No. 757,239. PATENTED APR. 12, 1904.

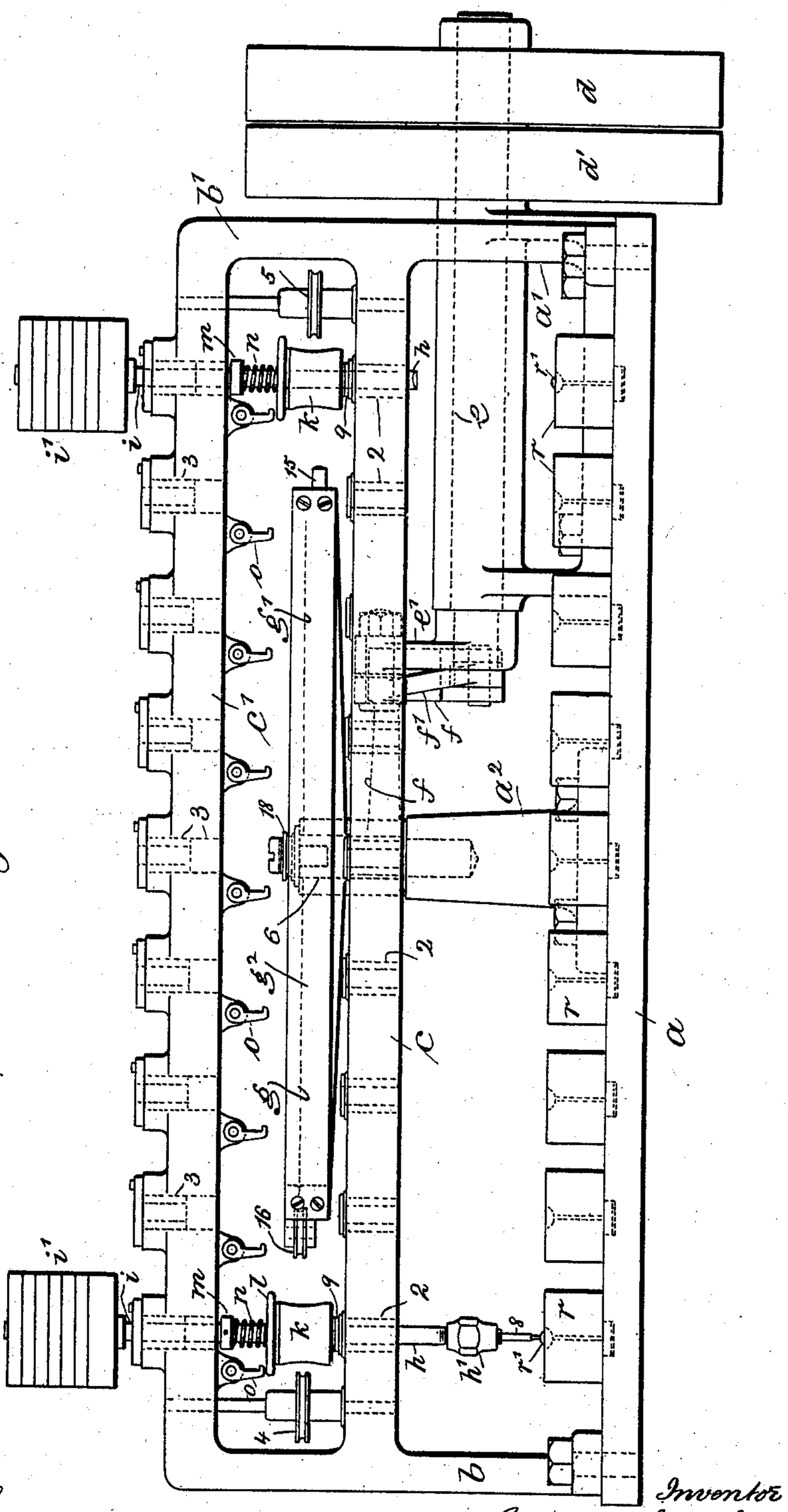
G. SMITH.

DRILLING MACHINE.

