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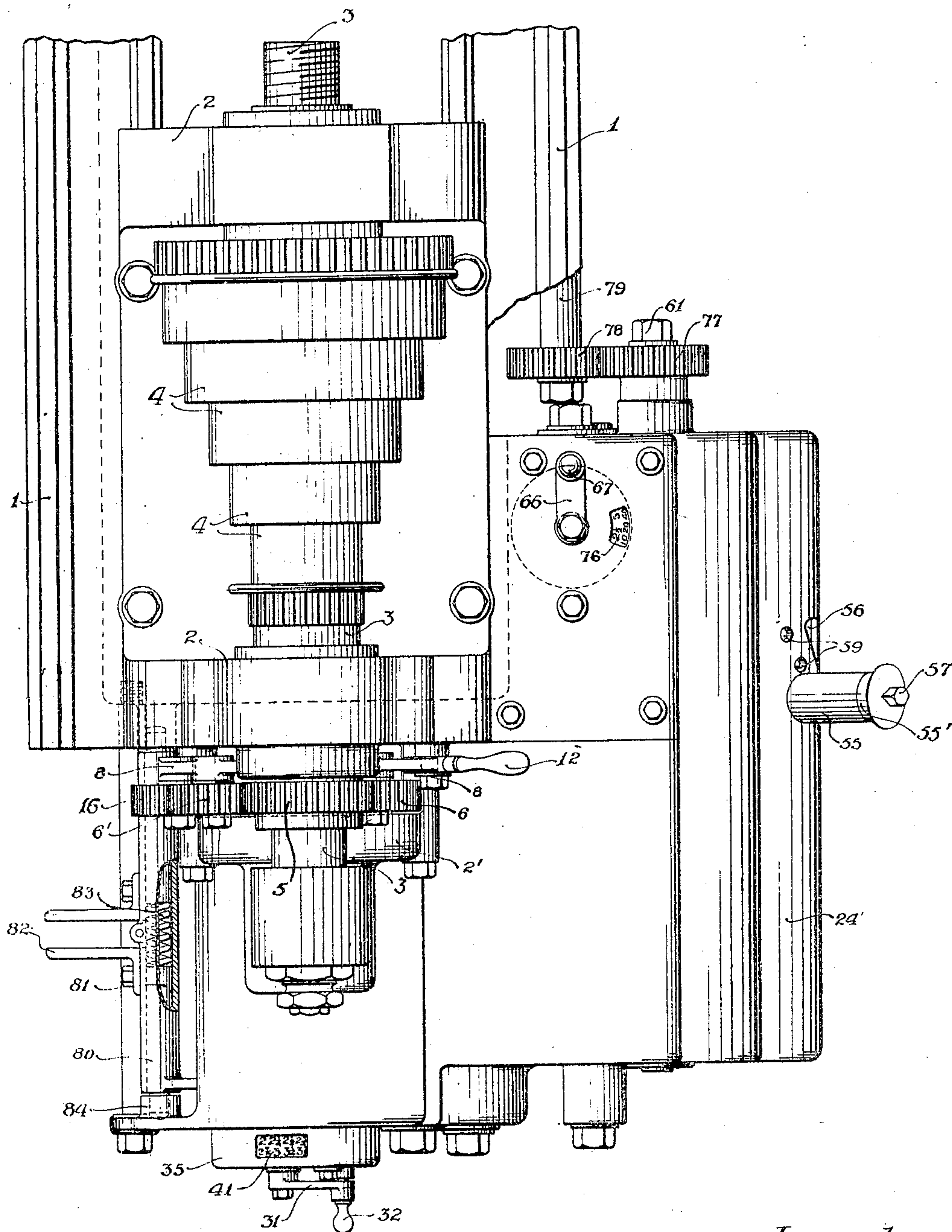
PATENTED AUG. 29, 1905.

