

No. 654,981.

Patented July 31, 1900.

J. HOWARTH & W. PRUSZKOWSKI,

BORING APPARATUS.

(Application filed Feb. 18, 1899.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1

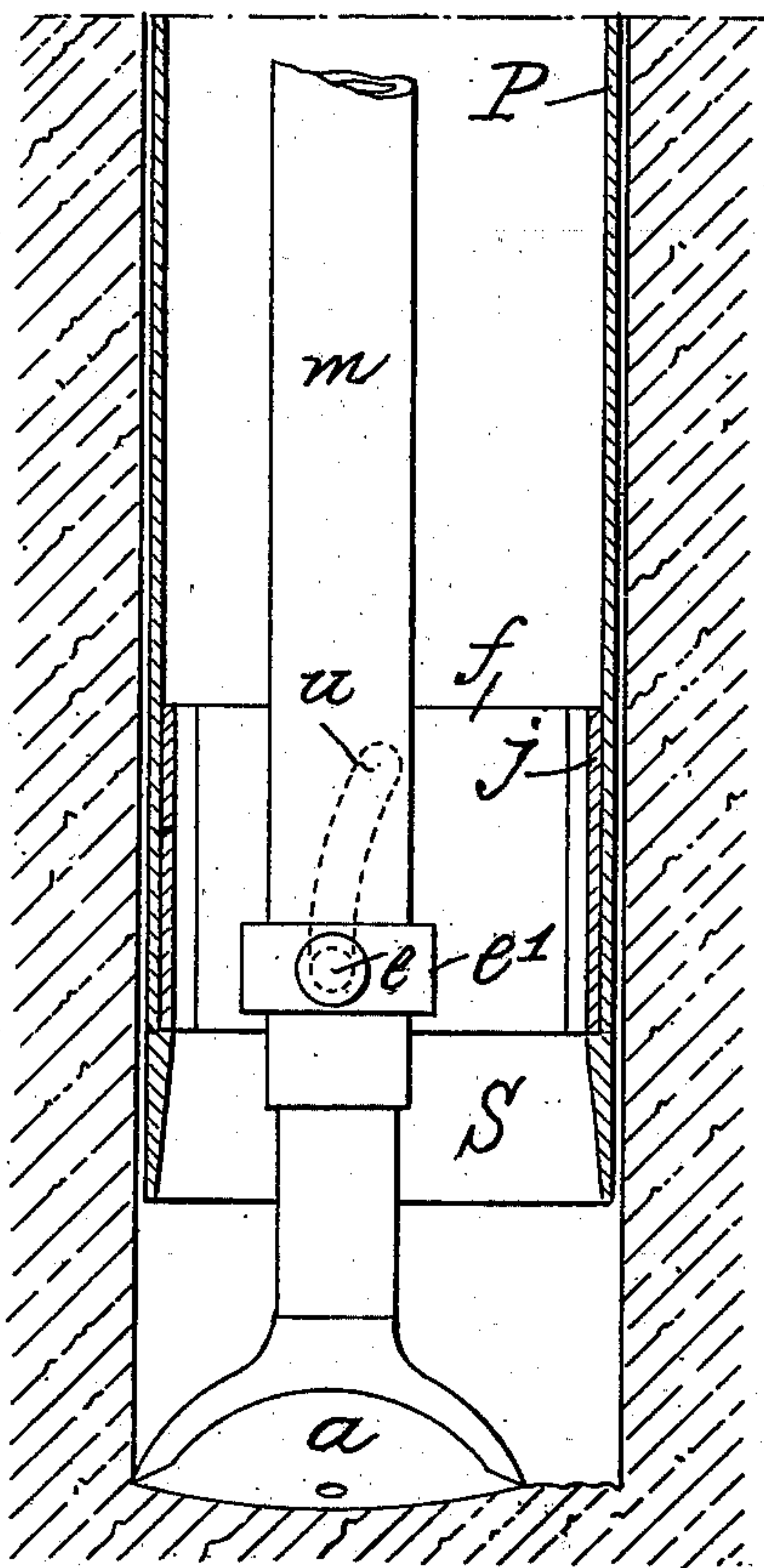
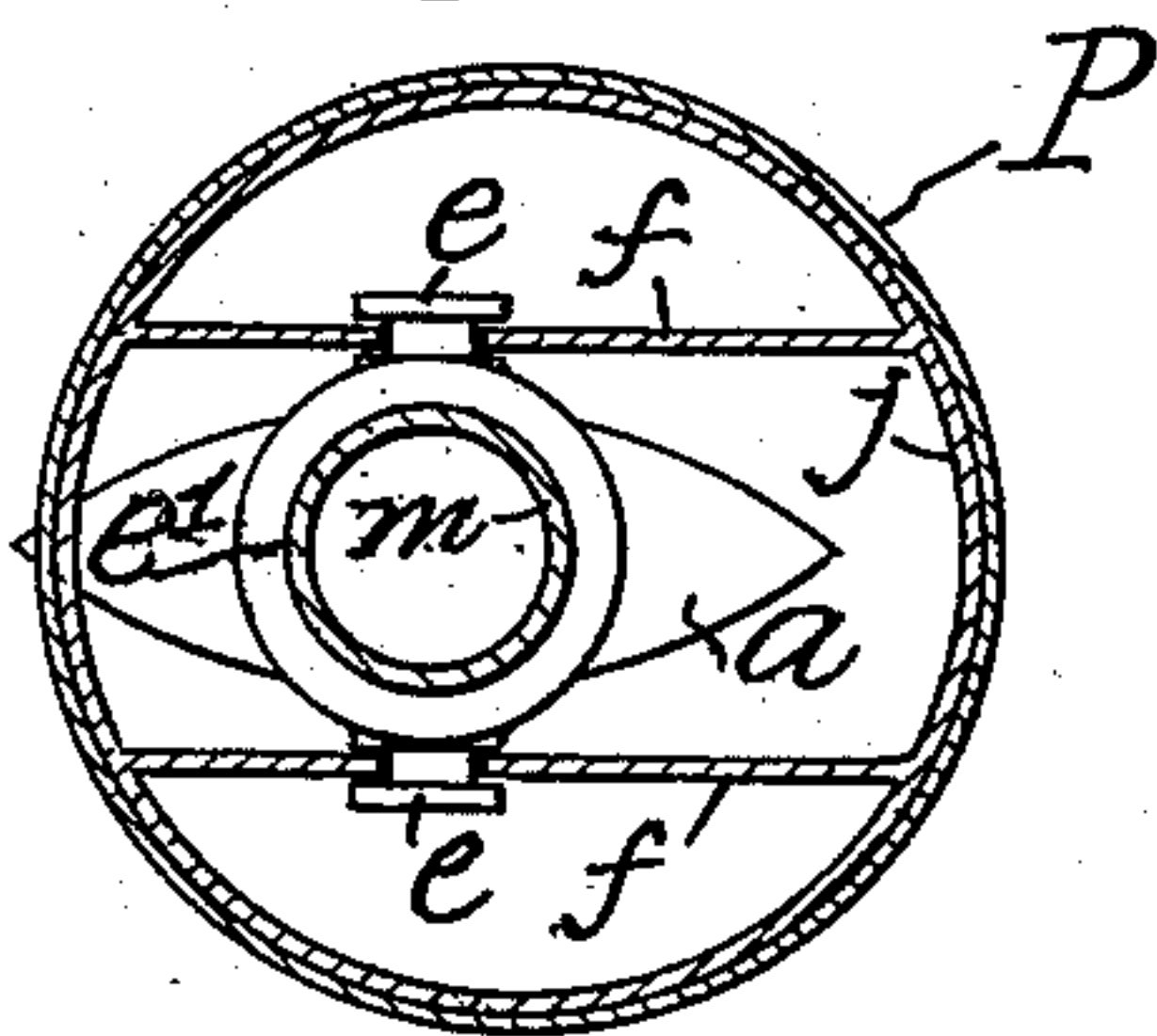


