

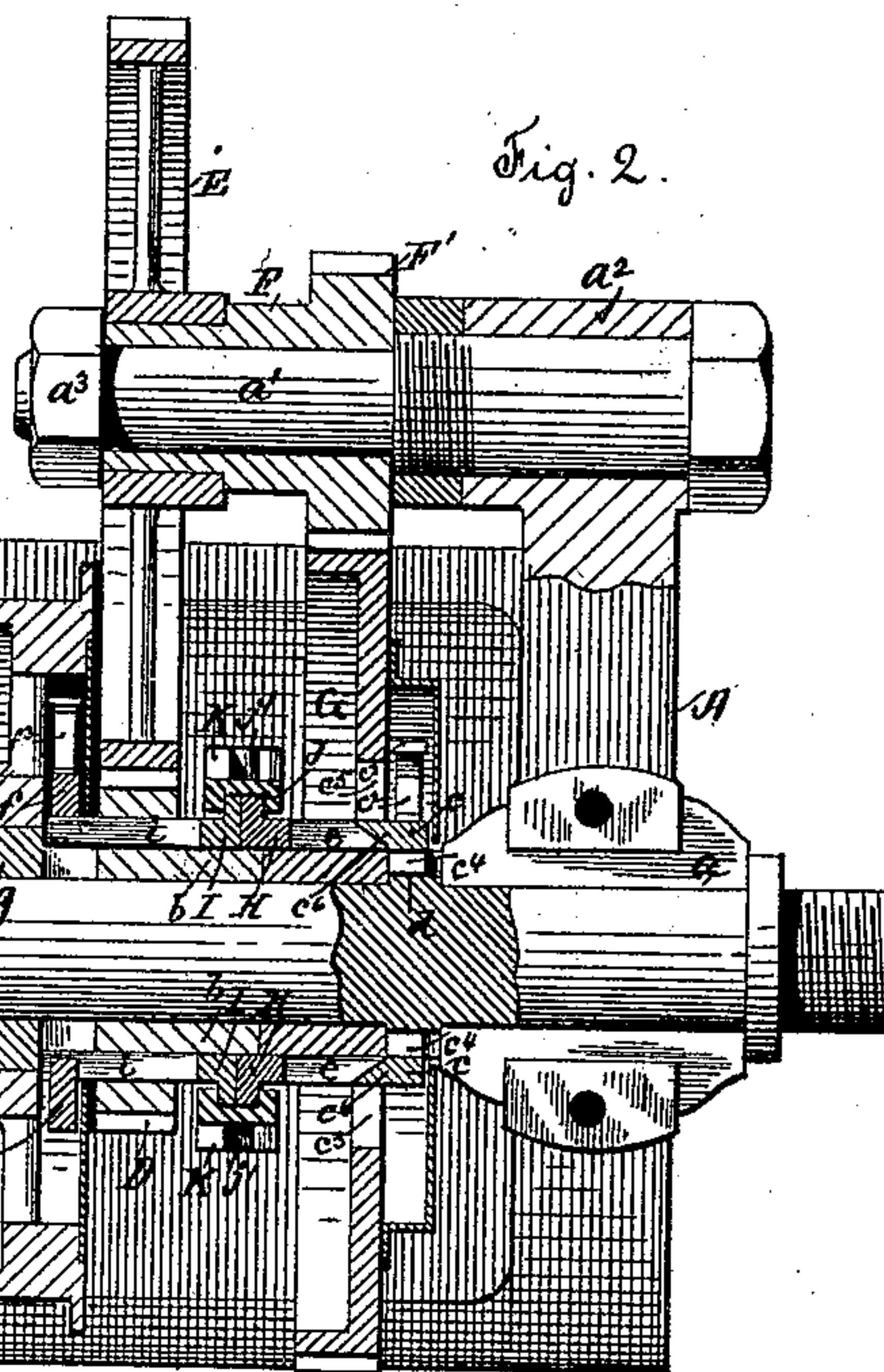
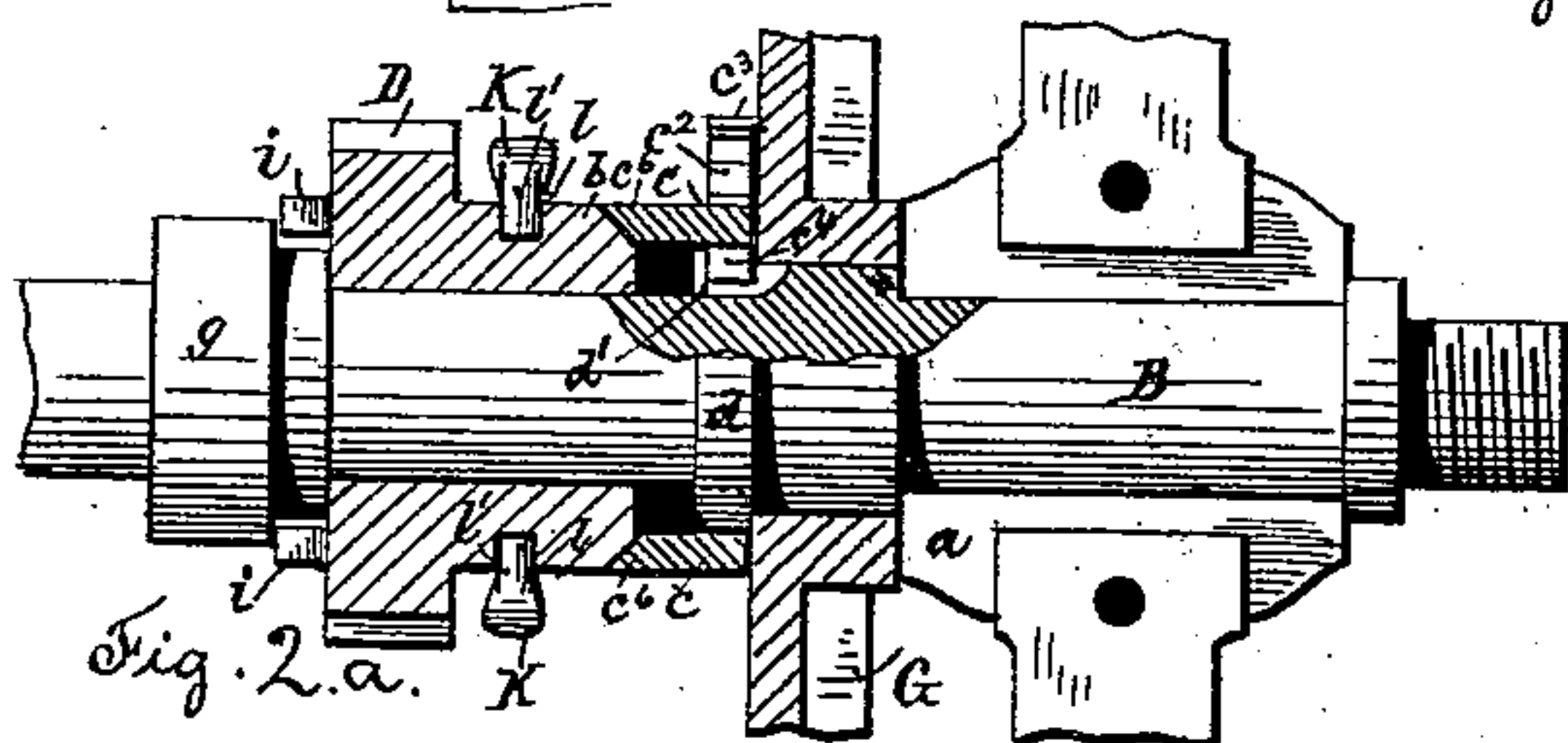
