No. 736,462. PATENTED AUG. 18, 1903.

F. L. TODD.

VARIABLE SPEED GEARING.

APPLICATION FILED SEPT. 2, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

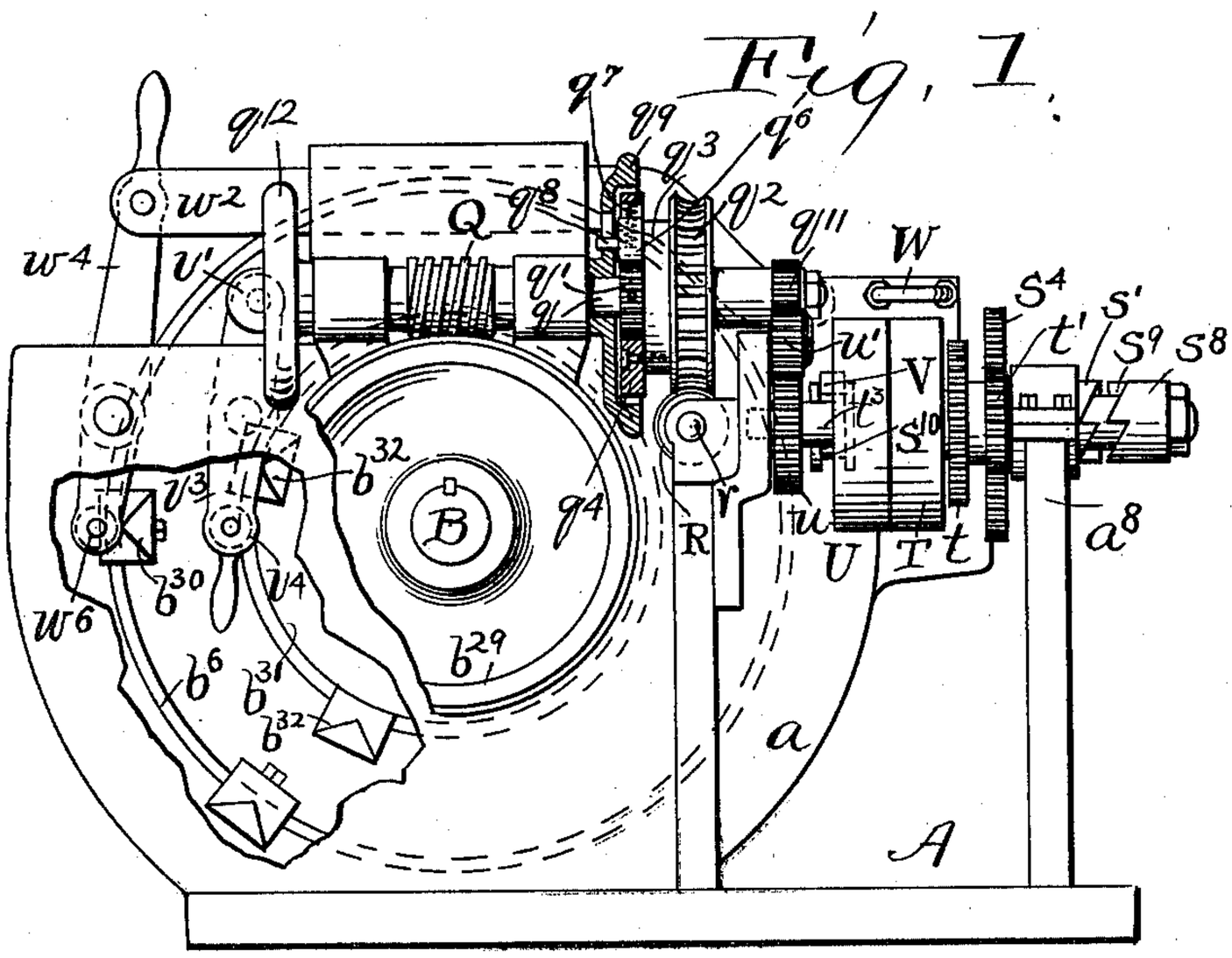
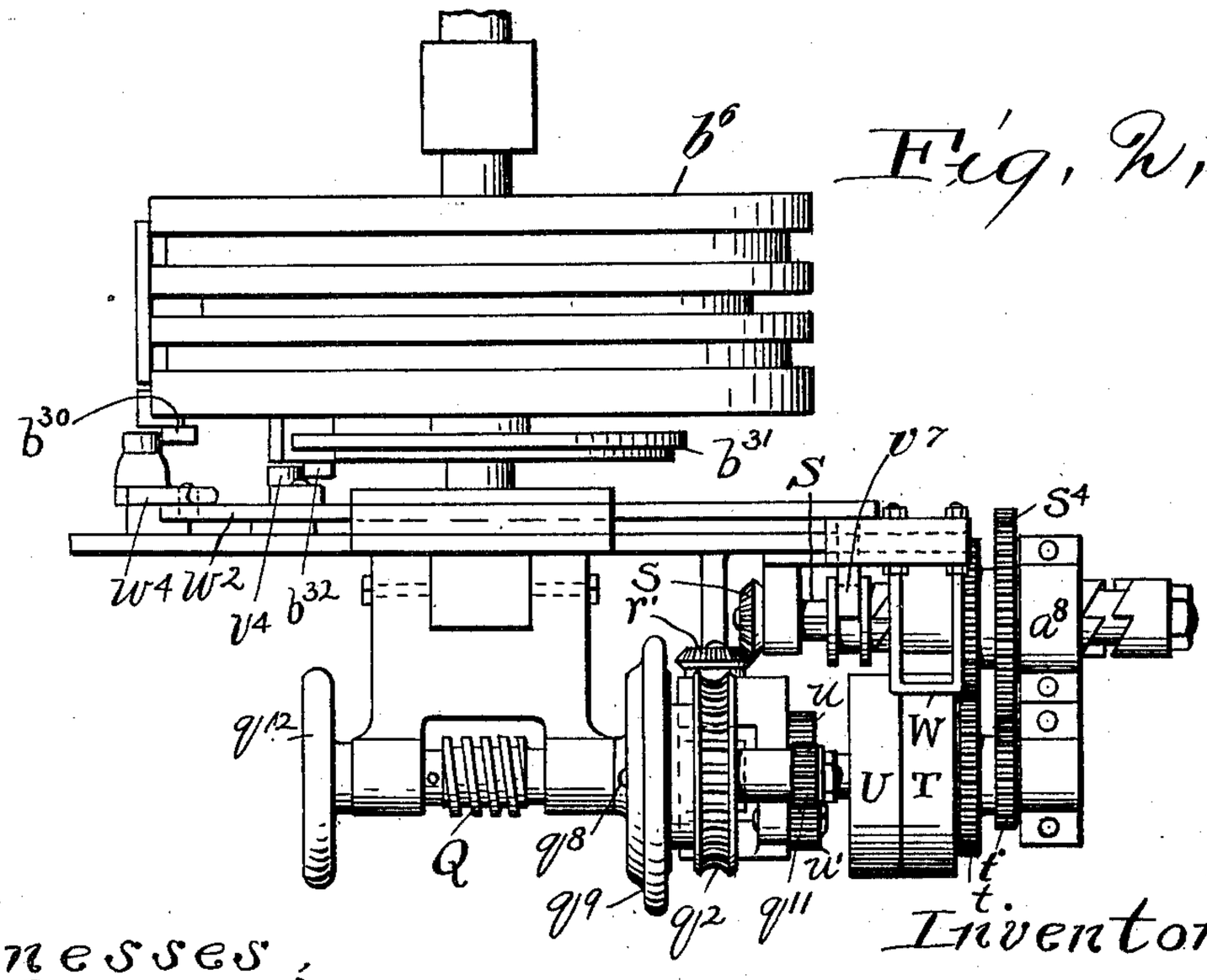


Fig. 2.