Fig. 2



Witnesses.
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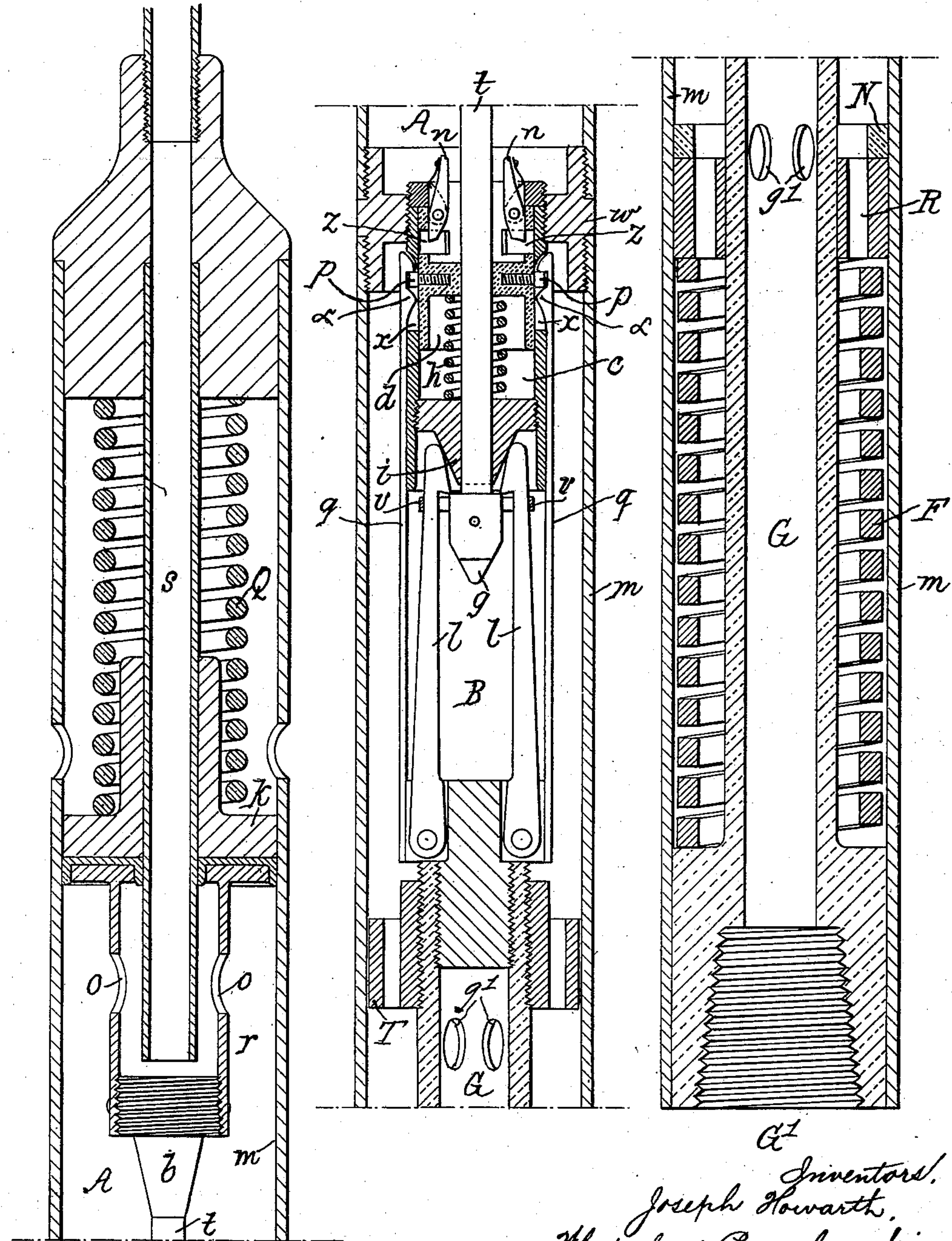
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3 Sheets—Sheet 2.

Fig. 3.



