No. 806,128. PATENTED DEC. 5, 1905.

H. FLOTTMANN.

ROCK BORING MACHINE.

APPLICATION FILED OCT. 15, 1903.

Fig: 1

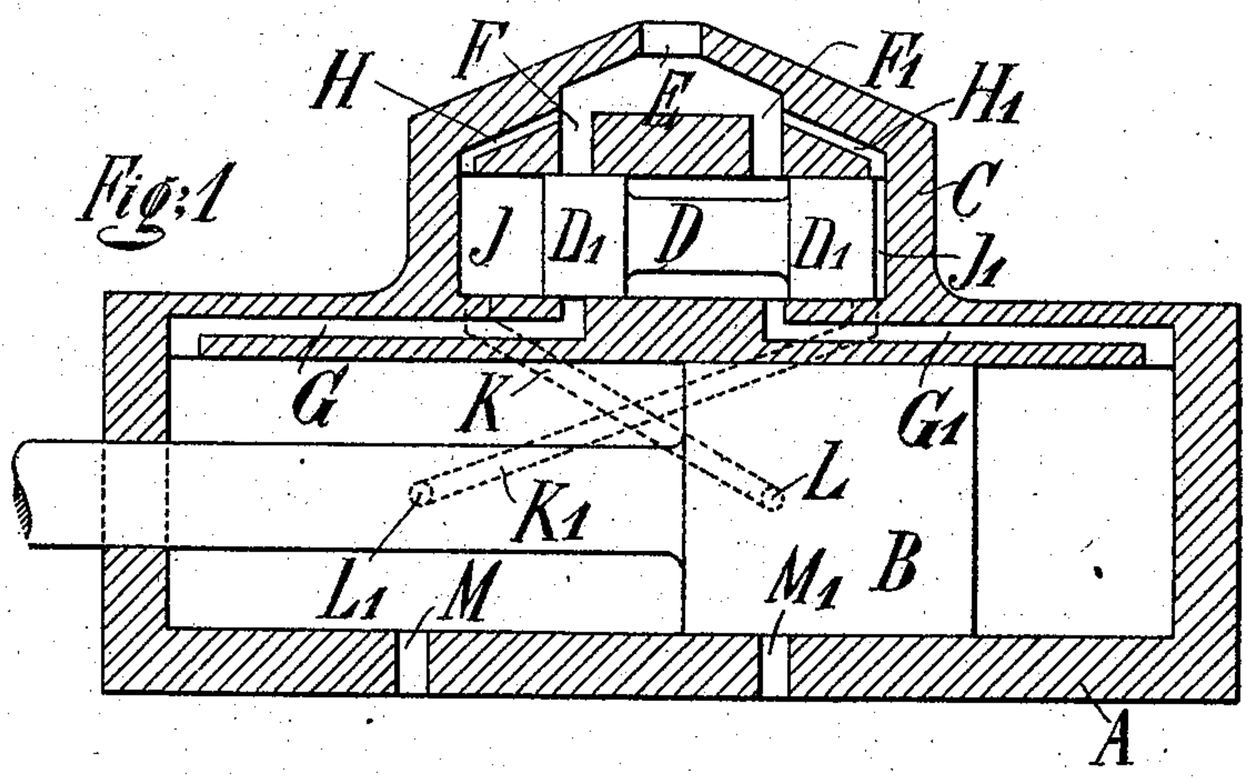


Fig: 2

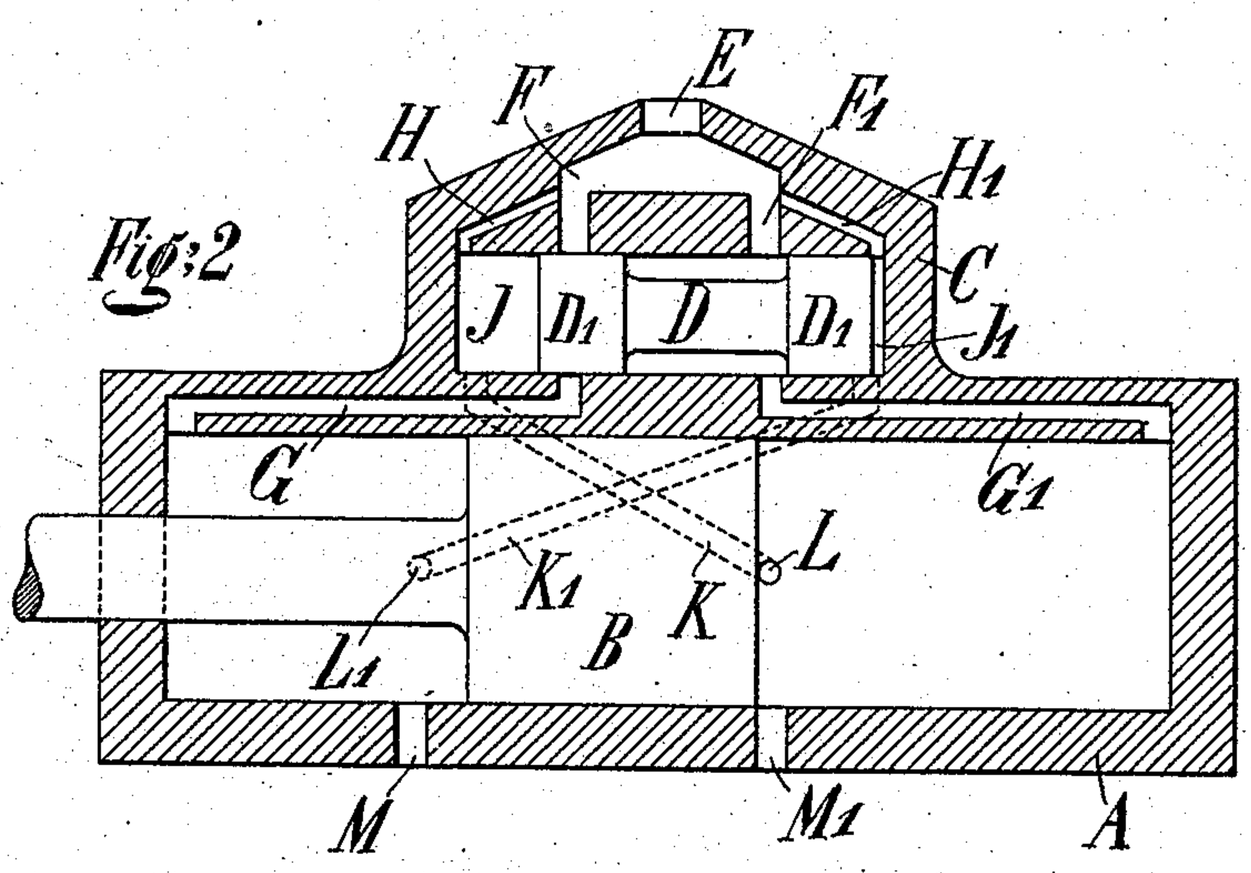
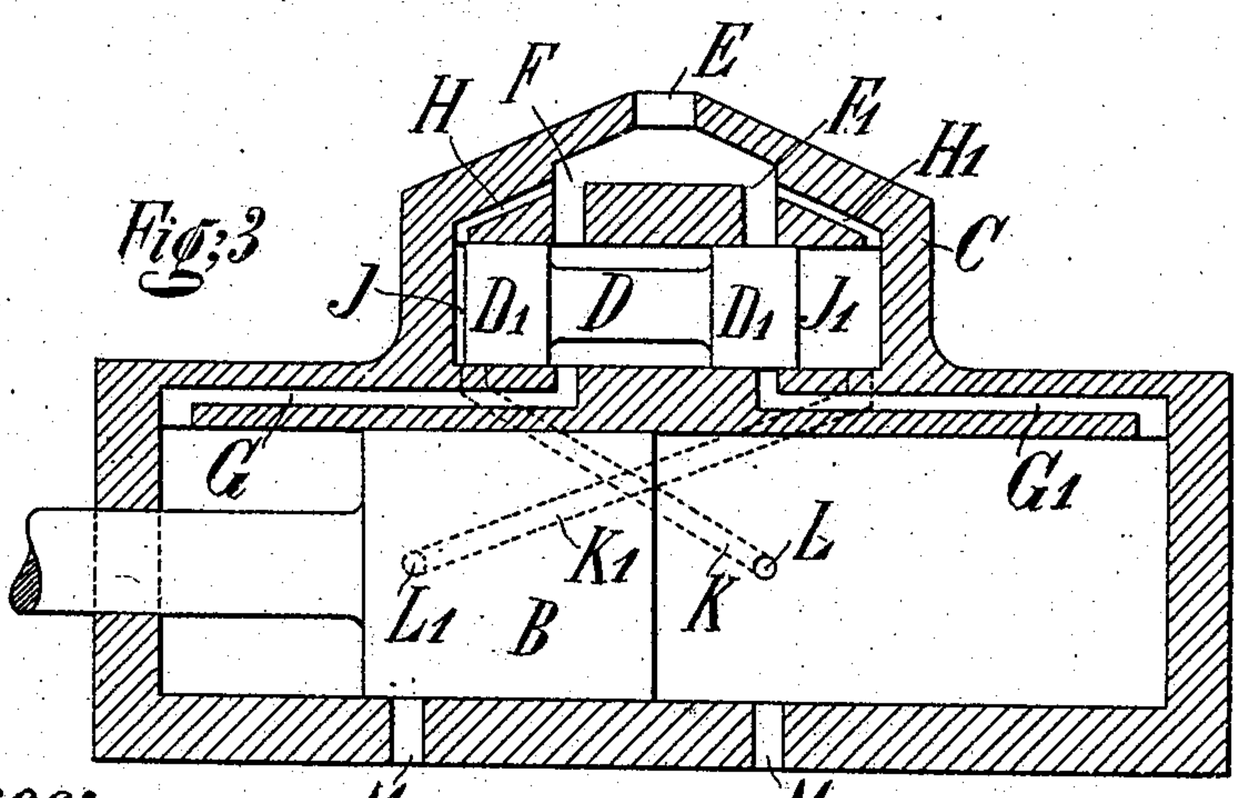