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N. L. Brennan

Inventor:
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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

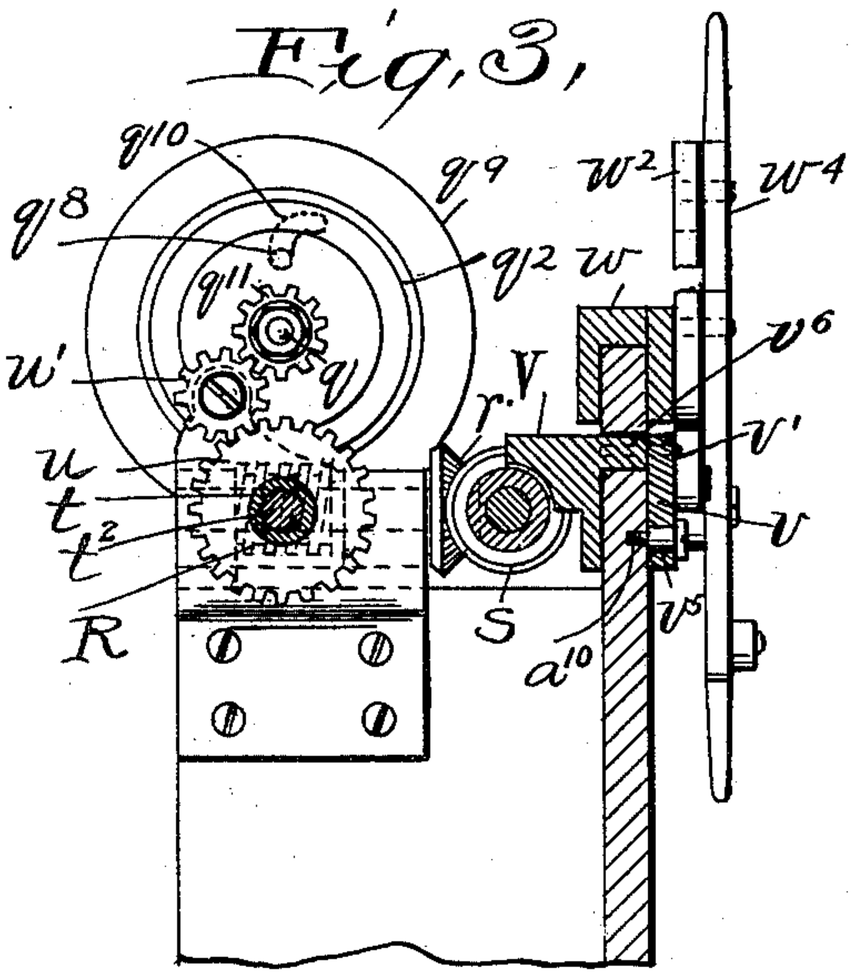


Fig. 4.