R. F. SCOTT & C. H. THUMLERT.
SPEED CHANGING MECHANISM.

APPLICATION FILED FEB. 11, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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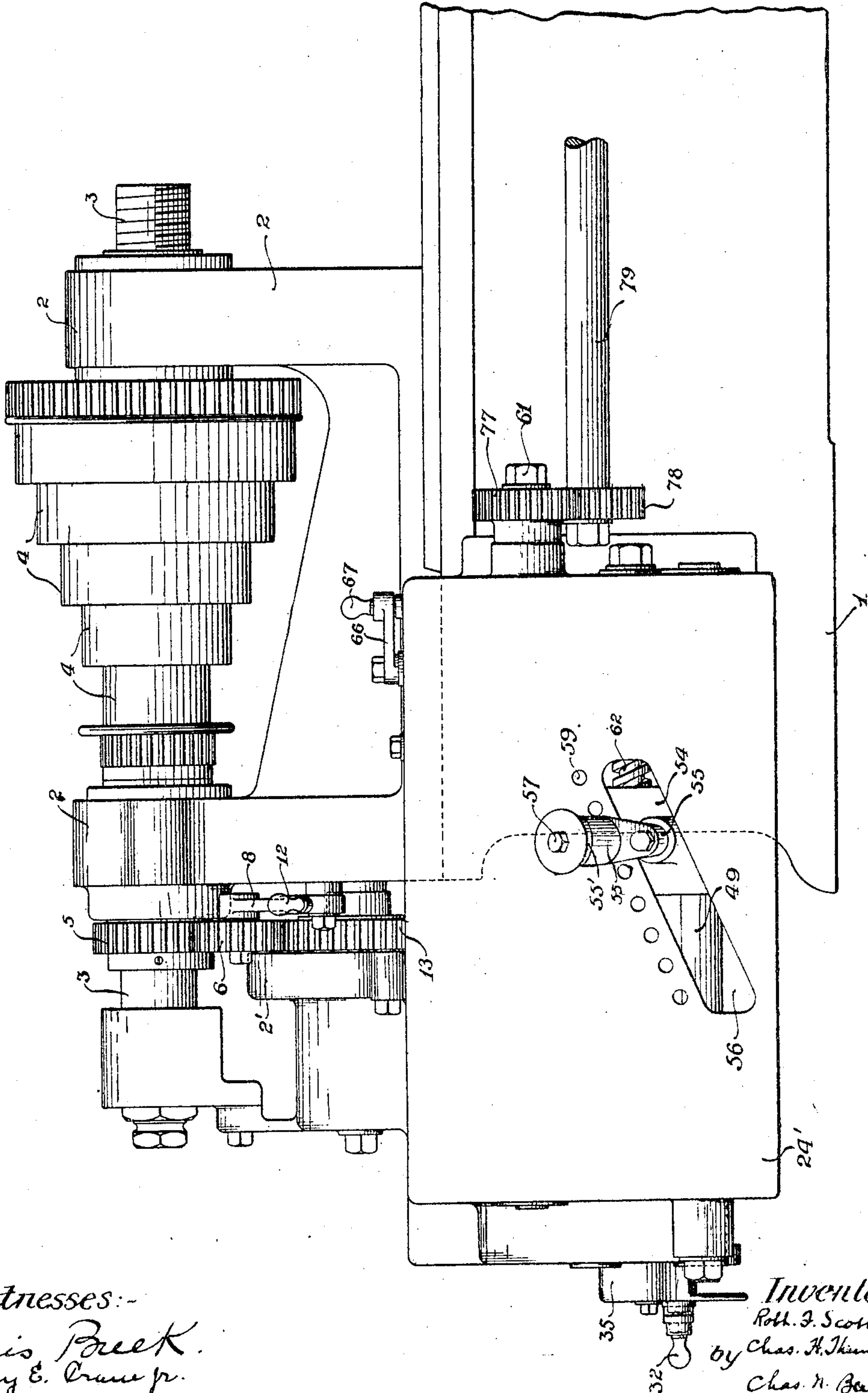
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

