

T. FORSTNER.
DRILLING MACHINE.

No. 512,285.

Patented Jan. 9, 1894.

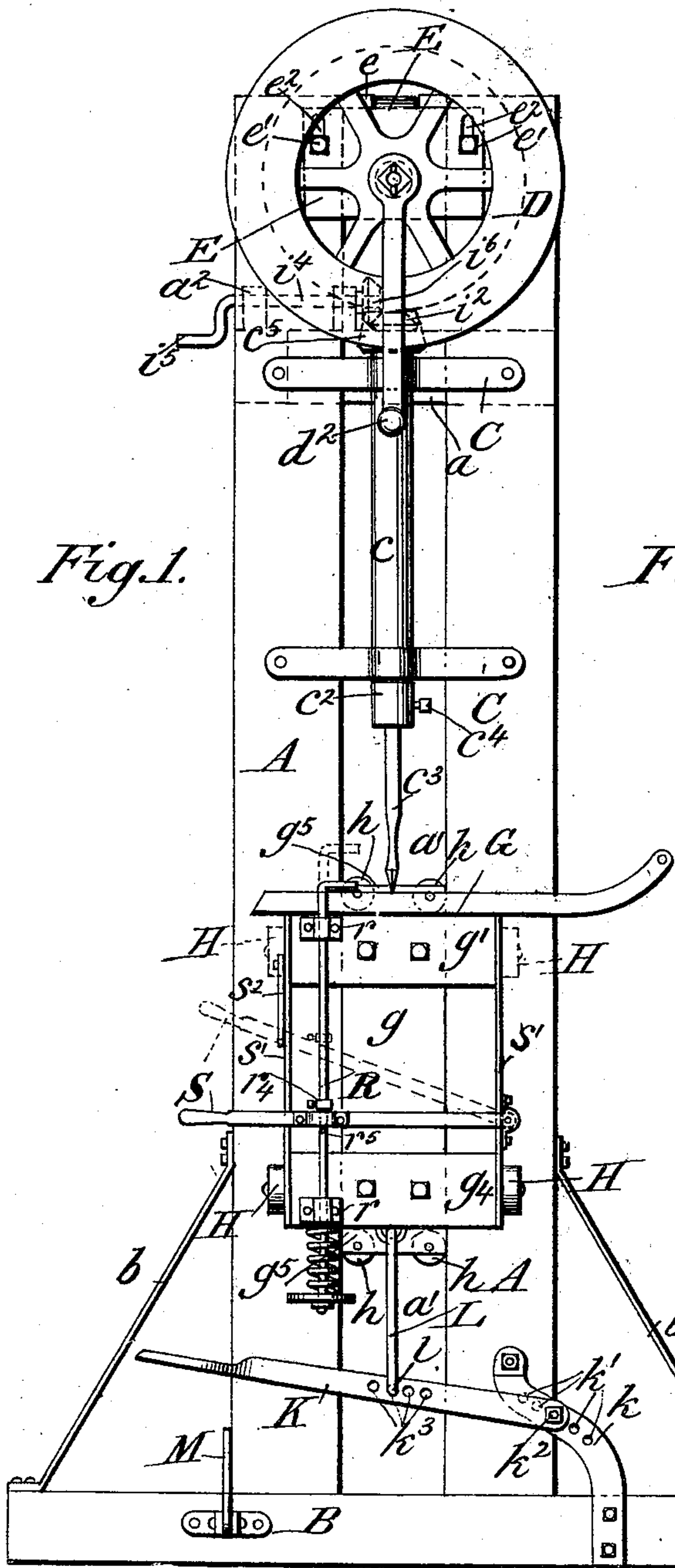


Fig. 2.

