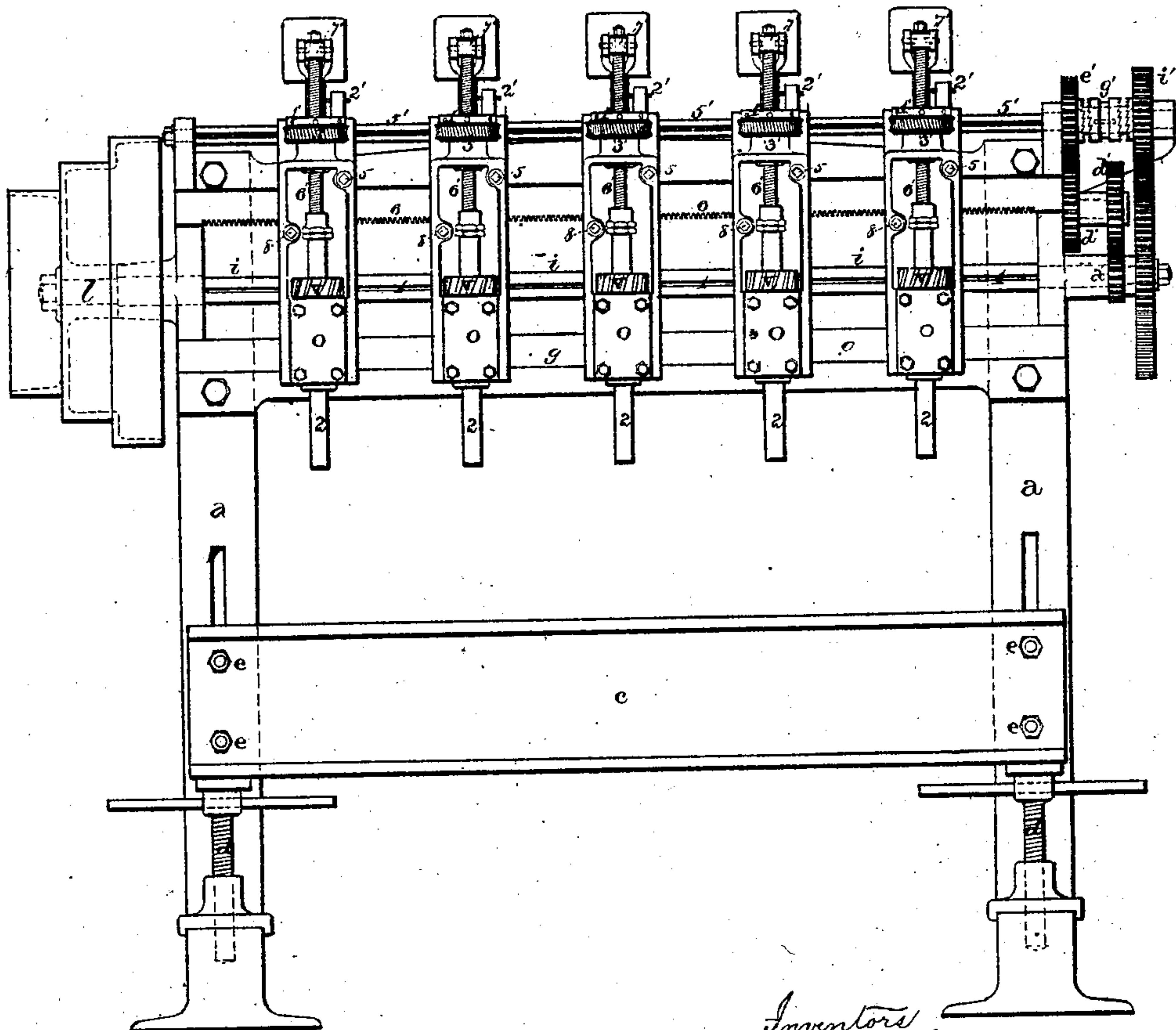


W. H. THORNE & I. N. De HAVEN.
Drilling Machines.

No. 142,966.

Patented September 16, 1873.

Fig. 1.



Witnesses
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H. F. Kinding.

