

No. 701,581.

Patented June 3, 1902.

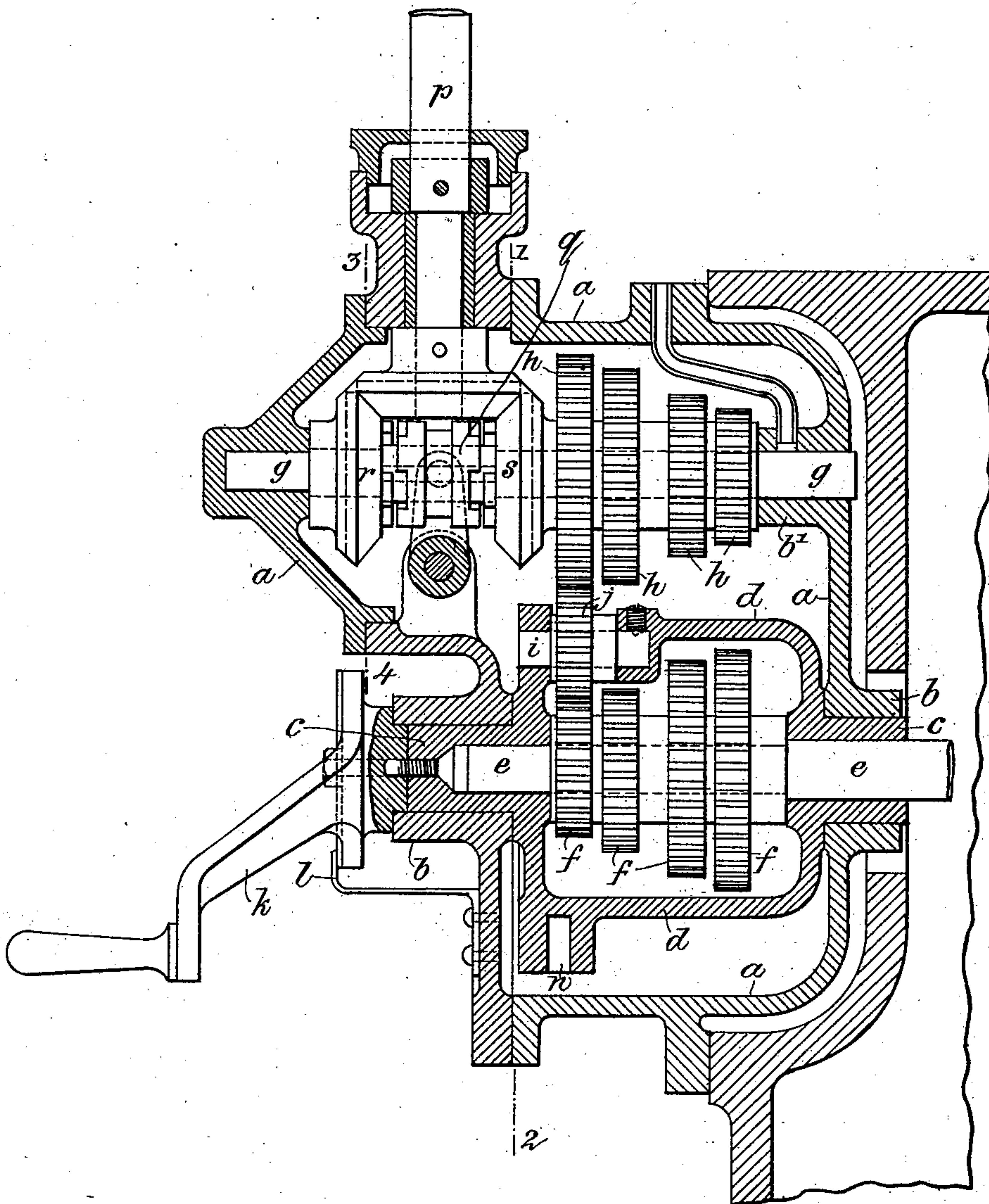
A. LAIDLAR.  
VARIABLE SPEED MECHANISM.

