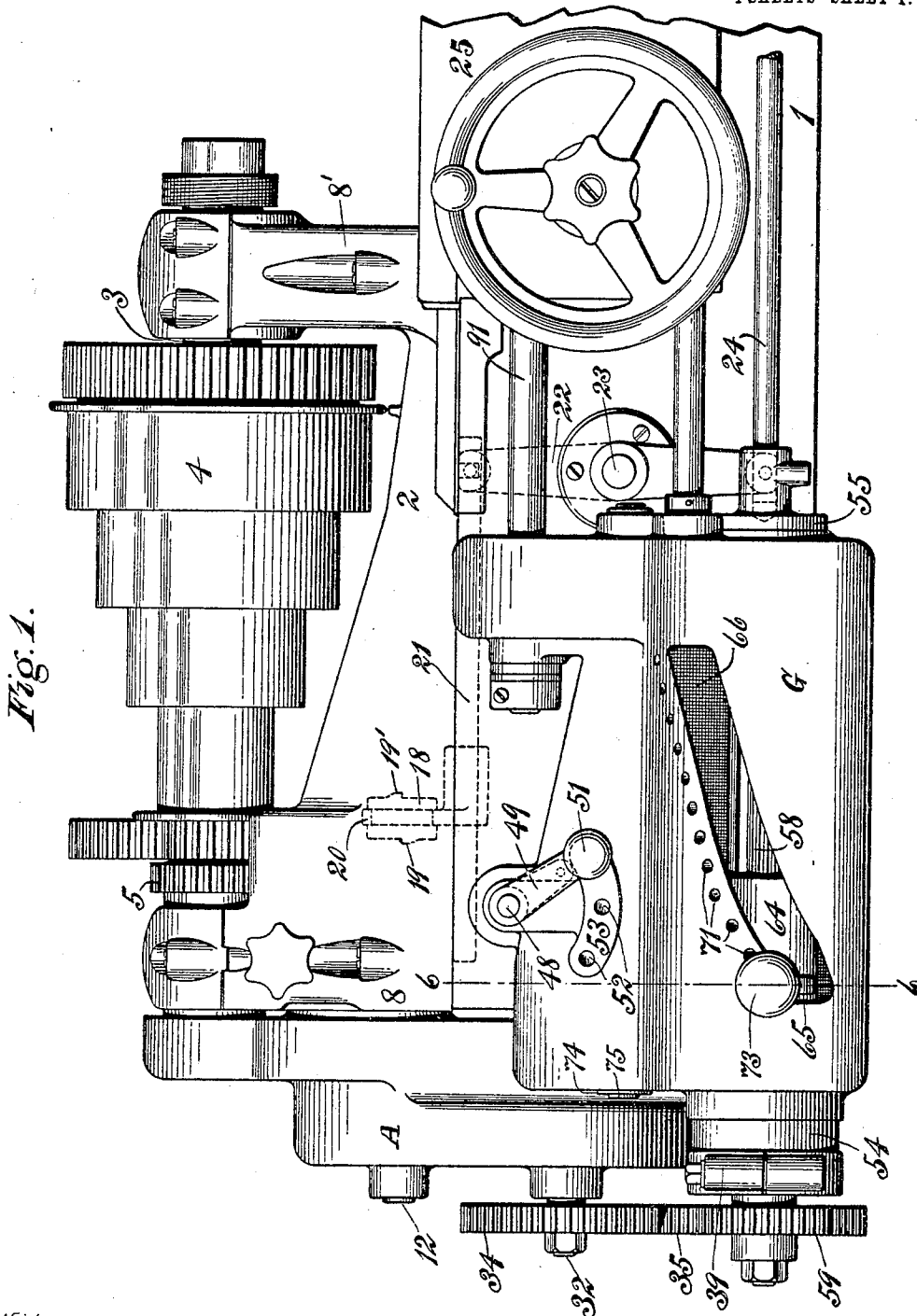


B. M. W. HANSON.
GEARING FOR LATHES.
APPLICATION FILED OCT. 13, 1904.

4 SHEETS—SHEET 1.