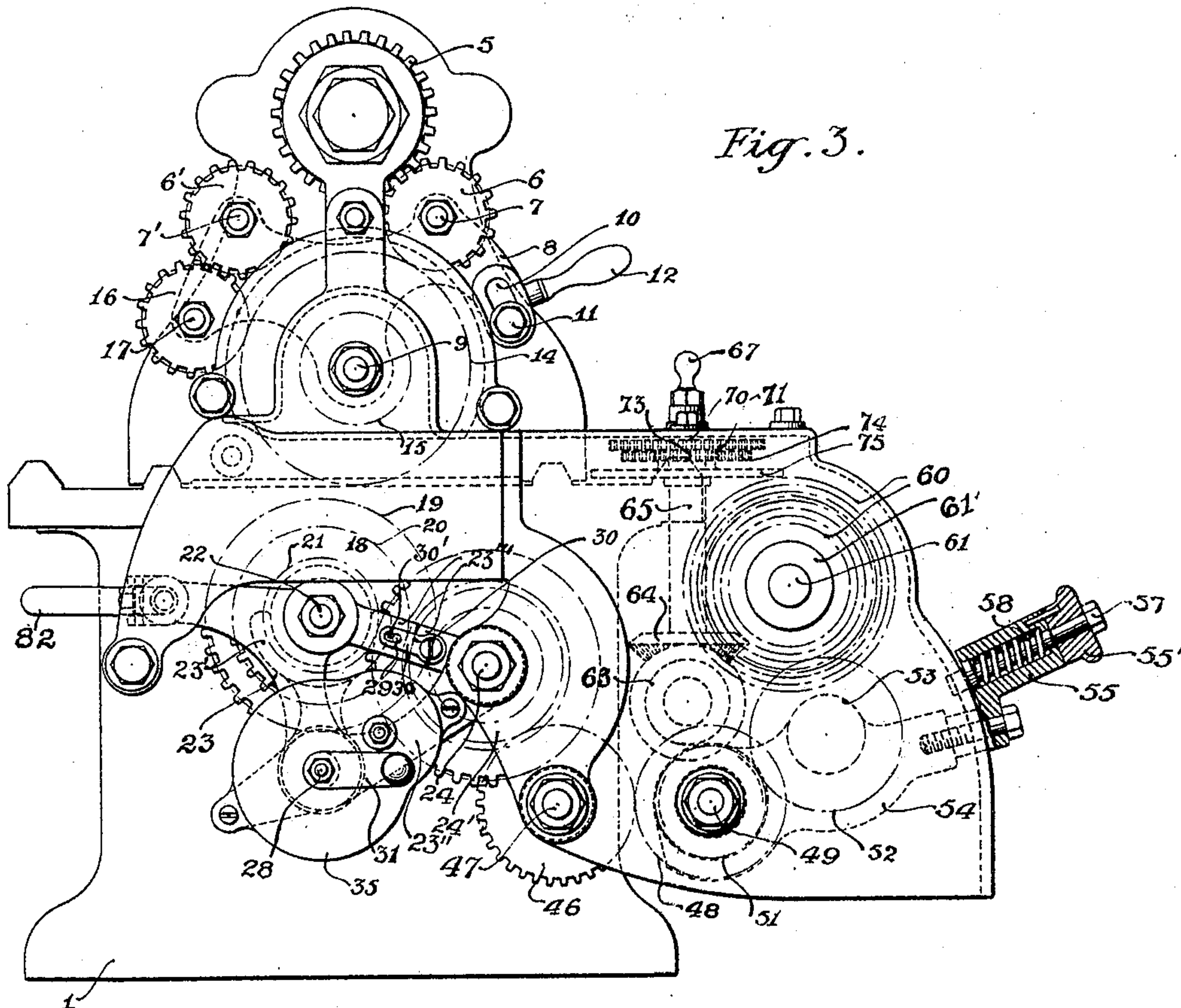


Fig. 3.

Fig. 5.