(Application filed Jan. 22, 1902.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



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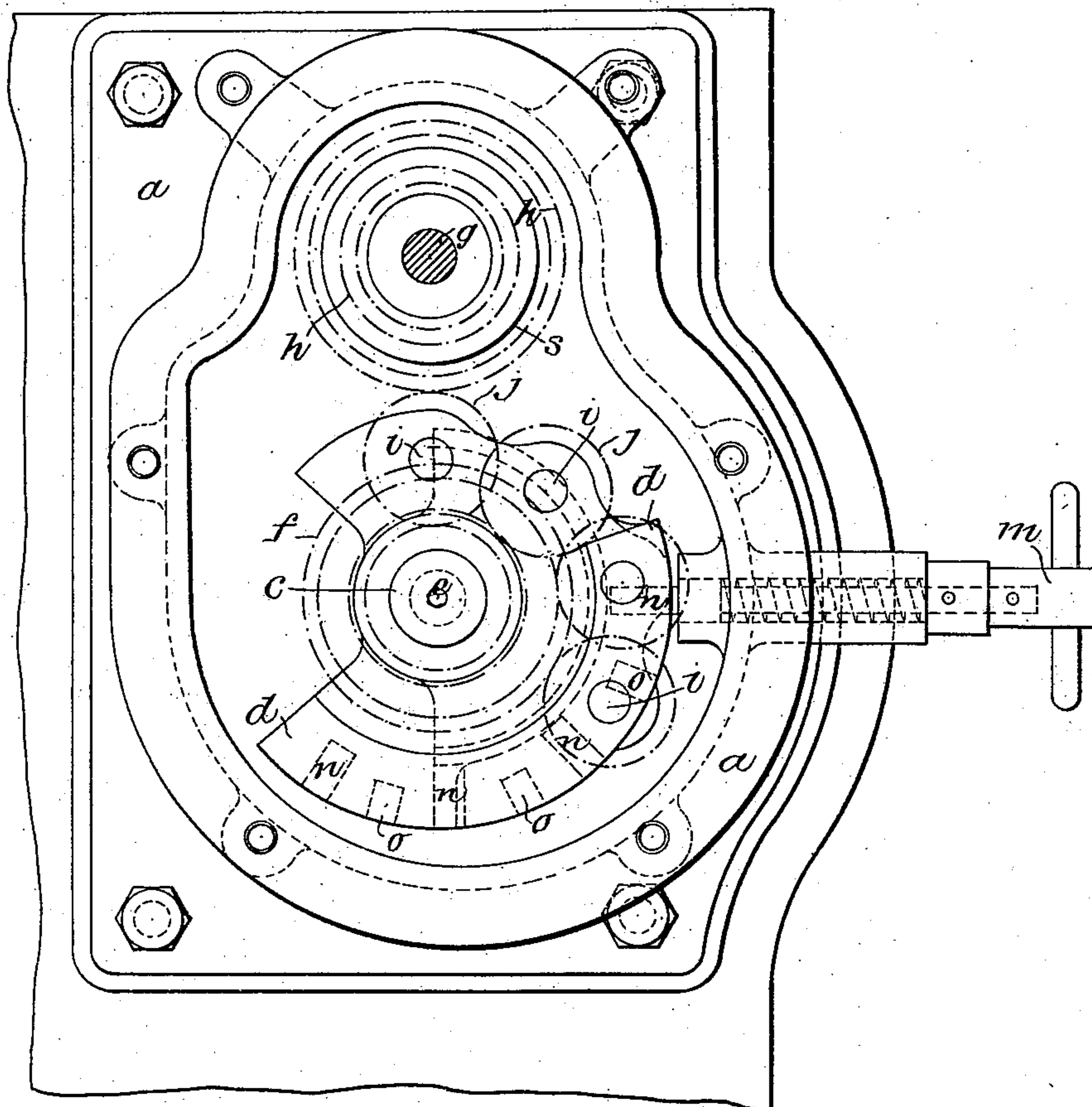
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FIG. 2.