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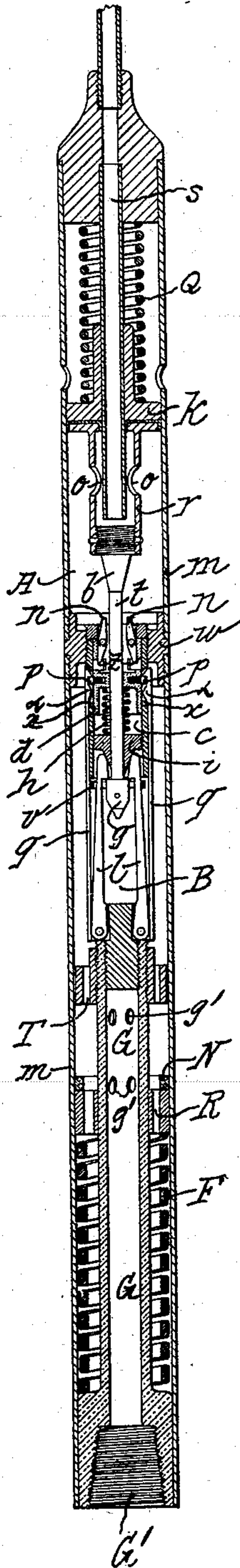


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOSEF HOWARTH AND WLADYSLAW PRUSZKOWSKI, OF SCHODNICA,
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BORING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 654,981, dated July 31, 1900.

Application filed February 18, 1899. Serial No. 706,008. (No model.)

To all whom it may concern:

Be it known that we, JOSEF HOWARTH and WLADYSLAW PRUSZKOWSKI, subjects of the Emperor of Austria-Hungary, residing at Schodnica, in the Province of Galicia, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Boring Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to a washout-boring apparatus, more particularly for deep borings, so arranged that the boring-tool is raised against the pressure of a spring by the pressure of the washout-water and is released at a certain height, when it is forced down again by the spring-pressure against the bottom of the bore-hole. The washout-water effects the raising of the boring-tool by being forced into a chamber kept closed by a suitable valve device, so as to raise a piston therein which is separably connected with the rod of the boring-tool, so that this is thereby raised until it is disconnected from the piston, and the valve device is simultaneously opened, so that the pressure-water escapes and allows the boring-tool to be forced down again. By this motion the valve device is closed again and the connection of the boring-tool is reestablished for renewed action. This entire device, together with boring-tool, may be eccentrically mounted with reference to the bore-tube in order that the tool may serve as an enlarging boring-tool in the usual and well-known manner.

That the invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a view of the lower end of a bore-hole and the boring apparatus, illustrating the bore, bore-tube, and the sleeve that supports the boring appliances in section, said appliances being shown in elevation. Fig. 1^a is a vertical section of the boring appliances, the bore-tube being omitted. Fig. 2 is a cross-

sectional view of Fig. 1, taken on a line above the sleeve *e'*. Fig. 3 shows sectional views, drawn to an enlarged scale, illustrating, respectively, the upper, intermediate, and lower portions of the boring appliances shown in Fig. 1^a, the bore-tube being omitted.

The boring or cutting tool *a* is screwed into the threaded lower end of the hollow piston *G'*, which can move up and down in the bore-cylinder *m*, placed within the bore-tube *P*. The hollow piston-rod *G* has holes *g'* for the entrance of the washout-water from the chamber *B* of the bore-tube above it, and it has a perforated ring *T* screwed onto it, which on the downward stroke under the action of the spring *F* can strike against the caoutchouc buffer *N*, lying upon ring *R*, which is fixed to tube *m* and serves both as guide to the piston-rod and as abutment for the spring *F*. The buffer *N* receives the blows of the ring *T* when the cutter is not acting on the bottom of the bore-hole.

The boring-tool is raised by means of a piston *k*, moving in a chamber *A* of the cylinder *m*, which is separated from chamber *B* by a partition *w* and is always in connection with the conduit for the washout-water. The piston *k* is for this purpose arranged to slide in the chamber *A* upon the central water-supply pipe *s* and is acted upon by a spring *Q*, which tends to force it downward.

With the piston *k* is combined a downward tubular projection *r*, in which the piston-rod *t* is fixed and which has holes *o* for the issue into chamber *A* of the water supplied through *s*. The piston-rod *t* is conically enlarged at the upper end *b* and has at its lower end a coned head *g*. The rod *t* passes freely through an opening of the partition *w* and also through the valve device *d*, formed as a piston-slide, and through the conical bottom *i* of a cylinder *c*, acting as guide to the piston-slide and fixed to the partition *w*.