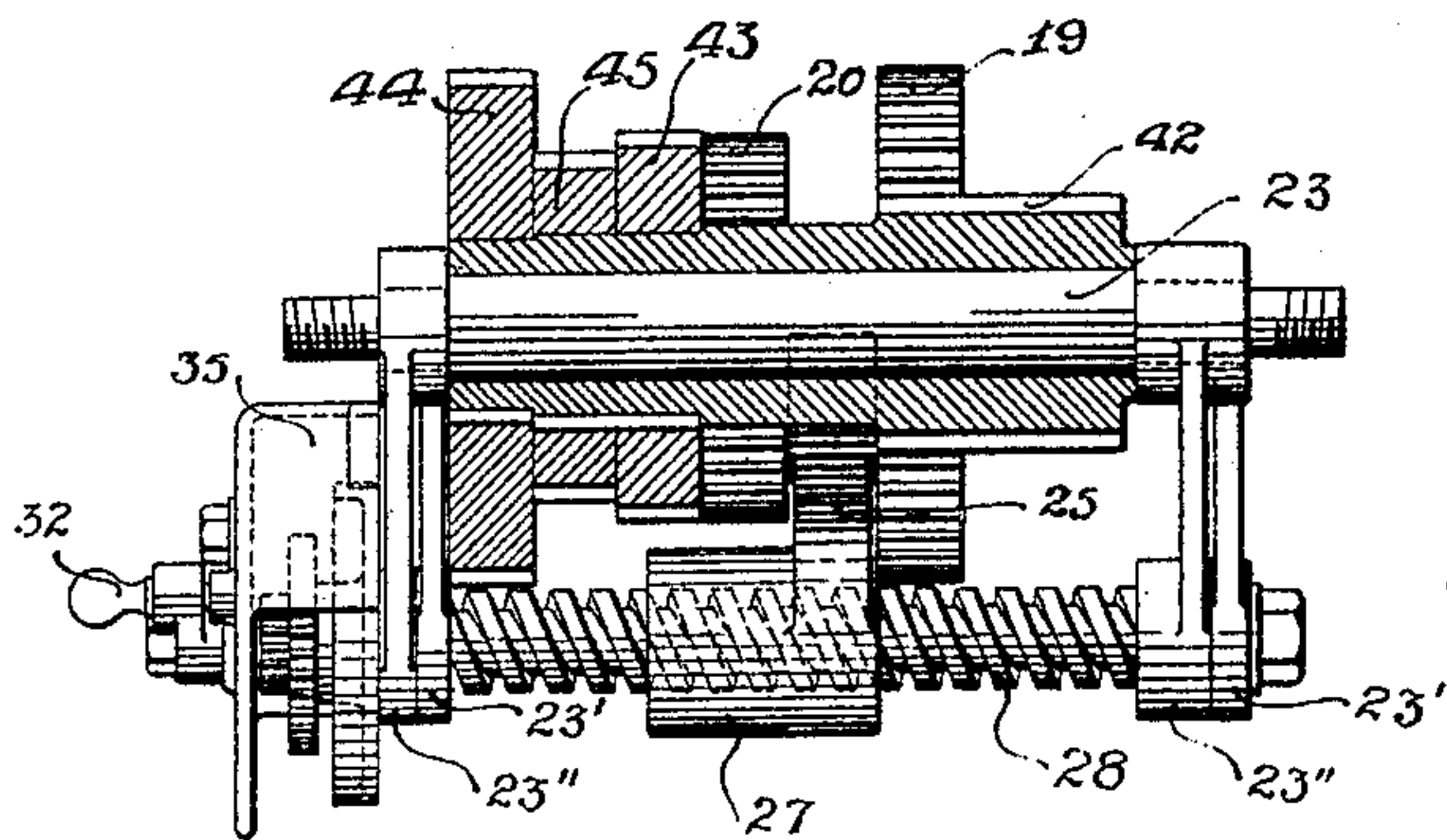
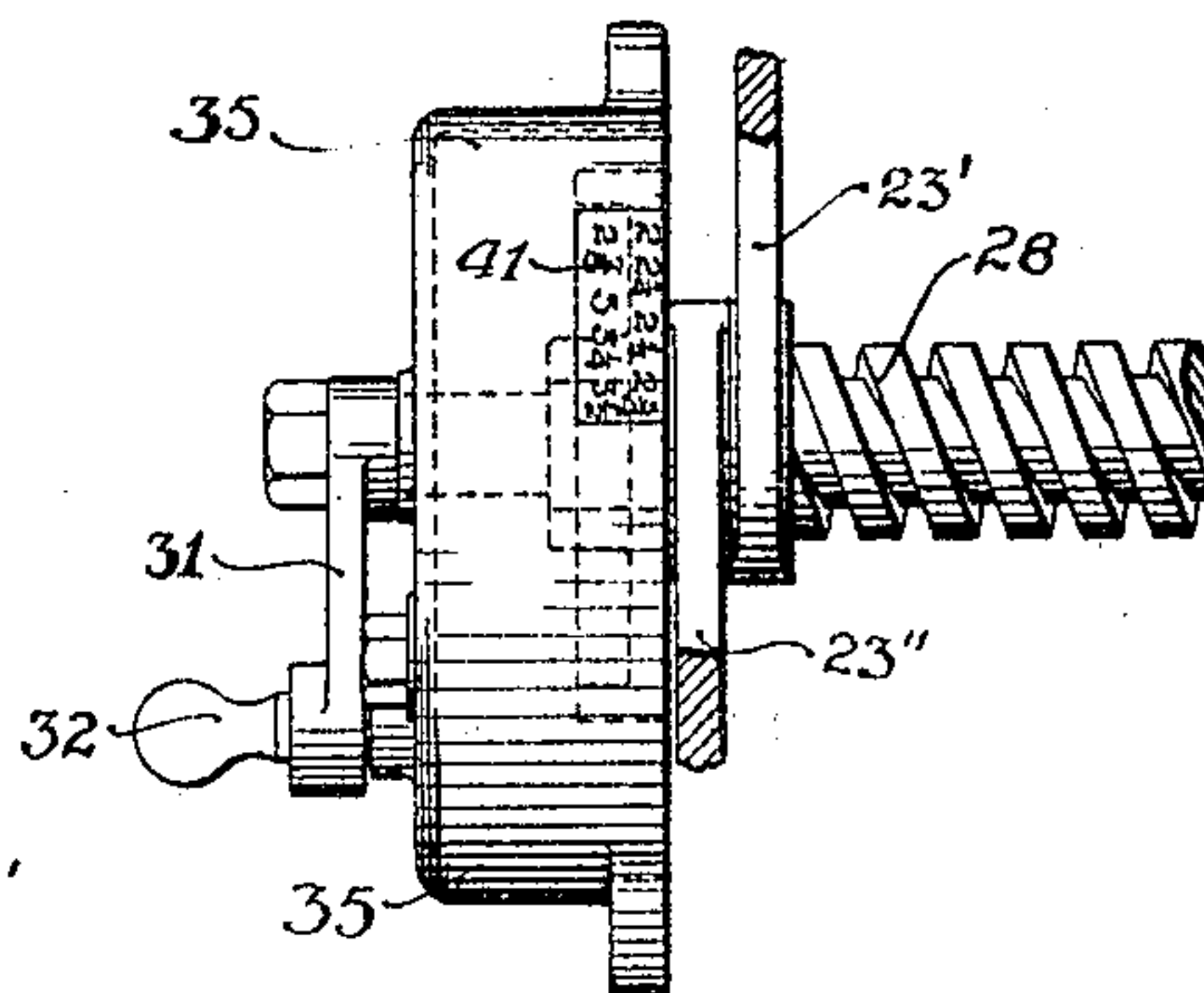


Fig. 6.