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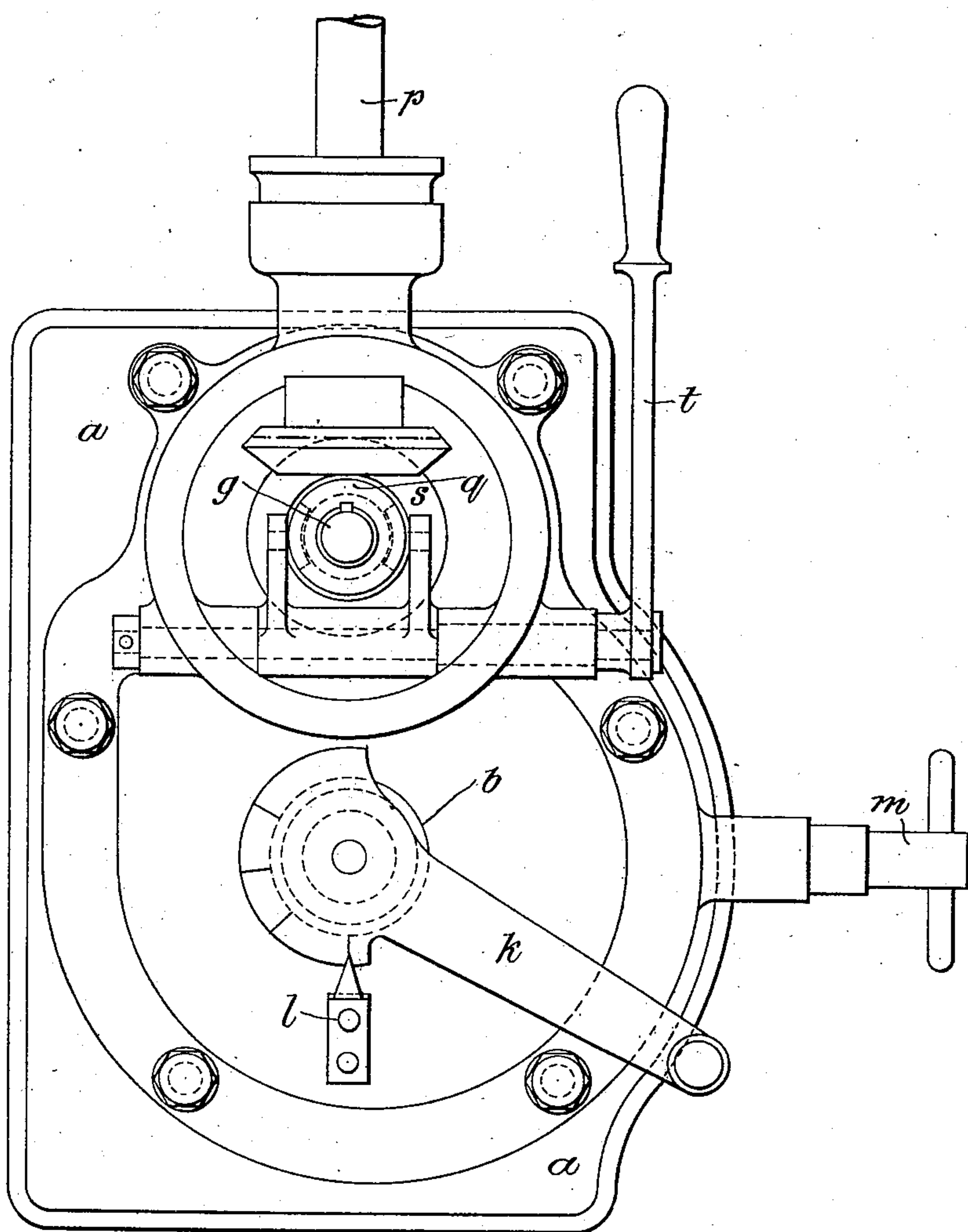
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Fig. 3.