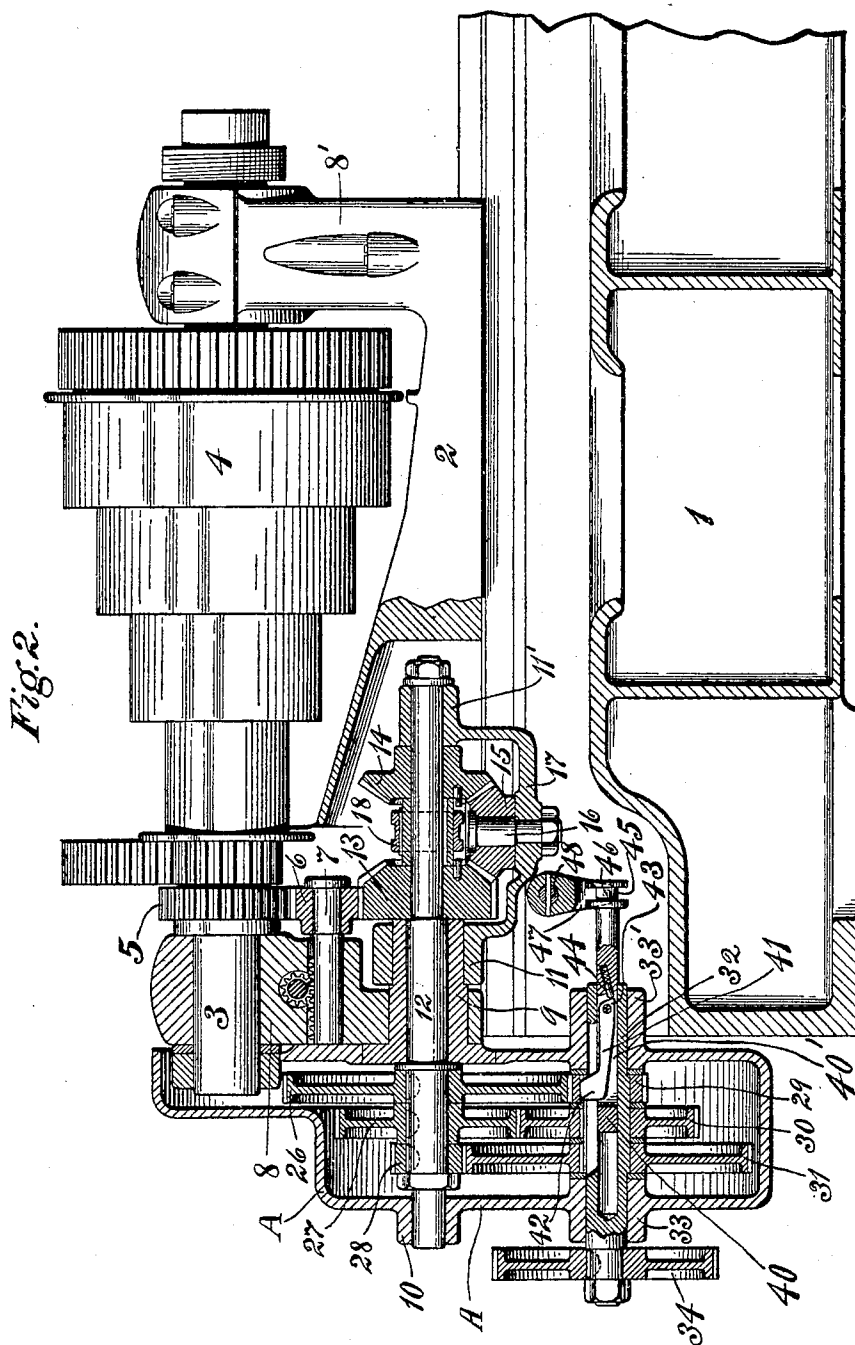
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4 SHEETS—SHEET 2.