APPLICATION FILED JUNE 6, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
Chas. A. Smith
J. Staib.

Inventor
George Smith
per Harold Serrell atty

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NO MODEL. 3 SHEETS—SHEET 2.

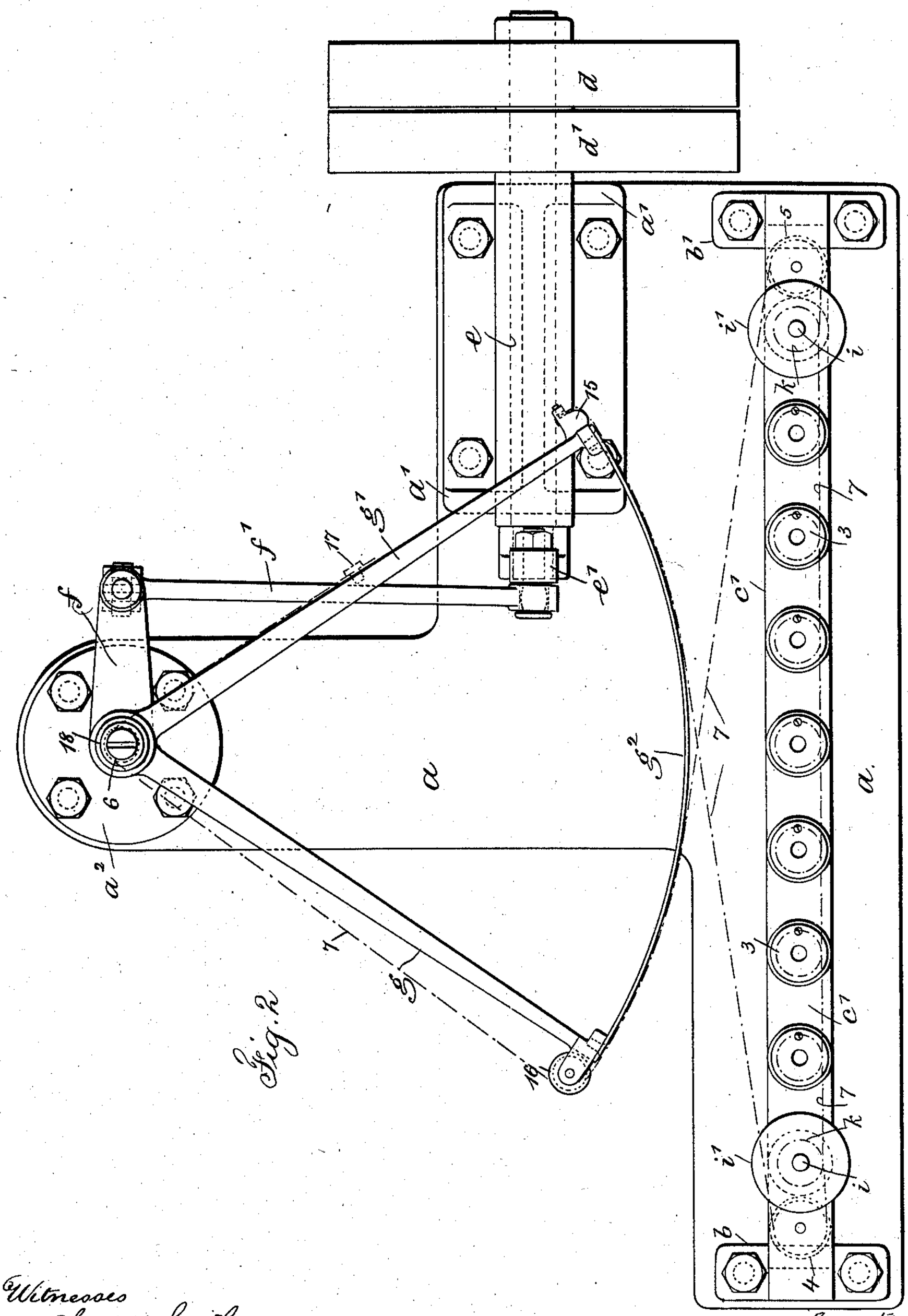

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

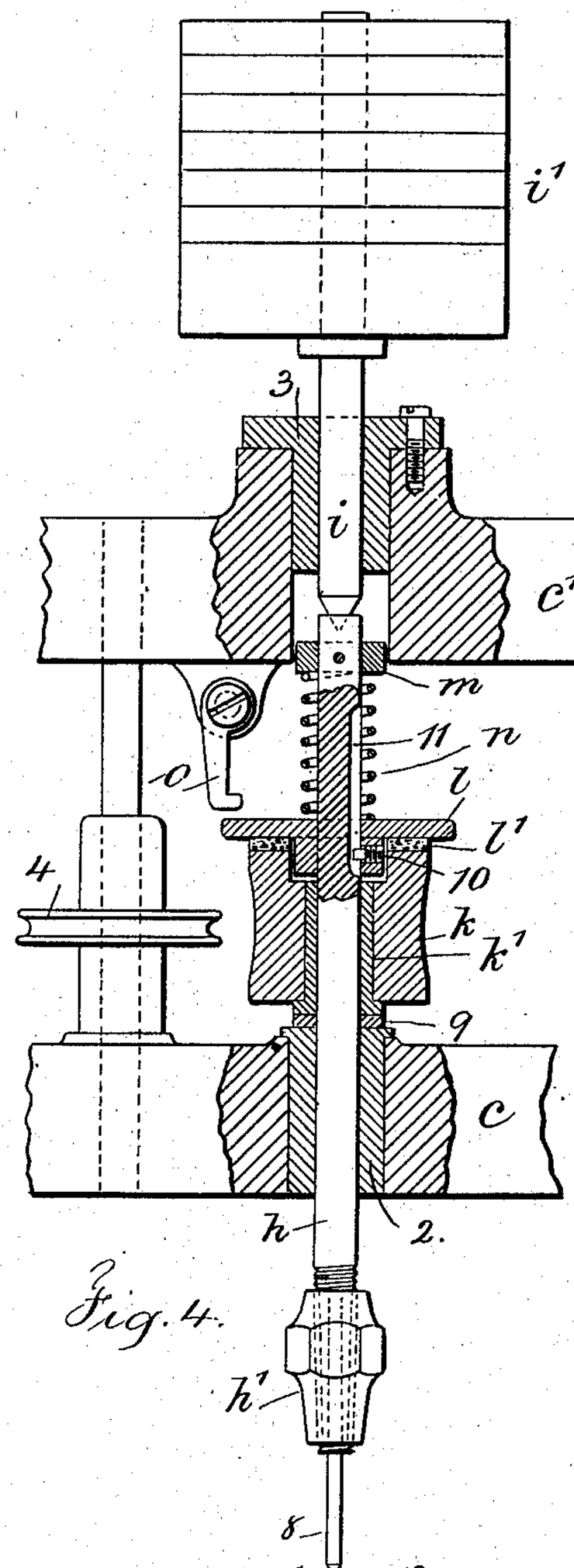


Fig. 4.

Fig. 3.

