(No Model.)

3 Sheets—Sheet 1.

A. L. NAVONE.

HUB AND GENERAL BORING AND MORTISING MACHINE.

No. 353,877. Patented Dec. 7, 1886.

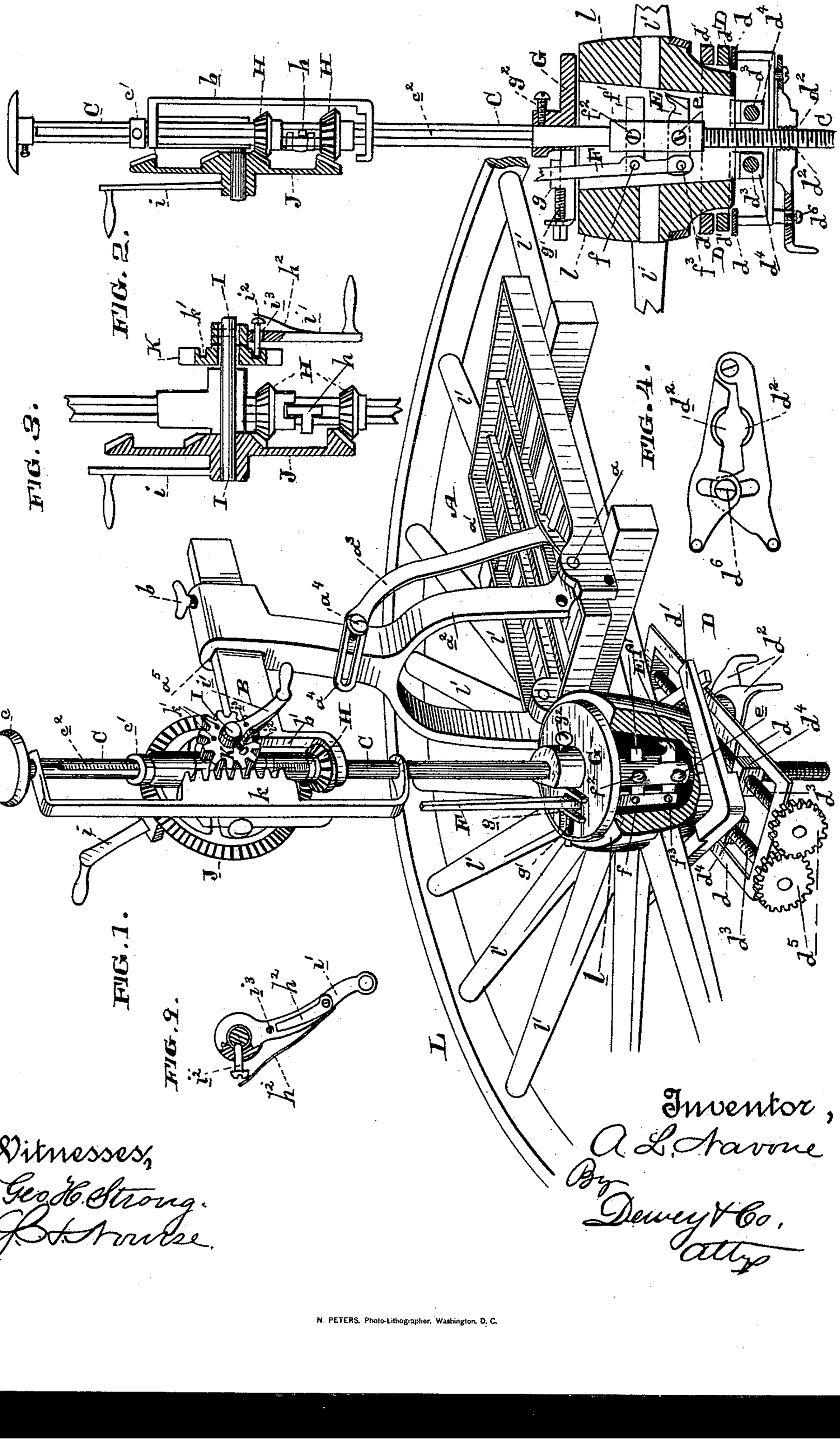

