No. 675,834. Patented June 4, 1901.

D. LAKE.

SCREW CUTTING MACHINE.

(Application filed Aug. 24, 1900.)

(No Model.) 6 Sheets—Sheet 1.

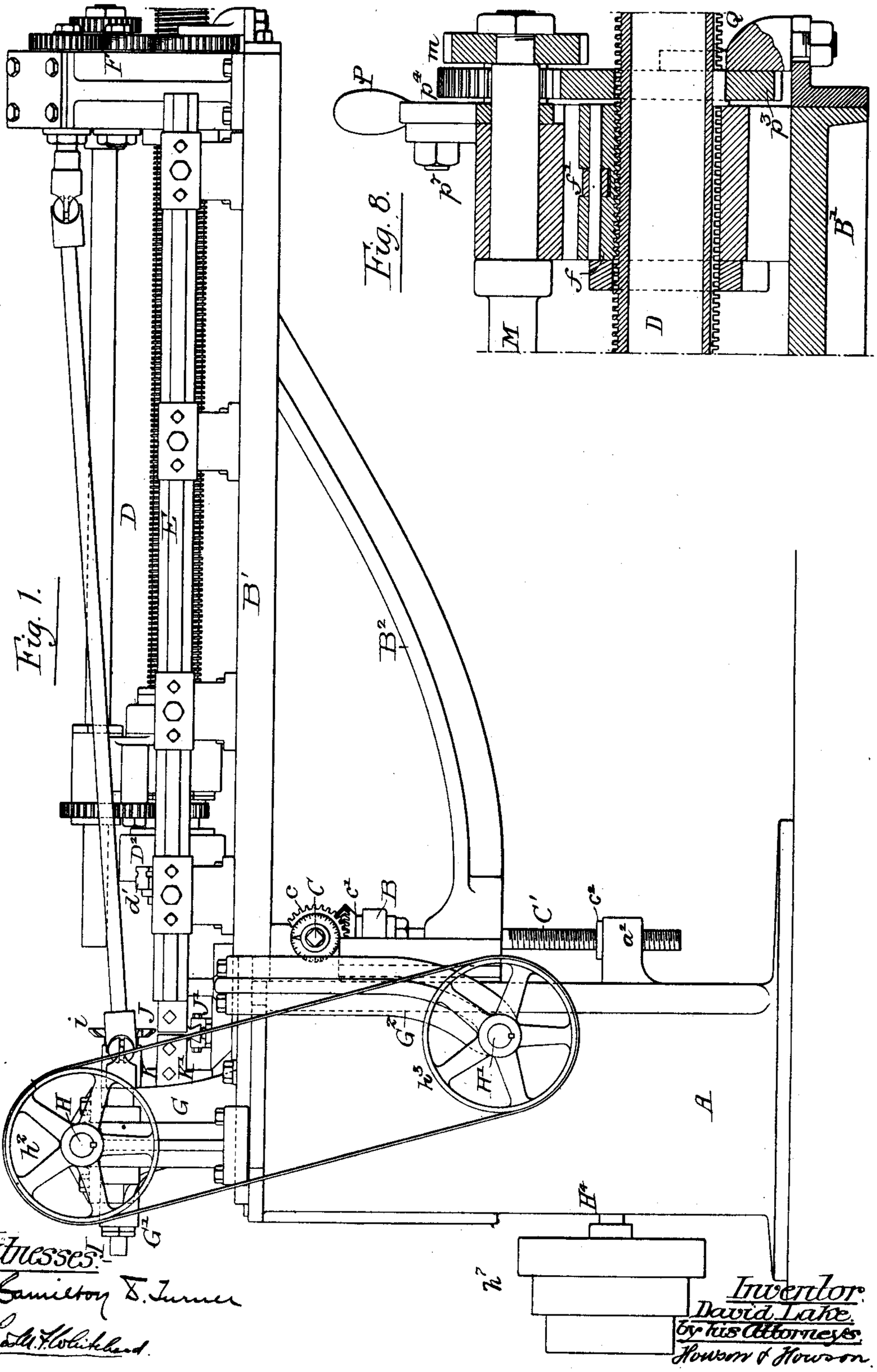

Fig. 1.

Fig. 8.