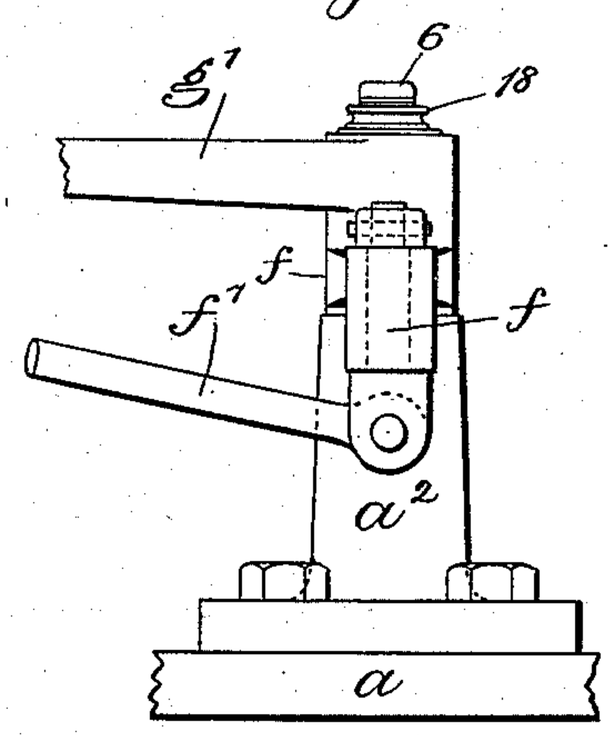
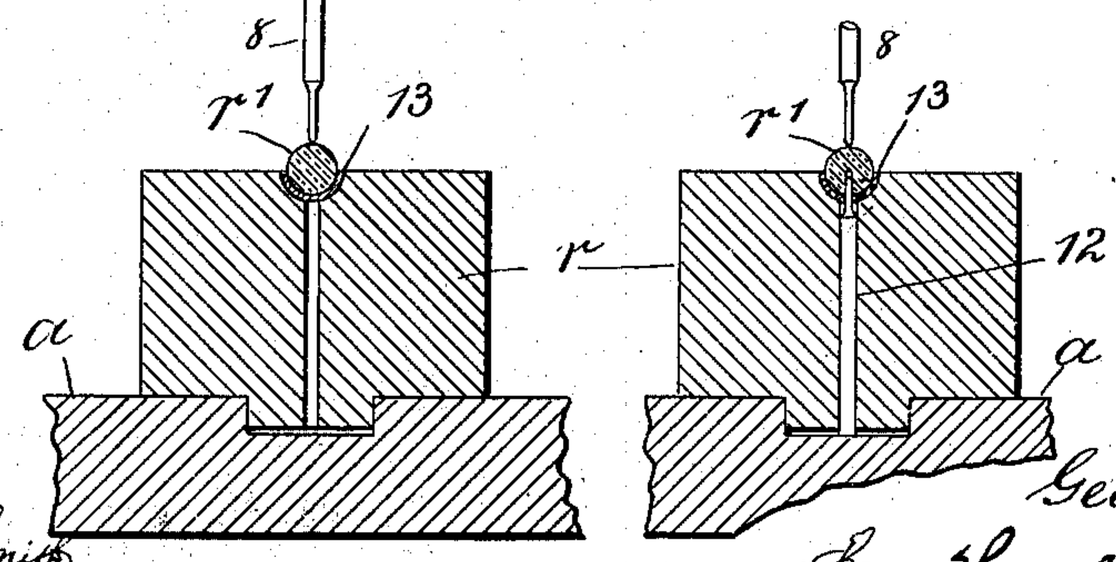


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE SMITH, OF PLAINFIELD, NEW JERSEY.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 757,239, dated April 12, 1904.

Application filed June 6, 1903. Serial No. 160,300. (No model.)

To all whom it may concern:

Be it known that I, GEORGE SMITH, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented an Improvement in Drilling-Machines, of which the following is a specification.

My invention relates to a multiple or gang drill or drilling-machine in which all of the drills or any number of them may be actuated simultaneously and in which the details of construction of the various drilling means are alike and fully correspond with one another.

In carrying out my invention the gang of drilling devices is mounted in line in a suitable frame and driven by swinging and rotary devices which impart alternating rotary movements first in one direction and then in the other to the series of drills.

My invention is especially applicable to the drilling of semiprecious stones or similar materials, particularly in the formation of beads for necklaces, and the stones to be drilled are mounted in removable blocks centrally perforated. I prefer to bore the stones half-way through and then reverse and reseat them by centering-pins preparatory to boring the other half of the stones. The drilling devices are adapted for vertical movement and are separable, so that devices actuated by the power applied may run free when it is desired that any one or more of the drills shall be inoperative. A weight is applied upon a centering-arbor to assist the boring function and to provide a positive and regulatable pressure, making hand-pressure unnecessary.