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

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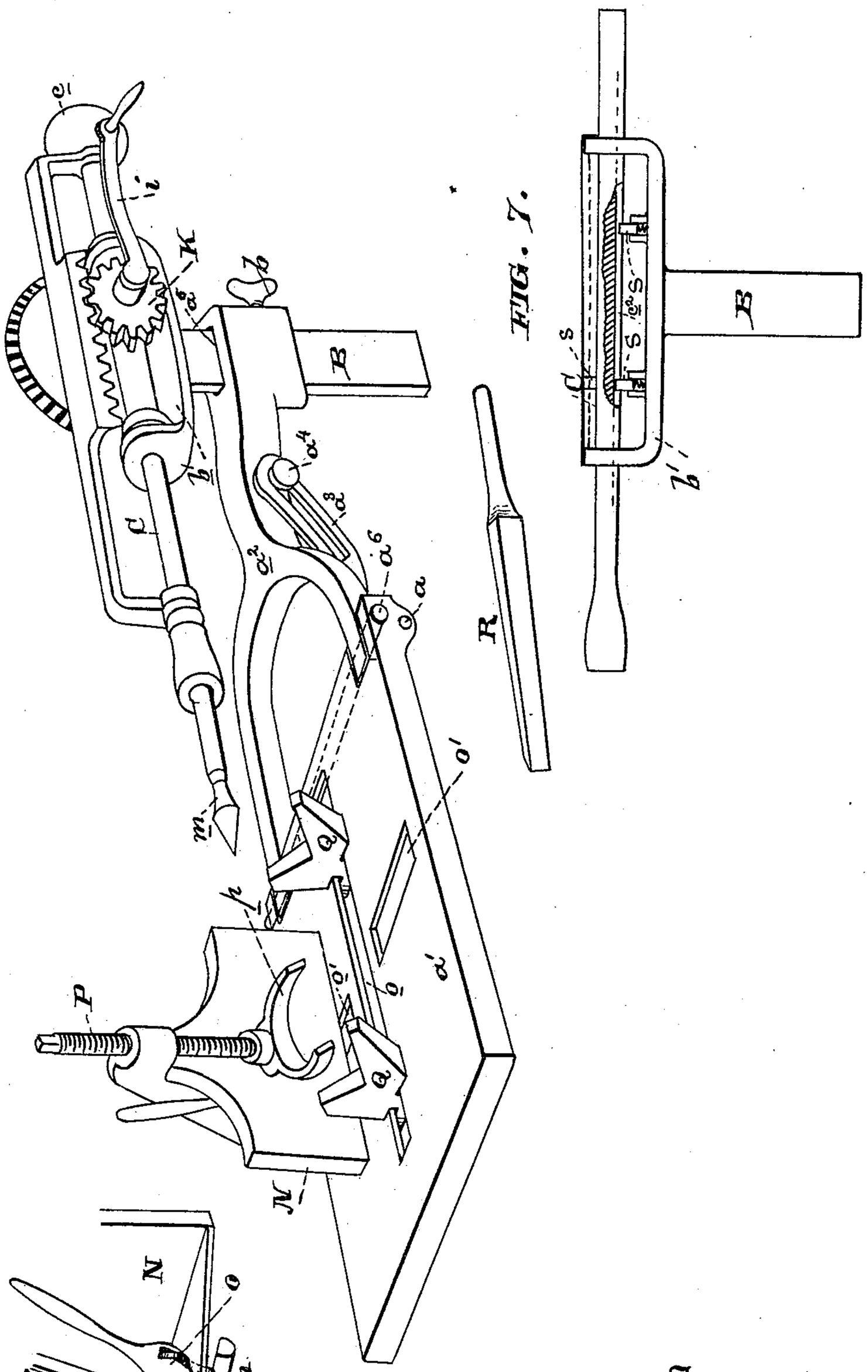

FIG. 5.

