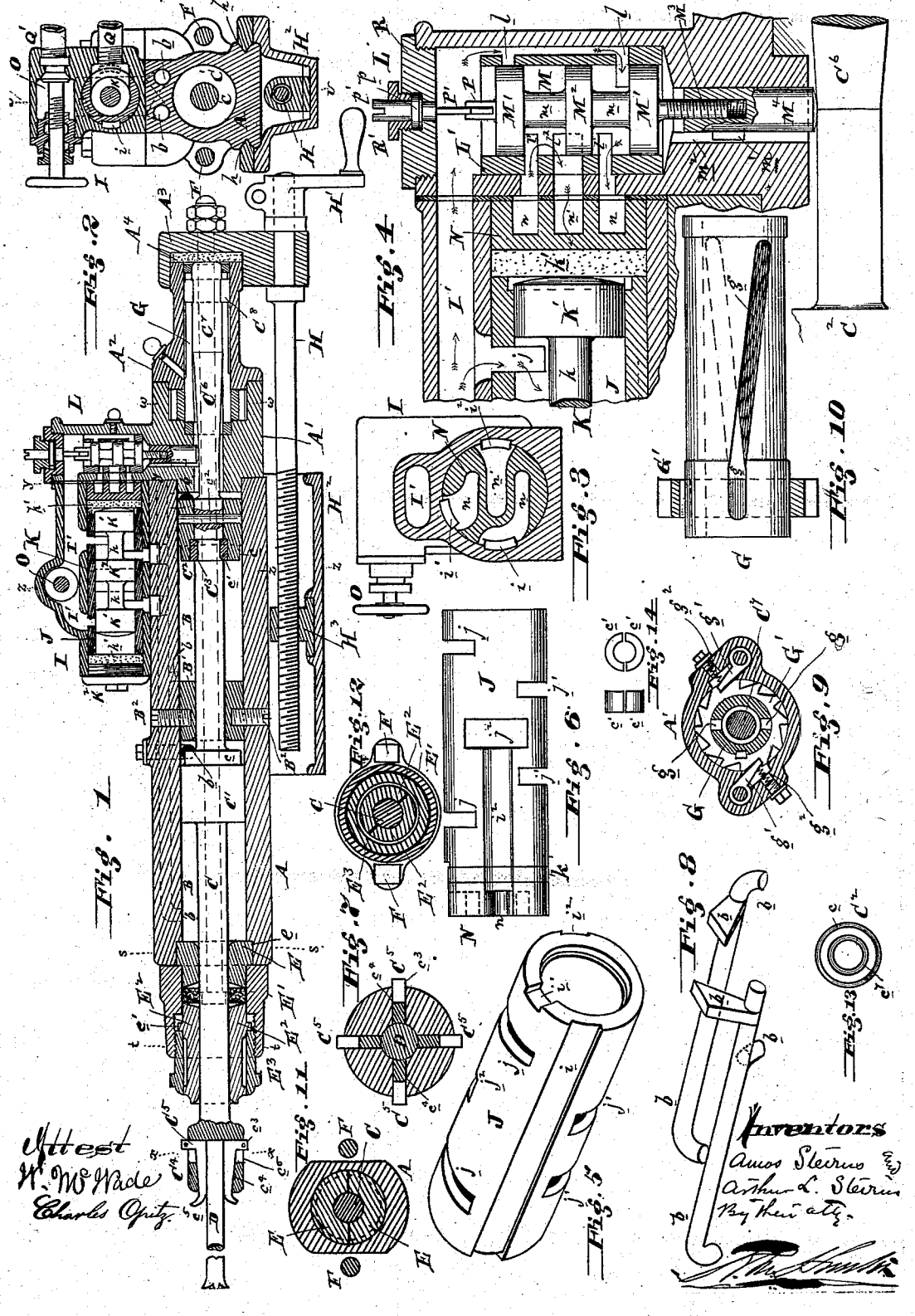
(No Model.)

A. & A. L. STEVENS.

STEAM ROCK DRILL.

No. 293,371. Patented Feb. 12, 1884.



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UNITED STATES PATENT OFFICE.

AMOS STEVENS AND ARTHUR L. STEVENS, OF PHILADELPHIA, PA.

STEAM ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 293,371, dated February 12, 1884.

Application filed June 27, 1883. (No model.)

To all whom it may concern:

Be it known that we, AMOS STEVENS and ARTHUR L. STEVENS, of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Steam Rock-Drills, of which the following is a specification.

Our invention has reference to steam rock-drills; and it consists in certain improvements fully set forth in the following specification, and shown in the accompanying drawings, which form part thereof.