In the drawings, Figure 1 is an elevation representing my improved device, in which figure, however, there is shown one complete drilling device and part of another broken off. Fig. 2 is a plan of the parts shown in Fig. 1. Fig. 3 is a detached elevation of the vertical sector-bearing from the right hand of Figs. 1 and 2. Fig. 4 is a vertical section and partial elevation of a complete drilling device with parts of the bed and frame, and Fig. 5 is a vertical section of part of the bed and one of the removable blocks for holding the stones with the stone reversed in its position for boring through the second half.

a represents the bed of the machine, of irregular form and of metal, to which the standards a' a^2 are connected. Upright parts *b* b' and horizontal parts *c* c' form a frame connected by bolts to opposite ends of the bed *a*. The horizontal part *c* is provided with a series of bearing-sleeves 2, and the horizontal part c' is provided with a series of bearing-sleeves 3, the sleeves 2 being preferably held in place by friction, while the sleeves 3 are secured in position by screws. (See Fig. 4.) Between the horizontal parts *c* c' and adjacent to the vertical or upright parts *b* b' are pulleys 4 5 upon suitable spindles in bearings in the said horizontal parts of the frame.

Fast and loose pulleys *d* d' are on a shaft *e*, and the shaft *e* passes through the bearing-sleeve of the standard a', and on the end opposite to the pulleys said shaft carries a crank e'. The standard a^2 is preferably formed with a vertical pivot or arbor 6, upon which is mounted an arm *f*, and a connecting-rod f' extends between the free end of the arm *f* and the free end of the crank e', the ends of said connecting-rod being pivotally mounted upon said parts and the end of the connecting-rod f' at the crank e' being also provided for a degree of oscillation according to the extent of movement of the arm *f* at either side of a right angle with the connecting-rod f'.

A sector formed of the arms *g* g' and a curved connecting-plate g^2 between their free ends is at the union of the arms *g* g' pivotally mounted upon the vertical arbor 6. A band 7, (represented by a dotted line on Fig. 2,) with one end connected to a clamp 15, with the other end connected to a fixed point or clamp 17, with a part passing over rollers 16 and 18 on the sector-arm *g* and arbor 6, respectively, and with the parts of the band crossing upon the face of the curved plate g' and the band passing around the pulleys 4 5 and between and around parts of the loose spools *k*, is employed to operate the drilling devices. From the illustration and the foregoing description it will be apparent that the fast pulley *d* imparts a revoluble movement to the crank e'. From the shaft *e* and by means of the connecting-rod f' a forward and backward movement is imparted to the arm *f*, which is in

proportion to the length of the crank e'. The arm f imparts a swinging forward and backward movement to the sector, composed of the arms g g' and the curved plate g^2, and through the same communicates power to the band 7 for operating the drills.

In the drilling devices and describing a separate structure a shaft h passes through a bearing-sleeve 2. Upon the lower end of the shaft h is a chuck h' to hold the drill 8. A centering-arbor i passes through the bearing-sleeve 3 in the horizontal part c' of the frame, and upon the upper end of this arbor i is a series of removable weights i''. Each bearing-sleeve 3 is preferably elevated by hubs upon the upper surface of the horizontal part c' of the frame, so that below the bearing-sleeve 3 there is an appreciable recess in the horizontal part c'. The lower end of the arbor i is pointed and fits a coinciding depression in the upper end of the shaft h, so that said shaft is centered to turn on the end of the arbor i and in the bearing 2.

The spool k and the spool-sleeve k' are preferably connected. The sleeve is of metal; but the spool is preferably of wood or composition and may even have the surface of leather or fiber. The sleeve k' surrounds and is revoluble upon the shaft h, and a washer 9, surrounding the shaft h, preferably intervenes between the lower surface of the sleeve k' and the upper surface of the bearing-sleeve 3. The upper central portion of the spool k, loose on the shaft h, is recessed and the sleeve k' reduced in length to correspond, so as to produce in the upper surface of said spool a recess to receive the lower portion of a friction-disk l, which disk comes above the spool k and rests upon a felt disk l', secured to the upper surface of the spool k and having the function of producing a gripping friction between the spool and the disk. This friction-disk is of greater diameter than the spool k', and it is revoluble with the shaft h because of a pin 10, which passes through the hub of the friction-disk l into a groove 11, running longitudinally of the shaft h.