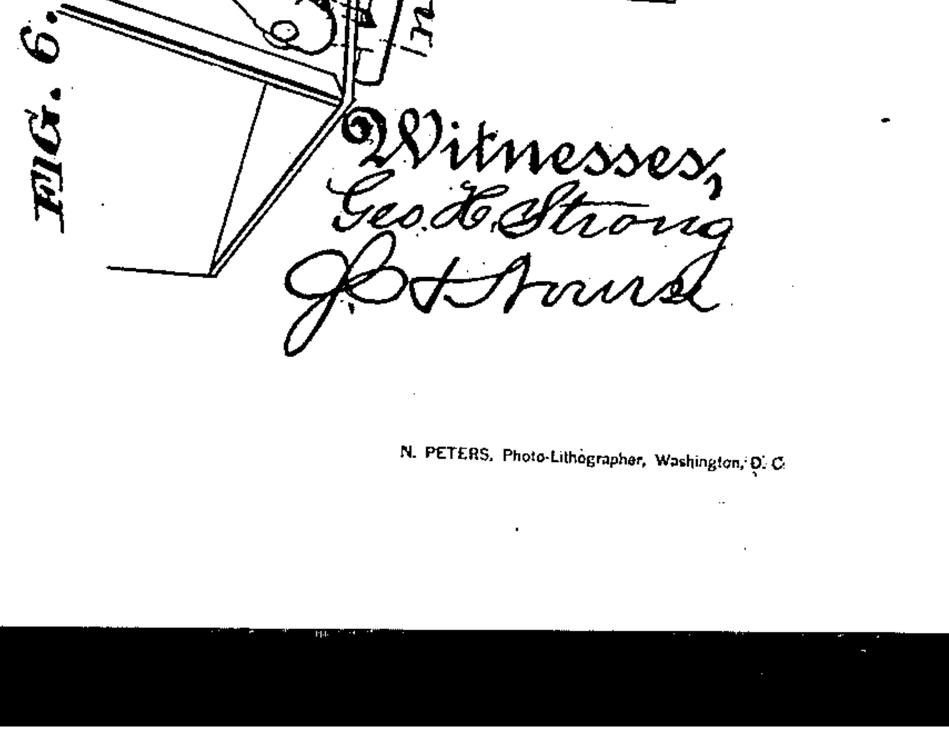

FIG. 6.

FIG. 7.

