(No Model.) 2 Sheets—Sheet 1.

A. CANTIN.

ROTARY ROCK DRILL.

No. 304,703. Patented Sept. 9, 1884.

Fig: 3.

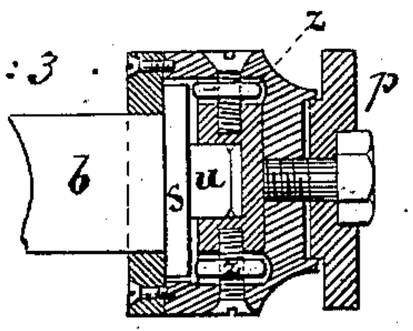
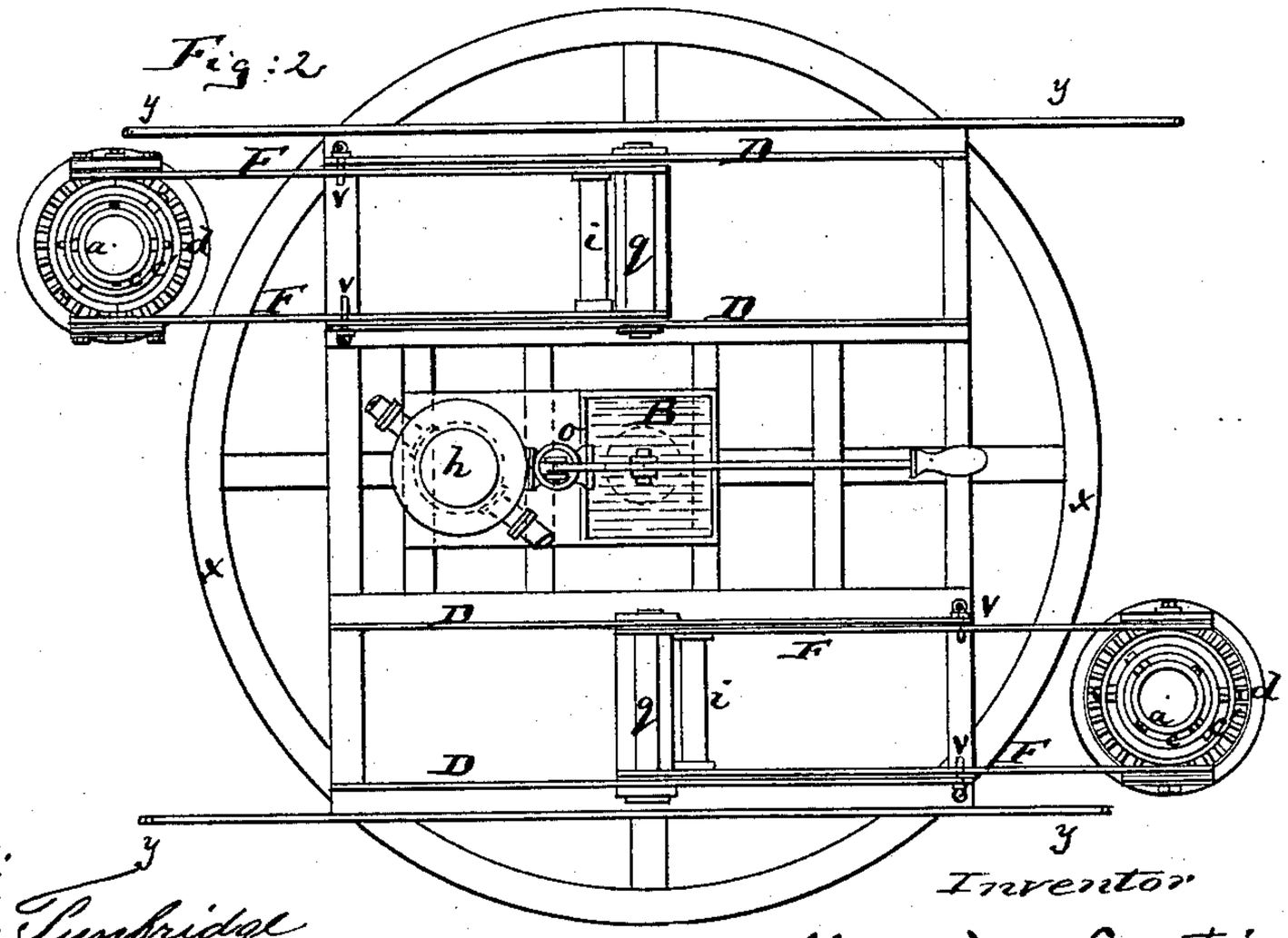


Fig: 1.