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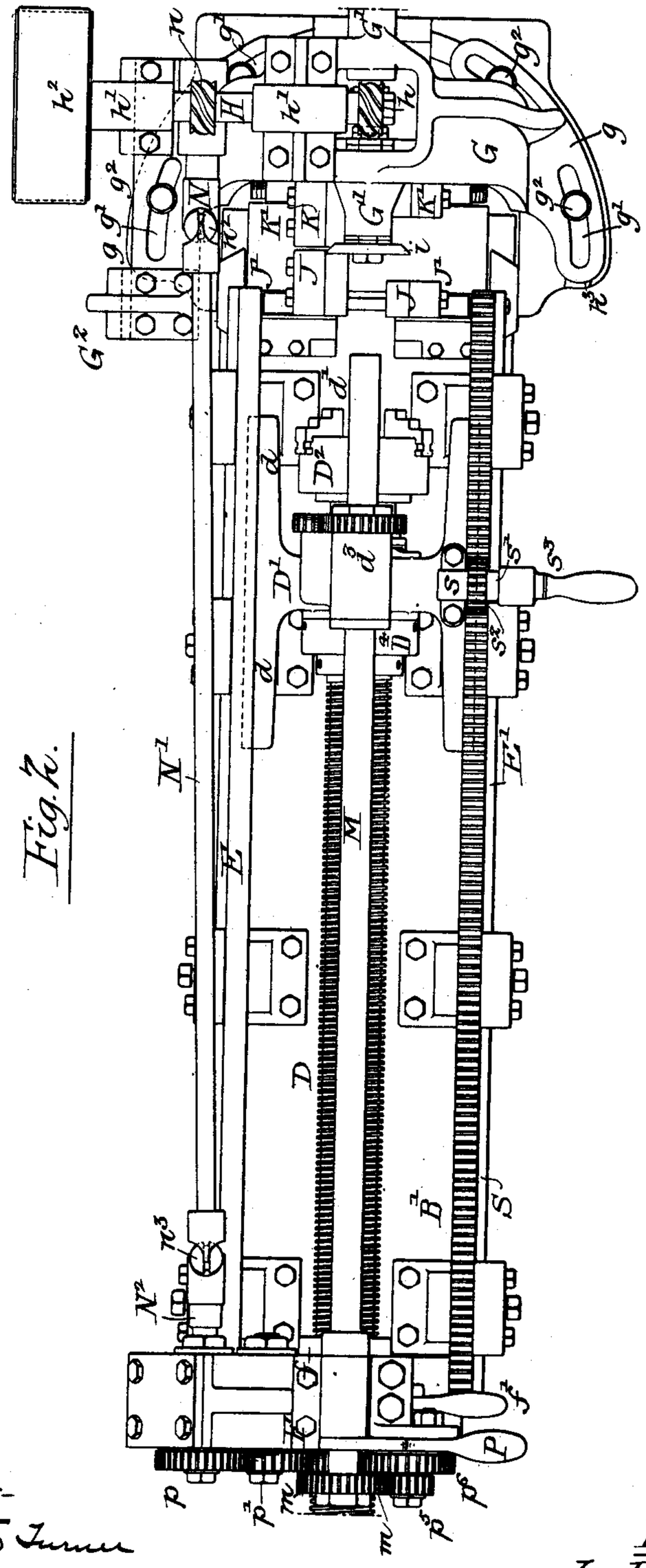
Fig. 2.



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SCREW CUTTING MACHINE.

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(No Model.) 6 Sheets—Sheet 3.