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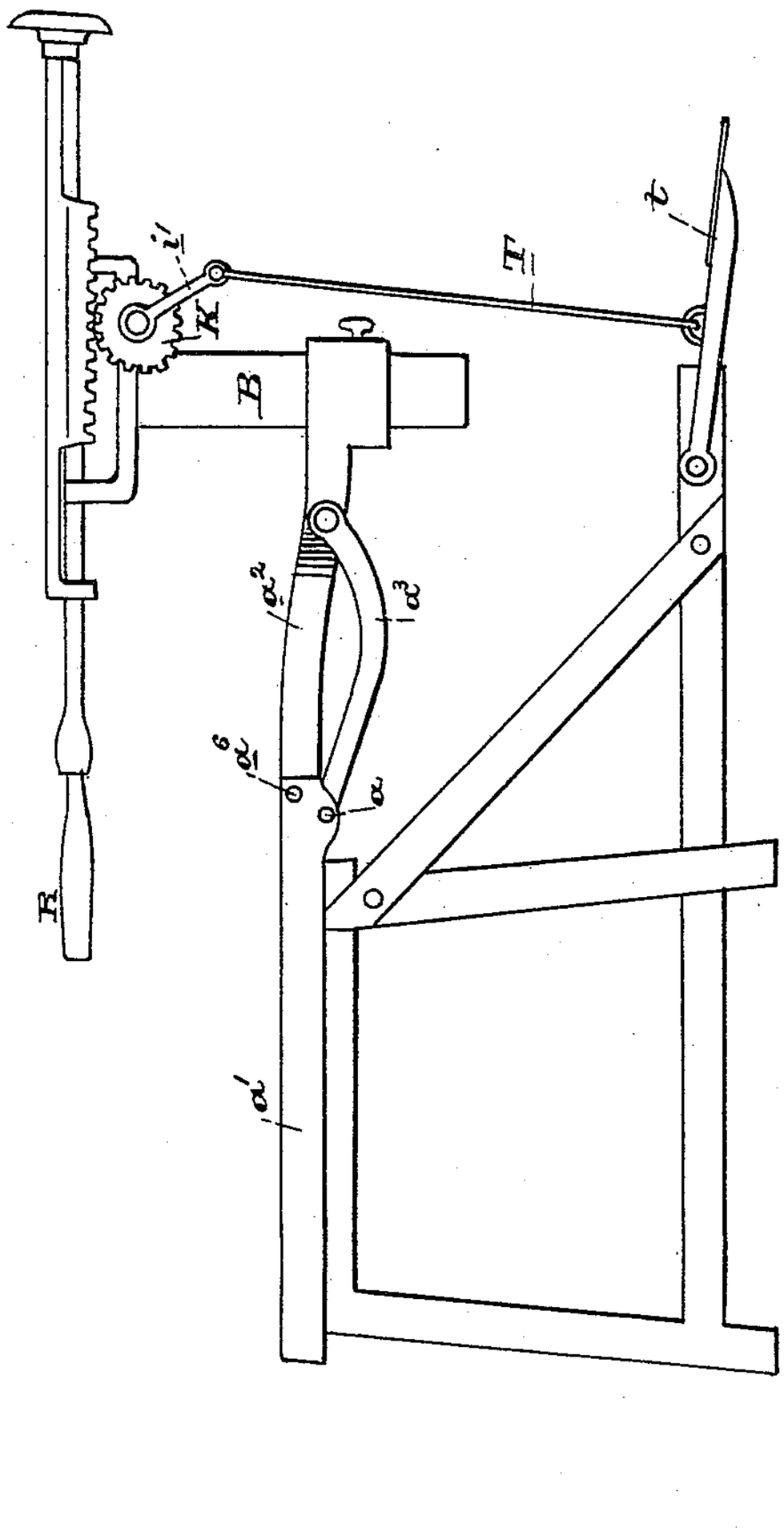

FIG. 8.

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UNITED STATES PATENT OFFICE.

ANTONIO L. NAVONE, OF CALISTOGA, CALIFORNIA.

HUB AND GENERAL BORING AND MORTISING MACHINE.

SPECIFICATION forming part of Letters Patent No. 353,877, dated December 7, 1886

Application filed March 23, 1886. Serial No. 196,301. (No model.)

To all whom it may concern:

Be it known that I, ANTONIO L. NAVONE, of Calistoga, Napa county, State of California, have invented an Improvement in Hub and General Boring and Mortising Machines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of machines adapted for hub-boring, general boring of various kinds, and mortising; and my invention consists in new and useful mechanisms hereinafter described for fitting the machine on the hub and clamping it; for boring various-sized holes with any desired taper, for rotating, feeding, and reciprocating the cutter, bit, or blade carrying spindle; for holding the work in proper position, and for serving other necessary purposes, all of which I shall hereinafter fully describe.

The object of my invention is to provide a complete and effective machine for boring hubs and for general boring of any kind and for mortising.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a perspective view of my machine, showing its application to hub boring. Fig. 2 is a vertical section through the hub, Fig. 1. Fig. 3 is a detail section showing the gearing for rotating the spindle. Fig. 4 is a plan of the adjustable nut d^2. Fig. 5 is a perspective view showing the application of the machine to ordinary boring. Fig. 6 is a detail of the locking-lever of the head-block. Fig. 7 is a detail showing the spring-pins S. Fig. 8 shows the treadle. Fig. 9 is a detail of the crank i'.