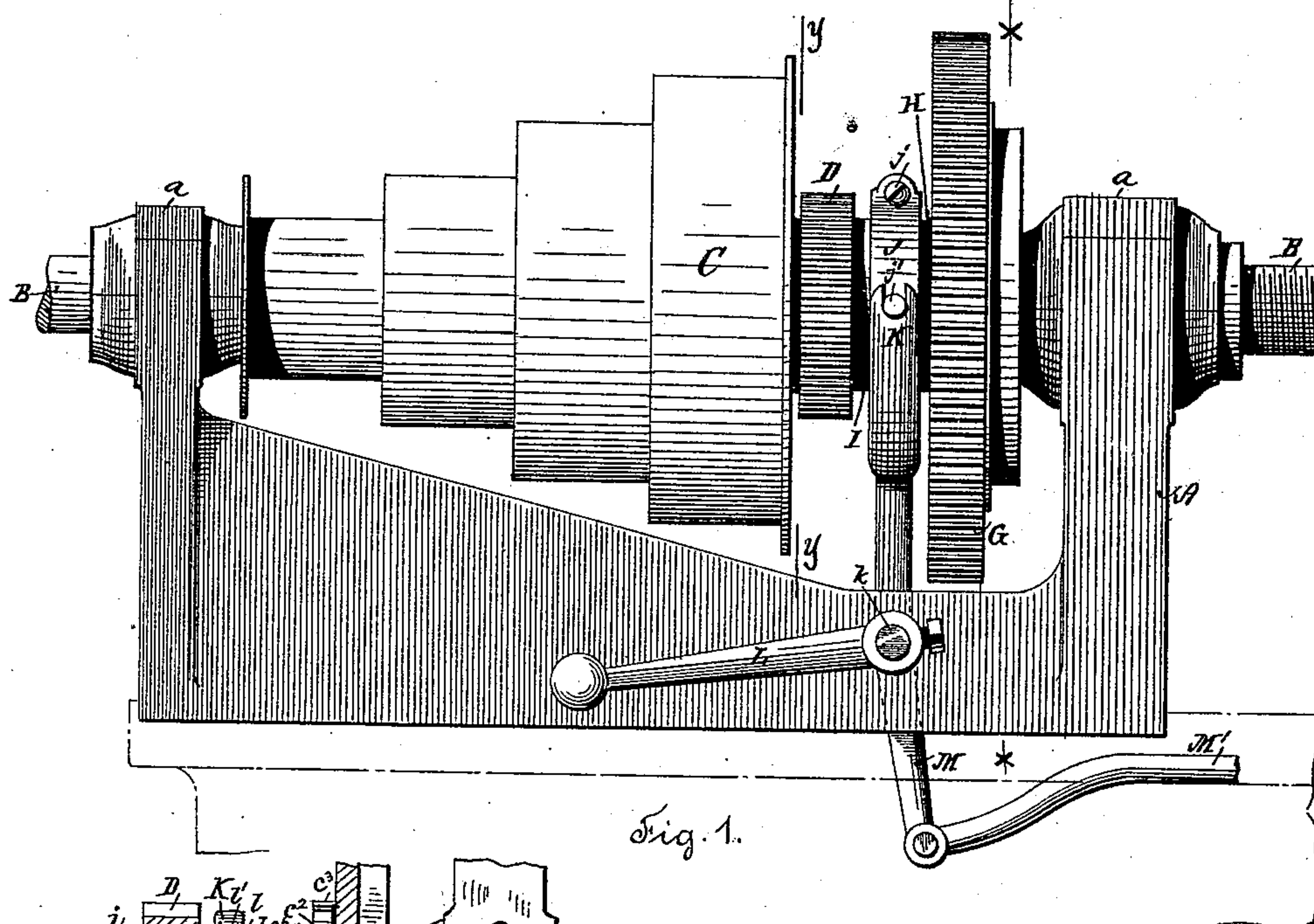
(No Model.)

