

(No Model.)

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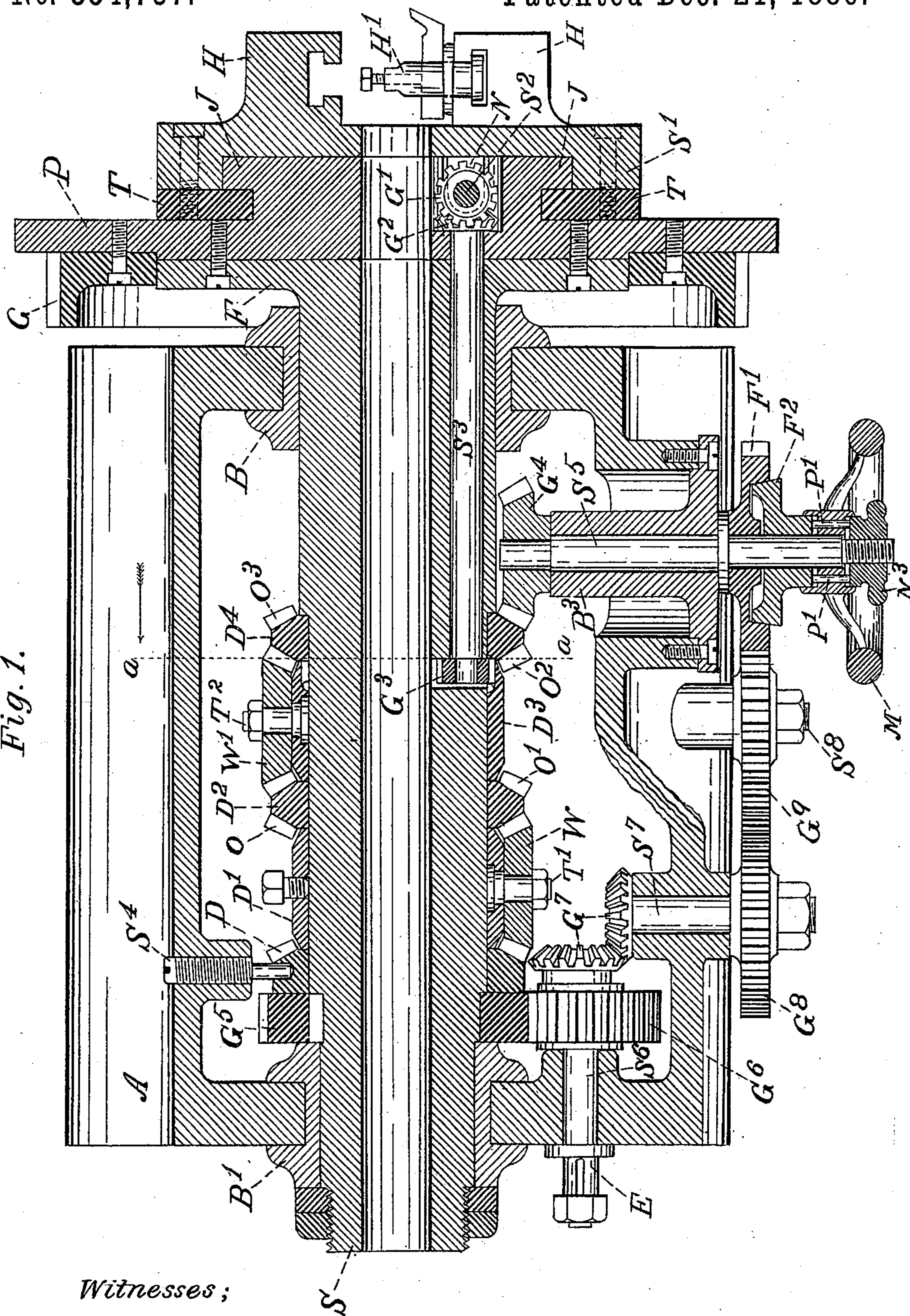
F. H. RICHARDS.

LATHE HEAD.

No. 354,737.

Patented Dec. 21, 1886.

Fig. 1.



Witnesses;

C. O. Palmer.
H. W. Faulkner.

Inventor;

Francis H. Richards

(No Model.)