A is the frame or bed of the machine, adapted to be secured to a bench in some suitable manner. The frame is centrally jointed on a transverse line by pins a, one portion or section of the frame consisting of a flat piece, a', and the other of a forked piece, a^2, the two being united by the pins a, whereby the section a' may lie in line with the section a^2, or may be turned at right angles thereto, which is its position when used for hub-boring. A link, a^3, is pivoted to the section a' and is slotted on a set screw, a^4, on the section a^2, so that the two parts or sections may be adjusted and fixed at the proper angle.

In the top of the vertically-extending part or section a^2 is a socket, a^5, through which passes the arm or bar B, which can be adjusted longitudinally in the socket, and fixed, when adjusted, by a set-screw, b. The outer end of arm B has a bracket, b', in which is journaled the rotating spindle or shank C, provided with a head, c, and a limiting-collar, c'.

D is a hub-clamp consisting of a frame, d, adjustable V-shaped and overlapping jaws d', a two-part adjustable nut, d^2, and screws d^3 for adjusting the jaws. The jaws are V-shaped pieces oppositely arranged, their adjacent arms overlapping and shouldered or halved into one another, so that they lie flush. By moving these jaws together the space inclosed by them is contracted, in order to clamp the hub, and by separating them the hub is relieved. This adjustment is accomplished by the right and left threaded screws d^3, which are seated in lugs or bearings under the frame d and pass through nuts d^4 under the jaws. One end of the screws is provided with meshing pinions d^5, and the other end of one of the screws projects and is adapted to receive a key, whereby both screws may be operated simultaneously. The nut d^2 is formed by two pivoted arms, each containing a semicircular threaded socket, which together form the nut. The outer ends of the arms are slotted on one another, and receive a set screw, d^6, by which they may be fixed where adjusted. The nut d^2 may therefore be opened or closed, and it lies directly under the center of the space inclosed by the jaws d'. The lower end of the spindle C is threaded and passes through the nut d^2.

E is the boring blade or cutter. This is passed through a slot in the spindle C just above its threaded portion, and is adapted to be adjusted longitudinally therein and fixed, when desired, by a screw, e.

F is a lever, pivoted at f to a fulcrum-bar, f', which also passes through a slot in the spindle, so that it can be adjusted back and forth, a screw, f^2, fixing it when desired. The lower end of the lever is pivoted by a pin, f^3, to the rear end of the cutter E, and its upper end passes through an adjustable bearing, g, seated and guided in a radial slot in a disk or head, G, fitted and adapted to slide vertically on the spindle C, and adapted to be fixed where adjusted by a screw, g^2. The bearing g is threaded on a screw, g', seated in the radial slot of the disk, and is adjusted radially by said screw.

The spindle C may be one integral piece, or its threaded lower end may be separate, and united to the upper portion by a sleeve or coupling.

The mechanism by which the rotary motion is imparted to the spindle C is as follows: The spindle is provided with a longitudinal groove, c^2. Upon the spindle, within the bracket b', are fitted loosely two independent beveled pinions, H, which are adapted alternately to be connected with the spindle by means of a key, h, sliding in the groove c^2, and adapted to fit in a suitable keyway in the pinions.

I is the driving-shaft, on one end of which is secured a crank, i, a crank, i', being adjustably fitted to the other end of the shaft. Upon the shaft is firmly secured a double gear-wheel, J, having two concentric rings or bands of cogs, the inner set meshing with the uppermost pinion, H, and the outer set meshing with the lowermost pinion. The inner set of cogs have the same number of teeth as the pinion with which they engage, whereby the spindle is rotated through said pinion only at the same speed as the crank. In the outer row the cogs are more numerous than the teeth of the pinion with which they engage, and therefore the speed of the spindle may be accelerated. This difference in speed is effected by the movement of the key h, which may fix either of the pinions H to the spindle, while the other remains idle. The other end of the shaft I has fitted loosely upon it a gear, K, which meshes with a rack-bar, k, which is secured at each end to the spindle C. This is the feed-motion for said spindle, and may be operated or not, as desired, as follows: The crank i' is fixed to the driving-shaft by a removable pin, i^2, and said crank can when so fixed be made to assist the crank i on the opposite side. By removing the pin i^2 and fitting it through a hole, i^3, in the crank and into any of the holes k' in the gear K said crank may be connected directly with said gear, which being loose on the driving-shaft will accomplish the feed movement without affecting the rotary movement.