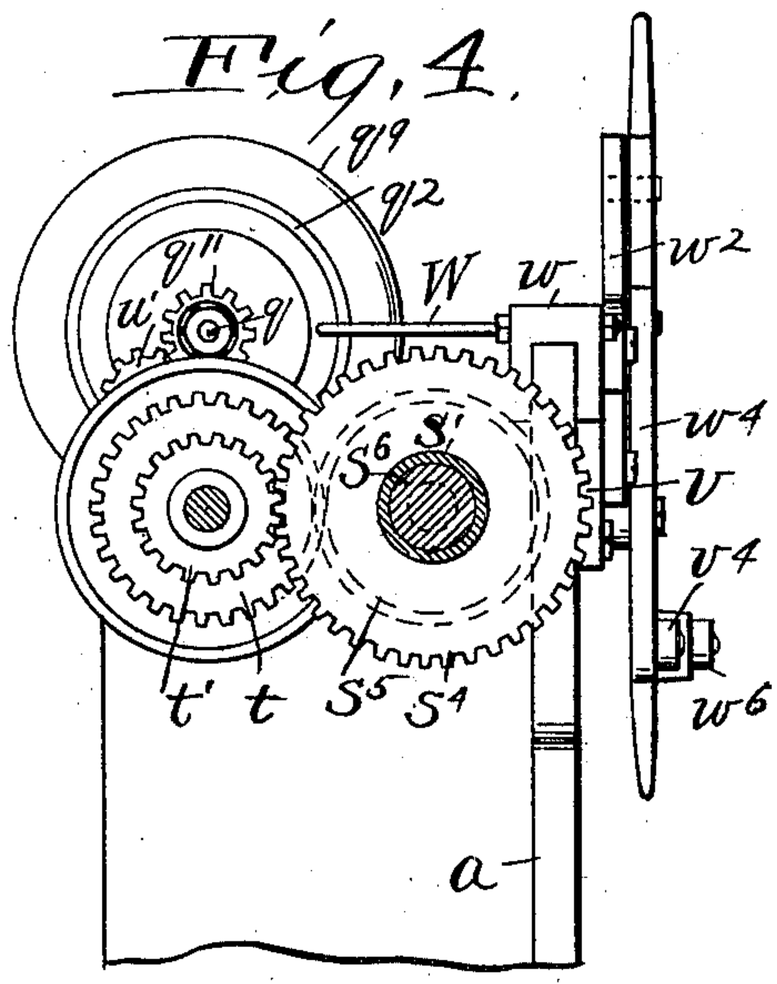


Fig. 5.

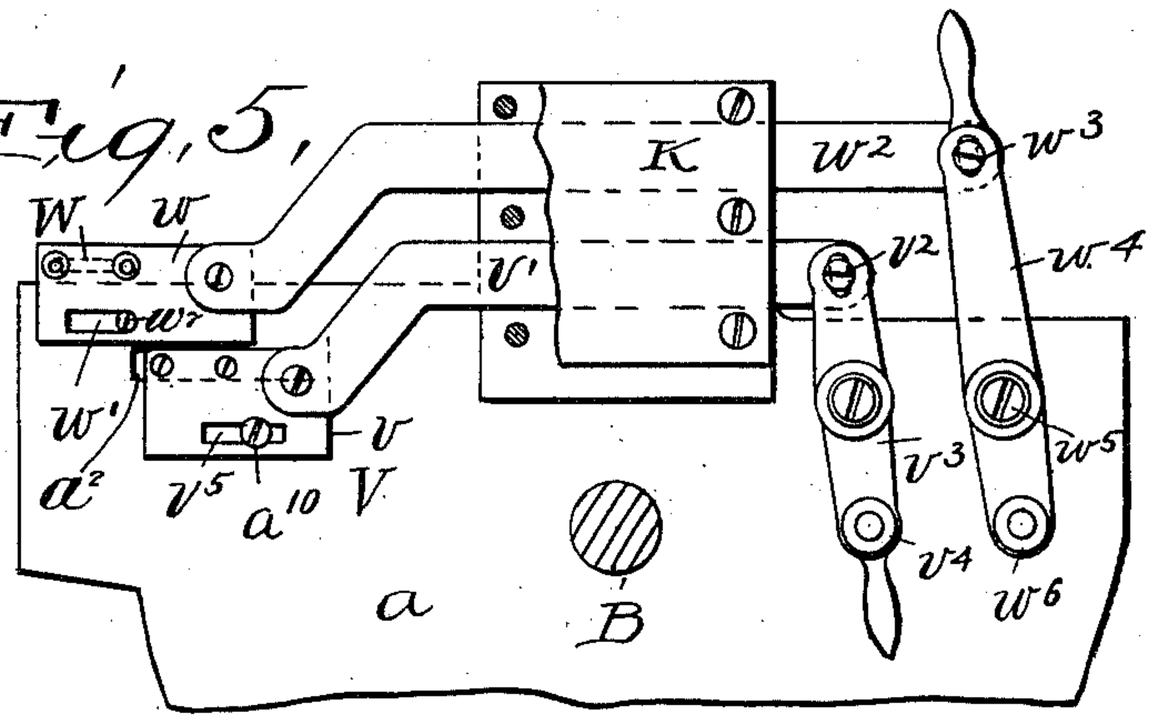


Fig. 7.