Fig: 3



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ROCK-BORING MACHINE.

No. 806,128. Specification of Letters Patent. Patented Dec. 5, 1905.

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To all whom it may concern:

Be it known that I, HEINRICH FLOTTMANN, a citizen of the German Empire, residing at Bochum, in the Province of Westphalia and Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Rock-Boring Machines, of which the following is a specification.

The valve-gears with self-moving valve-pistons of the rock-boring machines hitherto in use may be divided in two classes. In the one class the valve-piston is constructed as a so-called "differential" piston, and in the other class it has been tried to construct this piston simply cylindrical in order to avoid the division of the valve-chamber which was necessary when differential pistons were used. All these systems are based on the principle to introduce air under pressure to the controlling device in the proper moment, so that it may be reversed, and in the old systems also both admission-channels are reciprocally in communication with the exhaust-channels. These constructions require all of them more or less complicated devices for being carried out practically, for if fresh air under pressure is admitted on the one side for reversing the stroke the compressed air on the other side must be exhausted, or if this cannot be done the compression on the one side must be overcome by the pressure on the admission side. The controlling device of the old systems also required special constructions, because besides the division of the compressed air or other driving means to both sides of the working piston they had also to give the means for a proper reciprocal communication of the exhaust-channels with the used-up working or pressing medium.

