

No. 628,734.

Patented July 11, 1899.

L. C. WOERNER.

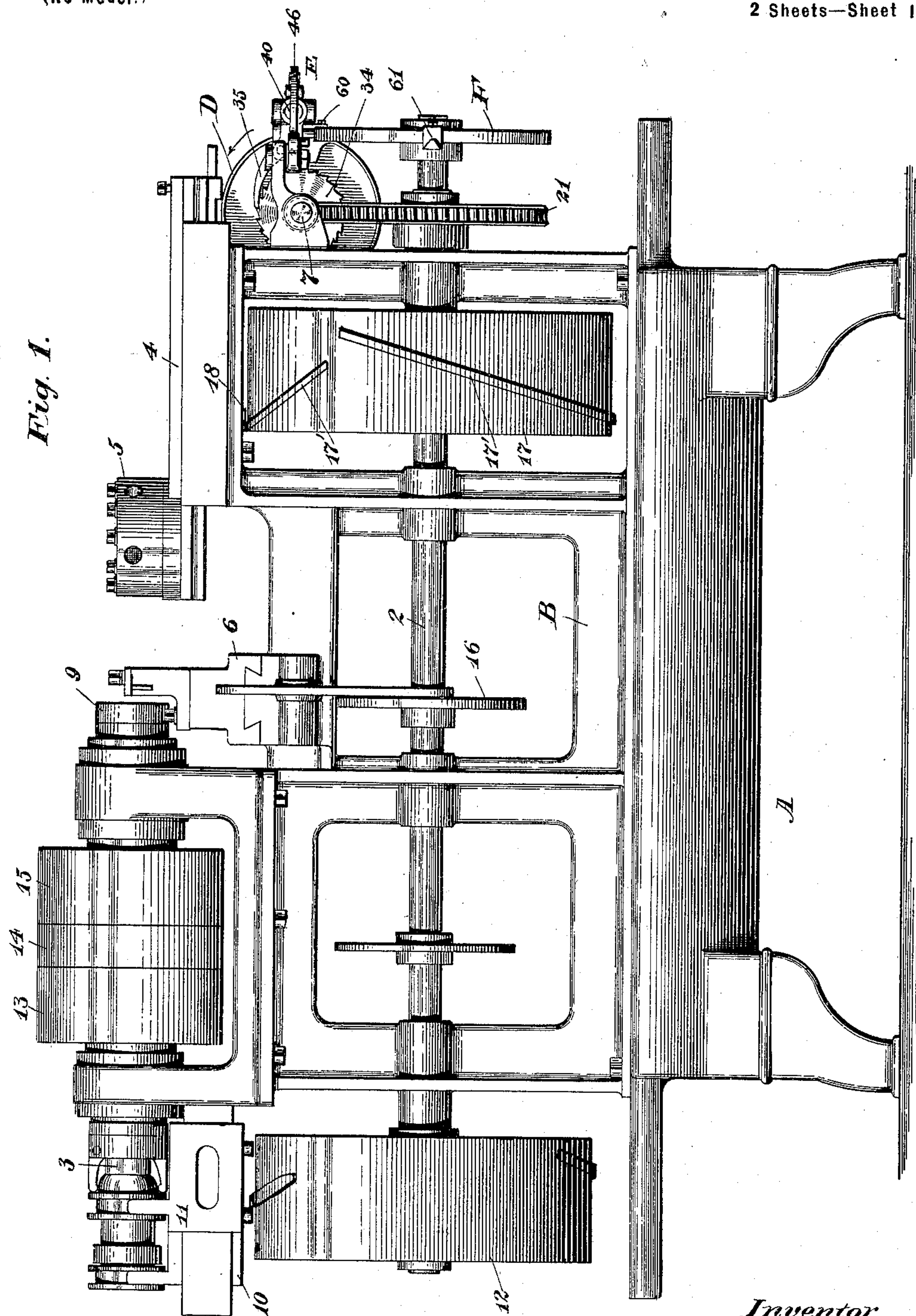
SPEED CHANGING MECHANISM FOR SCREW MACHINES.

(No Model.)