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FIG. 5.

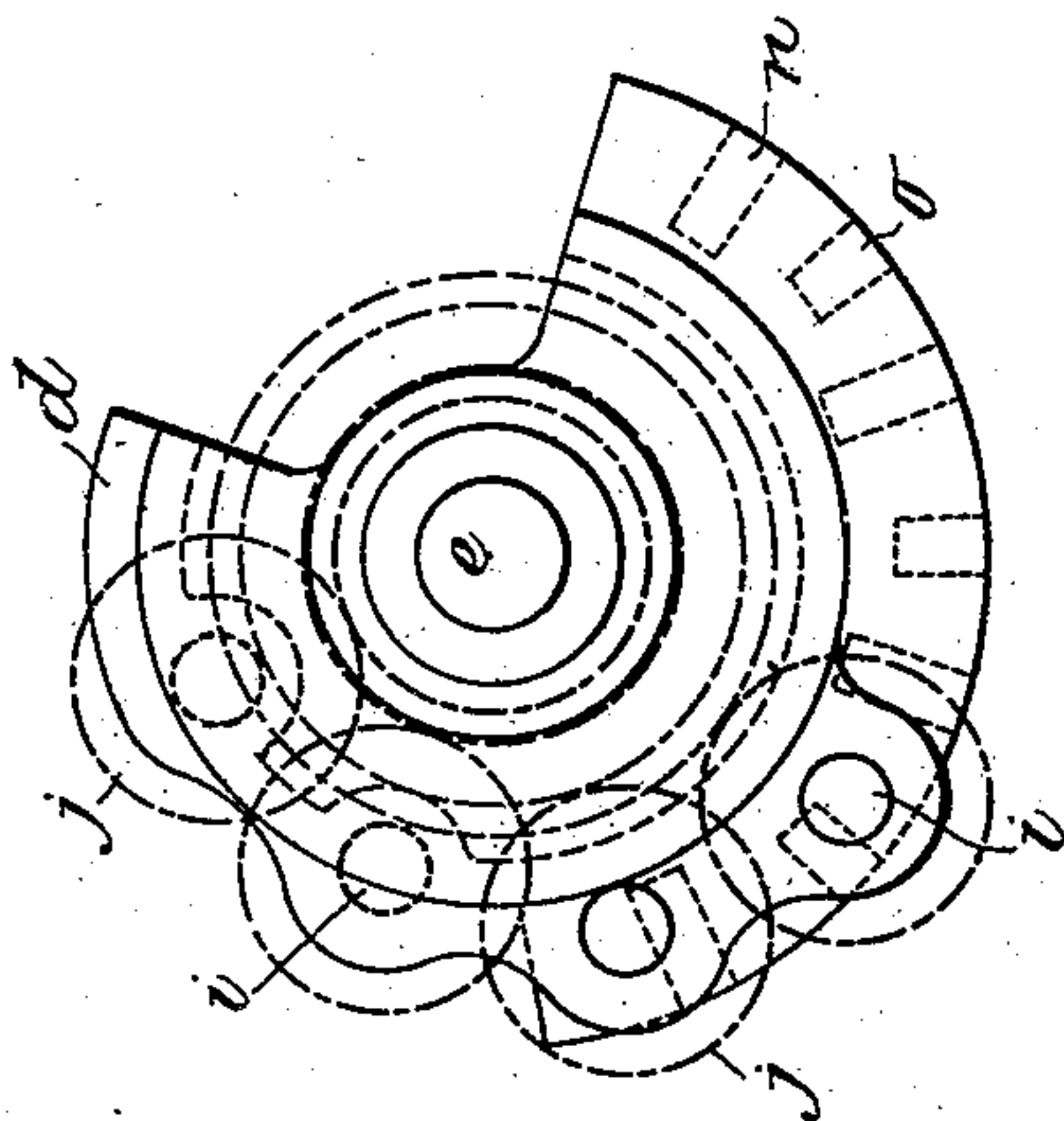
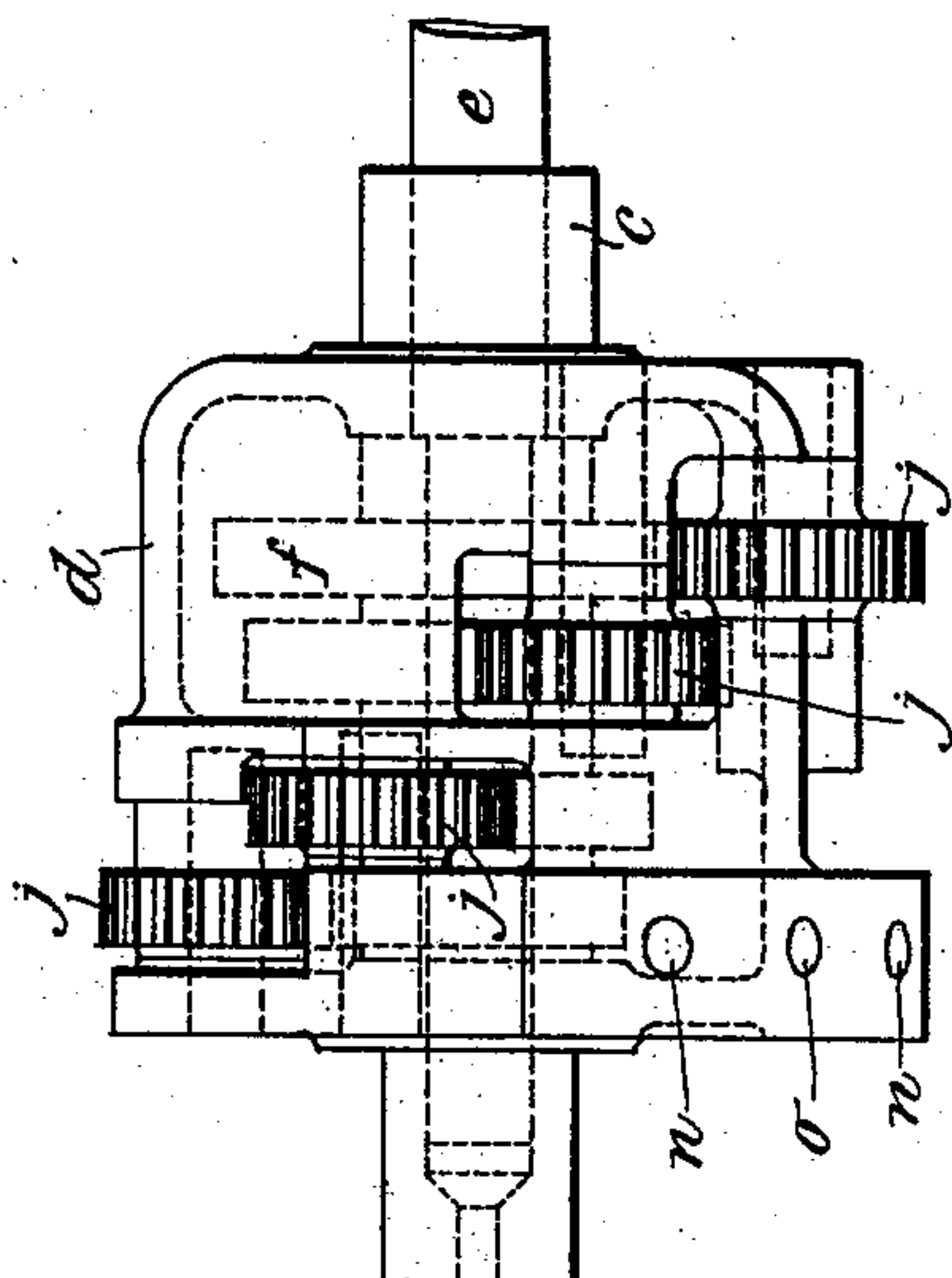


FIG. 4.