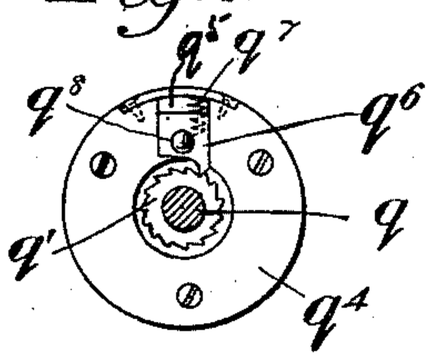
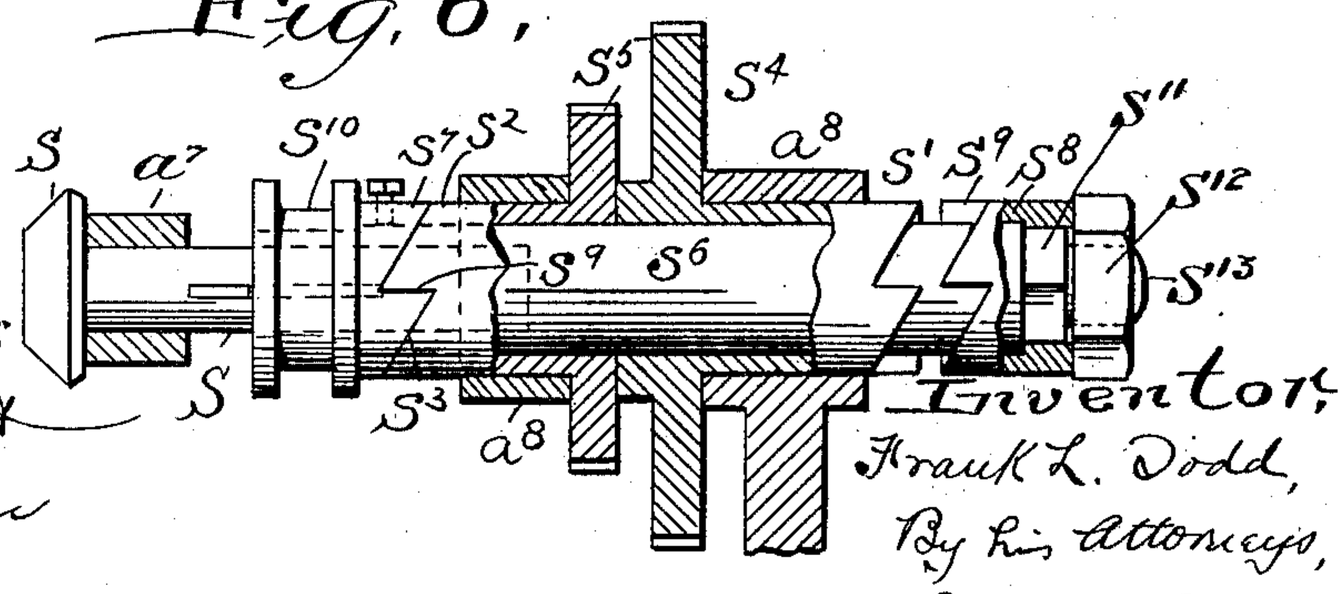


Fig. 6.



Witnesses
E. B. Gilchrist
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No. 736,462. Patented August 18, 1903.

UNITED STATES PATENT OFFICE.

FRANK L. TODD, OF ELYRIA, OHIO.