h^2 are springs on the crank i', under the loose ends of which the head of pin i^2 fits, whereby it is not liable to be jarred out of place.

The operation of the machine as a hub-borer is shown in Fig. 1, and is as follows:

L is the wheel having hub l and spokes l'.

The wheel is laid flat on the ground, and the part or section a' of the main frame is supported upon its spokes in any suitable manner, as by the intervention of pieces of scantling. The spindle C passes through the previously-perforated center of the hub, while the jaws d' of the clamp are set up to grasp its outer or lower end. The disk G rests upon the top of the hub. When the spindle has been properly adjusted in a perpendicular position, the section a' is secured to the wheel in some manner—as by a bolt passing down through the frame-work on which the wheel rests—and the two sections are firmly fixed by the link a^3. The spindle is then rotated at whatever speed may be desired by means of the gearing hereinbefore described, so that the cutter E bores into and through the hub, being fed downward positively by the threaded lower end of the spindle passing through the nut d^2 of the hub clamp. This nut being directly in the center, there is no difficulty in centering the hole in the hub, and the nut, by being adapted to be opened, as hereinbefore described, may release the spindle when necessary to return it to its initial position. If, for any reason, it be found that the feed caused by the nut d^2 is too positive and rapid, the nut can be opened and the feed accomplished by hand by operating crank i', gear K, and rack k, as hereinbefore described. When a straight hole is to be made through the hub, the cutter is fixed in position by its screw; but when, as is usual, a tapering hole is to be made, the screw of the cutter, the screw of the fulcrum-bar f', and the screw of the disk G are loosened, so that all the parts may automatically adjust themselves. The amount of taper being first determined, the bearing g of the disk G is radially adjusted, so as to fix the lever F in the proper position or inclination. As the cutter moves down into the hub the disk G, which rests on top of said hub, moves upwardly on the spindle, and the bearing g draws inwardly the upper end of the lever F, thereby forcing out its lower end and withdrawing steadily and accurately the cutter, so that the hole is made tapering downwardly. It will thus be seen that the amount or degree of taper may be accurately determined by adjusting the bearing g, through which the lever is guided. The longitudinal adjustment of the fulcrum-bar f' is to provide for different sizes of holes by lengthening or shortening the projection of the cutter in the first instance.

For ordinary boring the machine is placed as in Fig. 5, with the two parts or sections of its main frame lying in the same line and secured temporarily by a cross-pin, a^6. The hub-clamp D, the cutter E, and its adjusting mechanism, heretofore described, are dispensed with, and any ordinary boring-bit, m, is fitted to the spindle by a suitable chuck.

To hold the work on the frame A, I have the head-block N. This block is provided through its base with an inverted T-shaped lug or stud, n, the stem of which is loosely secured in the block, and has pivoted to its upper end an eccentric-headed lever, O, whereby it can be tightened. In the section a' of the main frame is made a longitudinal slot, o, and two transverse slots, o', one on each side of the slot o. The inverted T-shaped lug or stud n of the block is passed down through any of these slots, and is then turned at right angles underneath, and is secured or tightened to place by the eccentric-headed lever O. When placed in the longitudinal slot, the head-block N may be caused to face directly the boring-