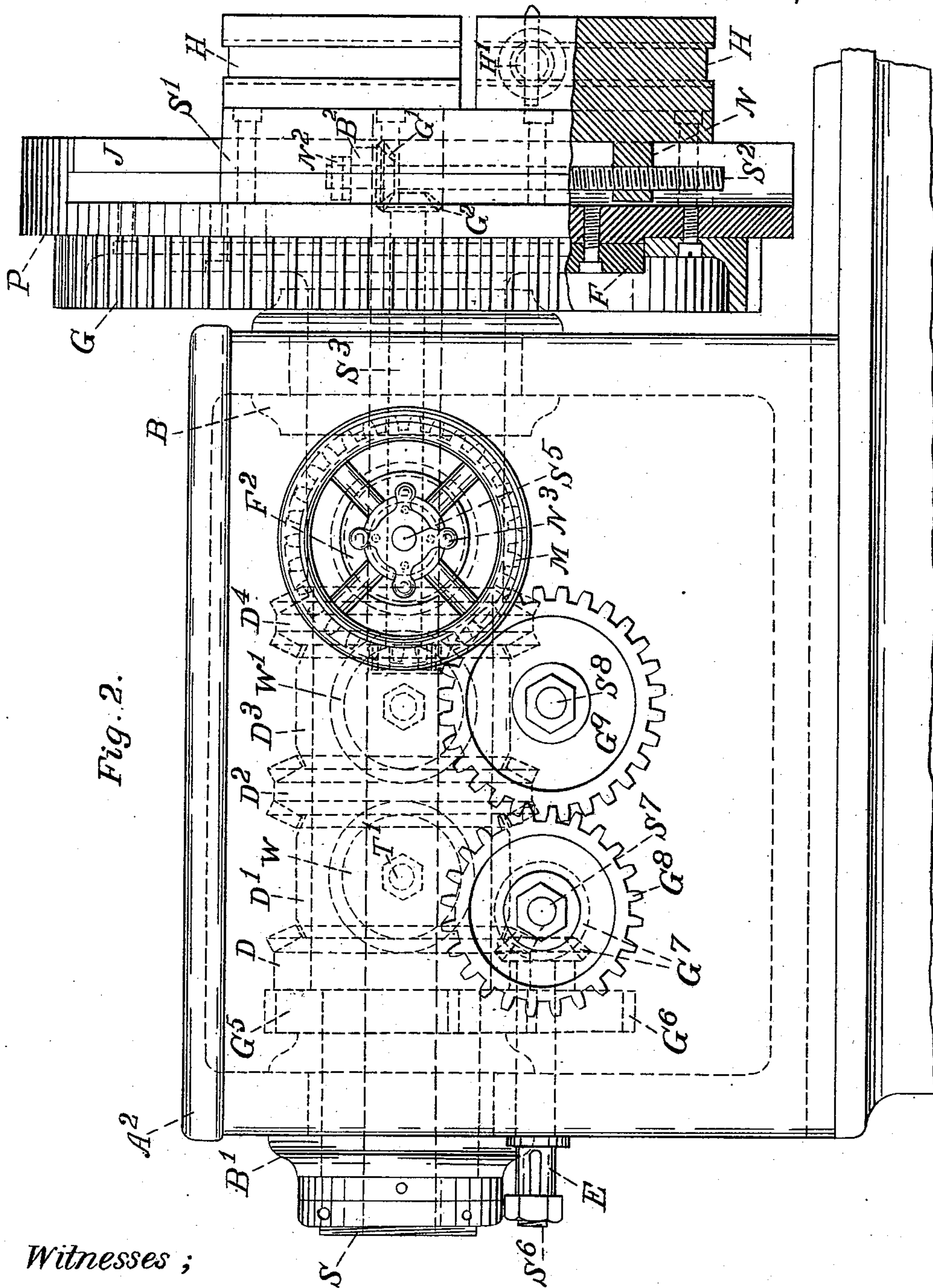
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Fig. 5.