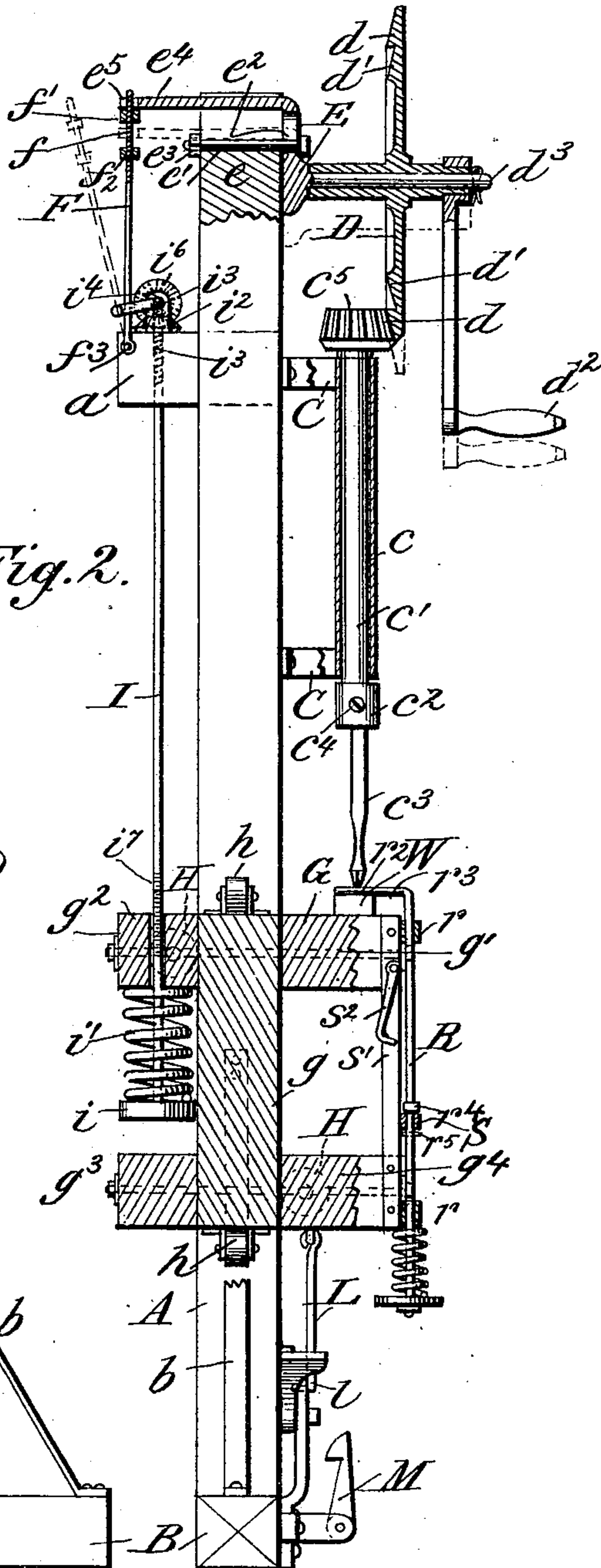


Fig. 7.