In the drawings, Figure 1 is a sectional elevation of our improved steam rock-drill on line *v v*. Fig. 2 is a cross-section of same on line *z z*. Fig. 3 is a cross-section of the valve mechanism on line *y y*. Fig. 4 is a section or a part of the valve mechanism on line *v v*, especially adapted to reciprocate the main steam-valve and vary the stroke of the drill. Fig. 5 is a perspective view of the brass valve-cylinder. Fig. 6 is a side elevation of same. Fig. 7 is a cross-section on line *x x*. Fig. 8 is a perspective view representing the steam-ports for the steam-cylinder. Fig. 9 is a cross-section on line *w w*, and shows the ratchet mechanism to rotate the drill-bit. Fig. 10 is an elevation of the slotted cylinder by which the drill-bit is intermittently rotated. Fig. 11 is a cross-section of the drill on line *s s*. Fig. 12 is a cross-section of same on line *t t*. Fig. 13 is an elevation of the upper steam-piston removed from its piston, and Fig. 14 is a plan and elevation of the bisected ring used to hold the said upper piston from moving upon the piston-rod.

A is the steam-cylinder, and is made of a casting bored entirely through, being afterward subdivided. In the middle of this cylinder I place a ring, B′, and secure it in place by screws B^2.

C is the piston-rod, and is made solid with the drill-chuck C^4, one piston, C′, and the tapering or cam extension C^6 C^7. The upper end of this piston-rod C is passed through the hole in the ring B′, which it fits nicely, and the piston C′ works in the lower chamber, B, of the cylinder A. A divided plug, E, is then placed around the piston-rod, and its enlarged end is received in a groove, *e*, in the bottom of the cylinder. (See Figs. 1 and 11.) Then the head E′ is placed over the chuck C^4 and fitted around the end of the split bushing E, holding it in place. This head E′ is secured to the cylinder by bolts F and centered by the bushign E. Then the split stuffing or packing gland E^2 is placed around the piston, (see Figs. 1 and 12,) and is pressed in by a screw-ring, E^3, which presses against a flange, *e′*. Packing is placed between the glands E^2 and bushing E, and thereby makes a steam-tight joint. The split ring *c′* (see Fig. 14) is placed upon the upper end of the piston-rod and in a groove, C^3. The loose piston C^2 is then placed on the piston-rod and against the ring *c′* inclosing it, and is secured in place by a pin, c^2, or other equivalent device. The upper end of the cylinder A is closed by the head A′, which carries the valve mechanism L, adapted to operate the main valve. The cam-extension C^6 C^7 projects through this head A′, and is provided with a feather, C^8, which works in oblique slots *g* in the cylinder G, which is secured to the ratchet-wheel G′, free to rotate in one direction, but held from rotation in the other direction by pawls *g′* and springs g^2. This cylinder G is supported on one end by the head A′ and on the other by a case, A^2, secured to said head, and is kept in place by a packing-block, A^4, preferably of vulcanized fiber, held in against the end of cylinder A^2 by a cap, A^3, through which the bolts F F pass. From this it is seen that all of the parts of the main steam-cylinder—viz., A, E, E′, A′, A^2, and A^3—are held together by said bolts F alone, this greatly simplifying the construction of rock-drills generally. The cylinder A is grooved on each side to receive the guides *h* of support H^2, which is provided with a nut, H^3, through which the screw H works to raise or lower the drill, the said screw being carried by an extension on the cap A^3, and provided with a crank, H′.

b b are the steam-ports which open from the steam-valve, and respectively extend to the tops of each cylinder or chamber B and the bottom thereof, one of the latter entering the lower chamber, B, a short distance from the bottom, as shown in dotted lines, Fig. 1, so as to enable the piston to cushion on live or exhaust

steam, as set forth in another pending application of ours.

I is the steam-chest, and is provided with the steam passage-way I′, to which steam is admitted by a steam-valve, O, located in said passage-way, and a brass cylinder or valve-case, J. This cylinder J is provided with two steam-ports, *j*, to admit steam, and two steam-ports, *j′*, to allow it to pass into or from the steam-ports *b*, and thence to or from the chambers B B. It is also provided with an exhaust-port, j^2, which opens into the exhaust Q. The ports *j* open into the steam passage-way I′. This case J is clamped between two disks of vulcanized fiber or any other suitable packing, *k′*, and the end closed by a screw-plug, K^2.

N is a disk having an exhaust-port, *n′*, and two steam-ports, *n*, the former of which is connected with the exhaust-port j^2 by a groove or port, i^2, (see Fig. 6,) and steam-ports *n n* are respectively connected with each end of the case J by grooves or ports *i i′*. (See Fig. 5.) The head A carries a brass cylinder, L, arranged at right angles to the piston-rod, and provided with steam-ports *l l′* and exhaust-port l^2, substantially as in the case J, the said ports opening into the ports *n n′*. The ports *l l* open into the steam passage-way I′.