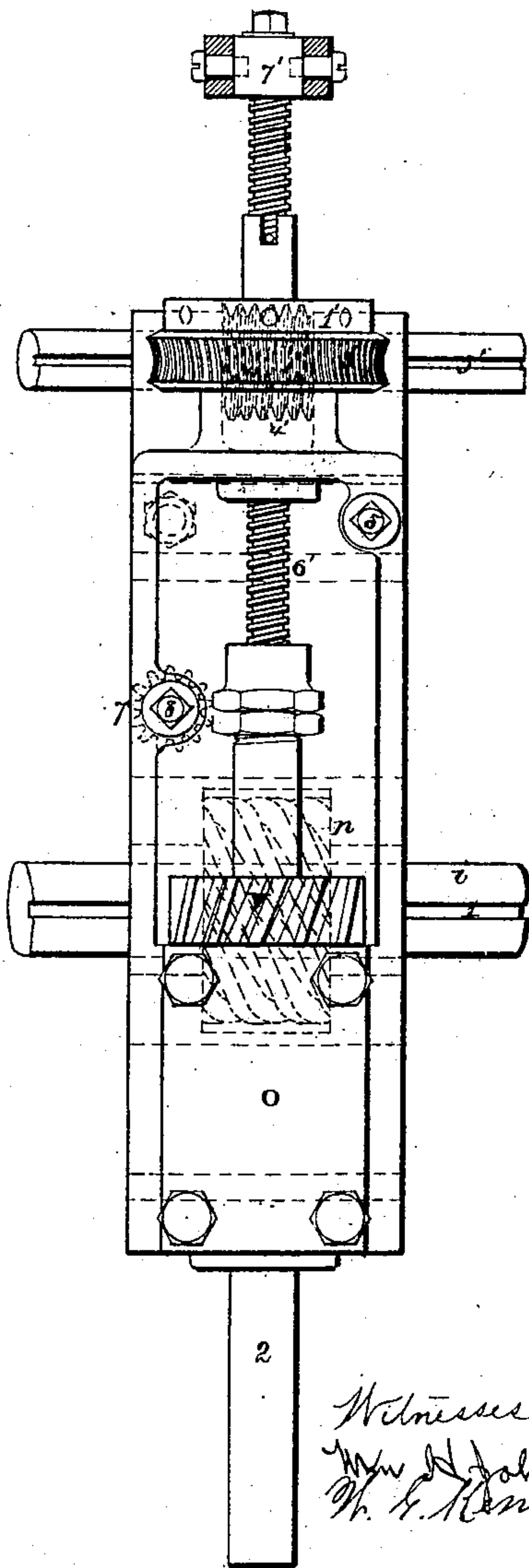
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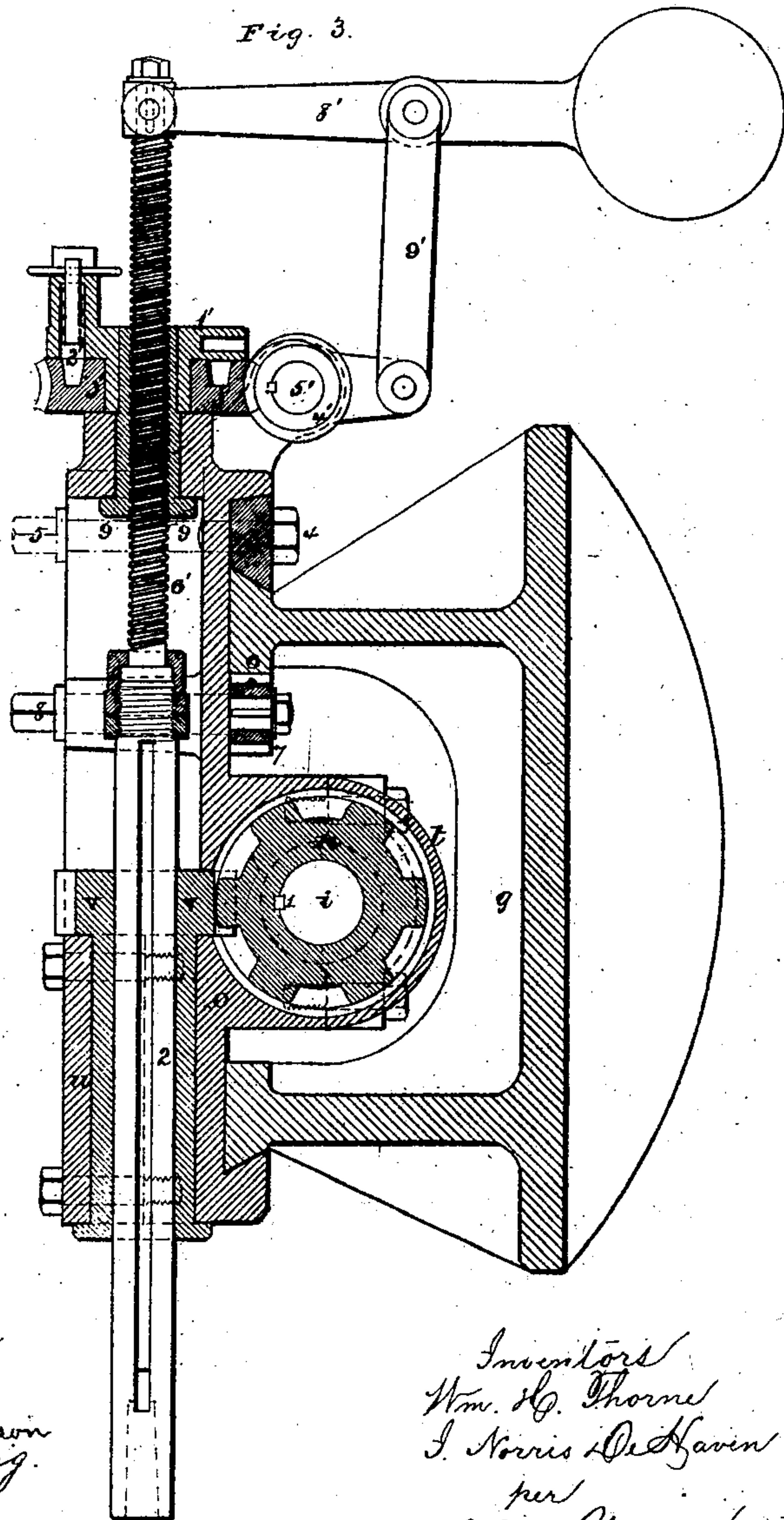
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Fig. 2.