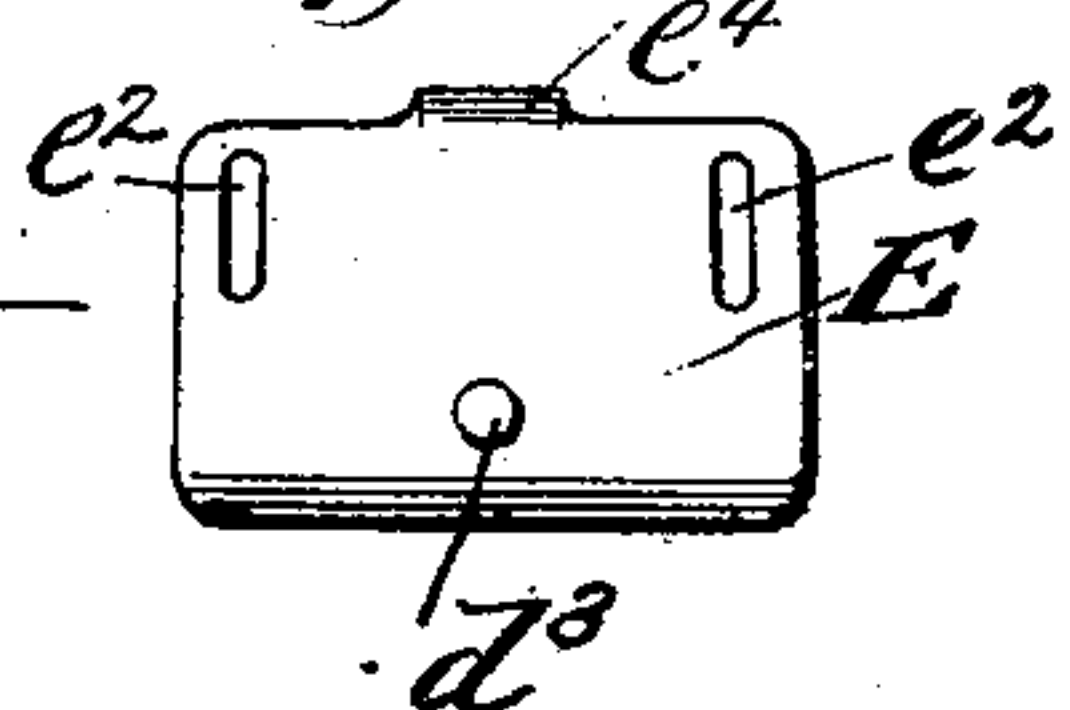
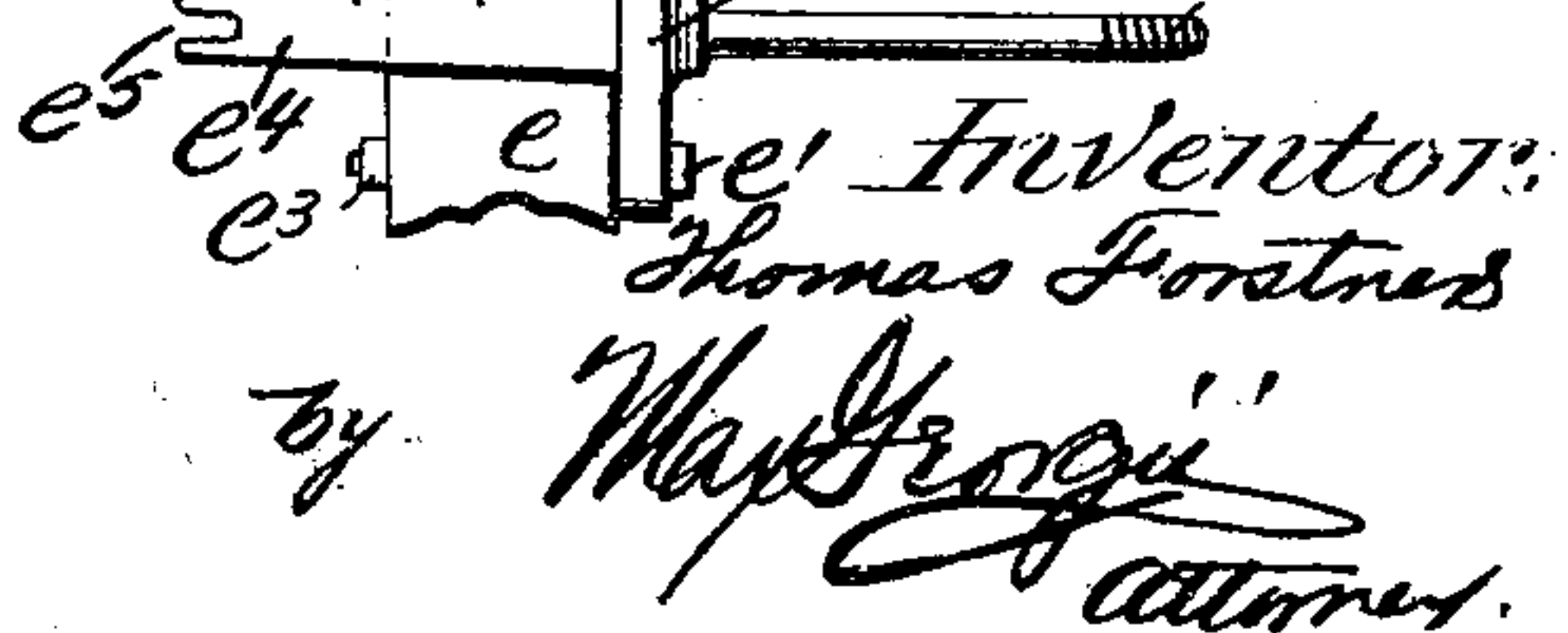