(Application filed Aug. 31, 1898.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses

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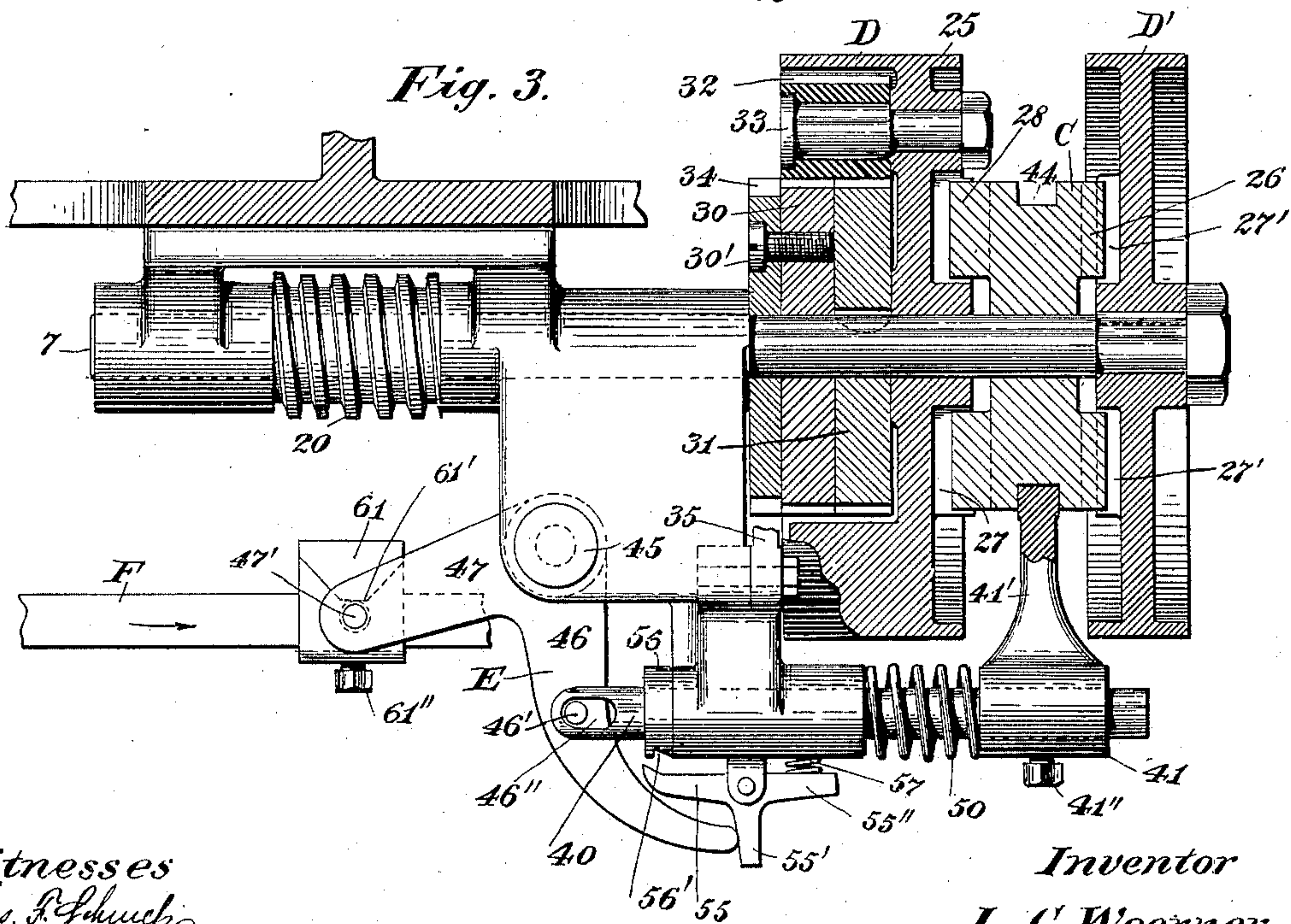
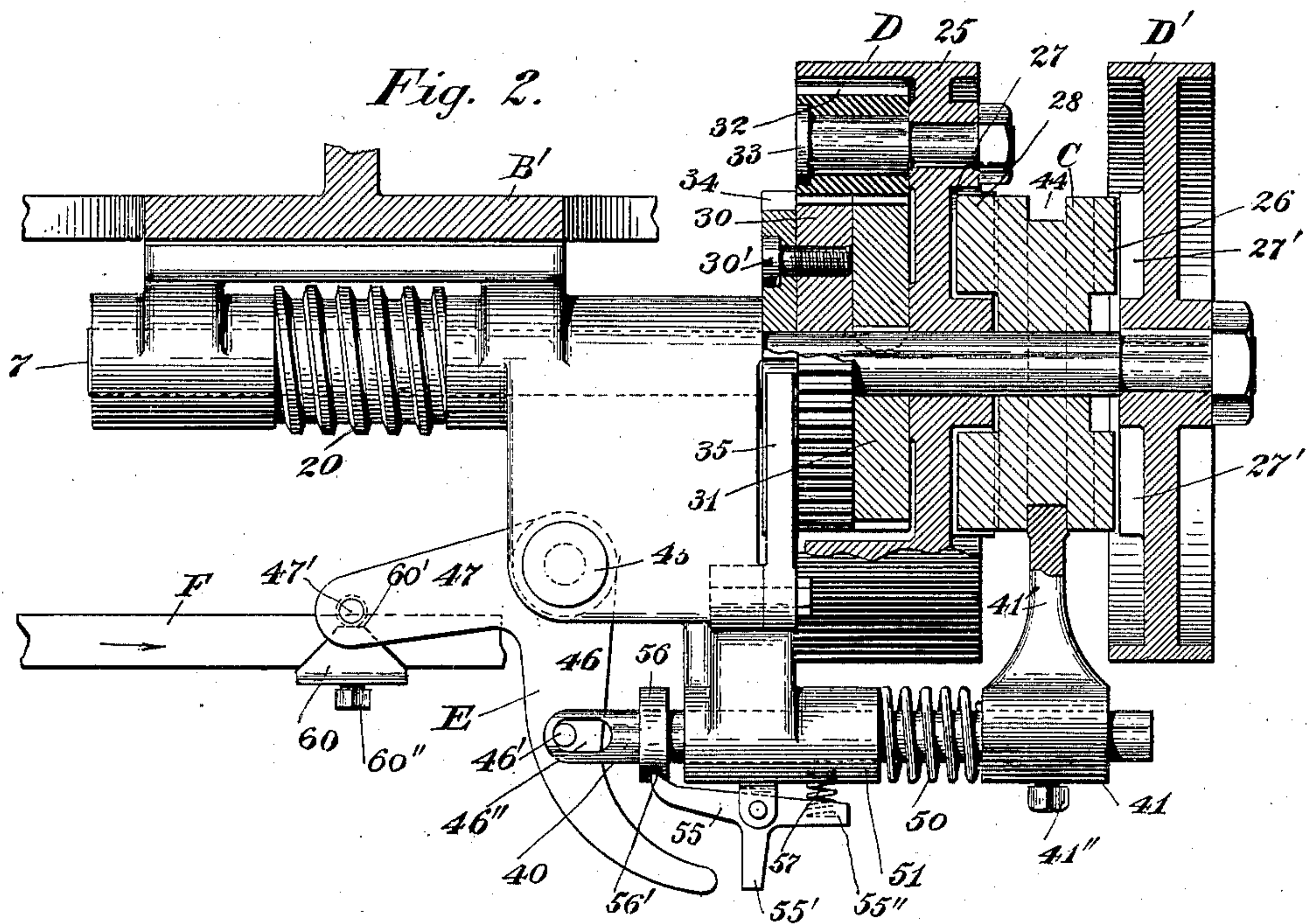
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(No Model.)