A short sleeve or ring m of less diameter than the recess in the horizontal part c' of the frame below the bearing-sleeve 3 surrounds and is secured to the shaft h near its upper end, and surrounding the shaft h between the said sleeve m and the upper surface of the friction-disk l is a helical spring n, the office of which is to normally force the disk l against the upper surface of the spool and create sufficient pressure and friction as between the disk and the spool so that the rotation of the spool will be transmitted to the disk and so to the shaft h to turn the same and the drill carried thereby.

Pivotally connected to a lug on the under surface of the horizontal part c' of the frame is a hook o, the free end of which comes just above the upper surface of the friction-disk l. When this hook is moved aside and the friction-disk l raised against the action of the spring n above the hook end and the hook end allowed to fall and engage the under surface of the disk l, said disk is held suspended and in a raised position above the spool k to separate the contacting surfaces of said disk and spool, so that the spool may keep on rotating by the band 7, while the disk l, the shaft h, and drill come to a position of rest.

Directly beneath each drill and supported upon the base a is a drill-block r, there being a projecting central portion of each block r fitting a recess in the bed a and the center of the block being perforated and there being in the upper surface of said drill-block, in line with said perforation, a recess to receive adhesive or plastic material 13, in which to set the stone r'. A centering-pin 12 is adapted to be received into this central opening and the reduced end of said centering-pin to enter the hole bored in the first half of the stone.

In the operation of boring, and referring to Figs. 4 and 5, the drill 8 is permitted to bore the stone r' half-way through. The drill-block r is then heated to soften the adhesive or plastic material 13. The stone is then removed and the centering-pin 12 placed in the recess in the block from the under side. The stone is reversed and the reduced end of the centering-pin 12 passed into the hole bored in the stone to center the stone, which is then reseated by the adhesive or plastic material 13 in the recess provided therefor preparatory to boring the other half of the stone, so that the aperture therein passes clear through.

The boring through of the second half of the stone is accomplished in the same manner as the first half, and the centering-pin 12 after the stone is seated to bore the second half through is preferably removed from the block r, so that when the drill passes through the second half of the stone the point may be free and not come into contact with the point of the centering-pin. The band 7 preferably passes around the pulleys 4 5 and completely around each spool k in the same direction. Consequently the drills are all moving in the same direction, and by means of the devices hereinbefore described a rotary movement is imparted to the drilling devices first in one direction and then in the other.

I have found in practice that it is not only advantageous but substantially essential to revolve the drills first in one direction and then in the other instead of continuously in the same direction, as the particular substances acted upon by the drills in the device of my invention require to be periodically freed of the material removed by the drill, so as to prevent the same clogging up, and this freeing is only accomplished by a movement in the reverse direction. Furthermore, the pe-

culiar character of the drills employed makes them capable of boring during both the forward and backward movements.

To bore stones of the character hereinbefore stated, it is preferable to provide a drill on its point with small pieces of harder stones, preferably diamonds, bedded in the steel, so that the drills are substantially the well-known form of diamond-drills, adapted to bore with either direction of rotation, but freeing themselves of the removed material with each reversal of the rotary movement. It is also apparent from the description hereinbefore given that any reasonable amount of pressure desired may be applied to the drill by means of the weights *i'*, as with comparatively soft material some of the weights will be removed, while with hard material probably all the weights will be employed. It is also apparent that all of the drilling devices may be simultaneously operated or any number of them, as it is possible to raise one or more of the friction-disks *l* and suspend the same upon the hooks *o*, and thus stop the drilling device, while the spool *k* and its sleeve *k'* continuously keep on rotating.

I do not herein limit myself to the straight-line arrangement of the group of boring devices nor to the arrangement of the pulleys, shaft, crank, connecting-rod, arm, and sector device shown and described, as an equivalent means may be employed for operating the drilling devices.

I claim as my invention—

1. In a drilling-machine, the combination with a prime mover for imparting rotary movement, of a series of vertically-movable, independent drilling devices each having a part separable to bring the respective drilling devices to a state of rest and a part revoluble, and a band from the prime mover.