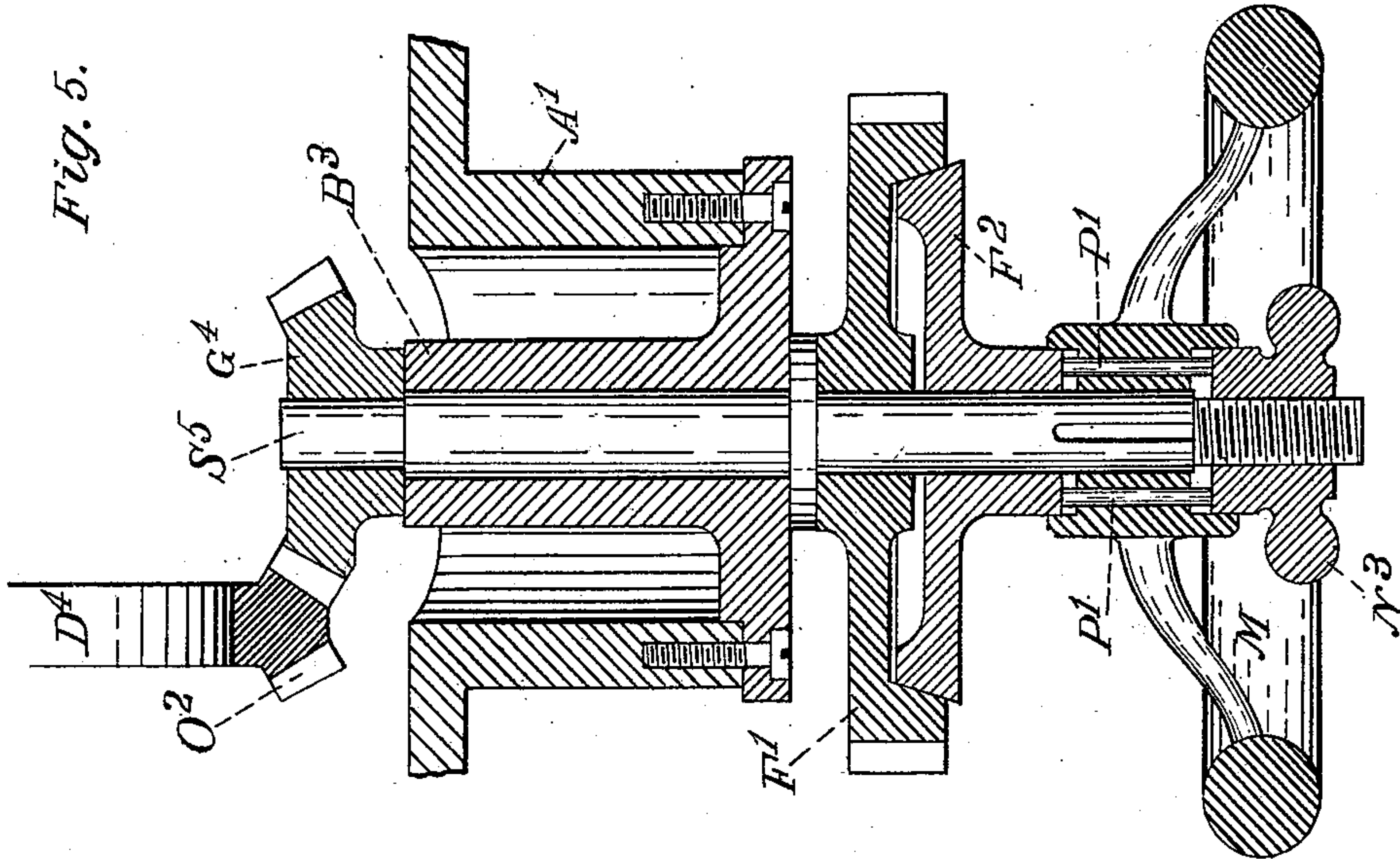
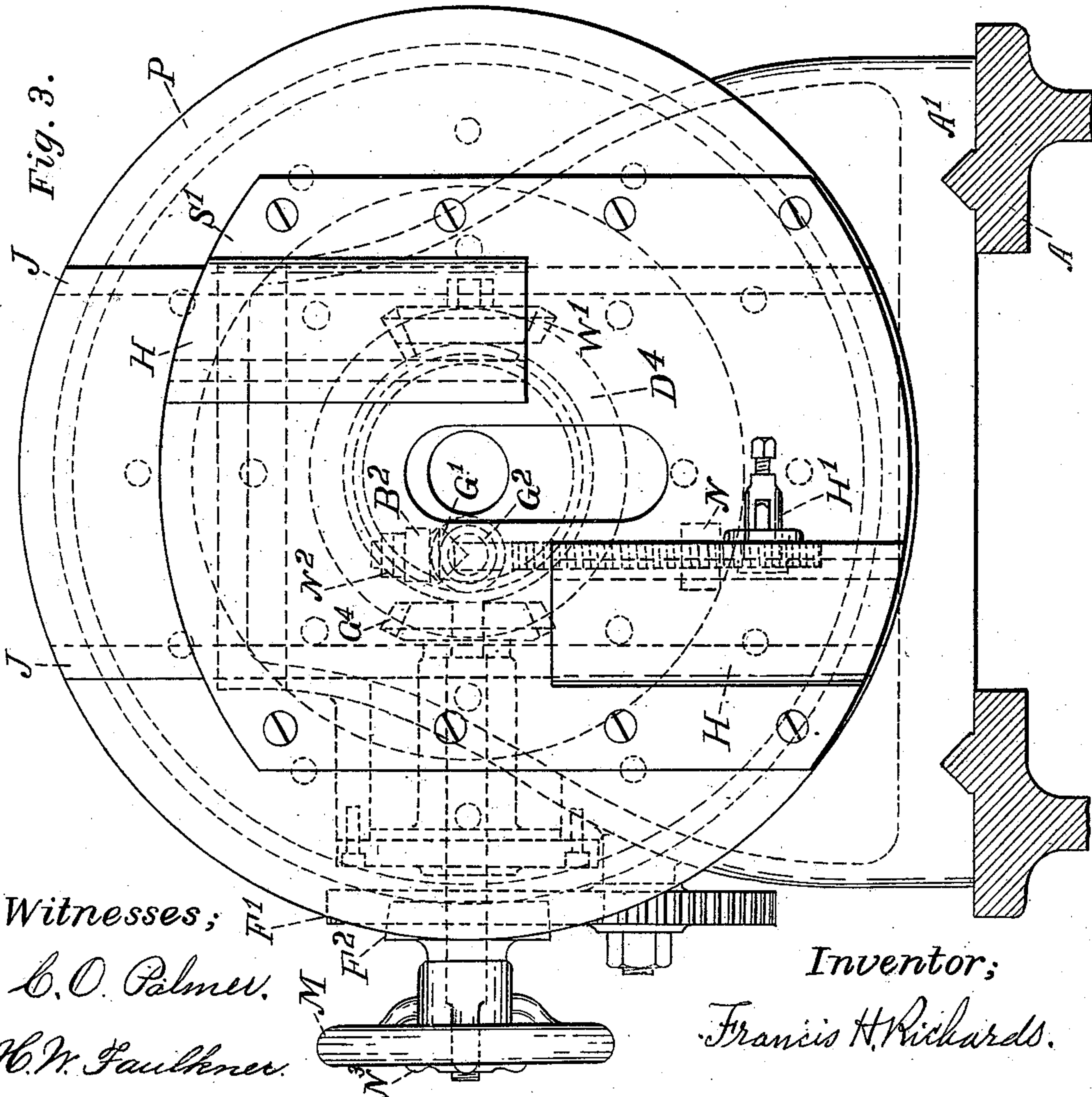