3 Sheets—Sheet 1.

B. G. LUTHER.
BACK GEARING MECHANISM.

No. 446,233.

Patented Feb. 10, 1891.



Witnesses
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(No Model.)

3 Sheets—Sheet 2.

B. G. LUTHER.
BACK GEARING MECHANISM.

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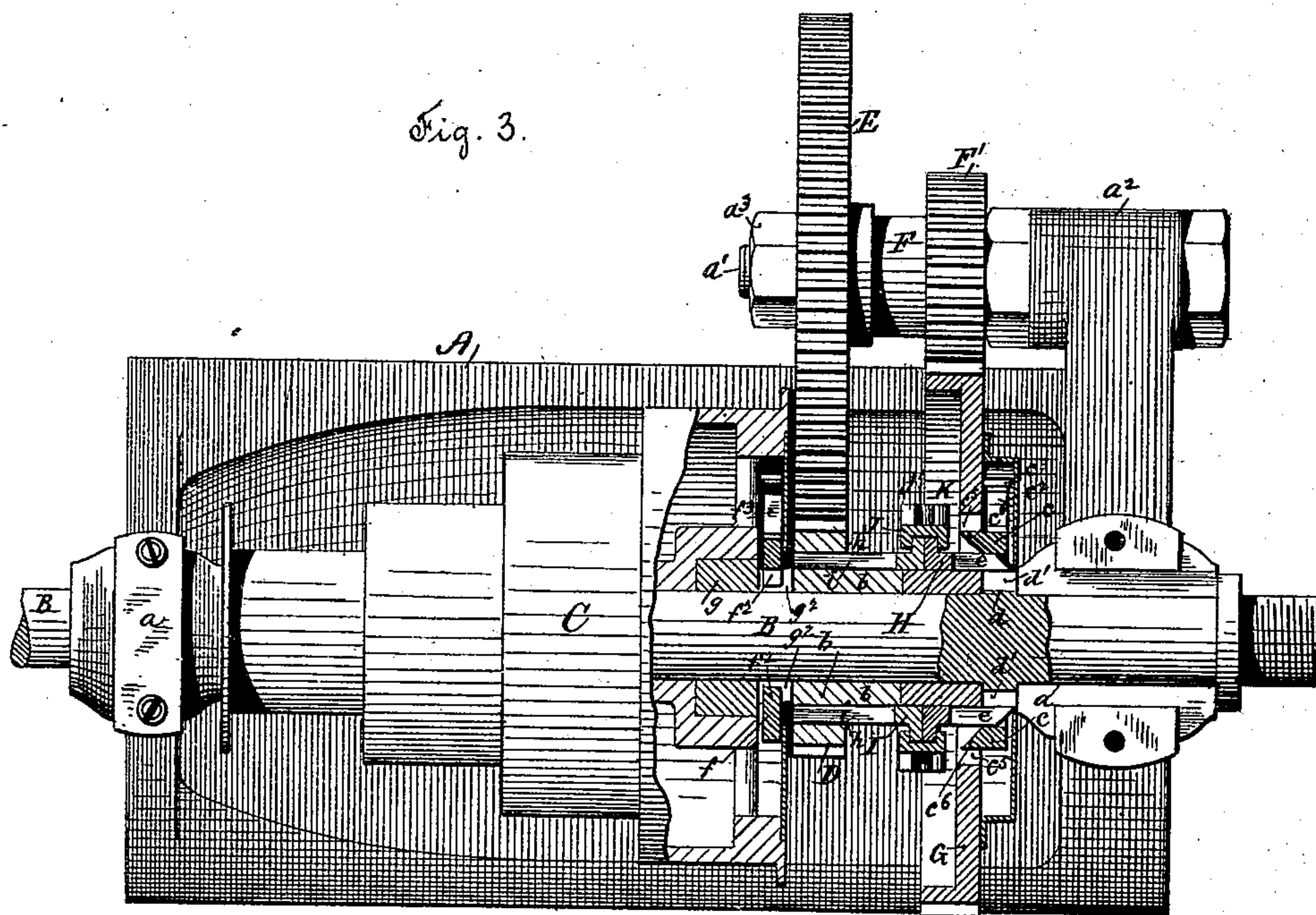


Fig. 4.

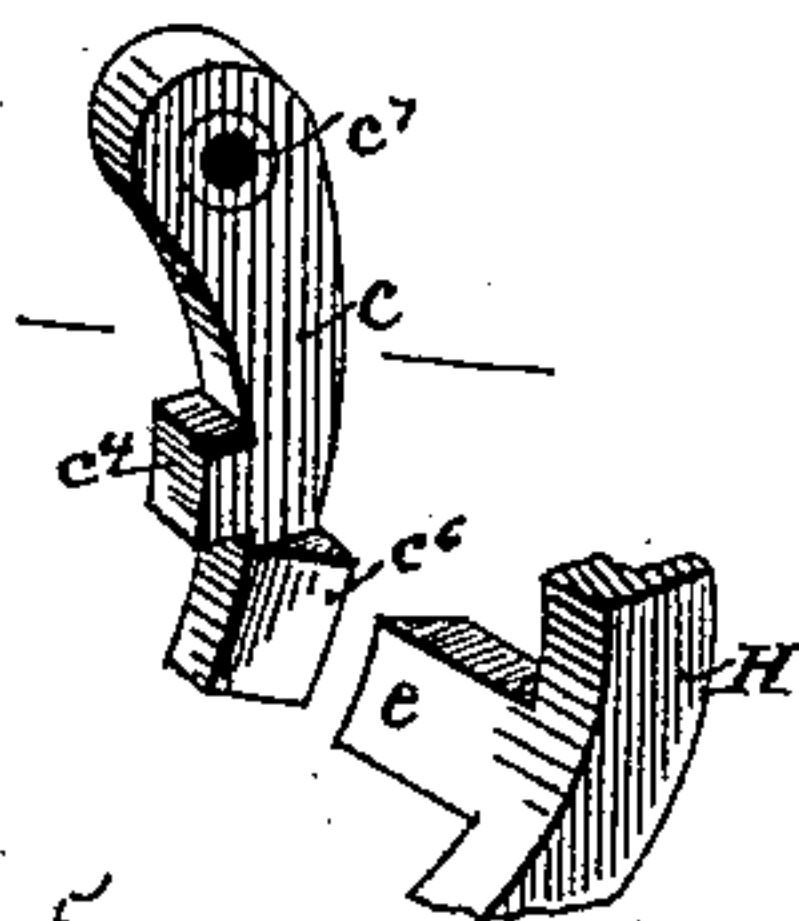


Fig. 5.



