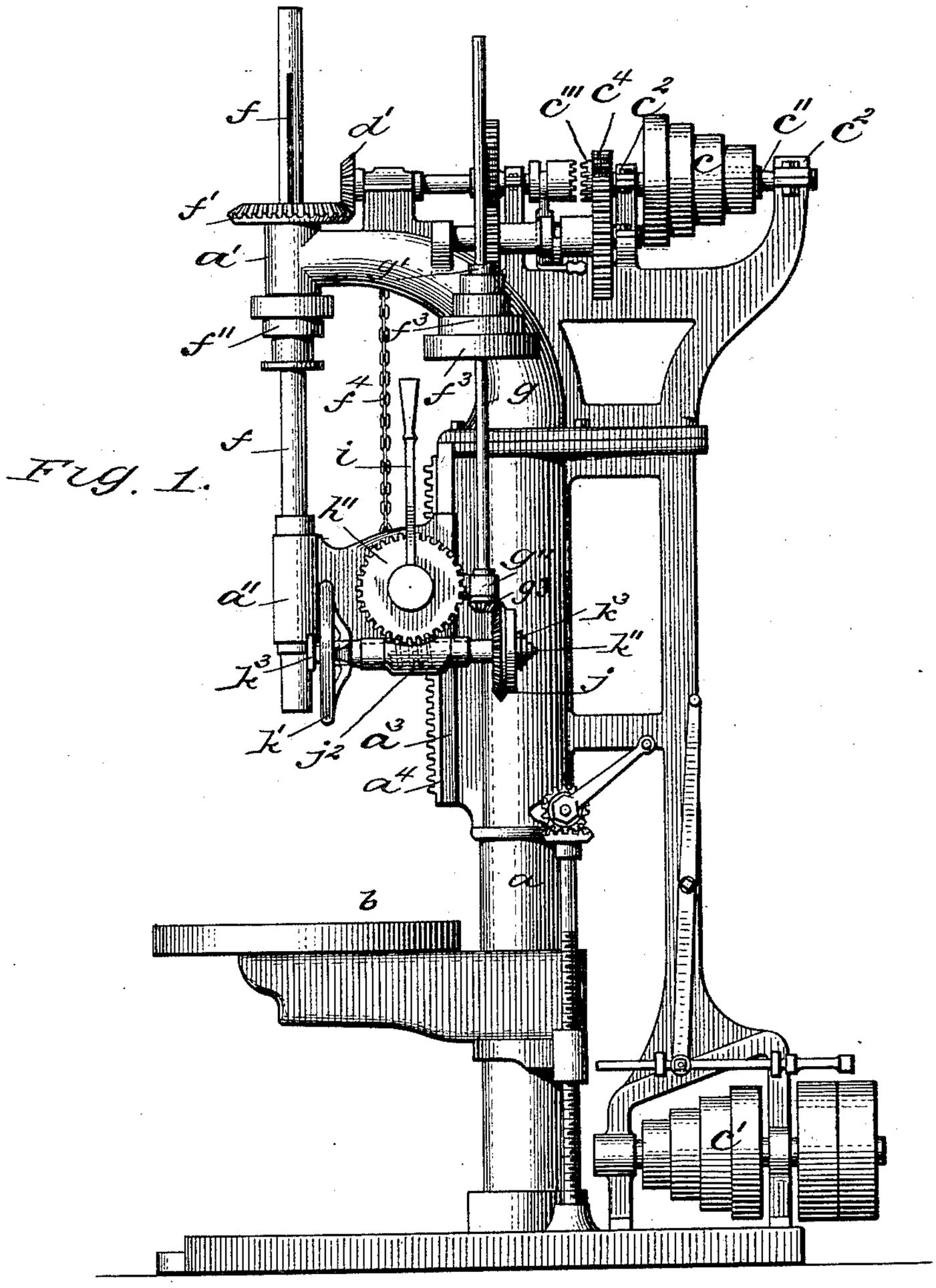
(No Model.) 2 Sheets—Sheet 1.

A. P. SIBLEY & G. O. WARE.

DRILLING MACHINE.

No. 462,884. Patented Nov. 10, 1891.