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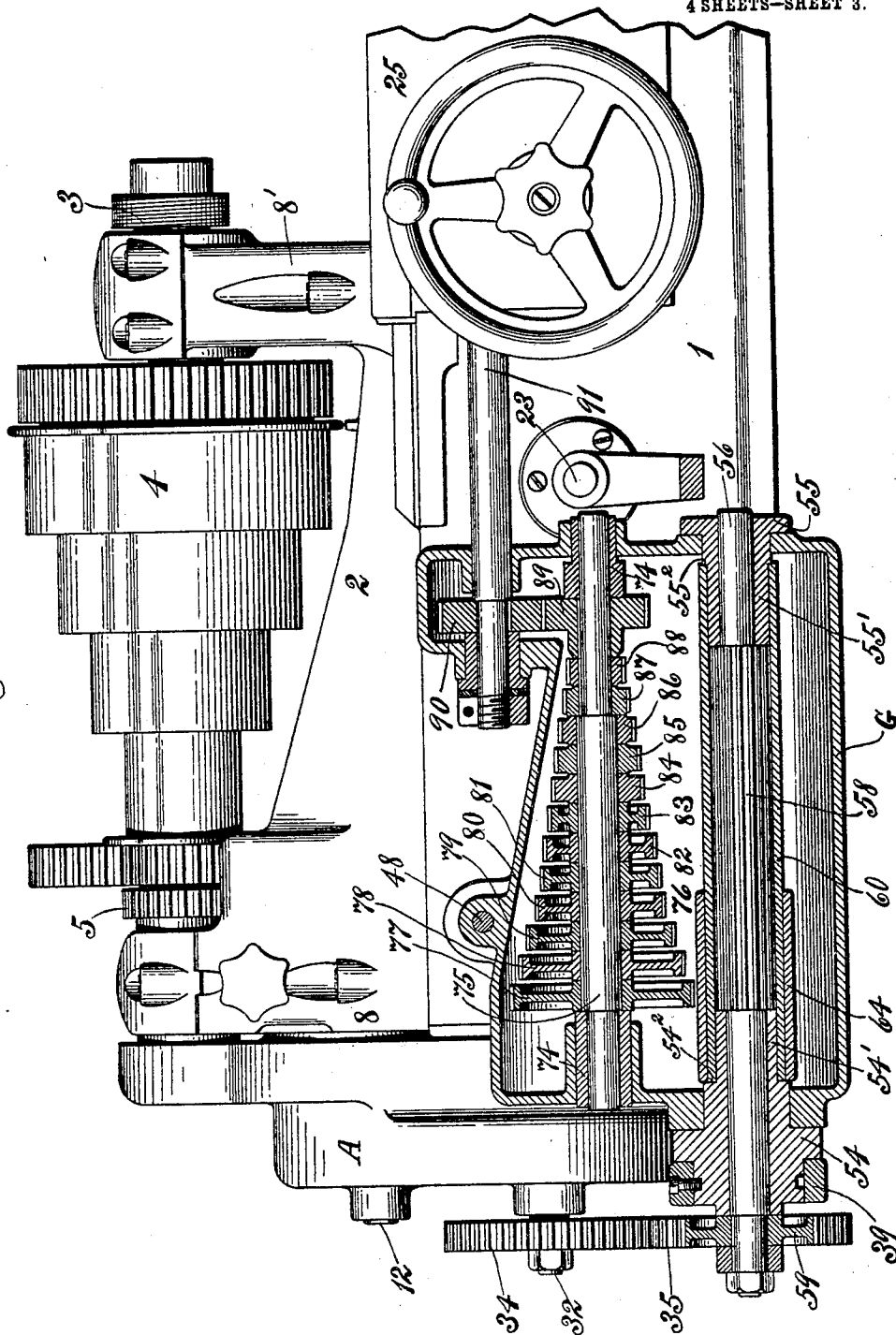
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4 SHEETS—SHEET 3.

Fig. 3.



Witnesses:

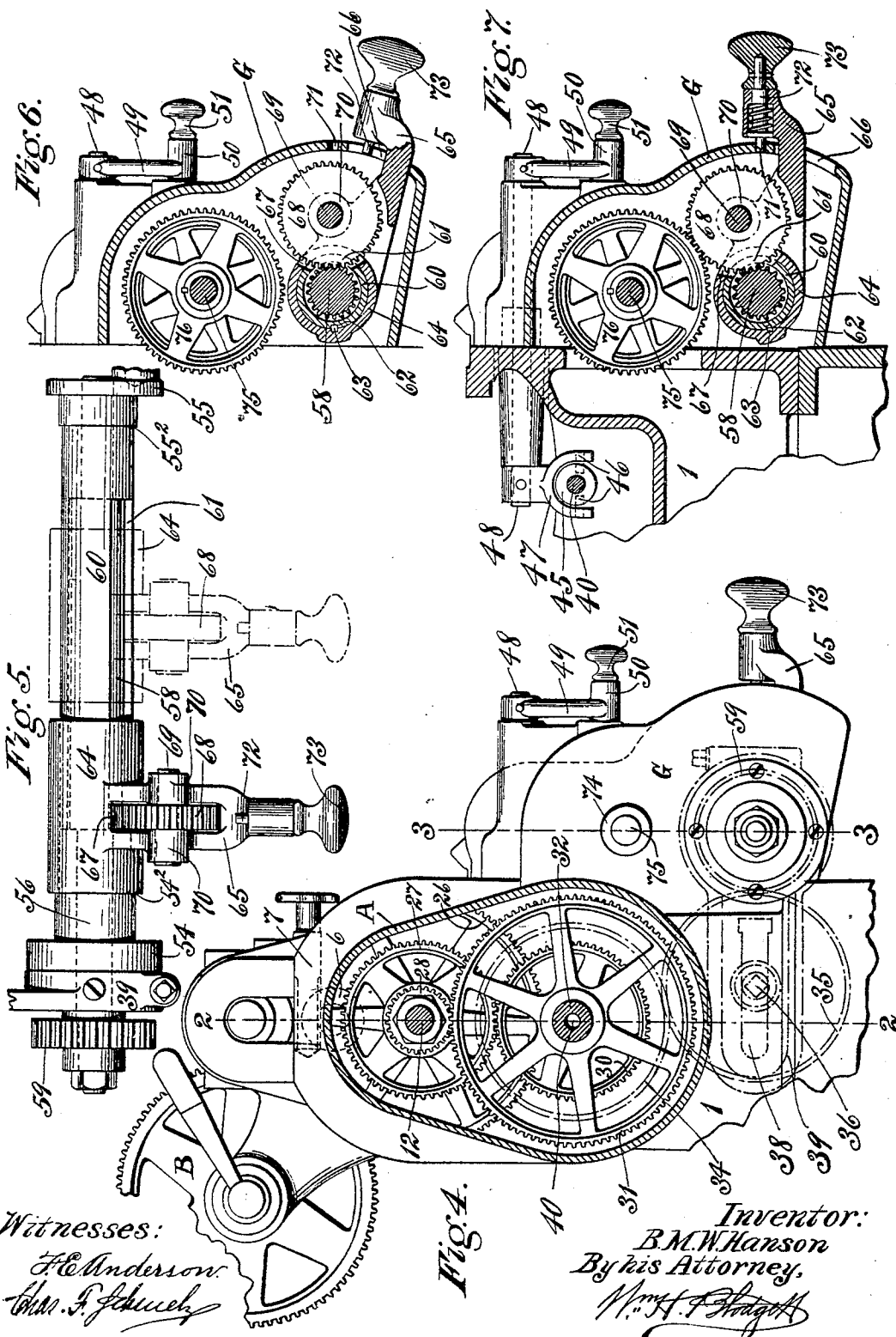
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UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