Fig. 3.



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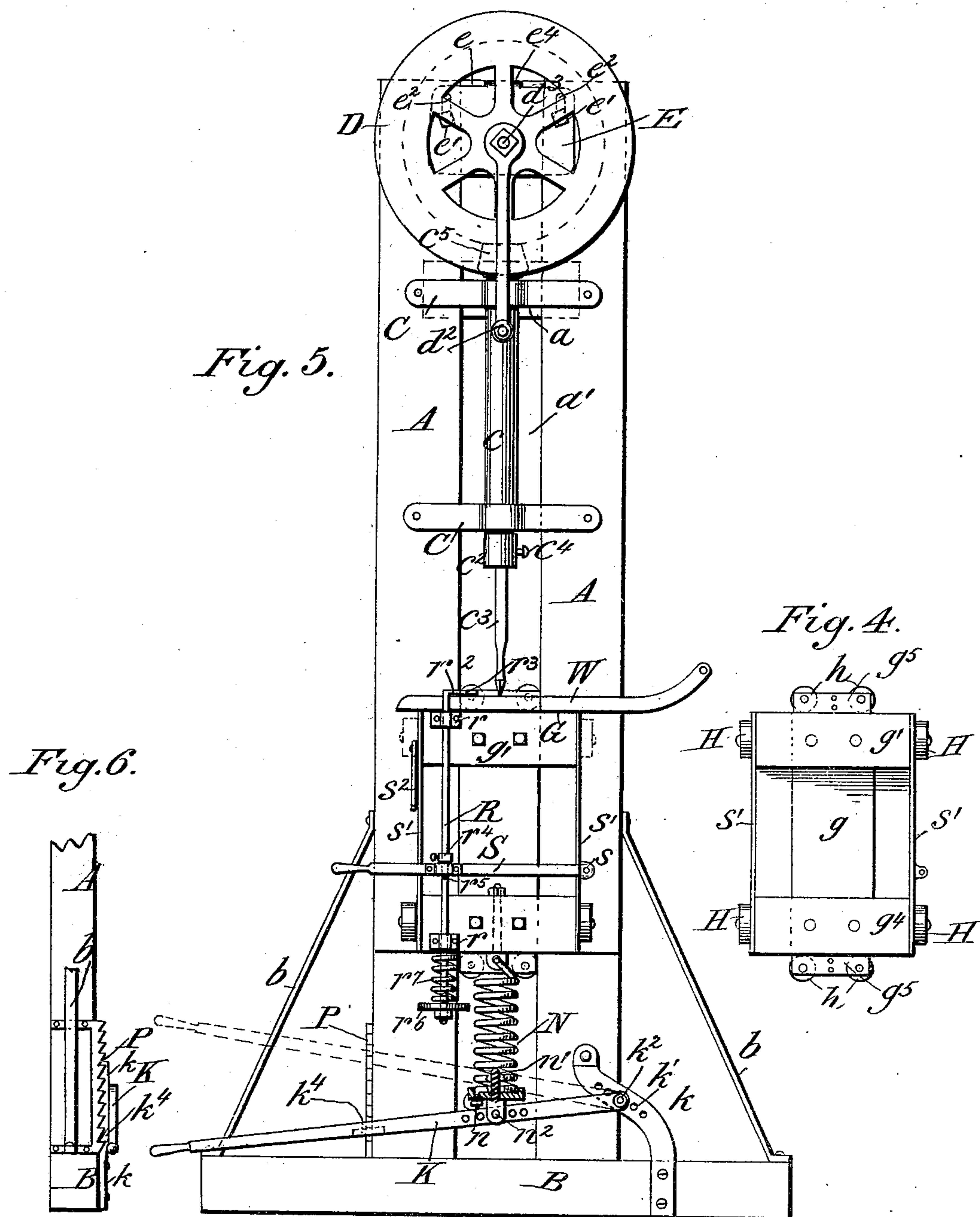
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