Fig. 8.

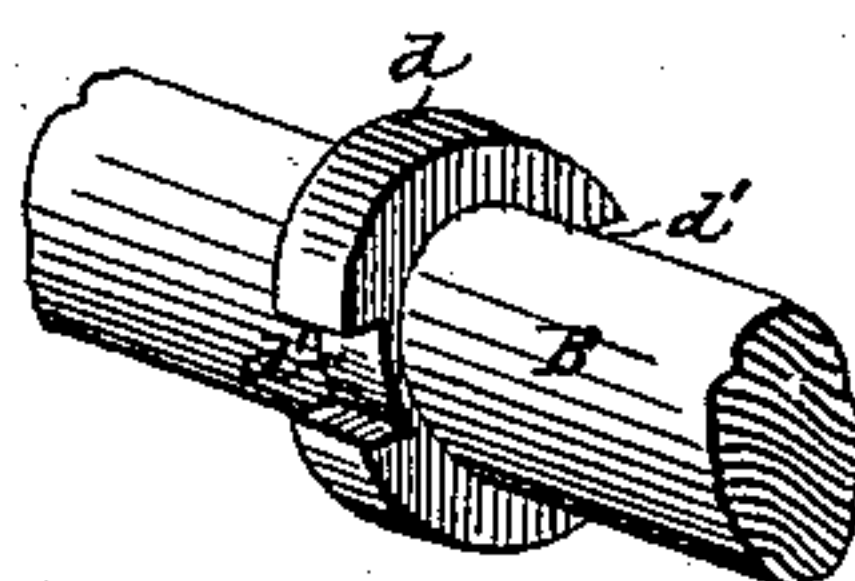


Fig. 7.

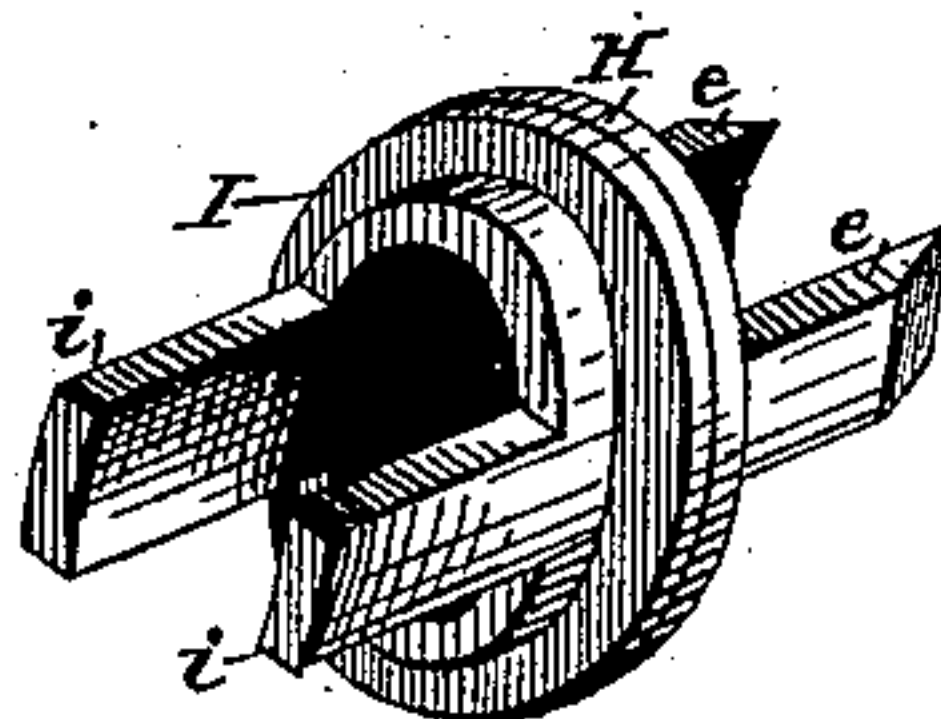
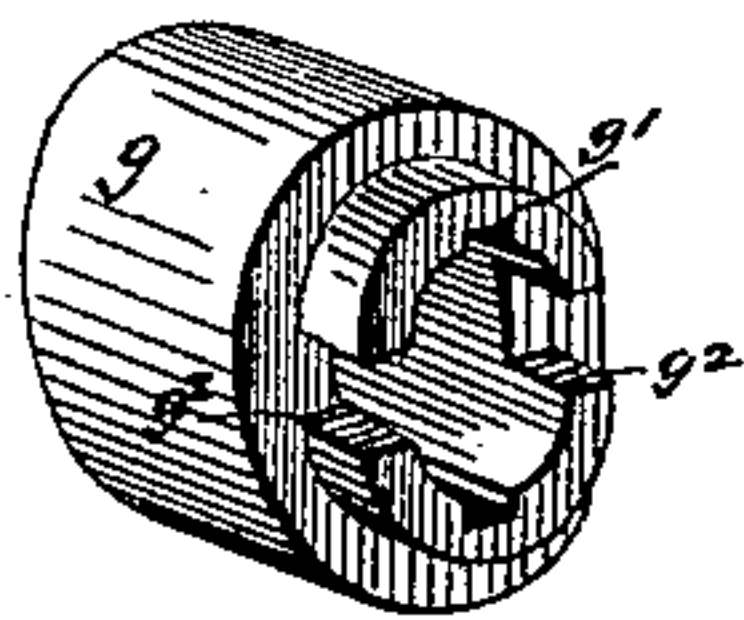


Fig. 6.