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2 Sheets—Sheet 2.



Witnesses

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UNITED STATES PATENT OFFICE.

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SPEED-CHANGING MECHANISM FOR SCREW-MACHINES.

SPECIFICATION forming part of Letters Patent No. 628,734, dated July 11, 1899.

Application filed August 31, 1898. Serial No. 689,913. (No model.)

To all whom it may concern:

Be it known that I, LOUIS C. WOERNER, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Speed - Changing Mechanism for Screw-Machines, of which the following is a specification.

My invention relates to speed - changing mechanism and means for controlling the action of said mechanism and is shown applied to a screw-machine of the ordinary "turret" type; and the object of the invention is to provide mechanism for imparting a slow-feed motion to the part of the machine desired and a quick-return movement after the feed has been accomplished.

Included in the organization of the speed-changing mechanism are a shaft carrying a main driving member loosely mounted thereon and which may be either a pulley, gear, or equivalent device; speed-reducing mechanism, shown as a pair of shears, one of which has a different number of teeth from the other, respectively loose on and fixed to said shaft; a pinion on the main driving member meshing with each of said gears, said pinion carrying a ratchet attached to or forming a part thereof; a pawl carried by the framework co-operating with said ratchet; a supplemental pulley or other device fixed to the shaft and serving as an auxiliary driver, and a clutch or coupling of any suitable kind intermediate the main driving member and said supplemental pulley.