Now it is the object of my invention to avoid these complications and to produce a valve-gear by constructing the same on quite a new principle. I do not cause the reversing of the valve-piston by allowing the compressed air to work intermittently on the one side and then on the other; but I allow the working means to act continually on both sides upon the valve-piston, and I release the same intermittently on opposite sides, so that there will be overpressure, respectively, on the one side or on the other. This play of changing the pressure is done in my case by the working piston. It follows that while in the old designs the working piston caused the admission of new compressed air it now causes the exhaust of the pressure medium on that side toward which the valve-piston shall be moved. This mode of working allows various simplifications in the construction of the valve-piston. Thus it need not to be constructed so as to close the exhaust-channel of the cylinder and form a special communication with a special exhaust-channel. This in my design is done by the working piston without the help of the valve-piston. By this I am not only enabled to design the valve-piston as simple as possible, but the channels for the admission of the pressure medium and for exhausting the same can be made shorter than in any other case. The reversing may be done at any moment. The working piston at the end of its stroke closes the exhaust-channels, so that no compressed air is wasted. In consequence of this a certain compression takes place on one side of the piston which allows and enables a quicker return stroke of the piston, and therefore the machine can work at a higher speed than the machines of the old system. While these could only make five hundred to six hundred strokes per minute, the new machine will make about one thousand. I attain this by constructing the machine and its valve-gear as shown on the accompanying drawings in diagram form and as described hereinafter.

Figure 1 shows a central longitudinal section through the cylinder and the valve-chamber, with the working piston at the right end. Fig. 2 is a similar section showing the working piston in its middle position, and Fig. 3 shows the same in its left position.

Above the working cylinder A, carrying the working piston B, is arranged the valve-case C, containing the valve-piston, having a reduced middle part D and enlarged ends D′. The compressed air or other driving means is admitted at E. The admission-channels to the piston F G and F′ G′ respectively distribute the air, as will be explained more particularly hereinafter. The valve-case E is also in communication with the spaces J and J′ at both ends of the valve-piston by the channels H and H′, and the channels K and K′, which cross each other, lead from the spaces J and J′ to the openings L and L′. The exhaust air is carried away by exhaust-openings M and M′, respectively. The valve-piston D D′ is guided in the valve-box by its enlarged heads D′ at both ends. The length of the valve-piston is so great that in its middle position the enlarged heads D′ cover the admission-channels F G and F′ G′, respectively, by

their inner edges, but that a small movement of the valve-piston only is required to form a communication between F and G and F′ and G′, respectively. Supposing now that both the valve-piston and the working piston take the position indicated in Fig. 1, then compressed air will pass through the channels F′ and G′ behind the working piston and will drive it toward the left. When it has passed the exhaust-opening M′, with the rear edge and also the opening L communicating with the space J, Fig. 2, the used-up air can exhaust freely and also the air in the space J can escape into the open air by the channel K and the cylinder-space. In consequence of its *vis inertiæ* the piston will travel farther toward the left and closes by its front edge the openings M and L′, so that the air in front of it will be compressed, and when the opening L′ is closed the pressure of the air on the right side of the valve-piston is greater than on the other side and presses the valve-piston toward the left, Fig. 3, and now the compressed air can enter to the front side of the piston B by the passages F G and will drive it to the right again, and so on.

It will be understood that the length of the working piston must be so long as to cover at both end positions, Figs. 1 and 3, the channels M′ and L and M and L′, respectively, but that in the middle position of the piston it must leave open for a short time only both systems of channels.

According to the description given above and with reference to the device shown, I claim as my invention—

In valve-gears for engines driven by compressed air and like driving mediums in combination with a cylinder and a single working piston therein a valve-casing, a valve-piston located therein and having enlarged heads at both ends and a reduced middle portion, an admission-port, channels H, H′ leading from said admission-port to spaces at both sides of the said valve-piston, other channels K, K′ leading at opposite sides into the working-cylinder space and exhaust-openings M, M′ corresponding in position with the openings L, L′ of the channels K, K′ into the working cylinder.

In testimony whereof I have affixed my signature in presence of two witnesses.

HEINRICH FLOTTMANN.

Witnesses:

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