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Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. THORNE AND I. NORRIS DE HAVEN, OF PHILADELPHIA, PA.

IMPROVEMENT IN DRILLING-MACHINES.

Specification forming part of Letters Patent No. 142,965, dated September 16, 1873; application filed August 16, 1873.

To all whom it may concern:

Be it known that I, WM. H. THORNE and I. NORRIS DE HAVEN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Metal-Drilling Machines; 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 pertains to make and use it, reference being had to the accompanying drawings which form part of this specification.

The nature of our invention relates to an improvement in metal-drilling machines; and it consists in, first, the combination of cross-head, drilling-heads, rack and pinion, and clamp and clamping-screw, so that the heads can be adjusted back and forth, and securely clamped in any desired position; second, the combination of the driving and feed shafts, worm and tangent wheels, clutch, nut, screw, and spindle, in such manner that a vertical traverse can be given to all, or any number of, the spindles at once, and so that any of them can be adjusted by hand independently, so that the points of the drilling-tools held by the spindles can be raised all to the same height above the table; third, the combination of driving-shaft, gearing, clutch, and feed-shaft, so that the feed-shaft can be revolved slowly in one direction to traverse the drilling-spindles down, or rapidly in the other to traverse the spindles up; or so that it will remain stationary and not traverse the spindles at all, according as the clutch is in contact with one or the other of the gear-wheels, or with neither. Our object is to drill boiler-plates, ship-plates, or any other iron work in which a number of holes are to be drilled in line with each other, either at equal or unequal distances apart.

The accompanying drawings represent our invention.

a represents the standards upon which the machine is supported, and upon which the table *c*, which supports the work being drilled, is adjusted up and down by means of the screws *d*, and then clamped in position by the bolts *e*, the standards being connected together above the table by the cross-head *g*. Journaled upon the cross-head *g* is the driv-

ing-shaft *i*, having the cone-pulley *l* upon one end, and which has a groove, *1*, extending almost its entire length, formed in its side. Feathered upon this shaft, so that they can be readily adjusted back and forth at pleasure, are a number of short screws or worms, *n*, having a journal formed upon each end, and which are secured in the back of the drilling-heads *o* by the caps *t*. These worms have their threads or screws cut at as great, if not greater, pitch than their diameter, and, revolving horizontally, mesh with and communicate motion to the tangent-wheels *v* placed at right angles to them, feathered upon the spindles *2*. These tangent-wheels have journals formed upon their under side, which are held between the caps *u* and the lower parts of the drilling-heads in a vertical position, the wheels in their horizontal revolution imparting motion to the spindles *2*, to which any suitable drilling device may be attached. Upon the rear sides of the drilling-heads, at the bottom, there is formed a V-shaped recess, in which a similar-shaped projection upon the cross-head *g* fits. Between the projection at the top of the drill-head and the V-shaped projection on the top of the cross-head there is placed a shoe, *3*, of rhomboidal section, and which is fastened with a bolt, *4*, which screws into the drilling-head at one end sufficiently loose to permit the drill-head to slide on the cross-head. The other end of the shoe is fastened to the drill-head by a square-headed screw, *5*, which passes through the head into the shoe. Upon the under side of the upper projection on the cross-head there is formed a rack, *6*, with which a pinion, *7*, placed upon the shaft *8*, engages, the shaft having a square head of the same size as the screw *5*. In the top of the drill-head is placed the freely-revolving nut *9*, which is fastened to the clutch-plate *1'*, carrying a spring-pin, *2'*, which can be dropped into one of the holes around the top of the tangent-wheels *3'*, or held up out of these holes and revolved with the nut independently of the tangent-wheel. The tangent-wheel *3'* revolves freely around the hub of the clutch-plate until the pin *2'* binds it to the clutch-plate, when it carries the clutch-plate and nut with it, the wheel receiving its motion from the screw or worm *4'* feathered upon the