Fig. 3.



Witnesses;

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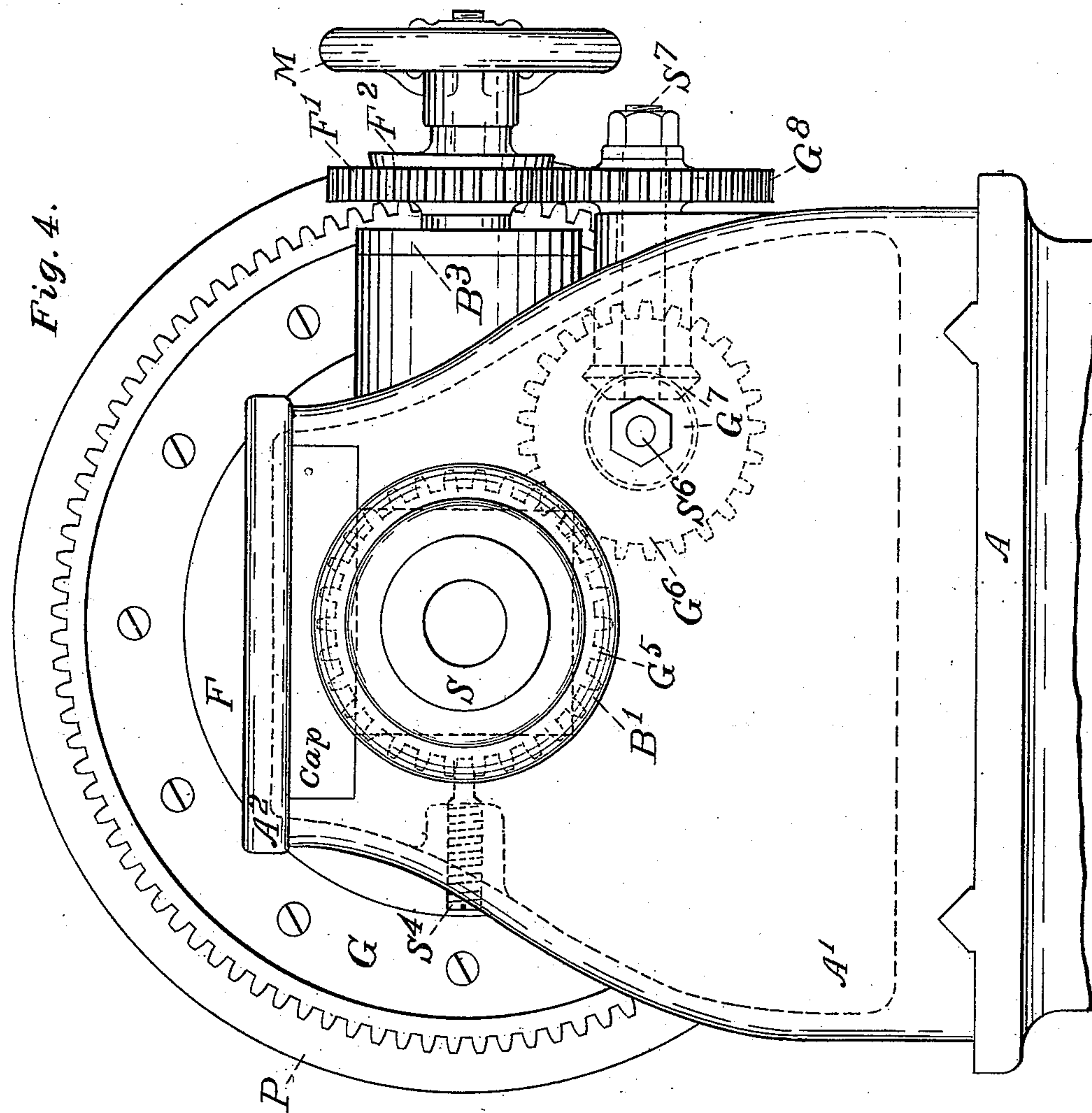
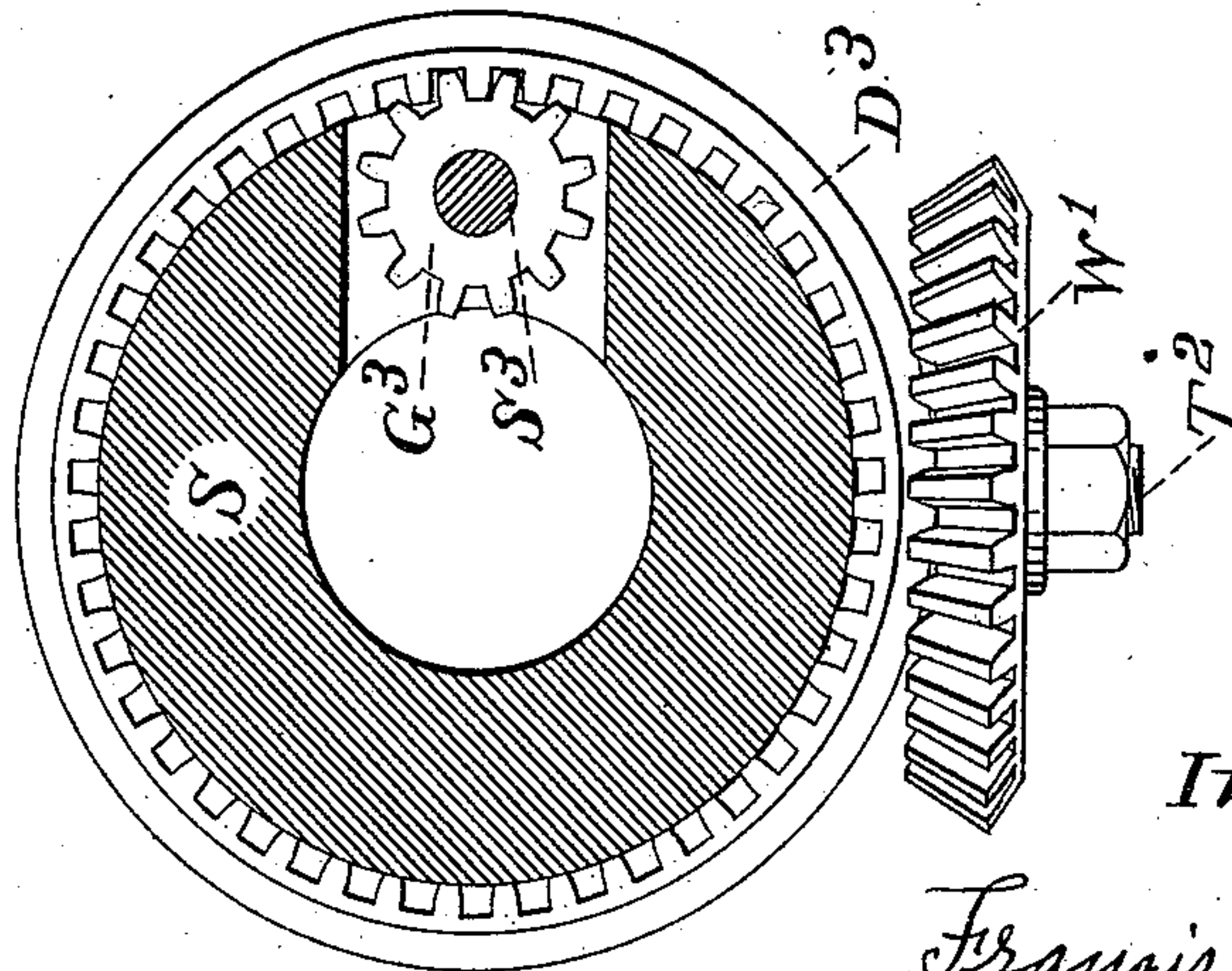