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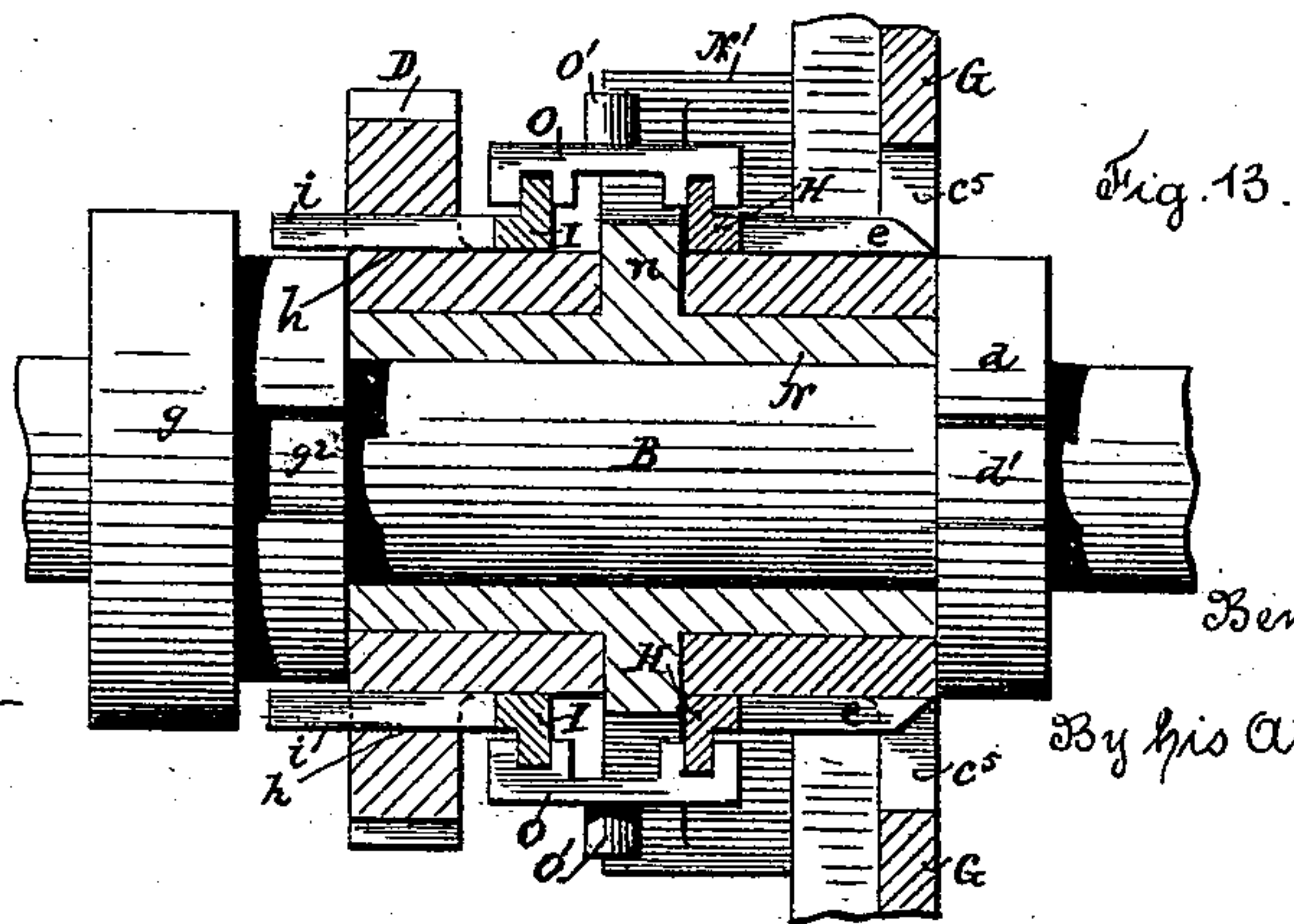