bit; or it may be turned to any angle on either side. When placed in the cross-slots, it is adapted to be turned parallel with the boring-bit and on either side thereof. Through the top of the block is threaded a screw, P, the lower end of which carries a holder, *p*, consisting of a forked bar or plate. The work is placed upon the section *a'* of the frame, and the holder *p* is screwed down upon it to keep it in position. When the head-block is facing the boring-bit directly, a straight hole may be bored in the work, and when turned to an angle an inclined hole may be bored. When the head-block is removed to the cross-slots *o'* and turned parallel with the boring-bit, it acts as a side gage or straight edge for boring longitudinally through the work. In such a case I use the small brackets Q, which are provided with lugs on their lower ends, adapting them to fit and to be secured within the longitudinal slot *o* of the frame. The work rests in these two brackets and against the head-block, while the holder *p* bears down upon it and secures it firmly. In this way such work as gun-barrels may be bored out, or the tenons may be made on spokes and such similar work.

In order to use the machine for mortising purposes I remove the auger-bit *m* and place an ordinary chisel, R, in the chuck. Upon the bracket *b'* of the arm B are spring-pins S, which are adapted to fit down into the groove of the spindle and prevent it from turning. I connect the crank *i'* directly with the gear K of the feed mechanism, as heretofore described and by operating said crank back and forth I cause the spindle to reciprocate longitudinally, and thus operate the chisel for mortising. When one side of the hole has been mortised out, I lift the spring-pin S, which held the spindle, and move said spindle around through a half-turn to the other side, where the other pin S will hold it on that side, thereby enabling me to mortise out the other side of the block. In order to obtain a better power for this work than the crank *i'* alone could give, I connect said crank by a rod, T, with the treadle *t*. The head of the spindle is for the purpose of assisting the feed or forward movement of the boring apparatus by pressing against it with the breast just as in an ordinary brace.

When I wish to use the machine for what is called a "sitting-machine," I remove the cross-pin a^6 and turn back the section *a'* of the frame to a position at right angles, and by sitting upon this portion I can hold it steadily enough while operating both cranks of the power mechanism.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hub-boring machine, the adjustable oppositely-located jaws *d'*, for holding the outer or front end of the hub, and the adjustable or two-part nut d^2 centrally located behind or beneath the space inclosed by the jaws, in combination with the rotating spindle C, threaded through the nut d^2, and the cutter E on the spindle, substantially as herein described.

2. In a hub-boring machine, the clamp D, consisting of the frame *d*, the oppositely-located jaws *d'*, having nuts d^4, the right and left screws d^3, the pinions d^5, connecting them, and the nut d^2 centrally located behind or beneath the space inclosed by the jaws, in combination with the rotating spindle C, threaded through the nut d^2, and the cutter E on the spindle, substantially as herein described.

3. In a hub-boring machine, the clamp D, consisting of the frame *d*, the oppositely-located jaws *d'*, having nuts d^4, the right and left screws d^3, the pinions d^5, connecting them, and the adjustable or two-part nut d^2, centrally located behind or beneath the space inclosed by the jaws, in combination with the rotating spindle C, threaded through the nut d^2, and the cutter E on the spindle, substantially as herein described.

4. In a hub-boring machine, the rotating spindle C and the longitudinally-adjustable cutter E, carried by the spindle, in combination with the means for automatically adjusting the cutter for tapering the hole in the hub, consisting of the disk or head G, loosely fitted on the spindle and resting on the hub, and the pivoted lever F, pivoted to the cutter and guided through the disk, substantially as herein described.

5. In a hub-boring machine, the rotating spindle C and the longitudinal adjustable cutter E, carried by the spindle, in combination with the disk or head G, loosely fitted on the spindle and resting on the hub, the radially-adjustable bearing *g* on the disk, and the pivoted lever F, pivoted at its lower end to the cutter, and passing through the adjustable bearing, substantially as herein described.