THOMAS FORSTNER, OF NEW ULM, MINNESOTA.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 512,285, dated January 9, 1894.

Application filed April 26, 1893. Serial No. 471,959. (No model.)

To all whom it may concern:

Be it known that I, THOMAS FORSTNER, a citizen of the United States, residing at New Ulm, in the county of Brown and State of Minnesota, have invented certain new and useful Improvements in Drilling-Machines; and I 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.

My invention relates to drilling and boring machines particularly adapted for metal, although machines having my improvements may also be used in operating on any other material, such as wood and the like.

This invention embodies an improvement on the drilling machine shown and described in my Patent No. 494,632, dated April 4, 1893. The object of the same, broadly stated, is first, to provide a more convenient means for adjusting the tension of the suspension rod; second, to provide an indicator which will show the amount of tension on the suspension-rod spring; third, to produce a readily-operated clamp for holding the work; fourth, to construct the drill-driving mechanism so that its speed may be changed according to the material being drilled; and last, to provide means for regulating the power of the treadle lever.

In the present invention I have substituted, for the hand-wheel used in adjusting the tension of the suspension rod and spring, a bevel gear and crank, whereby the tension may be regulated by the operator from the side of the machine. I also substitute, for the gear wheel previously used for driving the drill-spindle, a double or compound gear-wheel and make the head which carries the gear-wheel shaft vertically adjustable, thus rendering it possible to easily alter the speed of the drill according to the material being operated. I have also provided several new features which will first be described in connection with the accompanying drawings and then particularly pointed out in the claims.

In the drawings—Figure 1 is a front elevation of one form of an apparatus embodying my invention. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a detail plan view of the head. Fig. 4 is a detail front view of

the bed or work-table. Fig. 5 is a front elevation of one modification of my apparatus. Fig. 6 is a detail view showing the ratchet. Fig. 7 is a detail front view of the head.

Referring to the drawings, A are standards rising from the base, B, and rigidly held by braces, b, as shown. To the standards are secured brackets, C, carrying a long-bearing or sleeve, c, in which is revolubly mounted a drill-spindle, c', provided below the bearing or sleeve with the usual drill chuck or socket, c², in which the drill, c³, is held by a set screw, c⁴, the spindle, c', carrying at its upper end a bevel-gear pinion, c⁵, which is driven by a compound bevel gear wheel, D, having, in this instance, two concentric rows of teeth, one, d, near the periphery and another, d', located between the outer row of teeth and the center of the gear wheel. This gear wheel, D, is rotatable by means of a crank, d², being revolubly mounted on a shaft or stud, d³, projecting forward from a head, E, which is secured to a cross-piece, e, by bolts, e', which pass through the cross-piece and through slots, e², in the head and are provided with nuts, e³. The head also carries a rearward-projecting arm, e⁴, slotted at e⁵, into which slot enters the upper end of an adjusting rod, F, threaded at f, and provided with two nuts, f' and f², the said rod being pivoted at f³, to a fixed bracket, a, secured between the standards.