In connection with this speed-changing mechanism an improved device for controlling the action of the same is employed, which will be hereinafter described.

In the drawings accompanying and forming part of this specification, Figure 1 is a side elevation of a screw-machine of well-known construction with my invention applied thereto. Figs. 2 and 3 are horizontal sectional views of the speed-changing mechanism, showing the means for controlling the action of the same in plan. Both figures are drawn to an enlarged scale, Fig. 2 represent-

ing the parts in one extreme position and said Fig. 3 the parts in the other extreme position.

Similar characters designate like parts in all the figures of the drawings.

For supporting the different parts of the machine a suitable frame A and an auxiliary frame B are employed, said frame B directly sustaining the driving-shafts and work-holding spindle.

Embodied in the machine are the usual cam-shaft 2, the chuck-spindle 3, having blank feeding, gripping, and rotating devices, the latter being designated by 14 and the idle pulleys by 13 and 15, the slide 4, carrying the turret 5, which is to be equipped with the usual tools, and the cross-slide 6, carrying the usual cutting-off tool.

Common means are shown for reciprocating the turret-slide 4, and these means consist of the cam 17, provided with the cam-surfaces 17' 17', which engage stud 18 and actuate said slide first in one direction and then in the other. Common means are also illustrated for actuating the cutting-off tool, and said means consists of the cam 16, carried by the shaft 2 and coöperating through the medium of a lever with the slide 6, in which the tool mentioned is mounted.

Mechanism for opening and closing the work-holding chuck 9 and for feeding the rod through said chuck when necessary is employed, and this mechanism is operated by the slides 10 and 11, actuated in proper order by the cam 12, carried by the shaft 2.

As above stated, my invention relates to means for imparting a slow-feed movement to a part of the machine (in the instance illustrated the turret-slide) and a quick-return motion after the feed movement has been effected, and to accomplish these objects I employ the mechanism now to be described.

Carried by the cam-shaft 2 of the machine is the usual worm-wheel 21, which is driven by the worm 20, fixed to a shaft 7, extending in the construction shown at right angles to the cam-shaft 2.

Loosely mounted on the shaft 7 is a main driver, (shown as a pulley D,) and fixed to

said shaft 7 is an auxiliary driver consisting of a pulley or other suitable device D', while intermediate said parts is a coupling C or other suitable form of clutch loosely mounted on the shaft 7.

Two gears 30 and 31, each of the same size, but one having a different number of teeth from the other, are mounted on the shaft 7, and in the construction shown the gear 31 is fixed to the shaft 7 by a spline or otherwise and is provided with one more tooth than the gear 30, which is loosely mounted on said shaft.

Attached to or forming a part of gear 30 is a ratchet 34, (shown separate from said gear and connected thereto by the screw or screws 30',) and pivoted or otherwise suitably mounted on the framework is a pawl 35, which engages the teeth of the ratchet 34.

To the web 25 of the main driver D is attached a pin 33, on which is loosely journaled a pinion 32, the teeth of which intermesh with the teeth of both of the gears 30 and 31.

At one end of the cam-shaft 2 is located a wheel F, which carries two inclined or wedge-like cams 60 and 61 with angular working surfaces 60' and 61', adjustably connected to said wheel and secured thereto by set-screws 60'' and 61''.

Mounted in a bearing of the framework is a shipper-rod 40, carrying on one end thereof a shipper 41, having a fork 41', which works in a groove 44 of the clutch-coupling C, said shipper being connected to the rod by a screw 41''. Placed between the head of the shipper and the bearing in which the shipper-rod moves is a spiral spring 50, the purpose of which will hereinafter appear. One end of the shipper-rod 40 is slotted at 46'' and is also equipped with a collar 56, having a notch 56'.