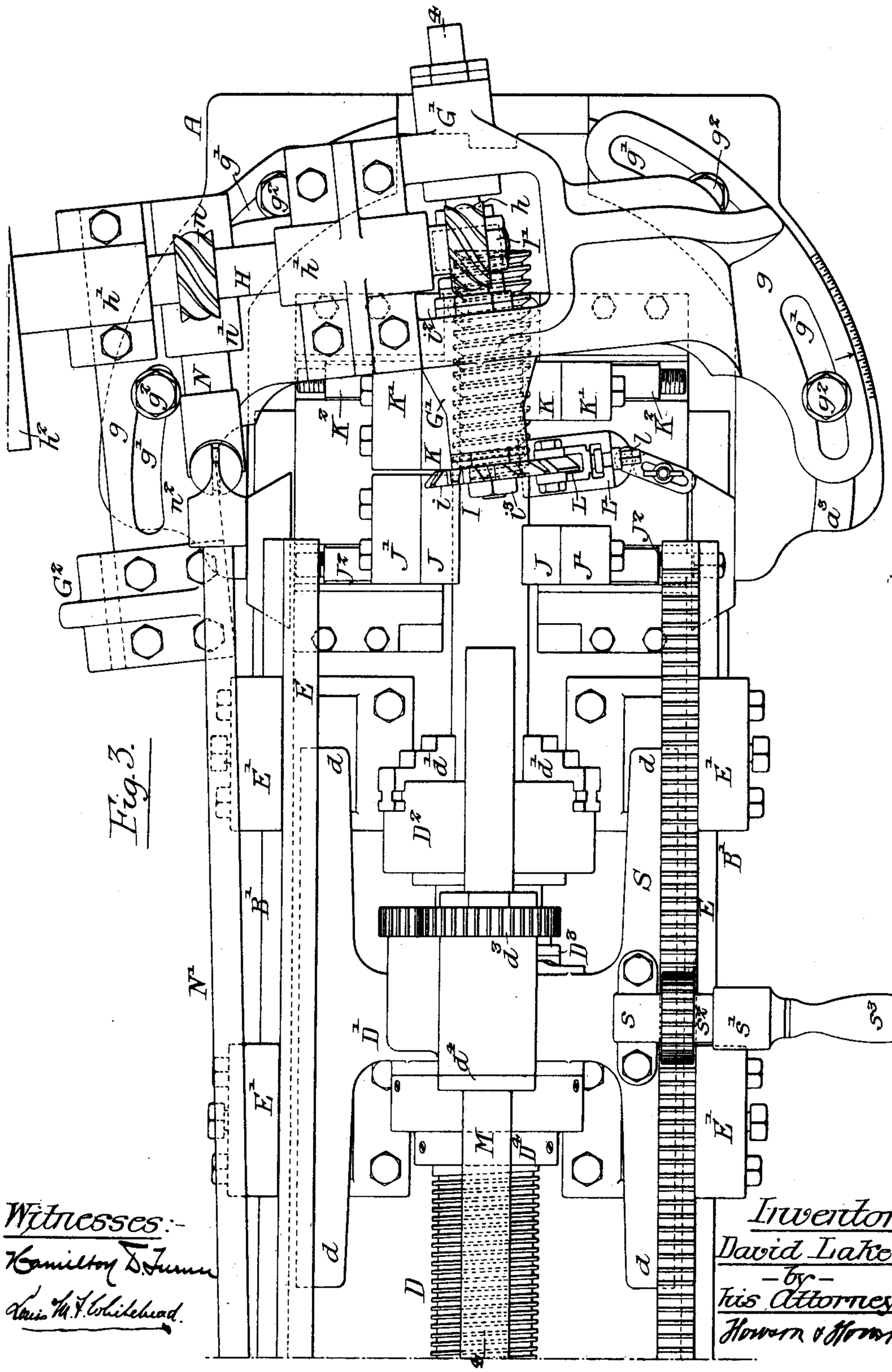

Fig. 3.

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SCREW CUTTING MACHINE.

(Application filed Aug. 24, 1900.)

(No Model.) 6 Sheets—Sheet 4.

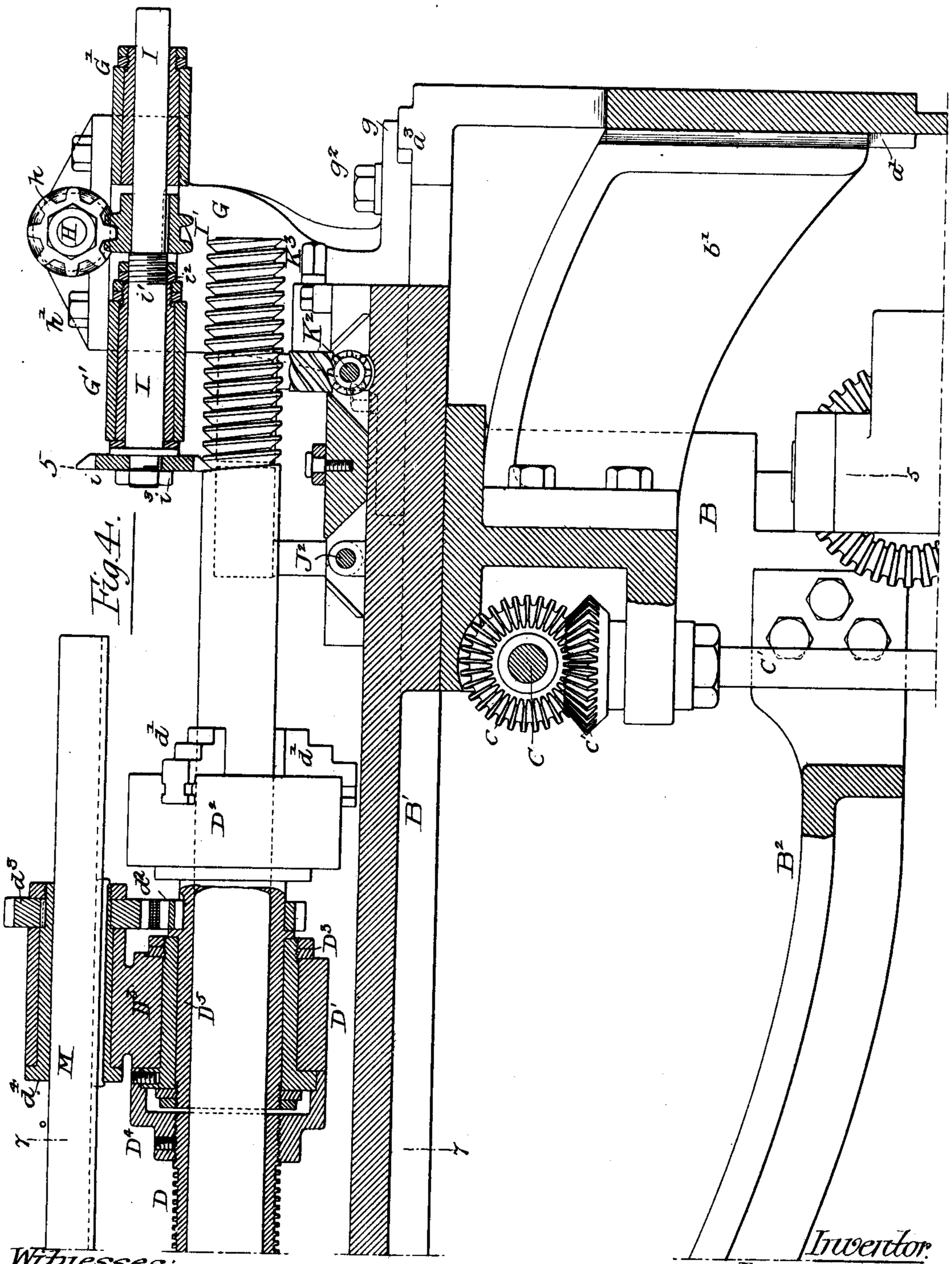

Fig. 4.