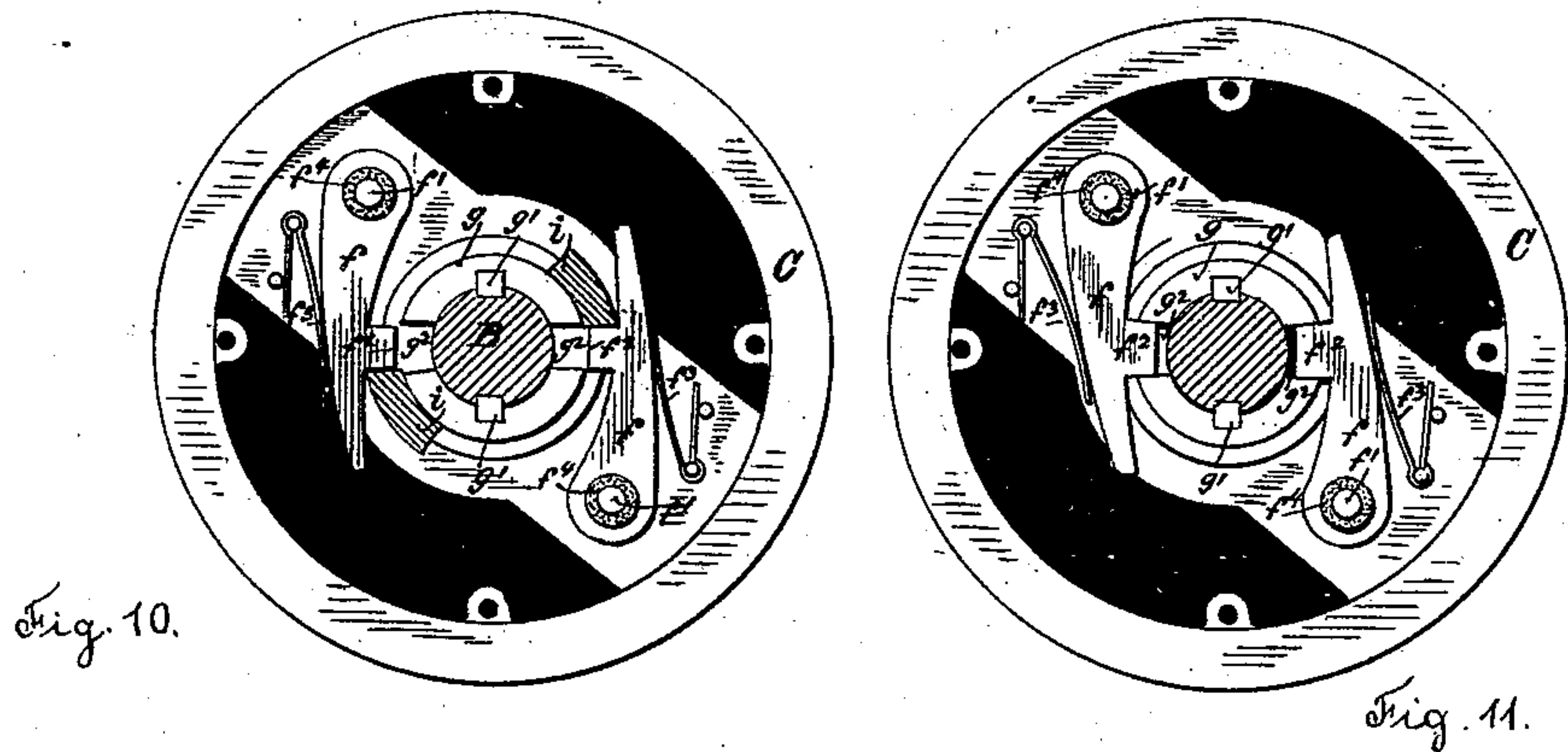
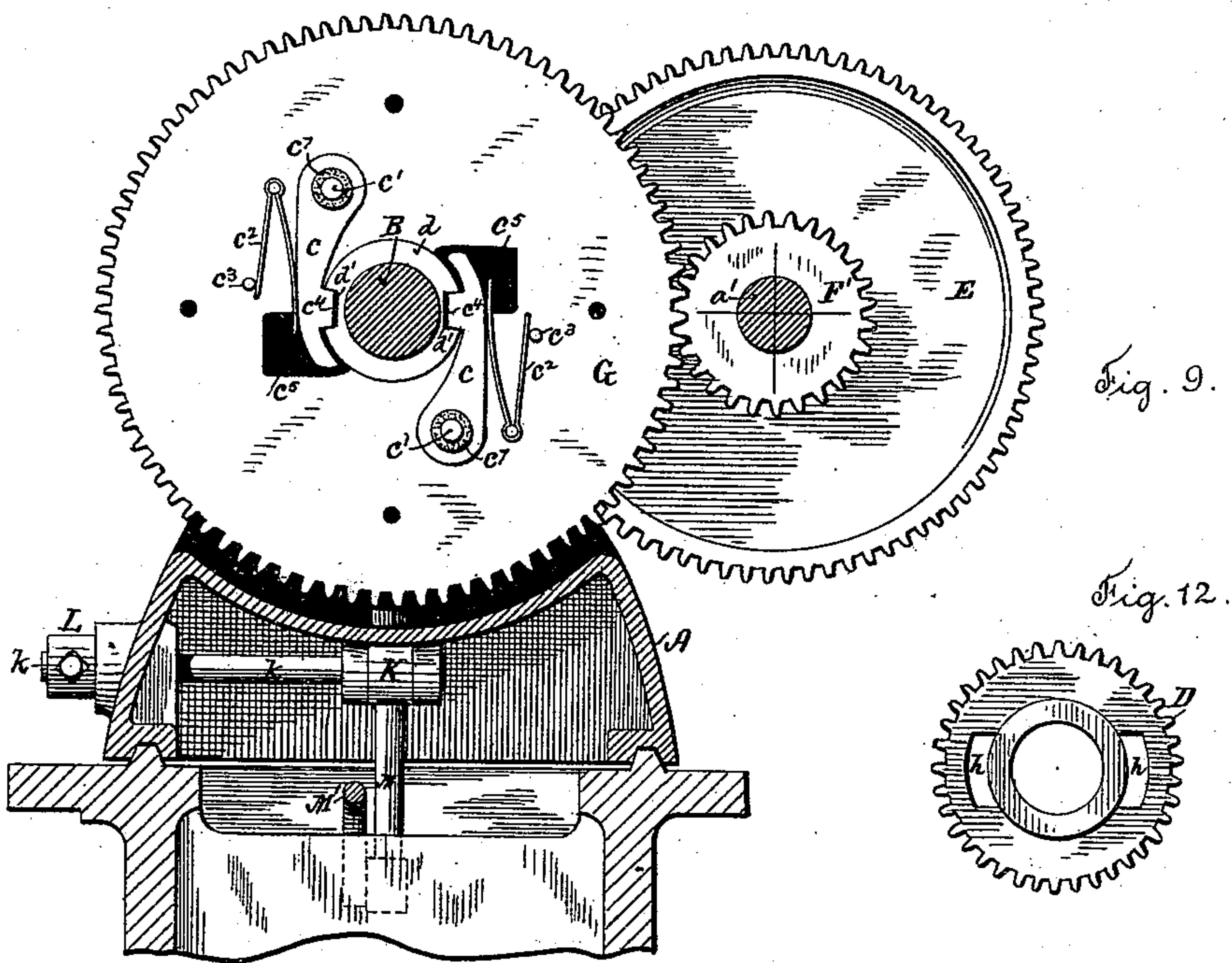
(No Model.)