GEARING FOR LATHES.

SPECIFICATION forming part of Letters Patent No. 795,222, dated July 18, 1905.

Application filed October 13, 1904. Serial No. 228,325.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a citizen of Sweden, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Gearing for Lathes, of which the following is a specification.

This invention relates to engine-lathes, and more particularly to improvements in the gearing employed for transmitting power from the spindle to the lead-screw.

Heretofore a pinion carried by a lever fitted for sliding and rocking movement upon a driving-shaft has been employed for transmitting power through an idler to any of the series of variable-speed gears of the cone carried by the shaft for driving the lead-screw, and means have been provided for locking this lever, so that the idler carried thereby may be held in mesh with the desired gear of the cone. In these old constructions the shaft upon which the shiftable lever is mounted is of small diameter, and consequently is liable to flexure under the strain, thereby causing chattering and lost motion of the enmeshed gears.

Primarily the object of my invention is the provision of improvements in the gearing for transmitting motion to the shaft carrying the variable-speed gears whereby the defects above mentioned are avoided and a compact and steady drive is furnished—one that will respond to all requirements and will not be liable to derangement from any cause.

A further object of the invention is the provision of a barrel-pinion of considerable diameter journaled for rotation in fixed bearings of the frame, a sleeve having a longitudinal slot surrounding said barrel-pinion, and a gear-shifting lever having a hub splined to the sleeve, so that said lever may be longitudinally shifted on said sleeve and may be rocked with said sleeve to bring the idler into mesh with the cone-gear desired.

Other objects of the invention will be hereinafter set forth.

In the accompanying drawings, Figure 1 is a side elevation of part of an engine-lathe involving my invention. Fig. 2 is a view simi-

lar to Fig. 1 with parts in longitudinal vertical section, the section being taken on line 2 2 of Fig. 4. Fig. 3 is a side view, partially in section, the latter taken on line 3 3 of Fig. 4. Fig. 4 is an end elevation, partially in section. Fig. 5 is a plan view of the sleeve, barrel-pinion, and lever by which the idler is carried, a shifted position of said lever and idler being shown by dotted lines. Fig. 6 is a partial longitudinal vertical section on line 6 6 of Fig. 1, showing the idler in a position out of mesh with one of the variable-speed gears; and Fig. 7 is a view similar to Fig. 6, showing the idler carried by the shiftable lever in mesh with a gear of the cone and also showing the means for shifting the key into engagement with the desired gear of a driving-train.

Like characters designate similar parts throughout the several views.

Referring to the drawings, the numeral 1 designates the bed of the lathe, 2 the head-stock, 3 the live-spindle, 4 the cone-pulley of said spindle, 5 a gear rigid with the spindle, and 6 an idler in mesh with said gear and loose on a shiftable stud 7, projecting from one of the bearing-standards 8 8' of said head-stock.