VARIABLE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 736,462, dated August 18, 1903.

Application filed September 2, 1902. Serial No. 121,733. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. TODD, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented a certain new and useful Improvement in Variable-Speed Gearing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

It is often necessary in different classes of machines to have a main operating-shaft driven at different rates of speed from time to time during the operation of the machine. This is especially true in screw-machines, and it is in connection with this class of machinery that the invention is specially designed, although it may be applied to other forms and types of machinery as may be desired.

Referring to the drawings, Figure 1 is a side elevation of my device, showing the cams which automatically operate the mechanism. Fig. 2 is a top plan view of the same. Fig. 3 is a detailed view showing the operating levers and their connections, also showing parts of the gearing. Fig. 4 is a detailed view of the gearing. Fig. 5 is a side elevation of the operating-levers. Fig. 6 is a detailed view of the spindle and the parts connected therewith, and Fig. 7 is a detailed view of the parts lying about the hand-wheel q^9.

The main shaft B is provided on its extremity, as shown clearly in Fig. 1, with a worm-wheel b^{29}, above which worm-wheel is mounted a worm Q, adapted to coöperate with the same to drive the main shaft. This worm is carried by the short spindle q, to which spindle is rigidly secured a rachet-wheel q'. This spindle q carries loosely a worm-wheel q^2, which rigidly carries a hub q^3, which lies between the said worm-wheel q^2 and the said ratchet-wheel q'. To this hub q^3 is rigidly secured a disk q^4. This disk, as clearly shown in Fig. 7, is provided with a radial slot q^5, in which slot is mounted a block-pawl q^6, which is pressed inwardly by a spring q^7, so that its point q^{13} may engage the teeth of the aforesaid pinion q'. The face of this block-pawl is provided with a laterally-projecting pin q^8, which pin is adapted to lie within the curved slot q^{10}, carried by the hand-wheel q^9. This slot is clearly shown in Fig. 3, in which figure the pin is shown lying at the innermost point of said slot. This hand-wheel, it may be said, is loosely mounted upon the spindle q, and it will readily appear that if it were turned to the right the slot q^{10} would coöperate with the pin q^8 to throw the block-pawl q^6 out of engagement with the ratchet-wheel q'.

From the construction described it will be apparent that by means of the hand-wheel q^9 the aforesaid worm-wheel q^2 can be connected through the pawl connection with the spindle q, so that the worm Q could be rotated and drive the main shaft B. When disconnected, the worm may be turned by the hand-wheel q^{12}. This worm-wheel q^2 meshes on its lower side with a second worm R, the shaft r of which being provided with a bevel-gear r', meshing with a bevel-gear s, carried by the spindle S. The spindle S, as shown in Fig. 6, is surrounded by a sleeve s^6, running throughout the length of the same, with the exception of a small portion adjacent to the bearing a^7. This sleeve is feathered to the spindle S, as shown, and has secured to one end a collar s^7, which is provided with an annular groove s^{10} and clutch-teeth s^3. The opposite end of this sleeve is squared at s^{11} to receive a squared socket of another collar s^8, which in turn is provided with clutch-teeth s^9 and is held in place upon said squared portion s^{11} by means of a nut s^{12}, which is secured upon a shank s^{13}, rigid with said sleeve s^6. Upon the sleeve s^6 are mounted two other sleeves, s^2 and s', which are each provided with clutch-teeth s^3 at one end and gear-wheels s^4 and s^5 at the other ends. The gear s^5, which is rigid with the sleeve s^2, is somewhat smaller than the gear s^4, rigid with the sleeve s'. Suitable bearings a^8, secured to the framework of the machine, surround both of the sleeves s' and s^2 and retain the gear-wheels s^4 and s^5 in a fixed position.

From the foregoing description it will appear that should the sleeve s^6 be shifted in a longitudinal direction the clutch-teeth upon one or the other of the collars s^8 and s^7 will be brought into engagement with the clutch-teeth upon one or the other of the sleeves s' s^2, thus locking the spindle S to either of said gears through the sleeve s^6, splined to said spindle.