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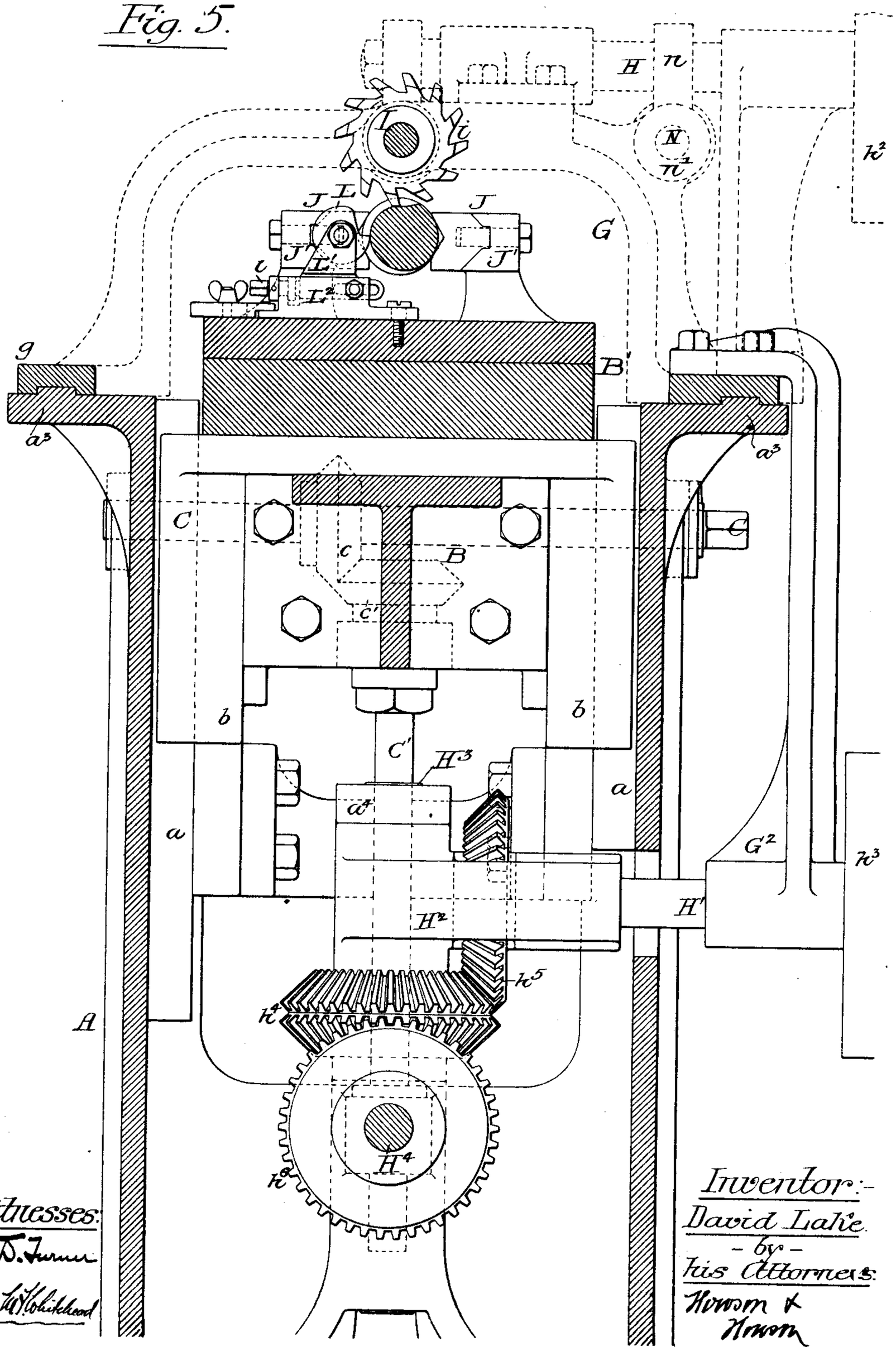
(Application filed Aug. 24, 1900.)

(No Model.) 6 Sheets—Sheet 5.

Fig. 5.



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No. 675,834. Patented June 4, 1901.

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SCREW CUTTING MACHINE.

(Application filed Aug. 24, 1900.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 6.