6. In a hub-boring machine, the rotating spindle C and the longitudinally-adjustable cutter E, carried by the spindle, in combination with the disk or head G, loosely fitted on the spindle and resting on the hub, and having a radial slot, the screw *g'* in the slot, and the bearing *g* on the screw, and the pivoted lever F, pivoted at its lower end to the cutter, and passing through the bearing, substantially as herein described.

7. In a hub-boring machine, the rotating spindle C and the longitudinally-adjustable cutter E, carried by the spindle, in combination with the slotted disk or head G, loosely fitted on the spindle and resting on the hub, the radially-adjustable bearing *g* in the slot of the disk, the longitudinally-adjustable fulcrum-bar *f'*, carried by the spindle, and the lever F, pivoted to the cutter, fulcrumed in the bar, and passing through the bearing, substantially as herein described.

8. In a hub-boring machine, the jaws *d'*, for clamping the outer or lower end of the hub, and the nut d^2, centrally located behind or be-

neath the space inclosed by the jaws, in combination with the rotating spindle C, threaded through the nut, the longitudinally-adjustable cutter E, carried by the spindle, the adjustable fulcrum-bar *f'*, the adjustable slotted disk or head G on the spindle and resting on the inner or upper end of the hub, the adjustable bearing *g* in the disk, and the lever F, pivoted to the cutter, fulcrumed in the bar, and guided by the bearing, all arranged and adapted to operate substantially as herein described.

9. In a boring-machine, the frame A, consisting of the jointed sections or parts *a' a²*, and the adjustable arm or bar B in the frame, in combination with the bit or cutter carrying spindle journaled in the arm or bar, and gearing for operating the same, substantially as herein described.

10. In a boring-machine, the frame A, consisting of the jointed sections *a' a²*, and the slotted pivoted link *a³*, for adjusting and fixing the sections, and the adjustable arm or bar B in the frame, in combination with the bit or cutter carrying spindle journaled in the arm or bar, and gearing for operating the same, substantially as herein described.

11. In a hub-boring machine, the frame A, consisting of the jointed sections or parts *a' a²*, one of which rests upon the spokes of the wheel, and the slotted pivoted link *a³*, for fixing the sections, the adjustable arm or bar B in the frame, having bracket *b'*, the spindle C, journaled in the bracket, and gearing for operating the same, in combination with the adjustable jaws *d'*, for clamping the outer or lower end of the hub, the central nut, *d²*, through which the spindle is threaded, the adjustable cutter E in the spindle, the adjustable disk or head G thereon, and resting on the upper or inner end of the hub, the adjustable bearing *g* in the disk, the adjustable fulcrum-bar *f'* in the spindle, and the lever F, pivoted to the cutter, fulcrumed in the bar, and guided by the bearing, all arranged and adapted to operate substantially as herein described.

12. In a boring-machine, the cutter or bit-carrying spindle, in combination with the means for rotating it at various speeds, consisting of the shaft I, crank *i*, gear J, with concentric rows or bands of cogs, pinions H, loose on the spindle and with which the gear J engages, and sliding key *h*, by which the gears H are alternately connected with and disconnected from the spindle, substantially as herein described.

13. In a boring and mortising machine, the cutter or bit carrying spindle, in combination with the means for feeding or reciprocating it, consisting of the shaft I, the gear K, loose thereon, the crank *i'*, connected with the gear, and the rack *k*, secured to the spindle and meshing with gear K, substantially as herein described.

14. In a boring-machine, the cutter or bit carrying spindle, in combination with the means for rotating the same, consisting of the shaft I, crank *i*, gear J, with concentric rows or bands of cogs, pinions H, loose on the spindle, and with which the gear J engages, and the sliding key *h*, by which the gears H are alternately connected with and disconnected from the spindle, and the means for feeding the spindle, consisting of the gear K, loose on shaft I, the crank *i'*, connected with the gear and the rack, secured to the spindle and meshing with gear K, substantially as herein described.

In witness whereof I have hereunto set my hand.

ANTONIO L. NAVONE.

Witnesses:
S. H. NOURSE,
J. H. BLOOD.