Fig: 4.

Fig: 2.



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John H. Speer.

Inventor:
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(No Model.) 2 Sheets—Sheet 2.

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Fig: 6

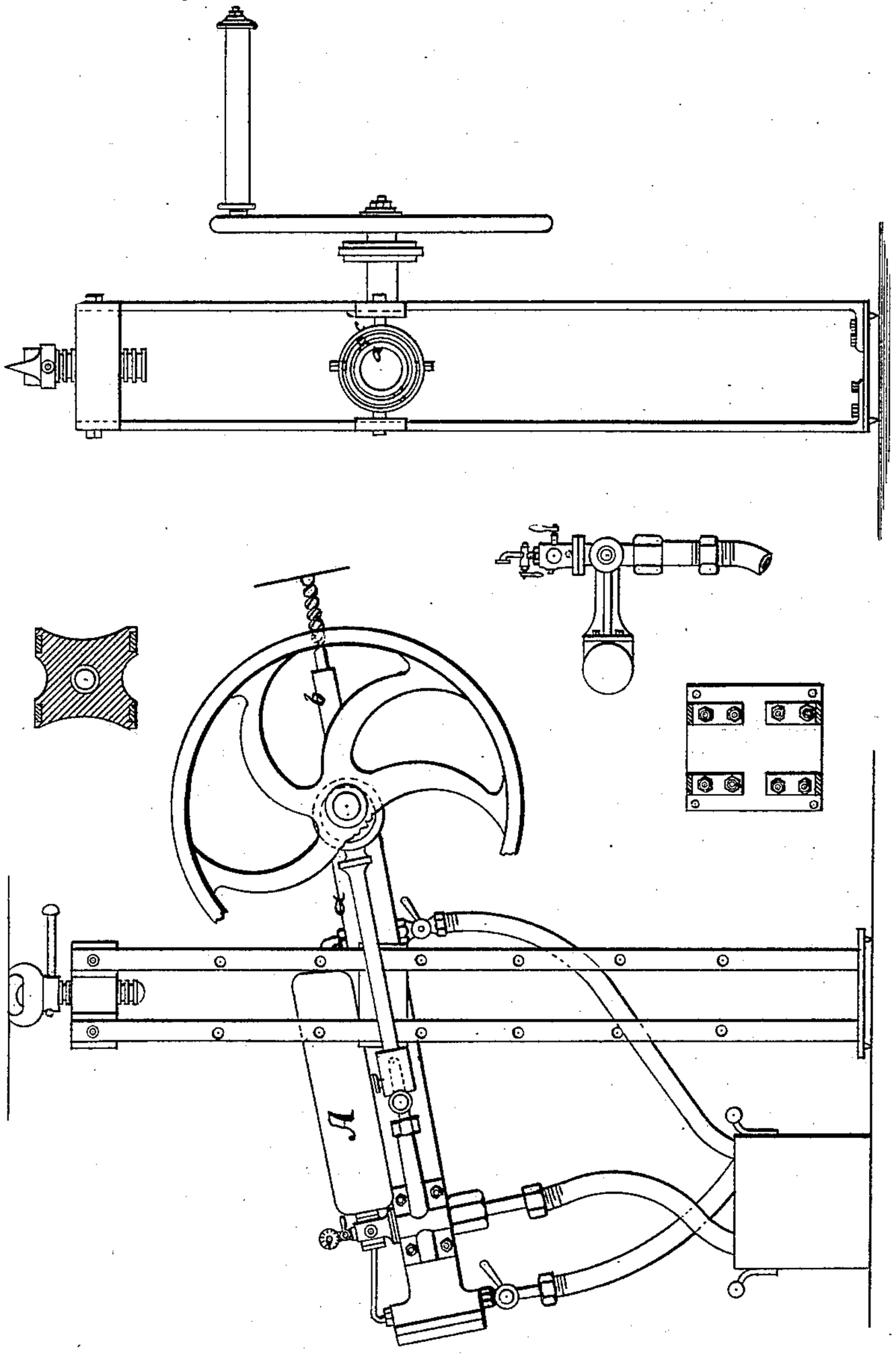

Fig: 5

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UNITED STATES PATENT OFFICE.