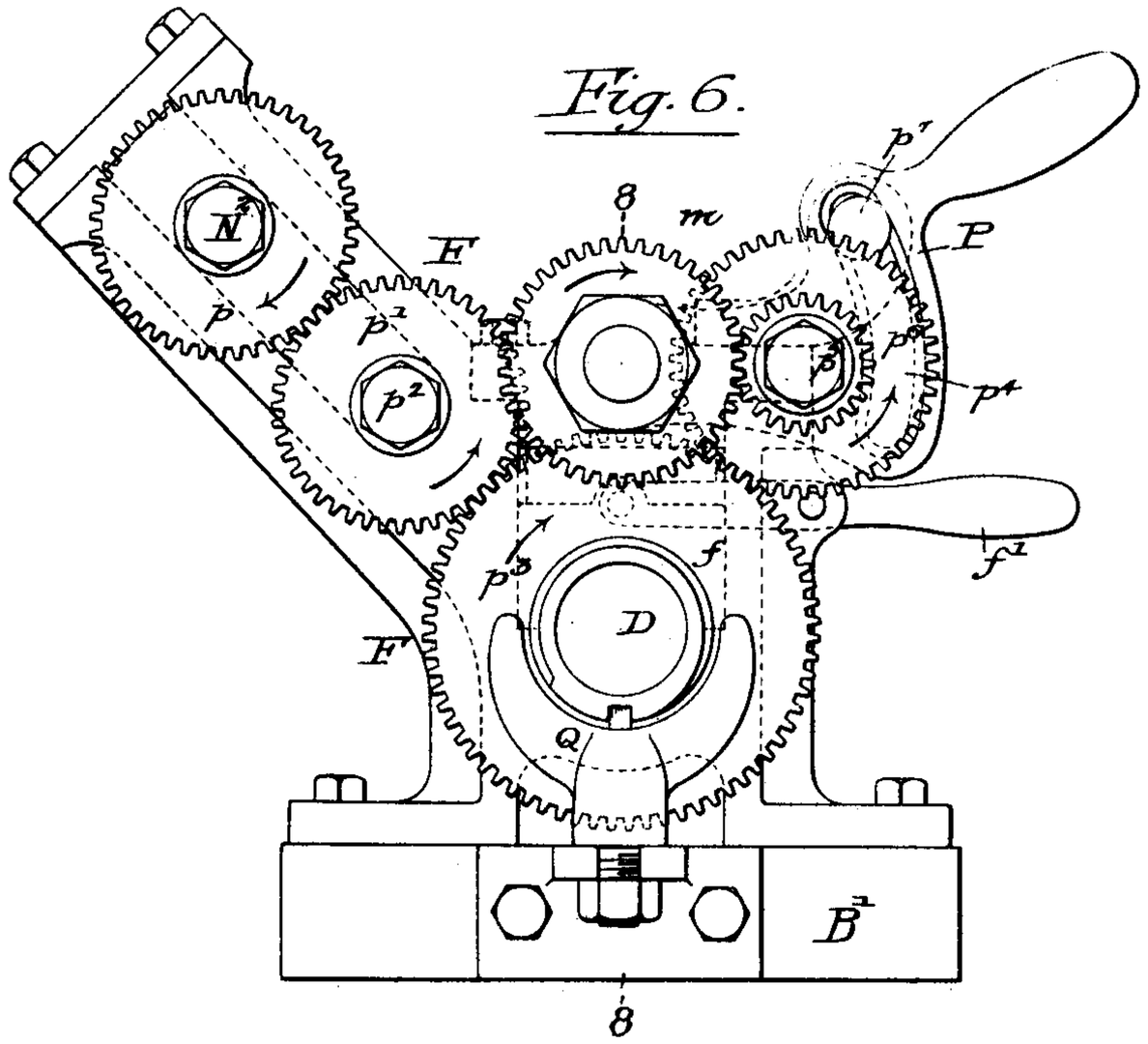
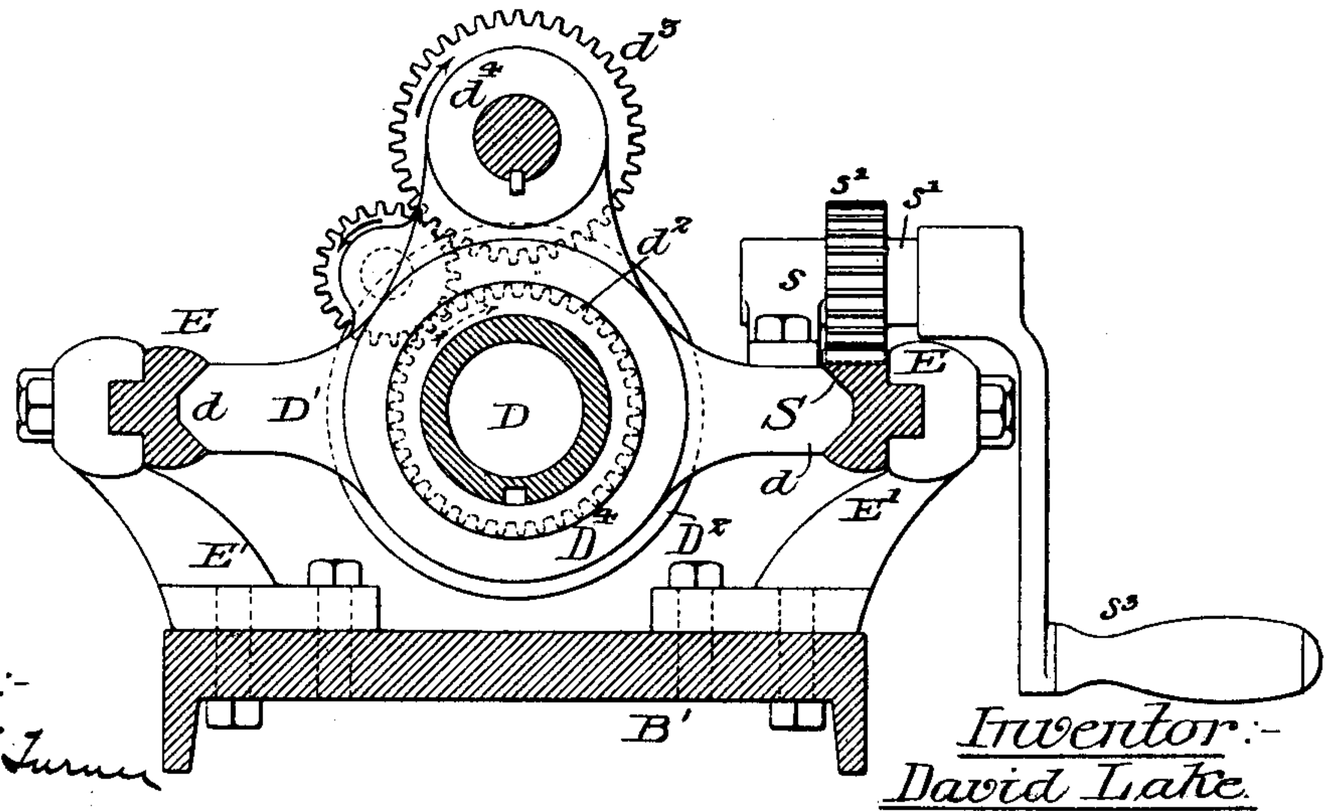