In the sides of the cylinder *c* are formed rectangular openings *x*, and in the piston-slide *d* there are similar openings *z* in order when the piston-slide is in the lowered position to allow the washout-water to pass from the space *A* through slide *d* into the chamber *B*. In this position of the slide the spring *h*, situated between it and the bottom *i* of cyl-

inder *c*, will be compressed. The slide is held in this position by means of spring-catches *n*, which are pivoted to lugs on the partition *w* within the opening thereof and which when the slide is in the lowered or open position spring over the upper edge thereof. They are moved out of engagement by means of the conical part *b* of the piston-rod *t*, which presses them apart in descending with the piston *k*.

The piston-slide is carried downward into its open position by means of spring-catches *q*, which are fixed to the hollow rod *G* of the piston *G'*, that carries the boring-tool, which catches are engaged, by means of their upper hook-shaped ends, with pins *p*, projecting from the sides of the piston-slide *d*. The spring-catches *q* are disengaged from the pins *p* on the descent of the boring-tool by the inclines *x'* on the catches *q* bearing against the bottom edge of the openings *x*, whereby the hooked ends are forced outward, so as to free the pins *p*.

The connection of the two piston-rods *G* and *t*, and consequently that of the boring-tool, with the piston *k* is effected by means of catches *l*, pivoted to the rod *G*, and whose hooked upper ends are drawn toward each other by means of a spring-ring *v*, so that on the descent of the piston-rod *t* they hook onto the coned head *g* as this is forced down between them. The disconnection of the hooks is effected on the upward motion of the rod *t* and the boring-tool by the coned bottom *i* of cylinder *c*, against which the hooks *l* bear, so as to be forced apart thereby as they rise.

The action of the apparatus above described is as follows: When the slide *d* is in the upper or closed position, the washout-water introduced under pressure into space *A* through tube *s* will raise piston *k* in compressing its spring *Q*. The head *g* of piston-rod *t* being engaged with the catches *l*, piston-rod *G*, piston *G'*, and boring-tool will rise with *k*, spring *F* being at the same time compressed by piston *G'*. As soon as the piston *k* and the boring-tool have reached their highest position the spring-catches *q* engage with the pins *p* of the piston-valve. At the same time, however, the upper rounded ends of the catches *l* slide against the coned surface *i* and are forced thereby so far apart as to be disengaged from the head *g*. This position of the parts is that shown in Fig. 3. The piston *G'*, with the boring-tool, being thus deprived of support, they are then propelled downward by the spring *F*. Before the commencement of this downward motion the openings *x* of cylinder *c* are still closed by the slide *d*, and the washout-water forced in through tube *s*, finding the chamber *B* closed, tends to raise piston *k* still higher; but as soon as the spring-catches *q* begin to descend with tube *G* and the boring-tool they draw the piston-slide *d* downward, so as to allow of the escape of water-pressure in *A*. The spring-catches are then forced out-

ward by their inclines *x'*, as described, so as to release the pins of the slide, which is then in the position in which the openings *x* are fully uncovered. At the same time the catches *n* spring over the top edge of the slide *d* and hold it down in the open position against the upward pressure exerted by the spring *h*, which has been compressed by the downward motion of the slide. The wash-water can now flow through the openings or ports *x* *z* from chamber *A* to chamber *B* and from thence through the holes *g'* in the hollow boring-tool spindle *G* into the lower end of the bore-hole, and from which such water and the spoils may be pumped in the usual manner. Owing to the decreased upward pressure on piston *k* the compressed spring *Q* can now force it downward. The head *g* is thereby forced down between the catches *l* again, which engage with the top thereof, and the cone *b* of piston-rod *t* forces the upper ends of catches *n* apart, so as to free the piston-valve *d*, which is consequently forced upward by its spring *h*. The openings *x* being thus closed again, the pressure-water entering through *s* is cut off from chamber *B*, and consequently fills the space *A* below piston *k*, again forcing this upward and raising the boring-tool. The described operation is then repeated and continues as long as pressure-water is supplied.