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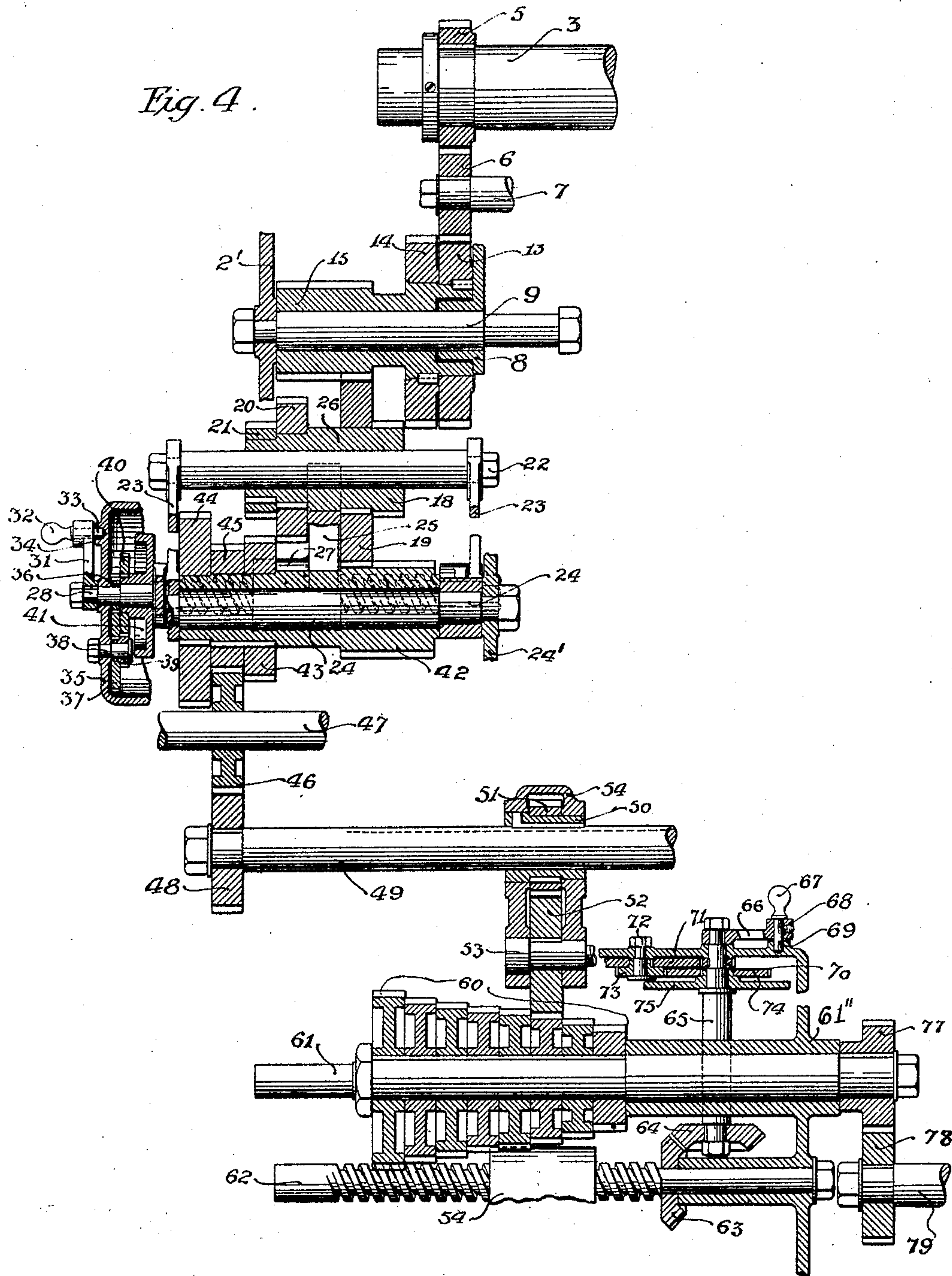
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4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT F. SCOTT AND CHARLES H. THUMLERT, OF PHILADELPHIA,
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SPEED-CHANGING MECHANISM.

No. 798,462.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed February 11, 1905. Serial No. 245,232.