FIG. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

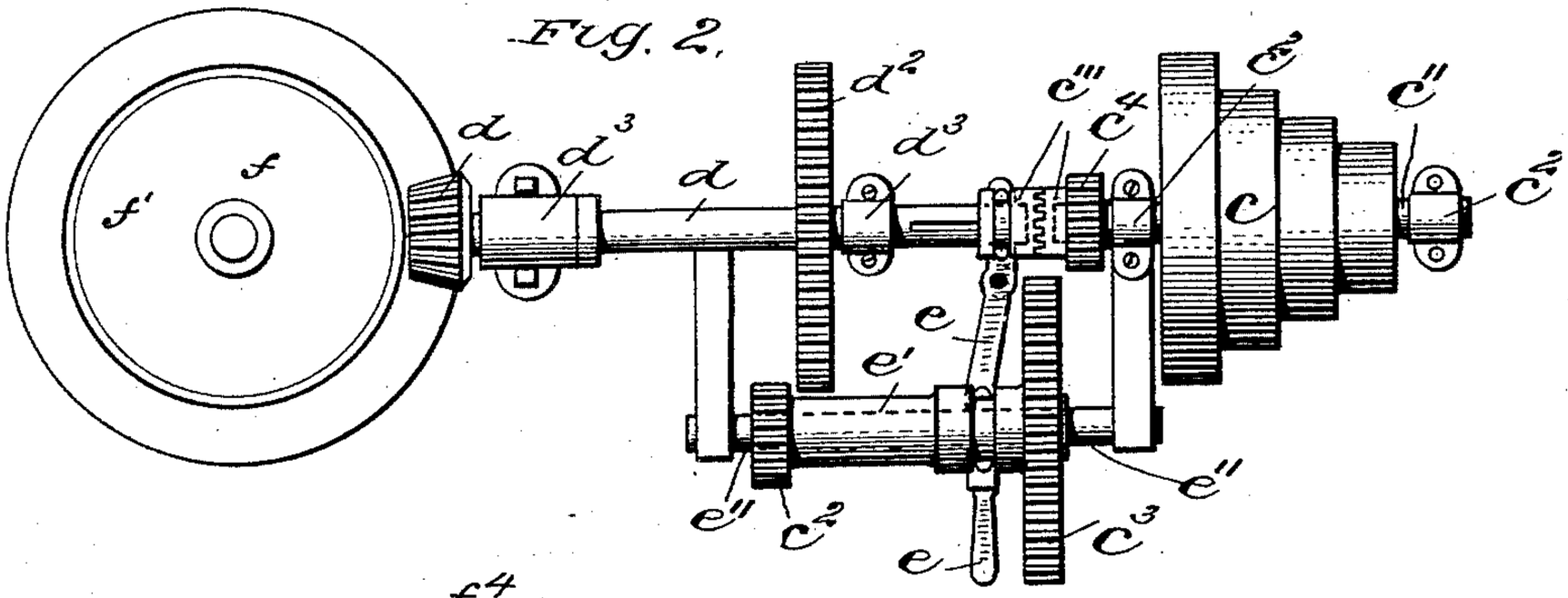

Fig. 3.