M is a cylindrical steam-valve, having cylinders M′ M′ and M^2, the two former of which control the admittance of steam by ports *l l*, and the latter of which puts the steam-ports *n* alternately into communication with the exhaust-port l^2, or, in other words, the steam-ports *n* with exhaust-port *n′*. These cylinders are connected together by body *m*, which extends below to form a screw-shank, M^3, which works in a nut, M^4, which is adapted to vertical movement, but not rotary movement, as it is kept from turning by a feather, *m′*, and groove m^2. This nut rests upon the cam-extension C^6 C^7. The top of the valve M is provided with extensions P, between which work a flat or square extension-piece, P′, secured to or formed integral with a disk, *p*, and head *p′*, held in the cap R by a gland, R′. By turning the extension P′ the valve M may be raised or lowered with respect to the case L′ by screwing it more or less into the nut M^4.

K is the main steam-valve, and is similar to valve M, it having cylinders K′ K′ and K^2, connected together by body *k*, and works in the case J and between the packing *k′*.

The pistons C′ C^2 have their diameters reduced, as at *c*, to allow the passage of steam from the ports to start said pistons and prevent the ports being entirely closed.

The drill-chuck is made with slots c^4 and apertures c^6, into which tapering keys C^5, having extensions c^3, are placed, the points of said keys being curved out, as at c^5, to allow of the ready insertion of the drill-bit D. The extensions or lugs c^3 prevent the keys falling out when the bit D is removed. The process of drilling causes the keys to be driven down, tightly clamping the bit D, but which may be removed, when desired, by knocking back the keys by striking the lugs c^3.

The operation is as follows: The various parts being as shown in Fig. 1, and steam being admitted from pipe Q′ by valve O, it passes through valve K to the upper ends of each chamber B, forcing down the pistons. During this operation the cam-extension C^6 C^7 slowly moves the valve M up and rotates the cylinder G. As soon as the valve M is raised sufficiently high to admit steam from upper port, *l*, steam passes along port *n i′* to the end of case J and throws the valve K to the other end of said case, and now the steam is admitted to the bottom ends of the chambers, and that above the piston passes off by exhaust-port j^2, and when said valve K′ shifted its position the exhaust-steam between its end and packing *k* is passed by ports *i n l′ l² n′ n²* to exhaust-port j^2. During the upward stroke of the piston-rod it makes a part of a revolution, as the ratchet-wheel G′ is prevented from rotating, and hence the feather C^8 follows the oblique slot *g*. A slight steam-pressure on the top of the valve M always insures its being worked by the cam-extension. The stroke of the drill may be regulated by turning the extension P′, as that changes the position of the valve M, causing it to vary the time of admission of steam to the rear end of the valve K, and thereby vary the time of admission of steam below the pistons to lengthen or shorten the stroke.

While we prefer the constructions shown, we do not limit ourselves to all of the details, as they may be modified in various ways without departing from our invention.

In this application we do not claim the specific construction of the drill-chuck, as that will form subject-matter of a future application.

We are aware of the patent to Githens, August 5, 1875, and claim nothing therein shown or described, the bolts in that patent being adapted to transmit motion to the buffer-head when the front cylinder-head is struck by the piston, and to hold the buffer-head rigid when the rear cylinder-head is struck by the piston, to the end that both heads shall have end-play or spring motion.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of a cylinder, piston-rod C, having piston C′, split bushing E, head E′, split gland E^2, ring E^3, and a chuck made solid on the end of said piston-rod, substantially as and for the purpose specified.

2. The combination of a cylinder, ring-piece B′, piston-rod C, having solid piston C′, loose piston C^2, split bushing E, head E′, split gland E^2, ring E^3, a chuck made solid on the end of said piston-rod, and mechanism to give said piston-rod a partial revolution upon its up-stroke, substantially as and for the purpose specified.

3. The combination of a cylinder, ring-piece B′, piston-rod C, having solid piston C′, loose

piston C^2, split bushing E, head E', split gland E^2, ring E^3, a chuck made solid on the end of said piston-rod, cam-extension C^6 C^7, having feather C^8, cylinder G, having oblique slots *g*, ratchet-wheel G', and one or more pawls, *g'*, substantially as and for the purpose specified.

4. The combination of a cylinder, ring-piece B', piston-rod C, having solid piston C', loose piston C^2, split bushing E, head E', split gland E^2, ring E^3, a chuck made solid on the end of said piston-rod, cam-extension C^6 C^7, having feather C^8, cylinder G, having oblique slots *g*, ratchet-wheel G', one or more pawls, *g'*, parts A' A^2, and cap A^3, and bolts F F, substantially as and for the purpose specified.