Journaled in a bushing 9 of the rear standard 8 and in bearings 10, 11, and 11' of the head-stock and a hood A secured thereto is a shaft 12, and loosely mounted on said shaft adjacent to the bearing 11 is a combined spur and bevel gear 13, the spur part of said gear being in mesh with the pinion 6. Also loosely mounted on shaft 12 is an inwardly-facing bevel-gear 14 in mesh with a bevel-gear 15, loose on a stud 16, projecting from a web 17, uniting the bearings 11 and 11'. Splined to shaft 12 intermediate the gears 13 and 14 is a clutch 18, having teeth 19 19', one on each side, and provided with a groove intermediate said teeth to receive a fork 20, carried by a shiftable rod 21, connected at its forward end to a lever 22, having a hub pivoted on a shaft 23 of the bed and connected at its lower end to a stop-carrying rod 24, the stops of which (not shown) are adapted to be alternately engaged by a lug on the carriage 25 in

the usual manner. These parts constitute one kind of reversing mechanism which may be employed, the invention, however, not being limited in this respect.

5 Keyed to the shaft 12 outside of the standard 8 are gears 26, 27, and 28 of different diameters, and these gears are in mesh with gears 29, 30, and 31, loose on a hollow shaft 32, journaled in bearings 33 33' of the hood
10 A. Rigid with the outer end of shaft 32 is a gear 34, and said gear intermeshes with a change-gear mounted on a stud 36 in the slot 38 of a swinging yoke 39, hereinafter described.

Of the series of gears rigid with shaft 12
15 26 is the largest and is in mesh with the small gear 29, loose on shaft 32, and when said gear 29 is keyed to shaft 32 the highest speed will be imparted to said shaft. Gears 27 and 30 are of the same diameter, and to
20 impart a slow speed to said shaft 32 the small gear 28 drives the large gear 31 and the shaft 32 when the said gear 31 is connected to said shaft.

To connect the desired loose gear of the
25 train to shaft 32 any desired appliances may be employed; but I have shown for this purpose a rod 40, slotted at 40' to receive a pivoted arm 41, having at one end a key 42, adapted to a keyway in the hub of each gear
30 29, 30, and 31 and provided with a heel 43 extending beyond its pivot.

Mounted in a chamber of the rod is a spring-actuated plunger 44, which bears constantly against the heel of the arm and tends
35 to throw the key 42 thereof upward, as shown in Fig. 2. This key has a rounded or sloping forward end, so that it may be readily engaged with the keyway of the desired gear when the rod 40 is actuated by means now to
40 be described.

At its inner end the sliding rod 40 is provided with a grooved head 45 to receive pins 46, carried by a fork 47, the stem of which is secured to a rock-shaft 48, mounted in the
45 bed and having keyed to its outer end an arm 49, provided with a tubular extension 50 for receiving the usual spring-actuated detent 51, the latter being adapted to engage any of a series of holes 52 in a sector 53, secured
50 to the bed, as shown in Fig. 1. In Fig. 2 the key 42 is shown in engagement with the small gear 29, and it is locked in place therein by the detent 51, which enters the inner hole of the series 52 in sector 53, as illustrated in
55 Fig. 1.

From what has been stated it will be seen that any desired speed may be imparted to the shaft 32 by shifting the key and then locking it in engagement with the desired
60 gear in the manner described.

Mounted in bearings 54 and 55, fitted in openings of the frame, is a shaft 56, provided with reduced journals and a long pinion 58 intermediate said journals, and said shaft
65 carries at its outer end a gear 59, in mesh with

the idler 35. Loosely mounted upon reduced portions 54' and 55' of bearings 54 and 55 and located between shoulders 54² and 55² back of said reduced portions is a sleeve 60, having a comparatively wide longitudinal
70 slot or gap 61 and a groove 62 for the reception of a spline or feather 63, carried by the hub 64 of an arm or lever 65, passing at its free end through a slot 66 in the frame. Said hub 64 is slotted at 67 to conform to the slot
75 or longitudinal gap 61 in the sleeve 60, both slots serving to permit a gear 68, carried by a shaft 69, journaled in bearings 70 of the pivoted lever-arm 65, to be engaged with the barrel-pinion 58 and to be thrown while in
80 constant mesh therewith from the position shown in Fig. 6 to that represented in Fig. 7.

A series of holes 71 is formed in the hood G for the reception of a spring-actuated plunger 72, carrying a knob 73, by which it may
85 be manipulated, and said hood is curved on an arc concentric with the axis of the barrel-pinion 58, as shown in Figs. 6 and 7, so that when the arm 65 is rocked the pinion 68 will always mesh with said barrel-pinion.
90

Journaled in bearings 74 of the frame is a shaft 75, carrying the cone of gears, designated generally by 76, and composed of gears 77, 78, 80, 81, 82, 83, 84, 85, 86, 87, and 88, arranged in step-like order and each rigidly
95 secured to said shaft 75.