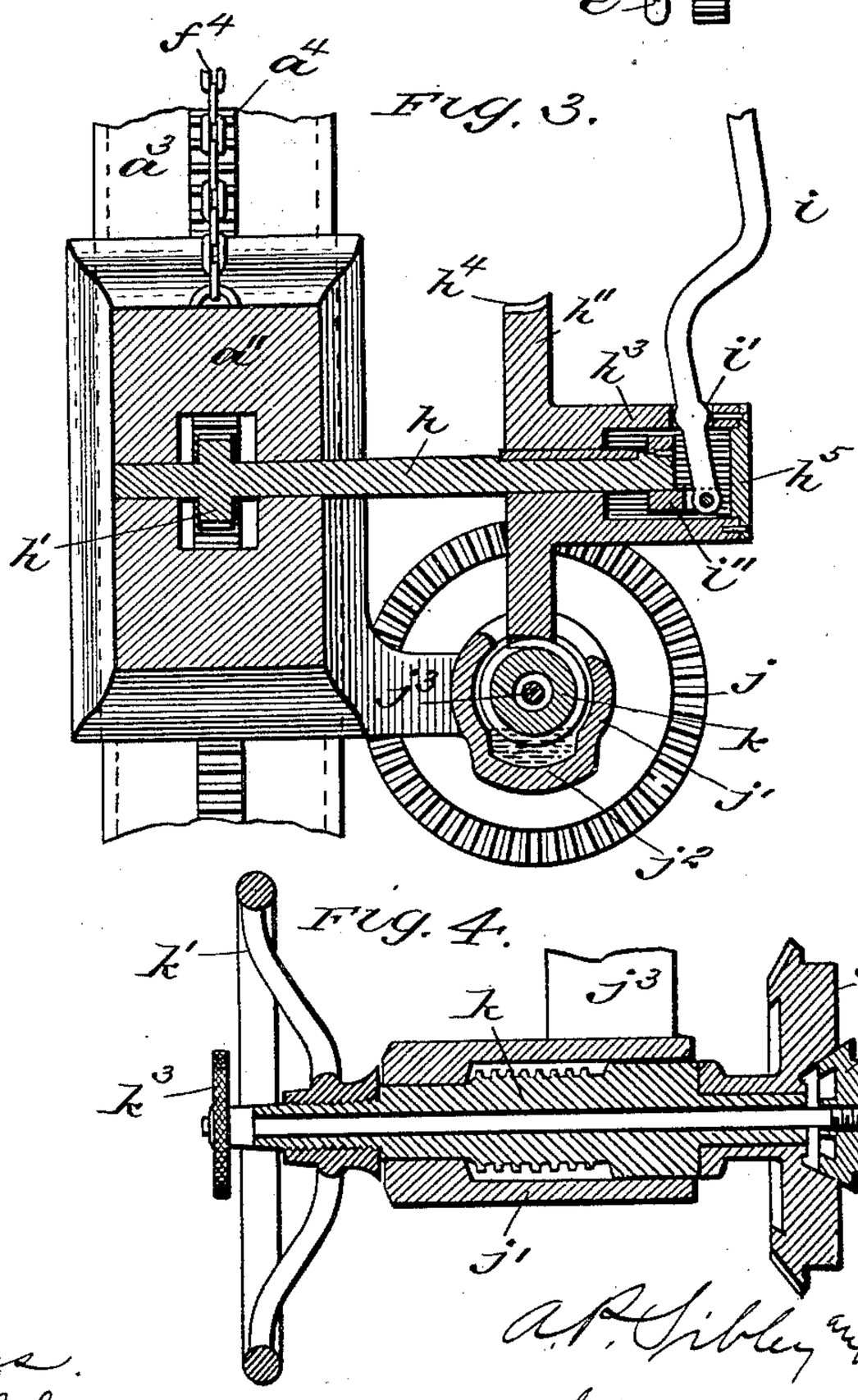

Fig. 4.

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UNITED STATES PATENT OFFICE.

ALBERT P. SIBLEY AND GEORGE O. WARE, OF SOUTH BEND, INDIANA.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 462,884, dated November 10, 1891.

Application filed August 3, 1891. Serial No. 401,486. (No model.)

To all whom it may concern:

Be it known that we, ALBERT P. SIBLEY and GEORGE O. WARE, citizens of the United States, residing at South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 represents a side elevation of our improved drilling-machine complete; Fig. 2, a plan view of the driving and back gear devices; Fig. 3, a detail vertical sectional view of a portion of the feeding mechanism; and Fig. 4, a horizontal sectional view of the worm, showing clearly the friction device.

This invention has relation to that class of vertical drilling-machines wherein the tool may be automatically and forcibly fed to an adjustable horizontal table and quickly returned therefrom, the vertical spindle carrying the tool being journaled in an upper stationary head and a lower movable head, the latter head sliding on ways on the post and having its vertical movements imparted to it by suitable mechanism; and the invention consists in certain novel features of construction and combinations of parts that will fully hereinafter appear, and be particularly pointed out in the claims.

Referring to the drawings by letters, *a* designates the vertical post of the machine, which is mounted upon a suitable base and supports upon its lower cylindrical portion a table *b*, having the usual adjustments. The driving cone-pulleys *c c'* are secured, as usual, upon horizontal shafts journaled in bearings upon the main frame, the pulley *c'* being located near the base of the machine and the other one being mounted on a shaft *c''*, journaled in bearings c^2 c^2 at the upper end of the machine. The shaft *c''* of the upper cone has secured on its extreme inner end (which only projects a short distance beyond its inner bearing c^2) one section of a clutch *c'''*, and on the shaft between the clutch and said bearing is secured a pinion c^4. On the frame in axial alignment with the shaft *c''* is another shaft *d*, which is journaled in bearings d^3 d^3, and has its inner end terminating near to the inner end of said shaft *c''*, this inner end of shaft *d* having mounted on it with a spline and groove the other section of clutch *c'''*, this latter section being adapted to rotate with the shaft, but having a sliding motion thereon, so that it may be readily engaged with or disengaged from its adjacent rigid section. This shaft *d* has secured to it about midway its length, between its bearings, a large gear-wheel d^2, and at its outer end it is provided with the usual bevel-pinion *d'*, meshing with the usual spindle-driving bevel-gear *f'*. A supplemental rod or shaft *e''* is secured in arms on the main frame parallel with the shaft *d*, and mounted on this rod is a sleeve *e'*, having a limited movement thereon between the supporting-arms. On one end of the sleeve *e'* is secured a large spur-wheel adapted to mesh with the pinion c^4, and on its other end is secured a pinion c^2, adapted, when properly adjusted, to mesh with the spur-wheel d^2. A lever *e* is pivoted on the frame between these shafts *d* and *e''*, one of its ends being connected to the sliding section of the clutch and its other end to the sliding sleeve *e'*, whereby a lateral movement of the said lever will cause the sliding clutch-section and the sleeve to simultaneously move in opposite directions.