The mechanism for driving the two gears s^4 and s^5 consists of two gears t and t', mounted

upon a shaft t^2, which rotates in suitable bearings mounted in the framework. These gears t and t' are rigid with the shaft t^2 and receive motion from a belt-pulley T. Mounted upon the shaft t^2 is a sleeve t^3, which is loose upon said shaft and carries a gear-wheel u, that meshes with a pinion u', mounted upon a suitable stud, and a belt-pulley U for rotating the same. This pinion u' meshes in turn with a pinion q^{11}, rigid with the shaft q.

The mechanism for shifting the collar s^7 and the sleeve s^6, together with the mechanism for shifting a belt from the belt-pulley T to the belt-pulley U, will now be described.

In a slot a^2 in the frame a is mounted a shoe V, having a part v^6 extending through said slot a^2, to which is secured, by means of screws or otherwise, a plate v, having therein a slot v^5. A pin a^{10} passes through said slot v^5 and is secured in the frame a for the purpose of guiding the plate v and the shoe V. This shoe has a suitable tongue v^7 extending into the annular groove f^{10} of the collar f^7. Pivoted to the plate v is a link v', which is slidable in a suitable guide K and carries at the one end a pin v^2, which operates in an elongated opening in a lever v^3, pivoted to the frame. This lever carries upon the end opposite to the end operating upon the pin a friction-roller v^4.

The mechanism for shifting the belt consists of a shoe w, carrying a belt-hook W and having a suitable groove therein for engagement upon the top edge of the frame a, and having also a slot w', through which passes a pin w^7, which retains said shoe upon the upper edge of the frame. The shoe is shifted back and forth by means of a link w^2, which is pivoted thereto. The link w^2 slides in the guide K and carries at the opposite end a pin w^3, operating in an elongated opening in a lever w^4, which is pivoted to the frame at w^5 and carries at its opposite end a friction-roller w^6.

Mounted upon the shaft B are cam-wheels b^6 and b^{31}, which are arranged to shift the lever v^3 and W^4 by means of cams b^{30} and b^{32}. The cams b^{30}, mounted upon the cam-wheel b^6, are arranged so that one cam will shift the lever w^4 in one direction and the next cam which follows it will shift the same lever in the opposite direction. The cams b^{32} act in a similar manner to shift the lever v^3 in one direction or the other.

It is obvious from the parts just described that when motion is conveyed to the pulley T through a suitable belt two different rates of speed can be conveyed to the shaft B through the mechanism about the spindle S, or a third rate of speed may be given to the shaft B by the belt-hook W being shifted through the mechanism for that purpose, when the belt will travel upon the pulley U and will convey motion to the shaft B through the pinions u, u', and q^{11}.

Having described my invention, I claim—

1. In variable-speed gearing, in combination, a driven shaft, two drive-pulleys, clutch mechanism and gearing between one of said pulleys and the driven shaft whereby the same may be rotated at two different rates of speed, gearing between the other one of said pulleys and said shaft, whereby the same may be operated at still another rate of speed, and means for automatically throwing all of said gears into and out of operation, substantially as described.

2. In variable-speed gearing, in combination, a driven shaft, a rotatable spindle, gearing between the two, a worm-wheel mounted on said spindle, a worm meshing with said worm-wheel, a belt-pulley, gearing and clutch mechanism between said belt-pulley and said worm whereby the same may be rotated at two different rates of speed, a second belt-pulley, gearing between said second belt-pulley and said spindle, and means for automatically operating said clutch mechanism, and shifting a belt from one of said pulleys to the other, substantially as described.