As shown at Figs. 1 and 2, the entire boring apparatus rests during the boring upon a shoe *S*, which is screwed into the bore-tube *P*. Upon the shoe rests a sleeve *j*, carrying two parallel transverse plates *f*, having slots *u* for the reception of studs *e*, fixed on a ring *e'*, attached to the cylinder *m* of the boring apparatus. The ring *e'* is so connected to the cylinder that the studs *e* are at right angles to the boring-cutter. The guide-slots *u* in the plates *f* are inclined, as indicated in dotted lines, so that at the lowest or working position of the boring-tool its axis is eccentric to the bore-tube *P*, and the boring-tool consequently makes a bore-hole of larger diameter than that of the bore-tube, the arrangement being made in the usual and well-known manner.

When the apparatus is drawn upward, the studs *e* slide upward in the slots *u*, and the boring-tool then assumes a central position in the bore-tube, so that it can then be drawn up through the latter, together with the sleeve *j*, carrying the boring apparatus.

We claim—

1. Shaft or well boring appliances, comprising a bore tube or casing, a boring-tool, a vertical, hydraulic power-cylinder, its piston, means for supplying water under pressure to the pressure-chamber of the cylinder below the piston, a spring acting upon the upper face of said piston, a connection between the said piston and tool, means for severing said connection when the tool is raised and for re-establishing said connection by the downward movement of said piston, and means for

exhausting the water from the power-cylinder into the lower end of the bore-casing, for the purpose set forth.

2. Shaft or well boring appliances, comprising a bore tube or casing, a boring-tool, a guide-casing for and in which said tool has vertical motion, a tubular tool-rod in communication with the lower end of the bore-casing, a vertical hydraulic power-cylinder within the guide-casing, the cylinder-piston, a spring acting upon the upper face of said piston, means for admitting water under pressure to the pressure-chamber of the cylinder below its piston, a connection between the latter and the tool-rod, means for severing said connection during the upward movement of said rod and reestablishing such connection by the downward movement of the piston, and means for exhausting the contents of the cylinder pressure-chamber into the tool-rod, for the purpose set forth.

3. Shaft or well boring appliances, comprising a bore tube or casing, a boring-tool, a guide-casing for and in which said tool has vertical motion, a tubular tool-rod in communication with the lower end of the bore-casing, a vertical hydraulic power-cylinder within the guide-casing, the cylinder-piston a spring acting upon the upper face of such piston, means for supplying water under pressure to the pressure-chamber of said cylinder below its piston, a connection between the latter and the tool-rod, means for severing said connection during the upward movement of said rod and for reestablishing such connection by the downward movement of the piston, a valve controlling exhaust-ports in the pressure-chamber of the power-cylinder, and ports in communication with the tool-rod, and means operating said valve to periodically open and close said ports, for the purpose set forth.

4. Shaft or well boring appliances, comprising a bore tube or casing, a boring-tool, a guide-casing for and in which said tool has vertical motion, a tubular tool-rod in communication with the lower end of the bore-casing, a vertical hydraulic power-cylinder within the guide-casing, the cylinder-piston, a spring acting upon the upper face of said piston, means for admitting water under pressure to the pressure-chamber of the cylinder below its piston, a connection between the latter and the tool-rod, means for severing said connection during the upward movement of said rod and reestablishing such connection by the downward movement of the piston, and means for exhausting the contents of the cylinder pressure-chamber into the tool-rod; in combination with means for locking said rod to the guide-casing without interfering with its vertical movements, for the purpose set forth.

5. Shaft or well boring appliances, comprising a bore tube or casing, a boring-tool, a guide-casing for and in which said tool has vertical motion, a tubular tool-rod in commu-

nication with the lower end of the bore-casing, a vertical hydraulic power-cylinder within the guide-casing, the cylinder-piston, a spring acting upon the upper face of such piston, means for supplying water under pressure to the pressure-chamber of said cylinder below its piston, a connection between the latter and the tool-rod, means for severing said connection during the upward movement of said rod and for reestablishing such connection by the downward movement of the piston, a valve controlling exhaust-ports in the pressure-chamber of the power-cylinder and ports in communication with the tool-rod, and means operating said valve to periodically open and close said ports; in combination with a locking device locking the valve against motion when the ports are open, and means acting upon said locking device to release the valve by the downward movement of the piston, for the purpose set forth.