2. The combination with a series of vertically-movable drilling devices having parts separable to bring the respective drilling devices to a state of rest and other parts revoluble, and a support therefor, of a band connecting said drilling devices, and means connected to the band for imparting rotary movements in opposite directions to the series of drilling devices.

3. In a drilling-machine, the combination with a prime mover for imparting rotary movement, of a series of vertically-movable independent drilling devices, a series of coacting and contacting revoluble parts associated with said drilling devices, separable at the pleasure of the operator so as, with the movement of one part, to bring the respective drilling devices to a state of rest without arresting the revolution of the other part, and a band from the prime mover.

4. The combination with a series of vertically-movable drilling devices and a support therefor, of a band connecting said drilling devices, means connected to the band for imparting rotary movements in opposite directions to the series of drilling devices, and a series of drill-blocks axially in line with the drilling devices, and axially perforated and having seats concentric with the perforations at one end to receive the stones to be bored and, centering-pins adapted to be received in the holes of the blocks.

5. In a drilling-machine, the combination with parallel frame parts having bearings, of a shaft, a drill-holding device connected with the lower end of the shaft, a loose spool mounted on said shaft, a spring-controlled friction-disk revoluble with said shaft and adapted to bear on said spool so as to communicate the movement of the spool to the shaft, means for applying pressure to the shaft for the boring operations, and means for supporting the said friction-disk in an elevated position so that the shaft may come to rest while the spool keeps on revolving.

6. In a drilling-machine, the combination with parallel frame parts having bearings, of a shaft, a drill-holding device connected with the lower end of the shaft, a loose spool mounted on said shaft, a spring-controlled friction-disk revoluble with said shaft and adapted to bear on said spool so as to communicate the movement of the spool to the shaft, a centering-arbor and a series of removable weights mounted thereon and adapted for applying pressure to the shaft, a hook pivoted to one of the parts of the frame and adapted when the friction-disk is elevated to engage the same and hold it in a separated relation to the spool, so that the shaft may be at rest while the spool is revolving.

7. In a drilling-machine, the combination with the horizontal frame parts *c*, *c'* having a series of vertically-alined apertures, of a series of bearing-sleeves in said apertures, a series of drilling devices each comprising a shaft vertically movable and a drill-attaching device at its lower end, a spool and spool-sleeve connected and surrounding the shaft, a friction-disk surrounding the shaft above the spool and adapted to engage the upper surface of the spool, said friction-disk having a hub-center and a pin passing through the same into a longitudinal groove of the shaft, a short sleeve around the upper end of the shaft secured thereto, and a spring around the shaft between the sleeve and the disk adapted to press the friction-disk with force upon the upper end of the loose spool so as to cause the shaft and connected parts to travel with the spool, a band passing around the spools of the series of drilling devices, and means for imparting alternating rotary movements to the said drilling devices.

8. In a drilling-machine, the combination with the horizontal frame parts *c*, *c'* having a series of vertically-alined apertures, of a se-

ries of bearing-sleeves in said apertures, a series of drilling devices each comprising a shaft vertically movable, and a drill-attaching device at its lower end, a spool and spool-sleeve connected and surrounding the shaft, a friction-disk surrounding the shaft above the spool and adapted to engage the upper surface of the spool, said friction-disk having a hub-center and a pin passing through the same into a longitudinal groove of the shaft, a short sleeve around the upper end of the shaft secured thereto, a spring around the shaft between the sleeve and the disk adapted to press the friction-disk with force upon the upper end of the loose spool so as to cause the shaft and connected parts to travel with the spool, a centering-arbor passing through the bearing of the upper frame part and engaging a recess in the upper end of said shaft, removable weights for applying degrees of pressure to the vertically-movable shaft, and a hook device adapted to engage the friction-disk and hold the same above the loose spool so as to maintain the shaft in a state of rest while the spool is revolving.

Signed by me this 3d day of June, 1903.

GEORGE SMITH.

Witnesses:

GEO. T. PINCKNEY,

S. T. HAVILAND.