Fig. 7.



Witnesses:-
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UNITED STATES PATENT OFFICE.

DAVID LAKE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF THREE-FOURTHS TO EDWIN W. CRELLIN, OF SAME PLACE, AND JOHN LEISENRING, OF UPPER LEHIGH, PENNSYLVANIA.

SCREW-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 675,834, dated June 4, 1901.

Application filed August 24, 1900. Serial No. 27,898. (No model.)

To all whom it may concern:

Be it known that I, DAVID LAKE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Screw-Cutting Machines, of which the following is a specification.

The object of my invention is to so construct a machine for cutting screw-threads that the thread can be cut on a bar of any length and of any diameter in a continuous operation and the thread can be cut on any pitch desired. This object I attain in the following manner, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of my improved screw-cutting machine. Fig. 2 is a plan view. Fig. 3 is a plan view of the cutting end of the machine, showing the cutter in the act of cutting a screw on the bar. Fig. 4 is a longitudinal sectional view on the line 4 4, Fig. 3. Fig. 5 is a vertical sectional view on the line 5 5, Fig. 4. Fig. 6 is an end view of the machine. Fig. 7 is a section on the line 7 7, Fig. 4; and Fig. 8 is a section on the line 8 8, Fig. 6.

A is a hollow standard mounted on a suitable foundation so that it will be rigid.

a a are guides for the vertically-adjustable bed-carrying piece B. This piece has portions *b b*, which conform to the guides, and has an extension *b'*, which enters a vertical slot *a'* in the standard, so that the piece B is free to slide vertically on the standard. Carried by the piece B is a bed-plate B'. This bed-plate extends rearward and carries the rear portion of the machine. A bracket B^2 stiffens the bed, as it will be understood that the bed must be rigidly supported and capable of vertical adjustment.

I will first explain the means for adjusting the bed.

C is a shaft which can be provided with a suitable handle, and on this shaft is a bevel-wheel *c*, gearing with the bevel-wheel *c'* on a vertical shaft C'. The lower end of the vertical shaft C' is threaded and passes through a nut c^2 on a bracket a^2, projecting from the standard, so that on turning the shaft C the threaded shaft C' will turn in the nut and will either raise or lower the bed B'. The shaft C may be provided with a hand, and on the frame may be placed a dial, as shown in Fig. 5, to indicate the extent of movement.

D is the hollow screw-threaded carrier for the rod on which the thread is to be cut. This threaded carrier has its forward bearing in a carriage D', having guides *d d*, traveling on guideways E E, supported on each side of the machine by brackets E', which are bolted to the bed-plate B'. The rear of the screw-threaded carrier travels through a nut *f* in the rear bearing F, as clearly shown in Figs. 1 and 2. On the front of the carriage D' is a chuck D^2, having jaws *d'*. These jaws are arranged to grasp the rod on which the thread is to be cut and clamp it securely to the carriage, so that it will be fed at a given speed according to the pitch of the thread and the depth of cut desired.

G is the carrier for the cutting-tool and its driving mechanism. This carrier is constructed as follows: The carrier has two segmental arms *g g*, which rest on the upper portion of the standard A, and the arms are slotted at *g'*. Bolts g^2 pass through the slots into the standard and secure the carrier in its adjusted position. I preferably form a rib a^3 on the standard and groove the under side of the arms *g* of the carrier. The rib is on a radius taken from the center of the cutting-line of the tool.

I is the cutting-tool shaft, and *i* is the cutting-tool. This tool in the present instance is of the form clearly shown in Fig. 3, having a series of cutting-teeth on its periphery. The cutter in the present instance is so formed as to cut a thread with one side vertical and the other side beveled; but it will be understood that any form of thread may be cut, according to the shape of the cutting-tool, the position of the tool, and the feed of the bar.