grooved shaft 5'. Secured to the top of the spindle 2, by means of the yoke and nut lock, or any other suitable device, is the screw 6', which passes up through the nut 9, and is fastened to the block 7' pivoted to the end of the weighted lever 8', which is fulcrumed upon the arm 9' pivoted to the top of the drill-head. Upon the end of the driving-shaft *i* are secured two wheels, *a'* *c'*. The one *a'* gives motion to the wheels *d'*, which, in turn, communicate it to the loosely-revolving wheel *e'* placed upon the grooved shaft 5', and which has teeth formed upon its side, so as to engage with the sliding clutch *g'* feathered upon the same shaft. The wheel *c'* gives motion to the loosely-revolving wheel *i'* placed upon the end of the shaft 5', and which has also teeth formed upon its side, so as to engage with the clutch *g'*.

The operation is as follows: Motion being imparted to the driving-shaft *i*, through the cone-pulley 1, is communicated, through the worms *n* and tangent-wheels *r*, to the drill-spindles 2. By turning the shaft 8 the pinion 7, meshing with the rack-bar 6, will cause the drill-heads to move freely back and forth upon the driving-shaft, carrying the worms with them, so that the spindles can be arranged to operate at any desired distance apart, and then can be clamped securely in position by the screw 5. As the drill-heads move back and forth they also carry the worms 4' on the grooved shaft 5' along with them, from which the tangent-wheels 3' receive their motion. When the tangent-wheels are fastened to the clutch-plate 1' and nut 9 by the pin 2' the revolution of the wheels will cause the screws 6' to traverse the drill-spindles up or down, according to the motion of the shaft 5'; and, as the worms *n* will be revolving at the same time, their rotary motion will be communicated to the spindle 2, so as to operate the drill.

When it is desired to traverse the screw up or down by hand the pin 2' is lifted out of the hole in the top of the tangent-wheel and the plate turned round, which will cause the drill-spindle to move rapidly up or down. The drills are all fed down together until the holes are completed, when they can be run up quickly. In case the drills are of different lengths the short ones can be adjusted in line with the long ones by throwing out the clutch-pin and screwing down by hand.

The two wheels upon the driving-shaft, the one *c'* turns *i'* rapidly in an opposite direction, while the one *a'* turns the one *e'* slowly in the same direction through the intermediates *d'*. The two wheels *i'* *e'* being loose

upon the shaft 5' will not turn it until the clutch is thrown into gear with one or the other. When in gear with *e'* the drills will be slowly fed down; but when in gear with *i'* they will be raised rapidly up.

We are aware that movable drill-heads, adjustable back and forth on grooved shafts, and having the drill revolved by one tangent-wheel, and traversed up and down by another, are not new, and we do not, broadly, claim such.

In case it is so desired, either shaft, *i* or 5', can be made continuous screws or worms in place of having short worms sliding on them.

The recess in the back of the drill-heads in which the worms are placed may be partially filled with oil for lubricating purposes.

Having thus described our invention, we claim—

1. The sliding drill-heads arranged upon the two shafts so as to be adjusted back and forth, and which are provided with a mechanism for operating the drill-spindles, and a mechanism which will slowly feed the drills down and rapidly run them up, and which are movable with the heads, substantially as shown and described.

2. The worms *n* sliding back and forth on the driving-shaft with the drill-head, and giving motion to the tangent-wheels to revolve the spindles, substantially as specified.

3. The worms *n* on the driving-shaft and worms on the shaft 5', in combination with a tangent-wheel to revolve the spindle, and a tangent-wheel to feed the spindle up and down, substantially as shown.

4. The cross-head *g*, provided with the rack 6, in combination with the pinion on the drill-head to move the heads back and forth, and a suitable clamping device, substantially as described.

5. The tangent-wheel 3', clutch-plate 1', pin 2', nut 9, and screw 6', combined to operate as set forth.

6. The combination and arrangement of the shafts *i* 5', drill-heads *o*, worms *n* 4', tangent-wheels *r* 3', nut 9, clutch 1' 2', screw 6, weighted lever 8', pinion 7, clamp 5, drill-spindles 2, and a suitable operating mechanism, substantially as shown and described.

In testimony that we claim the foregoing we have hereunto set our hands this 11th day of August, 1873.

WM. H. THORNE.

I. NORRIS DE HAVEN.

Witnesses:

STANISLAUS REMAK,
C. H. BAKER.