ALEXANDRE CANTIN, OF PARIS, FRANCE.

ROTARY ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 304,703, dated September 9, 1884.

Application filed March 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDRE CANTIN, of Paris, France, have invented Improvements in and relating to Rotative Rock-Drilling Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheet of drawings, making a part of the same.

The object of this invention is to provide an improved rock-drilling apparatus which is distinguished from apparatus of the same class as heretofore constructed by the following chief characteristic points, viz: first, the peculiar mode of mounting the drilling-machine upon its frame or carriage and the special arrangement of the latter to render the direction of the holes to be bored independent of the position of the said frame or carriage; second, the general arrangement of the apparatus, together with the employment of hydraulic pressure for exerting upon the drill a forward pressure always proportionate to the resistance of the material to be perforated; third, the general mode of construction of the drilling-machine, which is of oscillatory movement upon its point of suspension, in order to give the drill freedom during its rotary movement of drilling to alter its direction as may be required. I have adopted for the propulsion of the drill-holder hydraulic pressure exerted upon a piston, which constantly presses the drill to the bottom of the hole with the force most suitable for its advance, in order to obtain the maximum yield or effective work.

The principal advantages which I obtain by the improved apparatus consist in a great economy as regards the motive power required for operating the machine, less wear of the drills, and a yield or effective work much more considerable—that is to say, a more rapid deepening of the hole than with the machines heretofore employed. Furthermore, the improved machine, not being subjected to constant vibration and shocks, is, owing to its simplicity, liable to hardly any wear.

The first part, which I will now proceed to describe, is the drilling-machine in which I employ hydraulic pressure. This machine is designed for boring holes for blasting purposes in rocks or other kinds of resisting material in the making of tunnels, cuttings, mines, quarries, or for submarine purposes.

Figure 1 represents, in elevation and partly in section, two of the improved machines mounted upon a frame or carriage for operating in open quarries, the machine on the left-hand side being shown in central longitudinal section, and that on the right-hand side being shown in elevation. Fig. 2 is a plan of this arrangement. Fig. 3 is a vertical section of the piston in which the rod of the tool-holder is mounted. Fig. 4 is a cross-section of the rings in which the drill is hung. Fig. 5 is a side view, and Fig. 6 an end view, of a modified construction of frame or carriage for the machine.

The drilling-machine is composed, essentially, of a cylinder, *a*, a piston, *p*, a drill-holder, *b*, and bevel-wheels *d* and *e*, which I may replace by any other suitable means for transmitting motion. The admission and regulation of the hydraulic pressure are effected by means of the cocks N and R. *g* is the delivery-cock. The cylinder *a*, carrying all the mechanism, serves as the frame of the machine.

The drill-holder *b*, which is cylindrical, is fitted to the piston by means of a fixed collar, *s*, bearing upon the rollers *z* of this piston, Fig. 3, in such a manner that the piston will not rotate with the drill-holder. The end of the drill-holder is provided with a projection, *u*, which enters a recess formed for this purpose in the center of the piston, and thus constitutes a guiding-point for the drill-holder, which is fitted with a slight amount of friction into the cylinder *a*, and has keyed upon it the wheel *d*, which imparts to it a movement of rotation. The forward movement of this drill-holder is imparted to it by hydraulic pressure exerted upon the surface of the piston *p*.

It will be seen that the improved machine requires a relatively slight motive power, inasmuch as all the force is exerted upon the drill for its rotation only.

The cock R serves to intercept the admission of the fluid into the cylinder and allow it to escape from the same, the cock N serves to admit the fluid to act upon one face or the other of the piston, according as it is desired to effect the advance or retreat of the tool. The apparatus is suspended upon its frame or

carriage by means of three rings, *c c c'*, provided with trunnions placed as shown in Fig. 4, the exterior ring, *c'*, resting in or upon the frame or carriage. The object of this arrangement is to allow the direction of the pressure to be guided by the drill itself in such a manner that whatever be the deviation which the nature of the rock gives to the drill the apparatus will adapt itself thereto.

For drilling rocks whose nature and resistance are extremely variable I have adopted hydraulic pressure which only requires an apparatus of restricted volume. For this purpose I arrange upon the frame or carriage a reservoir, B, combined with a pump, *o*, for drawing water from the said reservoir and forcing it into the cylinder *h*, upon which are mounted the supply-pipes.