When it is desired to drill material requiring the maximum power of the machine, the inner bevel gear of the driving gear-wheel is brought into engagement with the bevel gear pinion on the drill spindle by slacking up the nuts, e³, on the bolts, e', and swinging the adjusting rod, F, out of engagement with the slot, e⁵, after which the head may be dropped until the said inner gear and the bevel pinion are in contact, when the nuts, e³, may be tightened and the adjusting rod swung up into the slot, e⁵, the lower nut, f', being adjusted on the threaded portion of the rod, F, so as to come immediately under and in contact with the under side of the arm, e⁴, thus supporting the arm and aiding in holding the head.

To set the machine for drilling material which requires the maximum speed of the machine, the outer row of gear teeth is brought

into mesh with the bevel pinion, the method of doing this being apparent from what has been heretofore stated, the arm, e^4 , being then supported by the upper nut, f^2 , on the adjusting rod, F.

G is a work-table or bed, consisting of a center or guide-block, g , vertically movable in the space, a' , between the standards, A. At the top and bottom of the guide-block, g , are attached four horizontal blocks, g' , g^2 , g^3 , and g^4 , which serve to hold the work-table in proper horizontal position, the first horizontal block, g' , constituting the work-table proper.

In order to overcome friction in the vertical movement of the work-table on the standards, A, and to prevent the said work-table from binding against the standards, I provide the same at suitable points with anti-friction rollers, H, preferably arranged as shown, that is to say, two rollers at the top in the block, g^2 , and two at the bottom of the work-table and in front of the standards. This construction is similar to that described in my application previously referred to. In addition to these rollers, I have also added a series of four rollers, h , operating in a plane at right angles to rollers, H, and bearing against the inner faces of the standards, the bottom of the work-table being extended as at g^5 .

In order to automatically feed the work up to the drill, as the latter sinks through it I suspend the table which carries the work from the fixed bracket, a , by a rod, I, which passes loosely through the block, g^2 , and is provided at its lower end with washer or head, i , between which and the block, g^2 , is arranged a helical or other spring, i' , which has a tendency to yieldingly force the table, G, upwardly against the drill, and with it any work which may be placed on the table. This construction of the work-table is similar to that shown and described in my application for patent hereinbefore mentioned.

In order to regulate the pressure with which the work is forced against the drill, I provide a device somewhat different from my previous construction, this device consisting of a bevel pinion, i^2 , internally threaded and engaging the upper end of the rod, I, which is also screw-threaded, as at i^3 , the pinion resting on the bracket, a . A small bearing, a^2 , fixed to bracket, a , supports a crank shaft, i^4 , provided with a crank i^5 , and a bevel gear-wheel, i^6 , the latter meshing with the pinion, i^2 . It will thus be seen that by rotating the crank, i^5 , the tension on the suspension rod, I, may be adjusted. Furthermore, for the purpose of indicating the amount of strain on rod, I, I paint or otherwise mark on said rod, at its lower end, a scale, i^7 , preferably of inches, as shown in the drawings, the top of the block, g^2 , serving as the index from which to read the scale.

For the purpose of depressing the work-table, a lever, K, is provided, being pivotally attached to a fulcrum-piece, k , provided with a segmental upper end in which is a series

of bolt-holes, k' , a bolt, k^2 , passing through the end of lever, K, serving to pivot the lever in any desired hole of the fulcrum-piece. The central portion of the lever is also provided with a series of holes, k^3 , into any one of which may be inserted as desired the lower hooked end, l , of a link, L, attached at its upper end to the lower side of the work-table. Thus by depressing the lever, the work-table may be drawn down and the suspension spring compressed, thereby permitting the work to be inserted beneath the drill, after which the lever may be released to permit the spring to feed the work to the drill. For the purpose of holding the lever down, as when mounting the work on the table, a catch or hook, M, is pivoted to the base, B, thus permitting the hooked end, m , of said catch to be swung over the top of the lever to hold it down or swung back to release it.