At its inner end, adjacent to the bearing 74, the shaft 75 is provided with a gear 89 in mesh with a gear 90, carried by the lead-screw shaft 91, the thread of the latter working
100 in the usual nut (not shown) of the carriage 25.

In the operation of the improved machine power is applied to the pulley 4 of live-spindle 3 through the usual back gearing (designated in a general way by B in Fig. 4) and is transmitted by gear 5 to pinion 6 and from thence to the combined spur and bevel pinion 13, loose on shaft 12, and when clutch 18
105 is in engagement with said pinion the shaft 12 and gears 26, 27, and 28 are driven in the same direction as the spindle. Power is then transmitted from the gear 29, 30, or 31, with which the key 42 is in engagement, to the shaft 32 and from the gear 34 on the end
110 of said shaft, through the interchangeable change-gear 35, to pinion 59 on the shaft of the barrel-pinion 58. Knob 73 is now manipulated to release the plunger 72, and the arm 65 is adjusted in the slot 66 of the bed to
115 slide its hub along the sleeve 60 to carry the pinion 68 opposite the desired gear of the cone 76, after which the pin is withdrawn and the arm swung upward until said pin snaps into the hole 71 in the frame immediately below the gear of the cone selected, thereby
120 throwing said pinion into mesh with said gear and through the gears 89 and 90, thus driving the lead-screw shaft 91 at the desired speed for the work to be accomplished. To
125 130

reverse the lead-screw and retract the carriage, the clutch 18 is thrown into contact with bevel-gear 14, which through the idler-bevel 15 meshing with the bevel-teeth of the driven gear 13 and the train of gearing described accomplishes this result.

By referring to Figs 6 and 7 it will be seen that as the hub of the lever 65 is keyed to the sleeve said sleeve and lever rock in unison and that therefore the slots 61 and 67 are always kept in proper registration to permit the engagement of gear 68 with the barrel-pinion 58.

By employing the cone of gears 76 and the shiftable pinion 68 it will be seen that any required speed of the lead-screw to suit the pitch of the screw to be cut may be effected, and if a pitch of a different standard—for instance, one of the metric system—should be required this can readily be cut by substituting the desired change-gear 35 for the one in use, and thus driving the lead-screw and carriage at the proper speed. It will be observed that the ends of the shaft 32 and the journal of barrel-pinion 58 project beyond the frame, so that the change-gear system may readily be placed in position.

While a cone of gears is shown as one of the elements for accomplishing the desired changes of speed in the lead-screw, it is distinctly to be understood that the invention is not limited thereto, for various mechanisms may be substituted for said cone without departing from the scope of the invention. Furthermore, the barrel-pinion, the slotted sleeve surrounding and sustaining the same, and the gear-carrying lever having a slot in registration with the slot in the sleeve may be used in relations other than that shown and described, if desired.

Changes may be made in the form and proportions of the various elements driven from the live-spindle without departure from my invention.

Having thus described my invention, what I claim is—

1. The combination, with driving mechanism, of a pinion; a rocking sleeve surrounding the pinion and having an opening; a slotted device connected to and rocking with the sleeve; a gear carried by said device and driven by the pinion; and a shaft driven by said gear.

2. The combination, with driving mechanism, of a pinion; a rocking sleeve surrounding said pinion, and having a longitudinal slot; a device fitted for sliding movement upon the sleeve, and connected for rocking movement with said sleeve, said device having a slot registering with the slot of the sleeve; a gear carried by said device, and in mesh with the pinion; and a shaft driven by said gear.

3. The combination, with a shaft, of variable-speed gearing; means for connecting

said gearing with the shaft; a driven pinion; a slotted sleeve movable around said pinion; an arm having a slotted hub, said hub being connected to the sleeve for sliding movement thereon; a gear carried by the arm, and in constant mesh with the pinion; and means for locking the arm when it is shifted to throw the gear into engagement with the desired member of said variable-speed gearing.

4. The combination, with a gear-cone, of a shaft driven by the shaft of said gear-cone; a barrel-pinion; mechanism for driving said pinion; a slotted sleeve surrounding said pinion, and movable in an arcuate path; a lever having a slotted hub connected to the sleeve and slidable thereon; and a gear carried by the lever and adapted to be engaged thereby with any gear of the cone.