When speed is required and it is desired to drive the shaft *d* directly from the cone-pulley shaft *c''*, the forward end of the lever is adjusted to the left, whereupon the back gears c^3 c^3 will be thrown out of gear with the gears d^2 and c^4, and the clutch-section on the shaft *d* will be thrown into positive engagement with the rigid section on the adjacent end of the cone-pulley shaft, as shown in Fig. 2. In this way the spindle may be driven directly from the cone-shaft. When it is desired to drive the shaft *d* through the medium of the back gears, the lever is thrown in the opposite direction, whereupon the clutches are disengaged and the back gears are thrown into engagement with their respective gears on the shafts *d c''*, as shown in Fig. 1. In this way a very slow motion of the tool, but great power, is obtained.

The advantages of mounting the driving-cone rigidly on a separate shaft and arranging the back gears as described are important. Where the gears or cones are loose on the shafts, they not only require constant oiling, but they invariably work loose, and also

cut their shafts; but our arrangement obviates these difficulties and provides mechanism that is very positive and powerful in operation, that may be readily adjusted without loss of time, and which will not require lubrication and will not work loose and cut the shafts.

The spindle *f* passes loosely down through the gear *f'*, mounted on the stationary head *a'*, and is secured thereto by a spline and groove, the lower end of the spindle passing through and journaled in the sliding head *a''* in the usual manner. The spindle is provided with a cone-pulley *f''*, which communicates motion through the medium of a belt to a similar cone-pulley f^3, secured on a shaft *g*, parallel with the spindle. The head *a''* slides on suitable ways a^3 on the post, and is counterbalanced by means of the usual chain and weight f^4. The vertical shaft *g* is journaled in bearings *g' g''*, the former of which is on the main frame and the latter is carried by the sliding head in the usual manner, so that this shaft may move vertically in unison with the head and spindle. A small bevel-pinion g^3 is secured on the lower end of shaft *g* and meshes with a bevel-gear *j*, journaled loosely on the end of the horizontal shaft of the worm *k*, said worm-shaft being journaled in bearings formed on an arm j^3, projecting from one side of the head, the worm itself being almost entirely inclosed by a tubular casing *j'*, formed on the arm j^3. A depression or pocket j^2 is formed in the tubular casing *j'* for the reception of the lubricant for the worm and its bearings. The worm-shaft has secured to its forward end a hand-wheel *k*, by which it may be rotated when desired. A rod or bolt *k''* passes longitudinally through the worm-shaft, and is provided at its forward end with a turning button k^3 and at its rear end with the usual beveled friction-disk *k'''*, adapted to frictionally engage the gear *j* and cause it to rotate with the worm-shaft, the friction device being controlled, as usual, by the button k^3 in front.

A horizontal shaft *h* is journaled in bearings in the sliding head and has formed integrally with its inner end a pinion *h'*, constantly engaging the rack a^4 on the post. This shaft is arranged above and at right angles to the screw *k*, and has mounted on its projecting portion a worm-gear *h''*, which is secured on the shaft by a spline and groove, so as to rotate with it, but have a limited endwise movement independently of it. This worm-gear has formed integrally with its outer face a tubular hub h^3, which projects out beyond the end of the shaft *h* and has its end closed by a cap h^5. A radial lever *i* is pivoted in a slot in one side of the chambered hub and has its inner end terminating therein and pivotally secured between ears *i''*, rigidly secured on end of the shaft *h*. This lever is employed to slide the worm-gear on its shaft and engage it with or disengage it from the worm, as the exigencies may require. To facilitate its engagement with and disengagement from the worm, the inner ends of the teeth on the periphery of the worm-gear are formed straight, as at h^4, instead of curved, as in the usual worm and gear devices.