By having the series of bolt-holes in the fulcrum-piece and the series of link-holes in the lever, the power necessary to compress the suspension spring may be readily adjusted.

In Fig. 5 I have shown a modified form of my feeding mechanism. Instead of having the suspension device I move the table to the drill from below by means of a spring, N, which takes the place of the link, L, being secured to the under side of the table in any suitable manner, and having its lower end resting in and secured to a dish-shaped washer-nut, n , mounted on the upper threaded end of a stud, n' , having its lower end bifurcated and provided with a bolt-hole through which a bolt, n^2 , may be passed to pivotally attach the stud to the lever, K, which is provided with a series of holes, k^3 . In this construction the lever is arranged as a hand-lever and is provided with a rib, k^4 , on one side, which rib is adapted to engage with a ratchet, P, attached to one of the standards, as shown. By pulling up the lever, K, the spring, N, may be compressed, being held in this position by entering the rib, k^4 , in the proper notch in the ratchet, P. It is to be understood that the lost motion of the lever, K, at its fulcrum, or the elasticity will permit the lever to be sprung to one side so as to release the rib, k^4 , from the teeth of the ratchet. By this means the tension on the spring, N, may be adjusted as desired, thus regulating the feeding of the work to the drill. For the purpose of holding the work to the work-table I have devised a new form of clamp. This consists of a foot-rod, R, rotatably mounted in bearings, r , attached to the front of the work-table and having its upper end bent at right angles to form a foot, r^2 , which is padded on its under side with a layer of rubber or other elastic material, r^3 . The foot-rod passes through an elongated opening in a hand-lever, S, fulcrumed at s , to one of a pair of vertical braces, s' , as shown, the foot-rod being provided above the hand-lever with a collar, r^4 , and below the hand-lever with a transverse

pin, r^5 . The lower end of the foot-rod is threaded and provided with an internally-threaded hand-wheel, r^6 , between which and the bottom of the work-table is interposed a spring, r^7 , which tends to hold the foot r^2 , down against the table, thereby clamping to the table any work as W, which may be placed beneath it. By means of the hand-wheel, r^6 , the tension of the spring may be adjusted to suit the requirements of the work. By lifting up the hand-lever, S, the foot may be raised to release or to permit the insertion of work, the hand-lever being held in this position by means of a swinging hook, s^2 , pivoted to one of the vertical braces, s' , as shown.

In constructing a machine for the market it is my purpose to supply it with both the suspension-rod and spring and also the adjustable spring pressure-device, K, N, P beneath the table, so that either feeding device may be used as desired.

While I consider the machines thus shown and described the best embodiment of my invention, it is manifest that the same may be considerably modified in many particulars without departing from the spirit of my invention, and I do not therefore desire to be limited to the exact details described.

What I do claim as new, and desire to secure by Letters Patent, is—

1. In a drilling machine, the combination, with a pair of standards, a work-table vertically movable between the standards, and a drill revolubly mounted on the standards, of a lever provided with a series of holes near its center and a bolt-hole at one end, a fulcrum-piece provided with a series of bolt-holes, a bolt insertible in the bolt-hole in the lever and in any desired hole in the fulcrum-piece, and a connecting device attached to the work-table and adjustably pivoted in any one of the holes in the central portion of the lever, substantially as set forth:

2. In a drilling machine, the combination, with a pair of standards, a work-table vertically movable between the standards, a drill revolubly mounted on the standards, and a lever provided with a series of holes near its center and a bolt-hole at one end, of a fulcrum-piece provided with a series of bolt-holes, a bolt insertible in the bolt-hole in the lever and in any desired hole in the fulcrum-piece, and a spring attached to the bottom of the work-table and adjustably pivoted in any one of the holes in the central portion of the lever, substantially as set forth.