3 Sheets—Sheet 3.

B. G. LUTHER.
BACK GEARING MECHANISM.

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UNITED STATES PATENT OFFICE.

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BACK-GEARING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 446,233, dated February 10, 1891.

Application filed October 17, 1890. Serial No. 368,484. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN G. LUTHER, a citizen of the United States, and a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Back-Gearing Mechanism for Machines, of which the following, in connection with the accompanying drawings, is a specification.

My invention relates to machines in which the working effect may be increased at will by the use of back-gears—as, for instance, in engine-lathes, drills, &c.—and has for its object to provide simple and effective means whereby such back-gears may be connected with or separated from the driving-pulley by a movement of a hand-lever whether the machine is running or standing still.

In machines of the kind above mentioned considerable delay has always been caused when throwing the back-gears in or out of engagement with the spindle, inasmuch as the face-gear must be disconnected from the cone by loosening the cone-stud and slipping the same out of the cone and clamping it again on the face-gear, all of which could be done only when the machine was at a standstill. After this the quill of the back-gears must be moved so as to bring the back-gears in engagement with the gears on the spindle. Sometimes when cutting a screw in the lathe the spindle must rotate very slowly; but it is desirable to return the cutting-tool to its starting-point at a considerably accelerated speed in order to gain time.

In the lathes as built heretofore too much labor is involved in throwing the back-gears out of action, in order to allow a quick return of the cutting-tool, and the former would have to be thrown into action again before the tool commences to take the succeeding cut.

In my present invention all this delay and labor is avoided, since by a slight movement of a hand-lever the back-gears may be brought into or out of engagement at will, as will be readily understood by referring to the accompanying drawings, in which—

Figure 1 is a side view of the head of an engine-lathe embodying my invention. Fig. 2 represents a horizontal section through the spindle, the back-gears being shown in action. Fig. 2^a is a detail view showing a modifica-

tion. Fig. 3 represents a similar view showing the back-gears disconnected. Figs. 4 to 8, inclusive, are perspective views of some of the details. Fig. 9 is a cross-section on line *x x* of Fig. 1. Fig. 10 is a cross-section on line *y y* of Fig. 1. Fig. 11 is a section similar to that shown in Fig. 10, representing the same parts in a different position. Fig. 12 is a side view of the pinion on the spindle. Fig. 13 represents a modification showing a supporting-shell surrounding the shaft, such construction being desirable in the larger machines.

In the drawings, A represents the head-casting of an engine-lathe, supporting in the bearings *a* the spindle B, upon which the cone-pulley C is mounted.

D represents the pinion, having a hub *b* and loosely supported on the spindle B.

E is the back-gear, mounted upon the quill F, the other end of which is formed into the back pinion F', which meshes into the face-gear G, loose upon the spindle. The quill F is supported on a stud *a'*, firmly held in the ear *a*² of the head-casting, and is prevented from side movement by the nut *a*³ at the end of the stud *a'*.

The face-gear G carries one or more dogs *c*, (see Fig. 9,) which are pivoted at *c'*, and the loose ends of which are thrown toward the spindle by means of springs *c*², resting with one end against the back of the dog and with the other against the pin *c*³.

The dog *c* is provided with a tooth *c*⁴, which is adapted to enter the notches *d'* in the collar *d*, and thus form a connection between the face-gear G and spindle B, so that any rotation of the gear will cause a like rotation of the spindle.

The face-gear G has openings *c*⁵ (see Figs. 2, 3, and 9) to loosely receive projections *c*⁶, which are made integral with the dogs *c*, and which are beveled on the surface next to the spindle to correspond with the beveled end of a slide H, by which the dogs may be raised out of the notches *d'*, above mentioned, in which case the gear G would be entirely loose upon the spindle B.

The slide H consists, essentially, of a flanged ring (see Fig. 6) having two spurs *e* diametrically opposite each other and of a width equal to that of the openings *c*⁵ in the face-gear G, the whole being supported on the out-

side of the hub of said face-gear, where it can move back and forth lengthwise, but must rotate with the gear.

Referring to Figs. 10 and 11 of the drawings, it will be seen that the cone-pulley C carries two dogs f , which are pivoted at f' and have a tooth f^2 , while the springs f^3 serve to swing their free ends toward the spindle, which is provided with the collar g , firmly secured thereto by the key g' . The collar g is provided with notches g^2 , with which the said tooth f^2 of the dog may engage, whereby the cone-pulley C will be connected with the collar g , and thereby with the spindle B, such condition being represented in Fig. 11.

The cone-pulley is disconnected from the spindle in the following manner: Supported on the outside of the hub of the pinion D, which is loose on the spindle B, is the slide I, consisting of a flanged ring provided with the spurs i , which pass through and are of a width equal to that of the openings h in said pinion D. It will therefore be understood that although the slide I may move lengthwise on the hub of the pinion the rotary movements of both are simultaneous. When now the slide I is moved toward the cone-pulley C, the spurs i will be carried into the path of the ends of the dogs, which will then ride upon the said spurs, and thus draw the teeth f^2 out of the notches g^2 , thus liberating the cone-pulley from the collar, and consequently from the spindle. If the rotary movement of the cone is still continued, the teeth f^2 will encounter the spurs i and carry them along, whereby a rotary movement will be imparted to the pinion D, and thus to the gears E, F', and G.

The slides H and I are provided with flanges, so that I am enabled to employ the shell J for operating both slides in unison, said shell J being made in halves, which are fastened together by the screw j , and each of which is provided on its side with a pin j' to fit the bifurcated ends of a fork K, which latter is secured upon a spindle k , to which a rocking motion may be given by the hand-lever L on the outside of the head-casting, or by lever M and a rod M', which runs inside the lathe-bed and above its ties, so that the back-gears can be thrown in or out of engagement from any point lengthwise of the machine.

If the back-gears are running, such condition being illustrated in the drawings, and it is desired to change into the more rapid cone speed, the operation is as follows: The handle L is to be raised, by which action the shaft k will be rocked and a similar movement will be imparted to the fork K, which operates upon the slides H and I, moving the same from left to right. The slide H in its movement toward the face-gear swings the dogs c around their pivot, by which movement their teeth c^4 are drawn out of the notches d' in the collar d , so that all connection between face-gears G and collar d or the spindle is completely severed, leaving the

gears at a standstill. As the slide I and its spurs i are drawn from under the dogs f , the springs f^3 will cause said dogs to fall with their teeth f^2 onto the collar g , to ride upon the outside of the latter until the teeth f^2 come to a place over the notches g^2 , into which the spring f will drive the same, so that a driving connection will thus be made between the cone-pulley and collar, and consequently with the spindle. The pinion D will now be perfectly loose upon the spindle, because the only means for connecting the same with the dogs of the cone-pulley have been withdrawn by the movement of the spurs i . (See Fig. 3, which represents the back-gears out of engagement.)