To all whom it may concern:

Be it known that we, ROBERT F. SCOTT and CHARLES H. THUMLERT, residents of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Speed-Changing Mechanisms, of which the following is a specification.

This invention relates to speed-changing mechanisms for lathes; and its leading objects are to obtain a wide range of closely-related speeds for the feeding mechanism, to provide means for readily and easily changing the speed, and to reduce the opportunities for error.

The nature and characteristic features of our improvements will more fully appear by reference to the following description and the accompanying drawings, in which—

Figure 1 represents a top plan view of the invention. Fig. 2 represents a side elevation thereof. Fig. 3 represents an end elevation thereof. Fig. 4 represents a developed view of the variable-speed-gear trains and mechanism for changing them. Fig. 5 represents a sectional elevation of a set of gears and the changing mechanism for a set of gears coacting therewith, and Fig. 6 represents a plan view of the primary change-screw and indexing device.

As shown in the drawings, the base 1 supports the head-stock 2, in which is journaled the live-spindle 3, provided with the driving-cone 4 of usual construction. The revolution of this spindle revolves the gear 5, fixed thereon, for driving the gears 6 and 6', revolvably mounted on the studs 7 and 7', carried by the tumbler-frame 8, which rocks upon the stud-shaft 9. A slot 10 in the tumbler-frame is engaged by a stationary bolt 11, which passes therethrough and is set in the head-stock to limit the throw of the frame, the latter being rocked by the handle 12 to engage and disengage the gears 6 and 6' alternately with the gear 5. The gear 6 engages a gear 13, which is fixed to the gears 14 and 15 and revoluble therewith on the stud-shaft 9, while the gear 6' engages a gear 16, which engages the gear 13, the gear 16 being journaled on a stud 17, carried by the tumbler-frame. It will be understood that by throwing the tumbler-frame 8 and clamping it so as to hold the gears 6 and 6' alternately in engagement with the

gear 5 the gears 13, 14, and 15 may be driven as a unit alternately in opposite directions.

The integrally-connected gears 18, 19, 20, and 21 are rotatable and longitudinally movable on the shaft 22, carried by the tumbler-frame 23, which is fulcrumed by a shaft 24, carried by the casing 24'. The nest of gears carried by the shaft 22 is driven at a high speed by engaging the small gear 18 with the large gear 14, at a low speed by engaging the large gear 19 with the small gear 15, and at an intermediate speed by engaging the large gear 19 with the large gear 14. To effect these several engagements of the gears, the gear-nest carried by the shaft 22 is oscillated by the tumbler-frame 23 and moved longitudinally by the fork 25, which engages the collar 26, the fork being carried by a sleeve 27, moved longitudinally by a worm-shaft 28. This worm-shaft is journaled in the tumbler-frame members 23' and 23'', which are hinged together thereby, and the tumbler-frame member 23''' is formed in sections, whereby flexibility of action for obtaining the registration of the gears to be engaged is obtained, a limited movement between the sections being permitted by means of a pin 29, secured to one of the sections, and a link 30, secured to the other of the sections and having a slot 30' therein engaging the pin. The worm-shaft 28 is revolved by the crank 31, having a handle 32, which operates a pin 33 for engaging a hole 34 in the casing 35 and holding the shaft, a single revolution of the handle effecting a movement of the gear-nest from one engagement and speed to another.

The tumbler-frame 23 is provided with the tube 80, having therein the bolts 81, with the handles 82 fixed thereto, the bolts being pressed outward by the spring 83, placed between them in the tube, and caused thereby to engage holes 84 in the frame, whereby the gears are held in the engagement desired.

On the worm-shaft 28 is fixed a pinion 36, which engages a spur-wheel 37, journaled on a stud 38, carried by the casing 35. The spur-wheel 37 has fixed thereto a pinion 39, which engages a spur-wheel 40, fixed to a dial or index-disk 41, journaled on the worm-shaft 28. The gears 36, 37, 39, and 40 are related, so that a single revolution of the handle produces but a fraction of a revolution of the dial and so that

the worm-shaft may be turned through the number of revolutions necessary to move the gears 18, 19, 20, and 21 between the limits of their throw within a complete revolution of the dial, the latter being indexed in correspondence with the engaging gears producing the various speeds.

The gears 19, 20, and 21 are adapted to engage the respective gears 42, 43, and 44, which are fixed together with the gear 45 and revolve on the shaft 24, carried by the frame 24'. The gear 45 engages with an idler-gear 46, which is journaled on the shaft 47, carried by the frame, and drives a gear 48, fixed on the shaft 49, journaled in the frame. When the small gear 18 engages the large gear 14, the large gear 19 engages the small gear 42 and the shaft 49 is driven at its highest speed. When the large gear 19 engages the large gear 14, it also engages the small gear 42, and the shaft 49 is driven at the highest intermediate speed. When the large gear 19 engages the small gears 15 and 42, a third speed is obtained. When the large gear 19 engages the small gear 15 and the gear 20 engages the gear 43, a fourth speed is obtained for the shaft 49. When the large gear 19 engages the small gear 15 and the small gear 21 engages the large gear 44, the lowest of the five speeds of the shaft 49 is obtained.