Fig. 6.



Witnesses;

C. O. Palmer.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF SPRINGFIELD, MASS., ASSIGNOR OF ONE-HALF
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LATHE-HEAD.

SPECIFICATION forming part of Letters Patent No. 354,737, dated December 21, 1886.

Application filed January 21, 1886. Serial No. 189,298. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Lathe-Heads, of which the following is a specification, reference being had to the accompanying drawings, in which—

10 Figure 1 is a plan view of a lathe-head embodying my improvements, in which the upper parts are broken away the better to show the inclosed mechanism. Fig. 2 is a front side elevation, partially in section, of the same.
15 Fig. 3 is a front end elevation. Fig. 4 is a rear end elevation. Fig. 5 is an enlarged view of a part of Fig. 1; and Fig. 6 shows a cross-sectional view of the spindle in line *a a*, Fig. 1.

Similar letters refer to similar parts throughout all the views.

This invention relates to that class of lathe-heads which have a tool-carrying slide on their face-plates for the purpose of turning off pieces which do not themselves revolve.

25 The object of my invention is to provide a lathe-head of the aforesaid class of such construction and having a tool-feeding mechanism of such a nature that there is always a positive connection between a hand-wheel
30 shaft conveniently located and the tool-carrying slide, which shall be unaffected by the starting, revolving, or stopping of the lathe-spindle.

For the accomplishment of this object the invention consists in certain combinations of mechanism illustrated by the drawings and hereinafter described and claimed.

In the drawings, A represents a portion of the bed of a lathe, and A' the lathe-head frame, which is therein shown of a box-shaped form, provided with a cover, A², and which incloses the principal parts of the mechanism. This frame has bearings B B' for supporting the lathe-spindle S, and it is also formed as required
45 to receive and hold in place the several details which are not carried by said spindle. This spindle is provided with a flange, F, for convenience in attaching the face-plate P, and may be driven by a gear, G, secured to said
50 face-plate, or otherwise, as desired. The

face-plate is furnished with suitable ways, as J, to which the tool-carrying slide S' is secured by straps T and screws, in the usual manner. This slide has one or more suitably-formed projections, H, adapted to carry the tool post or holder H'. When spindle S is hollow, slide S' is made with a central slot, as shown in Figs. 1 and 3. Lying back of slide S', in a channel formed in the face-plate, there is a screw, S², which works said slide by means of nut N. Said screw is held in place by bearing B² and nuts N², (shown by dotted lines in Figs. 2 and 3,) and is driven by shaft S³ through gears G² and G', fixed, respectively, to this shaft and said screw.