By referring to Figs. 9, 10, and 11 it will be seen that the sides of the notches d' and g^2 in the collars and the teeth c^4 and f^2 of the dogs are slightly beveled and the pivot-pins c' and f' are surrounded by rings c^7 and f^4 , which are made of leather or some other yielding substance. By this construction the beveled sides of both teeth will be allowed to come to a full bearing in their respective notches in the collars, so that any slight variation in placing the dogs or forming the notches will be remedied, inasmuch as the dogs will adjust themselves on account of the yielding rings c^7 and f^4 .

In Fig. 13 is represented a modification of the above-described construction to be employed in lathes of large sizes mainly, as it is desirable to relieve the spindle of the weight of the gears and the operating-slide, as follows: Instead of placing the gear directly on the spindle, I provide a sleeve N, having a flange n , on the outside of which the gears D and G are supported in running fit, while its inside diameter is large enough to allow the spindle B to loosely pass through the same. The sleeve N forms part of a casting, which may be secured by its foot N' to the head-casting, so that the weight of the parts which are supported on said sleeve will be taken off the spindle, thus saving the wear of the latter. In this construction it is necessary to leave a space between the flanges of the slides H and I, and the flange n of the supporting-sleeve serves as a stop for the said slides in both directions, the slides being connected to move together by the shippers O, which are operated by the ends of a fork similar to the one above mentioned engaging the pins O'.

In Fig. 2^a is illustrated a modification which is especially adapted for use in lathes of smaller sizes. In this instance the pinion D and the spurs i are cast in one piece, and the hub b is beveled at its end to operate the dogs c in the same manner as the slide H and its prongs e , previously described. The hub b of the pinion is provided with an annular groove l , which receives the pins l' of the fork K, so that the pinion D is moved by said fork K, producing the desired results by operating the dogs f and c , the latter of which are placed on that side of the gear G which faces the cone,

so that the above-mentioned holes or openings
c⁵ are unnecessary.

I claim as my invention—

1. The combination, with the spindle pro-
5 vided with a notch adapted to be engaged by
a driving-dog, of the cone-pulley provided
with a spring-actuated driving-dog having an
engaging tooth which is adapted to enter the
notch of the spindle, and the movable spur
10 which is adapted to engage with the dog to
cause the withdrawal of its tooth from driv-
ing engagement with the notch to driving en-
gagement with the spur, substantially as de-
scribed.

15 2. The combination, with the spindle pro-
vided with a notch adapted to be engaged in
both directions by a driving-dog, of the cone-
pulley provided with a spring-actuated driv-
ing-dog having an engaging tooth which is
20 adapted to enter the notch of the spindle and
cause the movement of the same in either di-
rection, and a movable spur which is adapted
to engage with the dog from either direction
to cause the withdrawal of its tooth from driv-
25 ing engagement with the notch to driving en-
gagement with the spur, substantially as de-
scribed.

3. The combination, with the spindle pro-
vided with a notch adapted to be engaged by
30 a driving-dog, of the cone-pulley provided
with a spring-actuated driving-dog adapted
for engagement with the notch to cause the
rotation of the spindle and the loose pinion
which holds a spur adapted for engagement
35 with the dog to cause the withdrawal of its
tooth from driving engagement with the
notch of the spindle to driving engagement
with the spur to cause the rotation of the
pinion, substantially as described.

40 4. The combination, with the cone-pulley
and the gear, which are arranged loosely upon
the spindle and each provided with a spring-
actuated driving-dog, and the spindle pro-
vided with notches adapted to be engaged by
45 the driving-dogs of the cone-pulley and gear,
of the loose pinion which holds a spur adapt-
ed for engagement with the dog of the cone-
pulley to cause the withdrawal of its tooth
from driving engagement with its notch to
50 driving engagement with the spur of the pin-
ion, the intermediate gears which connect the

pinion and the loose gear, and means for ef-
fecting the engagement and disengagement
of the driving-dog of the gear in timely rela-
tion to the disengagement and engagement of 55
the driving-dog of the cone-pulley, substan-
tially as described.

5. The combination, with the gear carrying
a spring-actuated driving-dog, of the spindle
provided with a notch which is adapted to be 60
engaged by the tooth of the dog, so as to be
capable of rotation in either direction by the
said dog, substantially as described.

6. The combination, with the loose gear car-
rying a spring-actuated driving-dog, and the 65
spindle provided with a notch which is adapt-
ed to be engaged by the tooth of the dog, of
means, substantially as described, whereby
the dog can be raised out of the notch of the
spindle, as set forth.

7. The combination, with the spindle, of the 70
pinion, the loose gear, the intermediate gears,
and the fixed standard adapted to support
the pinion and gear from bearing directly
upon the spindle, substantially as described. 75

8. The combination, with the spindle, of the
cone-pulley having a spring-actuated dog, a
notched collar on the spindle, adapted to be
engaged by the tooth of said dog, a sliding
spur for raising said dog out of engagement 80
with the notches of the collar into engage-
ment with the spur, the pinion, the interme-
diate gears, the loose gear upon the spindle,
its spring-actuated driving-dog having a tooth
adapted to engage with a notch in the spin- 85
dle, a slide whereby said dog is disengaged
from its notch, and means, substantially as
described, whereby the said slide and the
sliding spur are moved simultaneously, for
the purpose set forth. 90

9. The combination, with the spindle pro-
vided with engaging notches and the cone-
pulley, of the spring-actuated driving-dogs
having yielding rings upon their pivots, which
will allow both of said dogs to come firmly 95
into engagement with the notches of the spin-
dles, substantially as described.

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