The shaft I is mounted in bearings G', as clearly shown in Fig. 4. The bearings are preferably bushed, and the shaft I has a screw-threaded portion *i'*, on which are nuts i^2, so as to take up for any lost motion when desired. The cutter *i* is held to the spindle by a nut i^3 in the ordinary manner. Keyed to the spindle is a spiral gear-wheel I', and meshing with this is a second spiral gear-wheel *h* on the driven shaft H, mounted in

bearings h' on the carrier G. This shaft is driven by a belt which passes over a belt-pulley h^2 from a belt-pulley h^3 on a shaft H', mounted in bearings in the bracket G^2, depending from the carrier G. The shaft is also mounted in bearings H^2, swiveled on a vertical shaft H^3, having its bearings a^4 on a fixed portion of the standard. The vertical shaft H^3 has a double gear-wheel h^4, or two bevel gear-wheels may be placed back to back, if desired. One of the gear-wheels h^4 meshes with the bevel gear-wheel h^5 on the shaft H', while the other meshes with a gear-wheel h^6 on the driving-shaft H^4, mounted in suitable bearings in the standard. This driving-shaft has a cone-pulley h^7 for changing the speed of the driving mechanism.

It will be noticed that the vertical shaft H^3 is on a vertical line around which the carrier G is adjusted—namely, the line drawn through the center of the cutter i—so that no matter what position the carrier G is in the driving-shaft H^4 will always be in gear with the shaft H' and will drive the cutter through the shaft H and cutter-spindle I.

In order to steady the work at the cutter, I provide two sets of jaws J and K. The bearing portions of each set of jaws are V-shaped, so as to hold the work firmly, preventing it from moving out of line, yet allowing it to pass freely through the jaws when fed forward by the feed mechanism. The jaws J are arranged forward of the tool and the jaws K are arranged back of the tool. The jaws K are only used when it is desired to cut a thread on a rod up to the chuck. Then the jaws J are moved out, so as to clear the chuck, while the jaws K are moved into position to guide the rod. By this arrangement the major portion of the rod on which the thread is cut is not in contact with any bearing-surface, as the jaws J guide the rod just prior to its being cut, and it is only when the jaws K are in position that the rod is guided by its threaded portion. Each of the jaws is mounted on carriers J' and K', respectively, and these carriers are supported on suitable bearings secured to the bed B' of the machine. The jaws are moved toward and from the center of the rod to be cut by ordinary adjusting-screws J^2 and K^2, respectively. The adjusting-screw J^2 has a head to which a key can be applied, while the screw K^2 is geared to a spindle k^3 at right angles to the screw, and this spindle is provided with a head, so that a key can be applied. This construction is necessary, as the adjustable carrier G for the tool will not allow for the application of a key to the end of the shaft K^2.

Mounted between the two sets of jaws J and K is a clearing-tool L. This tool enters the groove between the threads of the screw immediately after the cutter has cut the groove, so as to finish and clean the thread. This cutter is of the peculiar form shown in Fig. 5, being mounted on a carriage L', moved toward and from the rod being cut by a screw l, mounted in a bearing L^2, secured to the bed-plate B', as shown in Fig. 5.

I will now refer again to the mechanism for feeding a rod to the cutter. As before remarked, the hollow screw-rod D is journaled to the carriage D'. The construction of the coupling is clearly shown in Fig. 4. A tubular section D^3 is mounted in the bearings of the carriage D', and a coupling D^4 couples the tubular screw D to the section D^3, so that the carriage D' is fed forward as the screw D revolves. The spindle D^5 of the chuck D^2 is hollow and extends through the tubular section D^3, as clearly shown in Fig. 4. The spindle has a shoulder at one end and is threaded at the opposite end for the reception of the confining-nuts. On the spindle of the chuck is keyed a gear-wheel d^2, which is geared through a gear-wheel d^3, secured to a sleeve d^4, splined to an intermediate wheel with a shaft M. The shaft M turns the chuck at the proper speed, and with it the rod to be cut, while the screw-spindle D is fed forward, so that by feeding the screw-spindle D forward and turning the shaft M at a given speed, according to the pitch desired, and setting the cutter at an angle to agree with the pitch a screw-thread will be cut accurately upon the rod.

In order to feed the hollow screw-spindle forward and to drive the shaft M, I use the following gearing, referring to Figs. 1, 2, 6, and 8: On the shaft H is a worm-wheel n, which gears with a worm n' on a short shaft N. This shaft is coupled to a shaft N' by a gimbal-joint n^2, and the shaft N' is coupled by another gimbal-joint n^3 to a short shaft N^2, having its bearings in the frame F at the end of the machine, as clearly shown in Fig. 6. The shaft N^2 has a gear-wheel p, which meshes with an intermediate wheel p' on a stud p^2, mounted in the frame F, and this intermediate wheel meshes with a gear-wheel p^3 on the hollow spindle D. The wheel p^3 meshes with a gear-wheel p^4, carried by a stud p^5, on which is a pinion p^6, which meshes with a wheel m on the shaft M. The spindle p^5 is carried by a pivoted arm P, which can be locked in different positions by a bolt p^7, which rests in a slot in the arm. This is the same construction as an ordinary back gear on a lathe. By changing the gears p p' p^3 the speed of the carriage forward can be regulated, and by changing the gears p^4, p^6, and m the speed of the shaft M can be regulated. The gear-wheel p^3 is held in position by the bearing F and a yoke Q, which is detachably secured to a bracket on the base, Figs. 6 and 8. The nut f can be thrown into and out of mesh with the threads of the spindle D by a lever f', as the nut f is a half-nut and mounted in guides in the frame F. On one of the guide-ways E is a rack S, and mounted on the bear-