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# UNITED STATES PATENT OFFICE.

ARTHUR LAIDLAR, OF BROADHEATH, ENGLAND.

## VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 701,581, dated June 3, 1902.

Application filed January 22, 1902. Serial No. 90,759, (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR LAIDLAR, a subject of the King of Great Britain, residing at Broadheath, in the county of Chester, England, have invented a new and useful Improvement in Variable-Speed Mechanism, of which the following is a specification.

This invention relates to means for varying the speed of any machine in which a variable-speed mechanism is required; but it is especially applicable for operating and varying the speed or feeds of machine-tools and the like.

In the accompanying drawings, Figure 1 is a sectional elevation of the speed-varying mechanism. Fig. 2 is a vertical section on the line 1 2 of Fig. 1, the front of a casing being removed; and Fig. 3 is a front view, a portion of the casing indicated by the line 3 4, Fig. 1, being removed. Fig. 4 is a side view of a portion of the mechanism detached, showing the position of certain intermediate wheels; and Fig. 5 is a back view of the same.

The invention consists in a device composed of two parallel shafts or axles (one driven) and carrying sets of spur wheels or pinions of various diameters, the two sets being arranged on the shafts in contrary directions—that is to say, the large wheel or pinion of one set is opposite the small wheel or pinion of the other set. These shafts are placed at such a distance apart as to allow a space between any pair of pinions or wheels, and this interval is made up by an intermediate wheel or pinion. These intermediate wheels are mounted on short axles carried by a frame or box provided with hollow trunnions and suitably mounted on the first shaft, so as to surround the set of wheels or pinions thereon. These wheels are placed parallel with but at varying distances from the shaft and they are also placed in planes parallel to one another and in line with the several pairs of gear-wheels each is intended to serve.

In order that the invention may be clearly understood, I will now proceed to fully describe it with reference to the accompanying drawings.

*a a* represents a casing, which is so shaped and flanged as to be readily attached to the machine to which it is to be applied.

The casing *a* is formed with bosses *b b*,

bored out to receive the trunnions *c c* of a box or frame *d*. These trunnions *c* are bored out to form bearings for a shaft *e*, so that the box can be rotated independently of the shaft, which shaft may represent a driving-shaft running at a constant rate of speed. On the shaft *e* inside the box *d* are keyed or otherwise secured a series of spur-wheels *f* of varying diameters. The casing *a* is also formed with bosses *b'*, bored out to receive a second shaft *g*, placed parallel with the shaft *e* and on which are keyed a series of spur-wheels *h*, also of varying diameters. The series of wheels *f h* do not intermesh, but are at a distance apart from each other and are so arranged on their respective shafts *e g* that the smallest wheel *f* comes opposite the largest wheel *h*. The spaces between these series of wheels *f h* are made up by a series of intermediate wheels *j*, mounted loosely on short shafts *i*, carried in bearings in bosses formed in the walls of the box *d*. (See Figs. 4 and 5.) The wheels *j* are each placed in the plane of and are permanently in gear with a wheel *f*, the first pinion *j* gearing with the first wheel *f* and the second pinion with the second wheel, and so on through the series. The short axles *i* are arranged at different distances from and around the shaft *e*, the amount of difference being equal to the difference in the length of the radius of two adjacent wheels *f*.

In Fig. 1 it will be seen that the pinion *j* serves as an intermediate pinion between the first wheel *f* and the first wheel *h*. By turning the box *d* in its bearings the next pinion *j* will be brought between the next pair of wheels *f* and *h*, and so on. Thus either pair of wheels on the shafts *e* and *g* can be caused to gear together through the intermediate pinions *j*.