5. The combination, with a frame having bearings, of a long pinion journaled in said bearings; a slotted, rocking sleeve surrounding the pinion, and supported at its ends; a slotted hub connected for sliding movement to the sleeve; an arm projecting from the hub, and by which it may be manipulated to rock the sleeve; a gear carried by the arm, and in constant mesh with the pinion; variable-speed gearing with any member of which the gear may be engaged; a shaft; and means for connecting the shaft of the variable-speed gearing with said shaft.

6. The combination, with a driven pinion, of a slotted rocking device surrounding and sustaining said pinion; a rocking lever sleeved and slidable upon said device; a connection between said lever and device; and a gear carried by said lever, and in constant mesh with the pinion.

7. The combination, with a pinion, and with mechanism including a change-gear for driving said pinion, of a slotted sleeve mounted for rotary movement, said sleeve surrounding and sustaining the pinion; a rocking lever-arm having a slotted hub splined to the sleeve; a gear carried by the lever-arm; means for locking the lever-arm when shifted; and a gear-train driven by said gear carried by the lever-arm.

8. The combination, with a shaft having journals, of a barrel-pinion, carried by said shaft; bearings in which said journals are mounted; a slotted sleeve surrounding and sustaining the pinion and mounted between shoulders of the bearings; a frame; a lever projecting through a slot of the frame, and having a slotted hub connected to the sleeve for rocking movement therewith, and slidable thereon; a gear carried by the lever; and a gear-cone with any element of which the gear on the lever may be engaged.

9. The combination, with framework having tubular bearings provided with shoulders and reduced portions, of a driven pinion having journals mounted on the bearings; a

slotted sleeve surrounding the pinion, and having ends fitted for rocking movement on the reduced portions of and located adjacent to the shoulders of the bearings; gearing driven by the pinion; and a device actuated by said gearing.

10. The combination, with a barrel-pin-
ion, of a slotted sleeve surrounding said pin-
ion; a device for rocking the sleeve; a gear
carried by said device, and passing through
the slot of the sleeve; a gear-train driven by
said gear; and a device actuated by said gear-
train.

11. The combination, with a barrel-pin-
ion journaled in bearings of the frame, of a
longitudinally-slotted sleeve surrounding
said barrel-pinion, and supported at its ends
for rocking movement on said bearings; an
arm having a hub in sliding engagement
with the sleeve, and also having a slot reg-
istering with the slot in the sleeve; a gear
journaled in said arm, and passing through
the slotted hub and sleeve to engage the bar-
rel-pinion; a detent for locking the arm when
adjusted along and rocked with said sleeve;
a cone-gear; and a pinion carried by the
shaft of the cone-gear.

12. The combination, with a barrel-pin-
ion; of a rocking sleeve having a slot; a gear
shiftable along said sleeve, and projecting
through the slot thereof; and means for rock-
ing and shifting said gear and sleeve.

13. The combination, with a barrel-pin-
ion journaled in fixed bearings, of a device
for supporting said pinion and mounted on the
bearings thereof; means for rocking said de-
vice; a gear carried by said device; a train
of gearing actuated by the gear; and mech-
anism driven by the shaft of said gear-train.

14. The combination, with a barrel-pin-
ion, of a slotted sleeve surrounding said pin-
ion; a slotted hub connected for sliding
movement to the sleeve; a device for shift-
ing the hub along the sleeve, and for con-
jointly rocking the hub and sleeve; a gear
journaled in said device, and passing through
the slots of the hub and sleeve; and mech-
anism driven by said gear.

15. The combination, with a series of gears
of different sizes, of a driven shaft on which
said gears are loosely mounted; a clutch for
locking any of said gears to the shaft; gear-
ing driven by said shaft; a barrel-pinion hav-
ing a shaft actuated by an element of said
gearing; a slotted sleeve surrounding said
pinion, and rockable thereon; a slotted hub
shiftable along said sleeve, and rockable
therewith; a gear carried by said hub; mech-
anism actuated by said gear; and a device
actuated by said mechanism.

16. The combination, with a driven bar-
rel-pinion, of fixed bearings in which the shaft
of said pinion is journaled; a slotted sleeve
mounted on the bearings, and surrounding
and sustaining said barrel-pinion, and rock-

able thereon; a hub having a slot register-
ing with the slot of the sleeve, and connected
for sliding movement to the sleeve; a lever-
arm projecting from the hub through a slot in
the frame; a detent carried by the lever-arm;
a gear journaled on the lever-arm and pass-
ing through the slotted hub and sleeve con-
stantly to engage the barrel-pinion; a shaft
having gears of different diameters, with any
of which the gear may be engaged; and a de-
vice actuated by said shaft.