Pivoted to the bearing of the framework in which the shipper-rod moves is a three-armed pawl 55, having a toe which engages at the proper time with the notch in the collar 56, an arm 55'' of said pawl being equipped with a socket or recess for the reception of the spiral spring 57, which normally tends to throw the toe of the pawl into the notch 56' in collar 56. A third arm of the pawl is designated by 55', and it is adapted to cooperate with the lever E, which is pivoted at 45 to the frame of the machine and has two arms 46 and 47, the former of which carries the pin 46', fitted in the slot 46'' of the shipper-rod 40, and the latter of which is equipped with an antifriction-roller 47' for cooperation with the cams 60 and 61, carried by the cam-wheel F. Both the web of the pulley D and of the auxiliary driver D' are provided with suitable clutch-faces 27 and 27', respectively, which cooperate with the clutch-faces 26 and 28 of the coupling C.

In operation when it is desired to apply a slow feed to the turret-slide 4 the devices are in the positions represented by Fig. 2, and the clutch C, which is loosely mounted on shaft

7, is out of contact with the clutch-teeth 27' on the auxiliary driver D'. Power being then applied to the pulley D said pulley is rotated in the direction of the arrow shown in Fig. 1, and as it rotates carries with it the pinion 32, causing the same to intermesh with the teeth of gear 30, loosely mounted on the shaft 7, and of gear 31, fixedly secured to said shaft. As before stated, gear 30 will be provided with an even number of teeth—as, for instance, fifty—while gear 31 will have an odd number of teeth—for example, fifty-one. As the planet-pinion 32 travels around the sun-gears 30 and 31, it is obvious that it will impart a slow-feed motion to the shaft 7. In other words, the gear 31 being provided with one more tooth than gear 30 and the latter gear being prevented from rotating backward by pawl 35 a slight partial rotation equaling the width of one tooth of gear 31 will be imparted to shaft 7 at each complete revolution of the planet gear or pinion 32, and in this way the worm 20 will be turned and through the intermediate connections will actuate the cam-shaft to impart in the construction shown a continuous slow forward movement to the turret-slide 4. Upon the completion of the slow movement just described cam 61 of wheel F by operating against the antifriction-roller 47' on arm 47 of lever E will cause arm 46 of said lever to be thrown to the right and the toe thereof to come into contact with projection 55' on pawl 55, thereby lifting the end of said pawl from its seat 56' in collar 56 and permitting spring 50 to shift shipper-rod 40 to the right, whereby the clutch-teeth 26 of coupling C are thrown into contact with the teeth 27 of the auxiliary driver D', fixed to the shaft 7. In this connection it will be observed that when the clutch-teeth 26 are engaged with the teeth 27 of auxiliary driver D' the teeth 28 are not withdrawn from contact with the teeth 27', and it therefore follows that the pulley D while rotating in the same direction will impart a quick-return motion to the shaft 7 and worm 20 thereof, the teeth of ratchet 34 slipping under pawl 35. This construction is important, for, as is obvious, the coupling C being loose on shaft 7 and the clutch-gear thereof being in constant engagement with the clutch-teeth of pulley D said coupling rotates with, and consequently acquires the momentum of, said pulley and after said pulley is connected with the auxiliary device or driver D' the inertia of the driver D therefore becomes effective in producing the quick-return motion of the turret-slide 4. This is a distinct advantage over a construction wherein the inertia of the coupling acts to retard instead of assist this quick return of the parts governed by said coupling. Another advantage resides in the fact that by this construction the clutch-coupling is prevented from chattering or from "lost motion" on the shaft, and the teeth 26 thereof will therefore much more readily en-

gage the teeth 27 of the auxiliary device D' when the coupling is shifted to cause the quick return of the slide, all the devices being then locked to the shaft and rotating together. At the termination of the return motion of the turret-slide 4 the cam 60 on wheel F will come into engagement with the antifriction-roller 47' on arm 47 of lever E, thereby shifting said lever, which through its pin 46' will restore the parts to the normal position shown in Fig. 2 and throw the slow-feed motion again into action.

While I have shown the auxiliary driver D' as a pulley to which a friction belt, brake, or other device may be applied, if necessary, to overcome the inertia of the shaft when the coupling C is shifted to the left, as represented in Fig. 2, at the end of the quick-turn motion of the slide 4, I desire it to be distinctly understood that my invention is not limited thereto, as any clutch fixedly secured to the shaft could readily be employed as a substitute for said pulley and would accomplish the same purpose.

While my invention is shown as applied to a screw-machine it is not limited thereto, it being generally applicable to all machines in which it is desirable to accomplish the result set forth.

It is obvious that many of the details of the clutch-controlling mechanism could be variously modified without departing from my invention.