A sleeve 50, splined on the shaft 49, has fixed thereon the gear 51, which engages with a gear 52, fixed to a stud 53, journaled in a yoke 54. This yoke is fulcrumed on the sleeve and provided with an arm 55, which is movable in an inclined slot 56 of the frame 24'. The arm has a knob 55', which carries a pin 57, pressed in by a spring 58, engaged therewith and with the arm, the pin being adapted for engaging the holes 59, extending parallel to the slot. By rocking the yoke 54 and moving it longitudinally on the shaft 49 the gear 52 may be engaged with any one of a cone of gears 60, fixed on a shaft 61, which is journaled in bearings 61' and 61'' in the frame, the gear 52 being held in its engagement with the proper gear of the cone by the engagement of the pin 57 with the corresponding one of the holes 59 which register with the gears of the cone.

To effect the longitudinal movement of the yoke, it is engaged by a worm-shaft 62, journaled in the frame. The shaft is revolved by a bevel-gear 63, fixed thereon and engaged by a bevel-gear 64, fixed on a shaft 65, journaled in the frame. This shaft 65 is revolved by a lever 66, having a handle 67 for operating a pin 68, which engages a hole 69 in the casing, a complete revolution of the handle shifting the gear 52 from one to the next of the gears 60.

Fixed to the shaft 65 is a pinion 70, which engages a spur-wheel 71, revolubly mounted on the stud 72, carried by the casing, the spur-wheel 71 having fixed thereto a pinion 73, which engages with a spur-wheel 74, fixed to a dial or index-disk 75, revoluble on the

shaft 65. The relation between the gears of the train for operating this dial is such that it reduces the motion of the handle so that a single revolution thereof produces but a fractional revolution of the dial while moving the gear 52 out of engagement with one of the cone-gears and into engagement with another adjacent thereto, the gear 52 being movable from one end of the cone to the other within the limits of a complete revolution of the dial, which bears an index visible through the opening 76 for indicating the speed of the engaging gears. A gear 77 is fixed on the shaft 61 and engages a gear 78, fixed on the lead-screw 79, which is revolved thereby.

It will be understood that this mechanism, while especially adapted for use in lathes, is not limited to such use, but is generally adapted for varying the speed between a driving and driven device.

Having described our invention, we claim—

1. In apparatus of the class described, a spindle, a gear thereon, a fulcrumed tumbler-frame, a nest of gears, gears carried by said tumbler-frame for connecting said first gear with said nest of gears, and a gear movable parallel and transversely to said nest of gears to engage different gears of said nest, substantially as specified.

2. In apparatus of the class described, a spindle, a gear thereon, a fulcrumed tumbler-frame, gears journaled on said frame and engaged alternately with said first gear by tilting said frame, a gear revoluble about the axis on which said frame is fulcrumed and engaged with the gears carried thereon, variable-gear trains adapted to be connected with and operated by the gear on said fulcrum, and means for connecting and disconnecting said variable-gear trains, substantially as specified.

3. In apparatus of the class described, a pair of gears, a second pair of gears, and a worm connected with said second pair of gears for changing their engagement with said first pair of gears, substantially as specified.

4. In apparatus of the class described, a pair of integrally-connected gears having different diameters, a second pair of integrally-connected gears having different diameters, a worm for longitudinally moving and a frame for oscillating said second pair of gears to change their engagement with said first pair of gears, substantially as specified.

5. In apparatus of the class described, a spindle, a gear thereon, a fulcrumed tumbler-frame, a nest of gears, gears carried by said tumbler-frame for connecting said first gear with said nest of gears, a gear and an oscillating support, and a worm for effecting different engagements of said last-named gear with said nest of gears, substantially as specified.

6. In apparatus of the class described, a set of integrally-connected gears having different diameters, a second set of integrally-connected

gears having different diameters, a sleeve having means for engaging and moving said second set parallel to said first set of gears, a worm-shaft engaging said sleeve, and a tumbler-frame supporting said second set of gears for changing their engagement with said first set, substantially as specified.

7. In apparatus of the class described, a set of integrally-connected gears having different diameters, a second set of integrally-connected gears having different diameters, a tumbler-frame, a shaft carried by said frame on which said second set of gears is movable longitudinally, a worm, means connecting said worm with said second set of gears, a lever for revolving said worm, and means for holding said lever and worm when a gear of said second set has been brought into proper engagement with a gear of said first set, said worm being pitched so that a single revolution thereof changes the engagement between said sets of gears, substantially as specified.