The pipes for the discharge of the water which has been employed in working the drilling-machine are conducted back to the reservoir B, so that the apparatus will work for a long time with the same water. This arrangement with a pump is especially adapted for cases where a number of drilling-machines are acting simultaneously upon the same face of the rock and are arranged upon the same frame or carriage.

For a drilling-machine upon a separate frame or carriage for working in narrow galleries in mines or tunnels, I employ a force-pump fixed upon the cylinder of the drilling-machine, furnished with a valve for regulating the pressure, and worked by means of the fly-wheel or pulley actuating the drill. In this case it is only necessary to employ a single movable bucket, into which are conducted the suction and delivery pipes.

I will now proceed to describe the frame or carriage upon which the machine is mounted, and which will vary according to the nature of the work to be executed—that is to say, in a general manner according to whether the operations are to be carried on in open quarries, in a gallery for making mines, tunnels, or cuttings, or for submarine purposes.

A number of drilling-machines may be mounted upon one frame or carriage, whether they are worked by hand or by a motor.

A frame or carriage for isolated operations in open quarries, Figs. 1 and 2, is composed of two horizontal superposed plates connected by a bolt, *r*. (Represented by dotted lines in Fig. 1.) The upper plate carries vertical semicircular guides D, between which move the arms F, carrying the drilling-machine. The arms F are held apart by the cross-bars *i* at their lower part, and by the exterior ring, *c'*, of the suspension device of the drilling-machine at their upper part. These arms F oscillate around a common axis, V, to give the drilling-machine any desired position in the vertical plane, where it is held by bolts or pins *v*, passing through the said arms and entering the semicircular guides D.

The lower plate is provided with spurs to prevent it from sliding. It also has segments *x*, serving as rails for the movement of the upper plate. For transport this kind of frame or carriage is provided with arms *y*, into which is introduced a bar or other suitable contrivance. The arms F are then shifted in such a manner as to lay the drilling-machines upon the frame or carriage, which has at its center the hydraulic apparatus.

It will be readily understood that the drilling-machines mounted upon this description of frame or carriage can operate at any angle or inclination. In the example represented in the drawings of the frame or carriage supporting two drilling-machines the one can bore vertically and the other horizontally, which is very advantageous in working in quarries. Moreover, this arrangement permits the strains to be equilibrated, thus giving the apparatus great stability, without the necessity for making the weight or volume thereof too great.

A frame or carriage for operating in galleries of mines is represented in Figs. 5 and 6. This frame or carriage, which may support one or more drilling-machines, is chiefly characterized by its simplicity, lightness, and consequent facility of removal from one place to another. It is composed, essentially, of four iron plates or girders, braced at one extremity by a piece of cast-iron, forming the head of the frame and receiving at its center a screw-claw, and at the other extremity by a plate provided with spurs and forming the foot of the frame. The drilling-machine is free to slide between the said arms by means of rollers mounted upon its trunnions. In the said arms are formed apertures for securing the machine at the desired height or in the position by means of bolts or pins. The frame or carriage is fixed by its screw-claw and its spurs between the roof and the floor of the gallery, or between its side walls.

Fig. 5 represents a drilling-machine provided with hydraulic apparatus which comprises two cocks, one in front and the other at the rear; but these two cocks may be replaced by a single cock. Moreover, to insure a rapid return-stroke of the drill and to simplify the management of the piston-cylinder, I arrange a pressure-reservoir or accumulator, A, which, by means of a cock, furnishes its excess of force in front of the piston to drive the same back.

I claim—

1. The combination, in the drill-carriage, of the lower rail, *x*, connected by vertical pivot *r* to the upper plate, having the guides D and the horizontal pivot *q*, with the arms F, that are joined to the pivot *q*, and that hold between them the ring *c'*, cross-bar *i*, rings *c c*, and cylinder *a*, substantially as herein shown and described.

2. The piston *p*, having central recess and rollers *z* in said recess, combined with the drill-holder *b*, having the collar *s* and the ter-

minal guide-projection *u*, substantially as specified, for use within a cylinder, *a*, which is adapted to wholly inclose the piston *p*, as set forth.

3. The drill-cylinder *a*, combined with the concentric rings *c c c'*, and with the pivoted arms F, that carry and are held apart by the outer ring, *c'*, substantially as herein shown and described.

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