6. Shaft or well boring appliances, comprising a cylindrical casing closed at its upper end, a partition dividing said casing into upper and lower chambers, a piston fitted in the upper chamber, a spring acting upon the upper face of said piston, means for supplying water to said chamber below the piston, a tubular tool-rod closed at its upper end, said rod having a piston-head at its lower end fitting the aforesaid lower chamber, and ports in communication therewith, a connection between the piston and tool-rod, means for severing said connection during the upward movement of the piston, and for reestablishing the same by the downward movement of said piston; in combination with a valve controlling ports between the upper casing-chamber below the piston and the lower casing-chamber, and means operating said valve to periodically open and close said ports, for the purpose set forth.

7. Shaft or well boring appliances, comprising a cylindrical casing closed at its upper end, a partition dividing said casing into upper and lower chambers, a piston fitted in the upper chamber, a spring acting upon the upper face of said piston, means for supplying water to said chamber below the piston, a tubular tool-rod closed at its upper end, said rod having a piston-head at its lower end fitting the aforesaid lower chamber, and ports in communication therewith, a connection between the piston and tool-rod, means for severing said connection during the upward movement of the piston, and for reestablishing the same by the downward movement of said piston; in combination with a valve controlling ports between the upper casing-chamber below the piston and the lower casing-chamber, means operating said valve to periodically open and close said ports, a locking device locking the valve against motion when the ports are open, and means acting upon said locking device to release said valve, for the purpose set forth.

8. Shaft or well boring appliances, compris-

ing a bore tube or casing, a boring-tool, a vertical hydraulic power-cylinder, its piston, a spring acting on the upper face thereof, means for supplying water under pressure to the pressure-chamber of the cylinder below its piston, a connection between the latter and the boring-tool, means for severing said connection during the upward motion of the piston and for reestablishing the same by the downward movement of said piston, and means for exhausting the water from the pressure-chamber of the cylinder into the lower end of the bore-casing; in combination with a sleeve loosely seated in said casing near its lower end, and oblique guides engaging the boring-tool and guiding the same, substantially as and for the purpose set forth.

9. In shaft or well boring appliances, the combination with the bore tube or casing and a vertically-movable rigid tool-rod having the boring-tool rigidly secured thereto, said rod arranged axially in the casing; of a guide in the latter guiding said rod from its normal axial position into an operative position eccentric to said bore-tube and holding said rod in said position during its boring operation, for the purpose set forth.

10. In shaft or well boring appliances, the combination with the bore tube or casing provided with an annular seat, and a vertically-movable tool-rod arranged axially within said tube and having radial pins diametrically opposite each other; of a guide-sleeve seated on the aforesaid tube-seat and having cross-partitions provided with oblique slots guiding the tool-rod from an axial inoperative to an eccentric operative position and vice versa as said rod moves vertically in one or the other direction, for the purposes set forth.

11. Shaft or well boring appliances, comprising a main casing closed at its upper end, a partition dividing said casing into two cham-

bers, a piston fitted in the upper chamber, and having hollow piston-rods projecting from its opposite faces, the downwardly-projecting rod having ports *o* and a solid extension having a tapering upper enlargement *b* and a conical lower head *g*, a tubular tool-rod provided with ports in communication with the lower casing-chamber and with a piston-head fitting said casing, a spring acting upon the upper face of said piston, and spring-pressed latches engaging the aforesaid head *g* on piston-rod; in combination with a valve-casing secured in the partition of the main casing and having ports in communication with the lower chamber thereof, a cylindrical reciprocatory valve in said valve-casing mounted on the lower piston-rod and open to the upper main casing-chamber and having ports adapted to register with those in its casing, a spring acting upon the valve to normally hold the same with aforesaid ports out of register, a plug secured in the lower part of the valve-casing having a conical axial projection *i*, a connection between the aforesaid valve and tool-rod, means for severing said connection during the downward movement of the rod and reestablishing the same during its upward movement, a spring-actuated locking device locking the valve when moved to bring the aforesaid ports into register, and means on the lower piston-rod for disengaging said locking device from the valve during the downward movement of said rod, substantially as and for the purpose set forth.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

JOSEF HOWARTH.

WLADYSLAW PRUSZKOWSKI.

Witnesses:

GERSUMM,
LUIS BAIRS.