Shaft S³ is carried in a hole formed within spindle S, and is furnished with gear G³, whereby it is driven. It communicates motion to the face-plate mechanism from a system of sun-and-planet gearing, which is a principal part of my present invention, and the construction of which I will next describe. This system of gearing consists of two sun-and-planet motions set in opposition to each other, and connected by an intermediate sun-wheel (common to both sun-and-planet motions) in such a manner that the movements derived from the first of said motions is, in a sense, counteracted in the other. Referring to Figs. 1 and 6, in which this gearing is most completely shown, D is the sun-wheel of the first sun-and-planet motion. It is fitted loosely onto spindle S, and is permanently kept from rotating by a screw, S⁴, in frame A. Next to that sun-wheel a ring, D', is rigidly fixed to said spindle and furnished with a fixed stud, T', for carrying the first planet-wheel, W. Stud T' may be fixed to the spindle without the intervention of ring D', if preferred; but I do not consider this construction as convenient in practice as that shown. Next to ring D', opposite to sun-wheel D, an intermediate sun-wheel, D², is loosely fitted to spindle S. This wheel has teeth on each side of it, of which those on the left-hand side, O, mesh with the teeth of planet-wheel W, and those on the right hand with the teeth of the second planet-wheel, W'. This wheel W' is carried on a stud, T², similar to T', which is fixed to the internally-toothed ring D³, loosely fitted to spindle

S, and similar to ring D'. The teeth of this ring mesh with those of gear G³, before described, as shown best in Fig. 6. At the right hand of this ring the second sun-wheel, D⁴, 5 which may be and is shown here as a duplicate of sun-wheel D², is placed loosely on said spindle. This sun-wheel has teeth O² on one side, meshing with the second planet-wheel, W', and teeth O³ on the other side, meshing 10 with the pinion G⁴ on hand-wheel shaft S⁵.

Having now enumerated all the essential parts of the said sun-and-planet motions, I will next describe one form of mechanism illustrative of a numerous class of such mechanisms, which are adapted to be used for imparting a continuous feeding motion through them 15 and the parts previously described to the tool-carrying slide.

An intermediate shaft, S⁶, is driven from 20 spindle S by gears G⁵ and G⁶, and is fitted at its outer end, E, to receive a gear for driving the usual screw-cutting mechanism of the lathe. Another intermediate shaft, S⁷, is driven from that one through gears G⁷. This 25 shaft carries a gear, G⁸, meshing with the intermediate gear, G⁹, which drives the friction-wheel F' on shaft S⁵. A clutch-wheel, F², is splined to this shaft S⁵, and is operated by means of nut N³, which nut, by means of pins 30 P', fitted to slide freely through the hub of hand-wheel M, can be made to force the said clutch-wheel against said friction-wheel whenever required. The hand-wheel is of course rigidly fixed on its shaft, which, for convenience in disassembling the machine, is supported in a removable flanged bearing, B³. Gears of different sizes may be substituted for G⁸ and G⁹ by a suitable modification of the parts supporting them, for the purpose of 40 changing the speed of shaft S⁵ relative to spindle S. The operation of this gearing, with its shafts and auxiliary parts, to communicate motion from the spindle to the hand-wheel shaft will be obvious from this description 45 and the drawings with my explanation.

The mode of operation of my improvement is as follows: When the spindle is at rest, the tool-slide is first moved to the desired position for beginning a cut. This is done by taking 50 hold of wheel M and turning shaft S⁵ and pinion G⁴, and thereby sun-wheel D⁴. The revolution of this wheel, owing to the well-known nature of the sun-and-planet motion, the wheel D² being at rest, (that is, while 55 spindle S is also at rest,) acts through planet-wheel W' and stud T² to turn ring D³ with one-half of the velocity of said wheel D⁴. The ring D³ acts through gear G³, shaft S³, gears G² and G¹, and screw S² to move the slide as 60 required. The tool having been properly set, the spindle may now be started revolving, when the operation of the mechanism will be as follows: In this case it is supposed that sun-wheels D and D⁴ and the hand-wheel and shaft 65 are for the time being at rest. It is then obvious that, as stud T' is carried around with the spindle, planet-wheel W will be revolved