3. In variable-speed gearing, in combination, a driven shaft, a rotatable spindle, suitable gearing between the two, a worm-wheel mounted on said spindle, a worm meshing with said worm-wheel, a driving-shaft, a belt-pulley loose upon said driving-shaft, gearing and clutch mechanism between said pulley and said worm, whereby the same may be rotated at two different rates of speed, a second belt-pulley rigid with said driving-shaft, gearing between said second belt-pulley and said rotatable spindle, means for automatically operating said clutch mechanism, a belt-shipper operating in connection with said belt-pulleys and means for disconnecting said worm-wheel from said rotatable spindle, substantially as described.

4. In variable-speed gearing, in combination, a spindle, a worm-wheel carried thereby, a hand-wheel, mechanism intermediate of said hand-wheel and said worm-wheel whereby said hand-wheel may connect or disconnect said worm-wheel and said spindle, a worm meshing with said worm-wheel, a pulley adapted to drive said worm and a second pulley adapted to drive said spindle independent of said worm, substantially as described.

5. In variable-speed gearing, in combination, a spindle, a ratchet-wheel rigidly carried thereby, a worm-wheel loosely carried thereby, a pawl adapted to engage said ratchet-wheel, a hand-wheel having a slot, mounted upon said spindle, said pawl projecting within said slot, whereby a rotation to said hand-wheel may disengage said pawl from said ratchet-wheel, a worm meshing with said worm-wheel, a pulley adapted to drive said worm and a second pulley adapted to drive said spindle independently of said worm, substantially as described.

6. In variable-speed gearing, in combination, a spindle, a ratchet-wheel rigidly mounted thereupon, a worm-wheel, a pawl carried thereby and adapted to engage said ratchet-wheel, a hand-wheel having a slot into which

said pawl projects whereby a rotation of said hand-wheel may disengage said pawl and said ratchet-wheel, a belt-pulley, gearing between said pulley and said worm-wheel, a second belt-pulley adapted to drive said spindle independently of said worm-wheel and means for automatically shifting a belt from one of said pulleys to the other, substantially as described.

7. In variable-speed gearing, in combination, a spindle, a worm-wheel loosely mounted thereupon, a clutch adapted to connect said worm-wheel with said spindle, a worm meshing with said worm-wheel, a belt-pulley, means whereby said belt-pulley may drive said worm at different speeds, a second belt-pulley adapted to drive said spindle independently of said worm-wheel, and means for automatically shifting a belt from one of said pulleys to the other, substantially as described.

8. In a variable-speed gearing, in combination, a spindle, a worm-wheel mounted thereupon, mechanism between said worm-wheel and said spindle for connecting and disconnecting the same, a worm meshing with said worm-wheel, a belt-pulley, means whereby said belt-pulley may drive said worm at different speeds, a second belt-pulley adapted to drive said spindle independently of said worm, a clutch adapted to control the different speeds of said worm, and means for automatically controlling said clutch, substantially as described.

9. In variable-speed gearing, in combination, a spindle, a worm-wheel loosely mounted thereupon, a clutch between said worm-wheel and said spindle, a worm meshing with said worm-wheel, a belt-pulley, gears between said belt-pulley and said worm, whereby said worm may be driven at different rates of speed, a clutch adapted to control the operative connection of said gears, and a second belt-pulley adapted to drive said spindle independently of said worm, means for automatically controlling said clutch and means for automatically shifting the belt between said pulleys, substantially as described.

10. In variable-speed gearing, in combination, a driven shaft, a spindle, gearing between said driven shaft and said spindle, a belt-pulley, gearing between said belt-pulley and said spindle whereby the same may be driven at different rates of speed, clutches for controlling said different speed-gears, a second belt-pulley, and gearing between it and said spindle, a cam-wheel mounted upon said driven shaft, cams mounted upon said wheel, levers operated by said cams, connections between one of said levers and said clutches, a belt-shipper for said belt-pulleys and connections between another of said levers and the belt-shipper for said pulley, substantially as described.

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

FRANK L. TODD.

Witnesses:
N. L. BRESNAN,
ALBERT H. BATES.