17. The combination, with framework hav-
ing a slot and a series of openings, of a driven
barrel-pinion journaled in said framework; a
longitudinally-slotted sleeve surrounding said
barrel-pinion and supported against longi-
tudinal movement; a longitudinally-slotted
hub; means for connecting the hub and sleeve,
said means permitting a sliding movement
of the hub on the sleeve; an arm carried by
the hub, and projecting through the slot of
the frame; a spring-actuated detent having
a manipulating-knob mounted in the arm,
and adapted to engage any of the series of
holes in the frame; a gear journaled on the
arm, and in constant mesh with the barrel-
pinion; a cone-gear with any element of
which said gear may be engaged; and mech-
anism actuated by the shaft of said cone-
gear.

18. The combination, with a spindle, of a
shaft; reversing mechanism on said shaft; a
clutch in said reversing mechanism; a series
of gears of different sizes keyed to the shaft;
a tubular shaft driven by said last-mentioned
shaft; gears of different sizes loosely mounted
on said tubular shaft; means for locking any
of said gears to said shaft; mechanism driven
by said shaft, including a barrel-pinion; a
slotted sleeve surrounding the barrel-pinion;
an arm having a slotted hub, said hub being
splined to the sleeve; a gear journaled on the
arm and in mesh with the barrel-pinion; a
variable-speed gear-train driven by said
gear; and mechanism operated by the gear-
train.

19. The combination, with a spindle, of a
shaft driven by said spindle; reversing mech-
anism loose on said shaft, and including a
clutch splined to the shaft between two ele-
ments of the reversing mechanism; means for
actuating the clutch; a series of gears of dif-
ferent diameters keyed to the shaft; a tubu-
lar shaft having a longitudinal slot; a series
of gears of different diameters loose on said
shaft; a slotted rod fitted in said tubular
shaft; a key pivoted to the rod; a spring-ac-
tuated plunger bearing against the heel of
the key; means for shifting said rod to en-
gage the key with the desired gear loose on
the tubular shaft; and gearing driven by the
tubular shaft when a loose gear is connected
thereto.

20. The combination, with a shaft, of a
gear-cone carried by the shaft; a barrel-pin-

ion; a frame; bearings in the frame for the journals of said barrel-pinion, each bearing having a reduced portion and a shoulder; a longitudinally-slotted rocking sleeve mounted at its ends on the reduced portions of the bearings, and prevented from longitudinal movement by the shoulders thereof; a lever extending through a slot of the framework and having at its inner end a longitudinally-slotted hub in sliding connection with the rocking sleeve; a gear journaled on the lever and in constant mesh with the barrel-pinion; a detent for locking the lever when adjusted to throw the gear thereon into mesh with the desired element of the gear-cone; a spindle; and intermediate variable-speed and reversing mechanism driven by said spindle, and serving to actuate the barrel-pinion.

21. The combination, with a driven barrel-pinion, of a longitudinally-slotted sleeve surrounding said pinion and prevented from longitudinal movement, but free for rocking movement thereon; a device for rocking said sleeve and locking it when rocked; a gear carried by said device, and in constant mesh with the barrel-pinion; and mechanism driven by said gear.

22. The combination, with a spindle, of variable-speed mechanism, including loosely-mounted gears driven from said spindle; reversing mechanism also driven from the spindle, and including a movable clutch; means for clutching any loosely-mounted member of the variable-speed mechanism to its shaft; a barrel-pinion; gearing intermediate the shaft on which the loose gears are car-

ried and said barrel-pinion; a longitudinally-slotted, rocking sleeve surrounding the barrel-pinion; an arm having a slotted hub connected to the sleeve for sliding movement thereon; a gear carried by said arm, passing through the slots of the hub and sleeve and in constant mesh with the barrel-pinion; and a gear-cone with any element of which the gear on the arm may be engaged.

23. The combination, with a driven barrel-pinion, of a curved hood concentric to the barrel-pinion, and having an inclined slot and a series of openings adjacent to said slot; an arm projecting through the slot; a detent carried by said arm; a longitudinally-slotted sleeve surrounding the barrel-pinion, and connected to the arm; a gear carried by the arm; and mechanism operated by the gear.

24. The combination, with a driven barrel-pinion, of a curved hood concentric to the barrel-pinion, and having a slot and a series of openings; a longitudinally-slotted sleeve surrounding the barrel-pinion and free to rock thereon; a longitudinally-slotted arm having a hub splined to the sleeve, said arm passing through the slot in the curved hood; a detent carried by the free end of said arm; a gear journaled on the arm and in constant mesh with the barrel-pinion, and mechanism driven by said gear.

In testimony whereof I affix my signature in presence of two witnesses.

BENGT M. W. HANSON.

Witnesses:

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N. S. BATES.