Having described my invention, I claim—

1. In combination, a shaft to which power is to be applied; two gears, one having a different number of teeth from the other, and one gear fixed to, and the other loosely mounted on, said shaft; a main driver carrying a pinion in engagement with both of said gears; means for preventing the backward rotation of the loosely-mounted gear; a clutch loosely mounted on the shaft and in constant engagement with the main driver; and an auxiliary driver fixed to said shaft and having a portion adapted to be engaged by said clutch when the latter is shifted.

2. In combination, a shaft to which power is to be applied; two gears, one having a different number of teeth from the other, one gear fixed to, and the other loosely mounted on, said shaft; a main driver carrying a pinion in engagement with both of said gears; means for preventing the backward rotation of the loosely-mounted gear; a clutch loosely mounted on the shaft and in constant engagement with the main driver; an auxiliary driver keyed to said shaft and having a portion adapted to be engaged by such clutch; and means for shifting said clutch.

3. In combination, a shaft to which power is to be applied; two gears, one having a different number of teeth from the other, and one gear fixed to, and the other loosely mounted on, said shaft; a main driver carrying a pinion in engagement with both of said gears; a pawl for preventing the backward rotation of

the loosely-mounted gear; a clutch loosely mounted on the shaft and in constant engagement with the main driver; and an auxiliary driver keyed to said shaft and having a face adapted to be engaged by said clutch when the latter is shifted.

4. In combination, a shaft to which power is to be applied; two gears, one having a different number of teeth from the other, and one gear fixed to, and the other loosely mounted on, said shaft; a main driver; a pinion carried by said driver and in engagement with both of said gears; means for preventing the backward rotation of the loosely-mounted gear; a clutch loosely mounted on the shaft and in constant engagement with the main driver; an auxiliary driver keyed to said shaft and having a face adapted to be engaged by said clutch when the latter is shifted; a rod for shifting said clutch; and means for automatically actuating said rod.

5. In combination, a shaft to which power is to be applied; two gears, one having a different number of teeth from the other, and one gear fixed to, and the other loosely mounted on, said shaft; a main driver carrying a pinion in engagement with both of said gears; means for preventing the backward rotation of the loosely-mounted gear; a clutch loosely mounted on the shaft and in constant engagement with the main driver; an auxiliary driver keyed to said shaft and having a clutch-face; a rod for actuating the clutch; a cam-shaft; and means controlled by the cam-shaft for actuating said rod.

6. In combination, a shaft; main and auxiliary drivers respectively loose on and fixed to the shaft; speed-reducing mechanism operative with the main driver; and a clutch connected at all times with the main driver and adapted to be engaged with the auxiliary driver.

7. In a screw-machine, the combination, with a slide, of a shaft; means carried by said shaft for actuating said slide in both directions; a second shaft, carrying means for driving the first-named shaft; main and auxiliary drivers, one loose on, and the other fixed to, said second shaft; speed-reducing mechanism operative with the main driver; and a clutch connected at all times with the main driver and adapted to be engaged with the auxiliary driver when it is desired to impart a rapid-return movement to the slide.

8. In a screw-machine, the combination, with a turret-slide, of a shaft; a cam-wheel mounted on said shaft for actuating the turret-slide in both directions; a second shaft, carrying means for driving the first-named shaft; main and auxiliary drivers, one loose on, and the other fixed to, said second shaft; speed-reducing mechanism operative with the main driver; and a clutch connected at all times with the main driver and adapted to be engaged with the auxiliary driver when it is desired to impart a rapid-return movement to the turret-slide.

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9. In a screw-machine, the combination,
with a turret-slide, of a shaft; a cam-wheel
mounted on said shaft for actuating said slide
in both directions; a second shaft, carrying
5 a worm for engaging the worm-wheel on said
first-mentioned shaft; main and auxiliary
drivers, one loose on, and the other fixed to,
said second shaft; a pinion carried by the
main driver; a gear fixed to the shaft; a sec-
10 ond gear loosely mounted on the shaft and
having a different number of teeth from the
fixed gear; a pawl-and-ratchet device for pre-
venting backward rotation of said loosely-

mounted gear; an auxiliary driver fixedly
connected to the shaft; a clutch in constant 15
engagement with the main driver and adapt-
ed to be thrown into contact with the auxil-
iary driver; means for shifting said clutch;
a detent for preventing the shifting action
of the clutch; a lever for actuating said de- 20
tent; and a cam for operating the lever.

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Witnesses:

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