3. In a drilling machine, the combination, with a base-piece, a pair of standards secured to the base-piece, a drill revolubly mounted on the standards, and a work-table vertically movable between the standards, of a fulcrum-piece attached to the base-piece and having a series of bolt-holes, a lever provided with a bolt-hole at one end, a rib at the other end, and a series of holes near its center, a bolt insertible through the bolt-hole in the lever and through any desired hole in the fulcrum-

piece, a stud having a bifurcated end, a bolt hole through the bifurcated end, and a screw-thread above the bifurcation, a bolt passing through the bolt-hole in the stud and insertible in any desired hole in the central portion of the lever, a spring-pan adjustably mounted on the screw-thread of the stud, a spring attached to the work-table and secured in the spring-pan, and a ratchet secured to one of the standards and arranged to engage with the rib on the lever, substantially as set forth.

4. In a drilling machine, the combination, with a work-table, of a foot-rod mounted on the work-table and provided with a foot at its upper end, a hand wheel threaded onto the lower end of the foot-rod, and a spring interposed between the work-table and the hand-wheel, substantially as set forth.

5. In a drilling machine, the combination, with a pair of standards, a drill-spindle revolubly mounted on the standards, and a bevel pinion fixed on the spindle, of a head provided with a slotted arm, a pivoted adjusting rod arranged to engage the slot in the arm, a series of nuts threaded on the rod, a stud fixed in the head, a driving wheel revoluble on the stud and having a series of concentric bevel gears, and means for turning the driving wheels, substantially as set forth.

6. In a drilling machine, the combination, with a pair of standards, a drill-spindle revolubly mounted on the standards, and a bevel pinion fixed on the spindle, of a slotted head provided with a slotted arm, a bolt passing through each slot in the head and through the standards, a nut for each bolt, a pivoted adjusting rod arranged to engage the slot in the arm, a series of nuts threaded on the rod, a stud fixed in the head, a driving wheel revolubly mounted in the stud and having a series of concentric bevel gears, and means for turning the driving wheel, substantially as set forth.

7. In a drilling machine, the combination, with a work-table, of a foot-rod mounted on the work-table and provided with a foot at its upper end, means for pressing the foot toward the table, a collar secured to the foot-rod, and a lever pivoted to the work-table and engaging the collar, whereby the foot may be raised, substantially as set forth.

8. In a drilling machine, the combination, with a base-piece, a pair of standards secured to the base-piece, a drill revolubly mounted on the standards, and a work-table vertically movable between the standards, of a fulcrum-piece attached to the base-piece and having a series of bolt-holes, a lever provided with a bolt-hole at one end and a series of holes near its center, a bolt insertible through the bolt-hole in the lever and through any desired hole in the fulcrum-piece, a spring attached to the work-table and adjustably pivoted in any hole in the central portion of the lever, and a lever-holding device attached to one of the standards, substantially as set forth.

9. In a drilling machine, the combination,

with a work-table, of a foot-rod mounted on the work-table and provided with a foot at its upper end, means for pressing the foot toward the work-table, a collar secured to the foot-rod, a lever pivoted to the work-table and engaging the under side of the collar, a pin passing transversely through the foot-rod below the lever, and a hook-device engaging the lever to hold the foot up from the work-table, substantially as set forth.

10. In a drilling machine, the combination, with a work-table, of a series of bearings attached to the front of the table, a foot-rod rotatable and vertically movable in the bearings and provided at its upper end with a foot, a layer of elastic material secured to the un-

der side of the foot, a collar on the foot-rod, a pair of vertical braces secured to the work-table, a lever pivoted to one of the braces and engaging with the collar, a transverse pin in the foot-rod below the lever, a hook-device pivoted to the other brace and arranged to engage the lever in its raised position, a hand-wheel threaded on the lower end of the foot-rod, and a spring between the hand-wheel and the work-table, substantially as set forth.

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

THOMAS FORSTNER.

Witnesses:

I. M. OLSEN,

C. A. HAGLURG.