The turning of the box *d* to bring into gear either of the pairs of wheels is effected by means of the handle *k*, secured to one trunnion *c* of the box *d*. The tail of this handle is formed with a divided sector, (see Fig. 3,) the divisions on which by the aid of the pointer *l* will indicate the pairs of wheels *f h*, which are in gear through the respective intermediate pinions *j*, and consequently the ratio of speed of the shaft *g* with respect to the shaft *e*.

In order to secure the box *d* in its adjusted



position, a spring-bolt *m* is provided, which takes into holes *n n* in the periphery of the box. Holes *o o*, intermediate of the holes *n*, are also provided for the bolt *m* to secure the  
 5 pinions *j* in a position out of gear with the wheels *h*, so that no movement of these wheels will take place.

*p* is a shaft at right angles to the shaft *g* and connected therewith by bevel-gearing.  
 10 In this case a reversing movement can be given to the shaft *p* by means of a clutch *q*, sliding on a feather on the shaft *g*. By sliding this clutch into gear by means of the fork and handle *t* with clutch-teeth on either of  
 15 the loose bevel-wheels *r s* a movement in either direction can be given to the shaft *p*, leading to the feed or other mechanism intended to be operated.

The whole of the gearing, it will be seen, is inclosed in the casing *a*, which may be partly  
 20 filled with oil and will form a dust-proof and oil-tight box, thus insuring cleanliness and free lubrication, or the shaft *g* may be continued through the casing *a* to connect direct  
 25 with the mechanism to which the variable speed is to be given.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A variable-speed mechanism comprising  
 30 a rotatable box having trunnions, stationary bearings for said trunnions, a shaft having its bearings in said trunnions, a second shaft parallel with that first mentioned, stationary bearings for said second shaft, two sets of  
 35 gear-wheels of different diameters each set fast on one of said shafts with those of each set opposite to those of the other set but at some distance apart therefrom, loose pinions and bearings therefor so located in said box  
 40 that by turning the latter either of the said pinions may be brought into gear with one of the gear-wheels of each set, and reversing mechanism comprising bevel-wheels and a sliding clutch on said second shaft, substan-  
 45 tially as herein described.

2. A variable-speed mechanism comprising a rotatable box having trunnions, stationary bearings for said trunnions, a shaft having  
 50 its bearings in said trunnions, a second shaft parallel with that first mentioned, stationary bearings for said second shaft, two sets of gear-wheels of different diameters each set

fast on one of said shafts with those of each set opposite to those of the other set but at some distance apart therefrom, loose pinions  
 55 and bearings therefor so located in said box that by turning the latter either of the said pinions may be brought into gear with one of the gear-wheels of each set, means for turning the box, and means for indicating the po-  
 60 sition of said box with respect to the shafts, substantially as herein described.

3. A variable-speed mechanism comprising a rotatable box having trunnions, stationary bearings for said trunnions, a shaft having  
 65 its bearings in said trunnions, a second shaft parallel with that first mentioned, stationary bearings for said second shaft, two sets of gear-wheels of different diameters each set fast on one of said shafts with those of each  
 70 set opposite to those of the other set but at some distance apart therefrom, and loose pinions and bearings therefor so located in said box that by turning the latter either of the  
 75 said pinions may be brought into gear with one of the gear-wheels of each set, substantially as herein described.

4. A variable-speed mechanism comprising a rotatable box having trunnions, stationary bearings for said trunnions, a shaft having  
 80 its bearings in said trunnions, a second shaft parallel with that first mentioned, stationary bearings for said second shaft, two sets of gear-wheels of different diameters each set  
 85 fast on one of said shafts with those of each set opposite to those of the other set but at some distance apart therefrom, loose pinions and bearings therefor so located in said box  
 90 that by turning the latter either of the said pinions may be brought into gear with one of the gear-wheels of each set, reversing mechanism comprising bevel-wheels and a sliding clutch on said second shaft, means for turn-  
 95 ing the box and means for indicating the positions of said box with respect to the shafts, substantially as herein described.

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

ARTHUR LAIDLAR.

Witnesses:

HAROLD WORSLEY,  
 THOMAS A. ANDREWS.