8. In apparatus of the class described, a worm-shaft, a gear, a set of gears, means whereby said worm causes said gear to engage different gears of said set, a dial, and a train of reducing-gears operated by said worm-shaft for operating said dial to index the action of said mechanism, substantially as specified.

9. In apparatus of the class described, a worm-shaft, a gear, a set of gears, means whereby said worm effects different engagements between said first gear and the gears of said set, a dial revoluble on said worm-shaft, a train of reducing-gears connecting said worm-shaft and dial, a lever for revolving said worm-shaft, and means for holding said shaft and lever in the position corresponding to the engagement of said first gear with the several gears of the set with which it engages, substantially as specified.

10. In apparatus of the class described, a set of integrally-connected gears, a second set of integrally-connected gears movable parallel to said first set of gears and adapted for making several engagements therewith, a third set of integrally-connected gears with which said second set of gears is adapted for making several engagements, a revoluble worm-shaft, and means for connecting said worm-shaft and second set of gears whereby the former moves the latter in effecting several engagements with said first and third sets of gears, substantially as specified.

11. In apparatus of the class described, a gear-cone, a fulcrumed support, a gear carried by said fulcrumed support and adapted to engage several gears of said cone, and a worm for shifting said support and the gear carried thereby, substantially as specified.

12. In apparatus of the class described, a set of gears, a gear, an oscillating support for said gear movable parallel to said set of gears for engaging said gear with several gears of

said set, a worm-shaft connected with said support, a revoluble shaft, means connecting said revoluble shaft with said worm-shaft, a dial for indexing the action of said gears, and means whereby said dial is operated by said revoluble shaft, substantially as specified.

13. In apparatus of the class described, a set of gears, a gear for engaging gears of said set, an oscillating support for said gear movable parallel to said set of gears, a revoluble worm-shaft connected with said support, a bevel-gear on said worm-shaft, a revoluble shaft and a bevel-gear thereon for driving said first bevel-gear, a dial, and a train of gears connecting said revoluble shaft and dial, substantially as specified.

14. In apparatus of the class described, a revoluble shaft, a gear revolubly fixed and longitudinally movable thereon, a yoke oscillatable and longitudinally movable on said shaft, a worm-shaft for moving said yoke, a gear revolubly supported by said yoke and engaging said first gear, a shaft, a gear-cone on said last-named shaft the gears of which said second gear is adapted to engage, a driven shaft, and mechanism connecting said gear-cone with said driven shaft, substantially as specified.

15. In apparatus of the class described, a primary set of gears, a secondary set of gears, a tertiary set of gears, means for varying the engagement of said secondary with said primary and tertiary set of gears whereby different speeds may be produced, a revoluble shaft connected with and driven by said tertiary set of gears at different speeds, a driven shaft, and mechanism comprising speed-changing gears connecting said first and last named shafts, substantially as specified.

16. In apparatus of the class described, a tumbler-frame having relatively movable parts, engaging gears carried by the respective movable parts thereof, and a gear with which said engaging gears are connected and disconnected by moving said frame, substantially as specified.

17. In apparatus of the class described, a fulcrumed frame, a gear carried thereby, a second gear engaged and disengaged with said first gear by swinging said frame, a pair of spring-pressed bolts reciprocating in said frame, mechanism engaged by said bolts to hold said frame, and handpieces on said bolts for disengaging them, substantially as specified.

18. In apparatus of the class described, a fulcrumed frame comprising parts that are hinged together, means for permitting a limited movement between said parts, engaging gears carried by the relatively movable parts of said frame, and a gear with which said gears are engaged by swinging said frame, substantially as specified.

19. In apparatus of the class described, a fulcrumed frame, a plurality of sets of engag-

ing gears carried by said frame, a worm-shaft
carried by said frame, and mechanism where-
by said worm-shaft changes the engagement
between said sets of gears, substantially as
5 specified.

20. In apparatus of the class described, a
set of gears, a tumbler-frame, a set of gears
carried by said frame and adapted to be en-
gaged thereby with said first set of gears, a
10 second set of gears carried by said frame and
engaging with the first-named set of gears
carried by said frame, a worm-shaft, and

mechanism connecting said worm-shaft with
the first-named set of gears carried by said
frame for changing its engagements with the 15
other sets of gears, substantially as specified.

In testimony whereof we have hereunto set
our hands, this 7th day of February, 1905, in
the presence of the subscribing witnesses.

ROBT. F. SCOTT.

CHAS. H. THUMLERT.

Witnesses:

UTLEY E. CRANE, Jr.,

ROBERT JAMES EARLEY.