on said stud, and, owing to the nature aforesaid of this class of mechanical movements, will cause sun-wheel D² to revolve in the same 70 direction and with double the velocity as said spindle. This is the result considering the motion of the wheel D² as derived from wheel D through wheel W. If, now, we consider wheel D⁴ to be at rest and ring D³ to turn uniformly with the spindle, the same as ring D', 75 then it is obvious that the motion of wheel D² thus derived from wheel D⁴ through wheel W' would be the same as before; hence, as the ring D³ gears with gear G³, which is connected 80 to the tool-slide, and as the said ring in this case turns uniformly with the spindle while the hand-wheel is at rest, the revolution of said spindle cannot, therefore, be the cause of any movement of the said tool-slide, for it 85 clearly requires a movement of said ring relative to said spindle to cause a movement of said slide.

Now, if we consider how, as above explained, the tool-slide can be moved by means of hand- 90 wheel M, acting through the sun-and-planet motion, while the spindle is at rest, and how the rotation of the spindle has of itself no power to effect or affect the movement of said slide, it will then be evident without further explanation 95 that in all cases, whether the spindle is at rest or in motion, the said slide will be moved directly in proportion to any movement of the hand-wheel, and that thus will be accomplished the principal object of the invention. 100

In practice I have not found it necessary to provide any means for preventing the rotation of gear G⁴, since the friction of the several bearings and of the slide naturally has that effect; 105 but to secure this result I fit the parts D², D³, and D⁴ to turn freely on spindle S.

This system of gearing is not limited in its applications to lathe-heads; but it may be employed to effect a similar purpose to that here 110 described in any kind of machinery.

I have shown and described face-plate P as being made separately from the spindle and secured thereto; but it may obviously be made integral therewith. It may also be made of 115 various forms other than a circular one. I have also shown slide S' arranged with its line of motion at right angles to the axis of the spindle; but it may be arranged to have said line of motion make any other angle therewith, 120 or even to be parallel thereto, by suitable modifications of the several parts.

The means shown in the drawings for rotating sun-wheel D⁴ is an arrangement of gearing; but the same result may be attained by 125 means of a belt running over that sun-wheel between the teeth O² and O³ from a suitable driving-shaft parallel to the spindle. A chain may also be used in the same manner; or the bevel-gearing for this purpose may be replaced 130 by spur-gearing.

I claim as my invention—

1. A main spindle, a shaft carried by said spindle and having a gear thereon, a toothed

ring carried upon said spindle and meshing with the gear of said shaft, a double sun-and-planet mechanism, substantially as described, a shaft adapted to be revolved in a fixed position at the will of the operator, and gearing between this shaft and said mechanism for imparting to said toothed ring a rotary motion relative to said spindle, combined and operating substantially as set forth.

10 2. A main spindle, a shaft carried within said spindle and having a gear thereon projecting outside of the periphery thereof, an internally-toothed ring carried upon said spindle and meshing with the gear of said shaft, a
15 sun-and-planet mechanism, substantially as described, a shaft adapted to be revolved in a fixed position at the will of the operator, and connecting-gearing between this shaft and said mechanism for imparting to said toothed ring
20 a rotary motion relative to said spindle, combined and operating substantially as specified.

3. In a lathe-head, a spindle having a shaft within it and ways for a tool-carrying slide, a tool-carrying slide adapted to slide on said
25 ways, feed-gearing, substantially as described, between said slide and said shaft, a system of

sun-and-planet gearing, substantially as described, and gearing to connect same with said shaft, all combined and operating substantially as set forth.

4. A spindle, as S, sun-wheels D, D², and D⁴, planet-wheel W, carried on a stud, T', affixed to said spindle, planet-wheel W', carried on a stud, T², affixed to ring D³, gearing from ring D³ to shaft S³, and shaft S³, combined and operating substantially as described.

5. In a lathe-head, a suitable frame-work, a spindle, as S, with a face-plate and its ways, a slide on said ways, the sun-and-planet mechanism on said spindle, the connecting mechanism between said sun-and-planet mechanism and said slide, a gear, as G⁵, fixed on said spindle, and intermediate connecting feed-gearing, substantially as described, between said gear G⁵ and sun-wheel D⁴ of said sun-and-planet mechanism, all combined substantially as and for the purpose set forth.

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Witnesses:

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