In operation motion is imparted to the shaft *g* from the spindle, and from thence it is imparted to the screw through the medium of the gears g^3 *j*, from whence it is communicated to the worm-gear and its shaft and pinion. In this manner the head is slowly and forcibly fed toward the table, the degree of motion and power being regulated by the several cone-pulleys and back gears. By turning the button k^3 and disengaging the friction device the automatic feed will be stopped and the sliding head may be readily adjusted vertically by means of the hand-wheel *k'* on the worm-shaft, as is evident, and by disengaging the worm-gear from the worm the shaft *h* may be readily rotated by using the lever *i* in the manner of a crank, thereby enabling the head to be rapidly adjusted toward and from the work without loosening the friction devices. The advantage of these feeding devices is obvious. In using the self-feed—that is, in releasing the head from the feeding devices and allowing it to feed itself by gravity—the operator does not have to loosen the friction devices, but simply has to disengage the worm-gear by a slight endwise movement thereof. This is also so when the operator desires to rapidly raise or lower the head, the lever *i* serving as a convenient crank for rotating the shaft *h*.

The oil cup or pocket j^2 serves to lubricate the parts where the most friction occurs, and the cap on the end of the hollow tube serves to keep out dust and dirt. The pinion *h* being formed integral with its shaft and the worm-gear being firmly fitted on the shaft and the shafts themselves being journaled in solid stationary bearings make these parts very strong and durable where the most strength is required. Disengaging the worm-gear from the worm by an endwise movement of the former is advantageous over the usual way of disengaging them, in that the centers of the shafts are not changed in the least.

It is evident that our feeding mechanism may be as readily used on those drills where the lower head is stationary and the spindle is secured in a vertically-adjustable "quill" sliding in the head and provided with a rack—such, for instance, as shown in the patent of A. P. Sibley, No. 412,677, dated October 8, 1889, the pinion *h'* in this case meshing with the rack on the quill, instead of a rack on the post, as shown.

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

1. In a drilling-machine, the combination of a frame, a drill-spindle, two independent shafts journaled on the frame and having

their inner ends in close proximity to each other, the inner end of one shaft being provided with a sliding clutch-section and the adjacent end of the other shaft with a stationary section, a pinion and driving-pulley on one of the shafts and a spur-wheel on the other, a supplemental shaft parallel with the other shafts, endwise-movable gears on this shaft adapted to engage with the aforesaid gears, and means for adjusting the sliding clutch-section and movable gears, substantially as described.

2. The combination, in a drilling-machine, of a frame and spindle, two independent horizontal shafts journaled on the frame, means for locking the shafts together, a spur-wheel secured rigidly on one of the shafts, a pinion and a pulley secured rigidly on the other, and movable back gears adapted to be engaged and disengaged with the gears on the said shafts, substantially as described.

3. In a drilling-machine, the combination of a frame, a post carrying a rack, a sliding head on the post carrying a drill spindle, a shaft *h*, journaled in the head and having formed integral with it a pinion meshing with the rack on the post, a movable worm-gear on the said shaft *h*, a worm meshing with the worm-gear and journaled on the sliding head, and means for driving the worm, substantially as described.

4. In a drilling-machine, the combination of a frame, a head supported on the frame, a drill-spindle supported by the head, a horizontal shaft journaled in the head and provided with pinion on its inner end, an endwise-adjustable worm-gear on the outer end of this shaft, and a screw journaled on the head and meshing with the worm-gear, substantially as described.

5. In a drilling-machine, the combination of a drill-spindle and means for feeding it, consisting of a rack, a shaft and pinion engaging said rack, an endwise-sliding worm-gear on this shaft and adapted to rotate therewith, a lever for adjusting and rotating this worm-gear, a worm engaging said worm-gear, and means for driving the worm, substantially as described.

6. The combination of a stationary worm, an endwise-movable worm-gear adapted to be engaged with said worm, the inner ends of the teeth of said worm being formed straight, as at h^4, substantially as described.

7. In a drilling-machine, the combination of a frame, a sliding head carrying a spindle, a horizontal shaft for feeding said spindle and head, said shaft having keyed on its projecting end a sliding worm-gear, this worm-gear being provided with a chambered hub, a cap secured over the end of this chambered hub, thereby inclosing the end of the shaft, a lever pivoted in a slot in the chambered hub and engaging the inclosed end of the shaft, a screw, and means for driving the screw, substantially as described.

8. The combination of a worm-gear and screw and means for driving said screw, a casing partially inclosing the screw, said casing having an oil pocket or depression formed in it under the screw, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ALBERT P. SIBLEY.
GEORGE O. WARE.

Witnesses:
H. A. ROLLINS,
M. B. HICKOX.