ing *s* on the carriage is a shaft *s'*, having a gear-wheel s^2, which meshes with the rack, and this wheel is turned by a handle s^3, so that when it is wished to move the carriage forward or back by hand the lever *f'* is operated to throw the nut *f* out of mesh with the screw-spindle D. Then the carriage, with its spindle, can be moved toward or from the cutter by operating the handle s^3; but when it is wished to feed the carriage forward by power the lever *f'* is operated to throw in the nut *f* in mesh with the screw-spindle D, and the carriage can be fed forward by power. The chuck D^2 may be of any ordinary type, so formed that a key can be used to clutch the jaws to the rod.

It will be seen that I simply use a tool to cut one portion of the rod at a time and turn the rod and feed it to the cutter as the cutter rotates, and with one cut I finish the thread. I do not require two or three sets of dies or sets of cutters. The finishing-tool which follows the cut is simply for the purpose of cleaning the thread after the cutter. Furthermore, it will be seen that by having the tubular chuck and screw-spindle D, I can thread a rod of any length, and by having the jaws at the cutter the machine can be made compact and sections of the rod can be cut at intervals.

The chuck is operated so as to firmly grasp the rod as it is fed to the cutting-tool, and the jaws J J are so set that the rod will pass between the jaws without vibration, the jaws steadying it against the cutting action of the cutting-tool, and if the machine has a hollow screw-spindle D of such a length that it can feed forward, say, four feet of the rod at one operation the chuck need not be released until a thread four feet long is cut upon the rod. Then all that is necessary is to clamp the jaws J J to the rod by turning the adjusting-screws, releasing the chuck and backing it off by means of the rack and pinion, and then attaching the clutch again to the rod and backing off the jaws J J slightly, and the cutter can proceed with the work of cutting the thread at the point where it previously stopped.

I have found by experience that the thread is continuous and the marks do not show where one section of thread stops and another begins.

The machine is able to cut a thread very quickly and accurately on any length of rod, and when it is desired to work up to the head—for instance, as on a bolt—the jaws J J are backed off and the jaws K K are set to guide the rod, so as to allow the chuck to come up to the cutting-tool.

I claim as my invention—

1. The combination in a screw-threading machine, of a hollow-threaded carrier for the blank upon which a thread is to be cut, means for feeding the carrier laterally, means for turning the blank, a cutter, an adjustable carrier therefor and means for operating the cutter, substantially as described.

2. The combination in a screw-cutting machine, of a hollow carrier for the blank, means for rotating the carrier, means for rotating the blank independently of the carrier, a cutter, and means for rotating the cutter, substantially as described.

3. The combination in a screw-cutting machine, of a carriage, a hollow feed-screw for feeding the carriage and through which the blank is passed, a chuck on the carriage engaging the blank, means for turning the chuck independently of said hollow feed-screw, and a cutter, substantially as described.

4. The combination in a screw-cutting machine, of a carriage, a hollow feed-screw for the carriage, a chuck on the carriage, a cutter, driving mechanism for the cutter, and mechanism for feeding and other mechanism for turning the blank, substantially as described.

5. The combination in a screw-cutting machine, of a standard, a cutter carried by the standard, means for rotating the cutter, a bed vertically adjustable on the standard, and a hollow tubular carrier for the blank to be cut, said carrier being mounted on the bed, substantially as described.

6. The combination in a screw-cutting machine, of a standard, an adjustable carrier on the standard, a cutter carried by the standard, a vertically-adjustable bed, guides thereon, a carriage on said guides, a hollow feed-screw for the carriage, a chuck for the blank mounted on the carriage, and means for rotating the chuck and for rotating the feed-screw, substantially as described.

7. The combination in a screw-machine, of a standard, a bed thereon, a carriage for the blank mounted on said bed, means for feeding the carriage and for turning the blank, an adjustable carrier for the cutter, a vertical driving-shaft on a line with the cutter, and mechanism between the said shaft and the cutter-shaft, substantially as described.

8. The combination in a screw-cutting machine, of a standard, a bed vertically adjustable on the standard, a carriage on the bed, a chuck for the blank on the carriage, a long hollow feed-screw coupled to the carriage, a nut on the bed, means for turning the screw and for revolving the chuck, and a cutter on the standard, substantially as described.

9. The combination in a screw-cutting machine, of a cutter, means for driving the same, a bed, a carriage on said bed, a hollow feed-screw for the carriage, a chuck for engaging the blank, a shaft running parallel with the feed-screw, and means for turning the shaft and the feed-screw, substantially as described.

10. The combination in a screw-cutting machine, of a cutter, driving means therefor, a

carriage, a hollow feed-screw connected to said carriage, a chuck journaled in the carriage in line with the feed-screw, a driving-shaft for the chuck, a train of gears for driving both the shaft and the feed-screw, and a shaft coupling the train of gears to the cutter-driving mechanism, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID LAKE.

Witnesses:
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JOS. H. KLEIN.