5. The combination of a cylinder, ring-piece B', piston-rod C, having solid piston C', loose piston C^2, split bushing E, head E', split gland E^2, ring E^3, a chuck made solid on the end of said piston-rod, cam-extension C^6 C^7, having feather C^8, cylinder G, having oblique slots *g*, ratchet-wheel G', one or more pawls, *g'*, parts A' A^2 and cap A^3, packing A^4, and bolts F F, substantially as and for the purpose specified.

6. The combination of cylinder A, ring-piece B', piston-rod C, having solid piston C', loose piston C^2, bisected ring *c'*, and means to secure said piston C^2 on the piston-rod, substantially as and for the purpose specified.

7. The combination of cylinder A, having steam-ports *b*, ring-piece B', piston-rod C, having solid piston C', loose piston C^2, bisected ring *c'*, and means to secure said piston C^2 on the piston-rod, the said pistons having a portion of their length reduced in diameter, as at *c*, substantially as and for the purpose specified.

8. A cylinder, in combination with a piston-rod having a solid piston and chuck formed upon it, a split bushing to fit the end of the cylinder and encircle the piston-rod, a head to hold said split bushing together and in place, and means to make a steam-tight joint, substantially as and for the purpose specified.

9. The combination of cylinder A, having steam-ports *b*, the lower of which enters the lower chamber, B, of the cylinder a short distance above its bottom, to enable the piston to cushion on live or exhaust steam, ring-piece B', piston-rod C, having solid piston C', loose piston C^2, bisected ring *c'*, and means to secure said piston C^2 on the piston-rod, the said pistons having a portion of their length reduced in diameter, as at *c*, substantially as and for the purpose specified.

10. In a rock-drill, a piston-rod extended to form cam-extension C^6 C^7, in combination with a piston steam-valve to admit steam to the cylinders above and below the pistons, and an auxiliary valve mechanism controlled by said cam-extension to control or govern the time of admittance of steam to each end of said piston steam-valve to cause it to reciprocate, substantially as and for the purpose specified.

11. In a rock-drill, a piston-rod extended to form cam-extension C^6 C^7, in combination with a piston steam-valve to admit steam to the cylinders above and below the pistons, an auxiliary valve mechanism controlled by said cam-extension to control or govern the time of admittance of steam to each of said piston steam-valves, to cause it to reciprocate, and mechanism, substantially as set forth, to vary the stroke of the piston-rod, substantially as and for the purpose specified.

12. In a rock-drill, a piston-rod provided with the cam-extension C^6 C^7, projecting from the rear end of the cylinder and inclosed in a separate case, in combination with said cylinder-case, valve mechanism actuated by said cam-extension to control the admittance of steam to the cylinder above and below the piston, and means, substantially as set forth, controlled by the reciprocations of said cam-extension, to impart an intermittent rotary motion to said piston-rod, substantially as and for the purpose specified.

13. In a rock-drill, the cam-extension C^6 C^7, in combination with valve mechanism I and L, when constructed as shown, substantially as and for the purpose specified.

14. In a rock-drill, the cam-extension C^6 C^7, in combination with valve M, having screw M^3, ports *l l' l²*, valve K, ports *j j' j² n n' i i' i²*, nut M^4, and means to screw said screw M^3 more or less into the said nut M^4, substantially as and for the purpose specified.

15. In a rock-drill, the cam-extension C^6 C^7, in combination with valve M, ports *l l' l²*, valve K, ports *j j' j² n n' i i' i²*, packing *k' k'*, to receive the concussion of the valve K in its reciprocations, substantially as and for the purpose specified.

16. In a rock-drill, the cam-extension C^6 C^7, in combination with valve M, ports *l l' l²*, valve K, ports *j j' j² n n' i i' i²*, passage-way I, and steam-valve O in said passage-way, to admit steam from the steam-main simultaneously to both valves K and M, substantially as and for the purpose specified.

17. The combination of cylinder A, piston-rod C, a rear cylinder-head, and split bushing E with head E' and longitudinal binding-bolts F F, substantially as and for the purpose specified.

18. The combination of cylinder A, piston C, a rear cylinder-head, and split bushing E with head E', a packing-gland, E^2, and longitudinal binding-bolts F F, substantially as and for the purpose specified.

19. The combination of cylinder A, piston-rod C, a rear cylinder-head, and split bushing E with head E', a split packing-gland, E^2, ring E^3, and longitudinal binding-bolts F F, substantially as and for the purpose specified.

In testimony of which invention we hereunto set our hands.

AMOS STEVENS.
ARTHUR L. STEVENS.

Witnesses:
WILLIAM MCWADE,
CHAS. OPITZ.