No. 685,587. Patented Oct. 29, 1901.

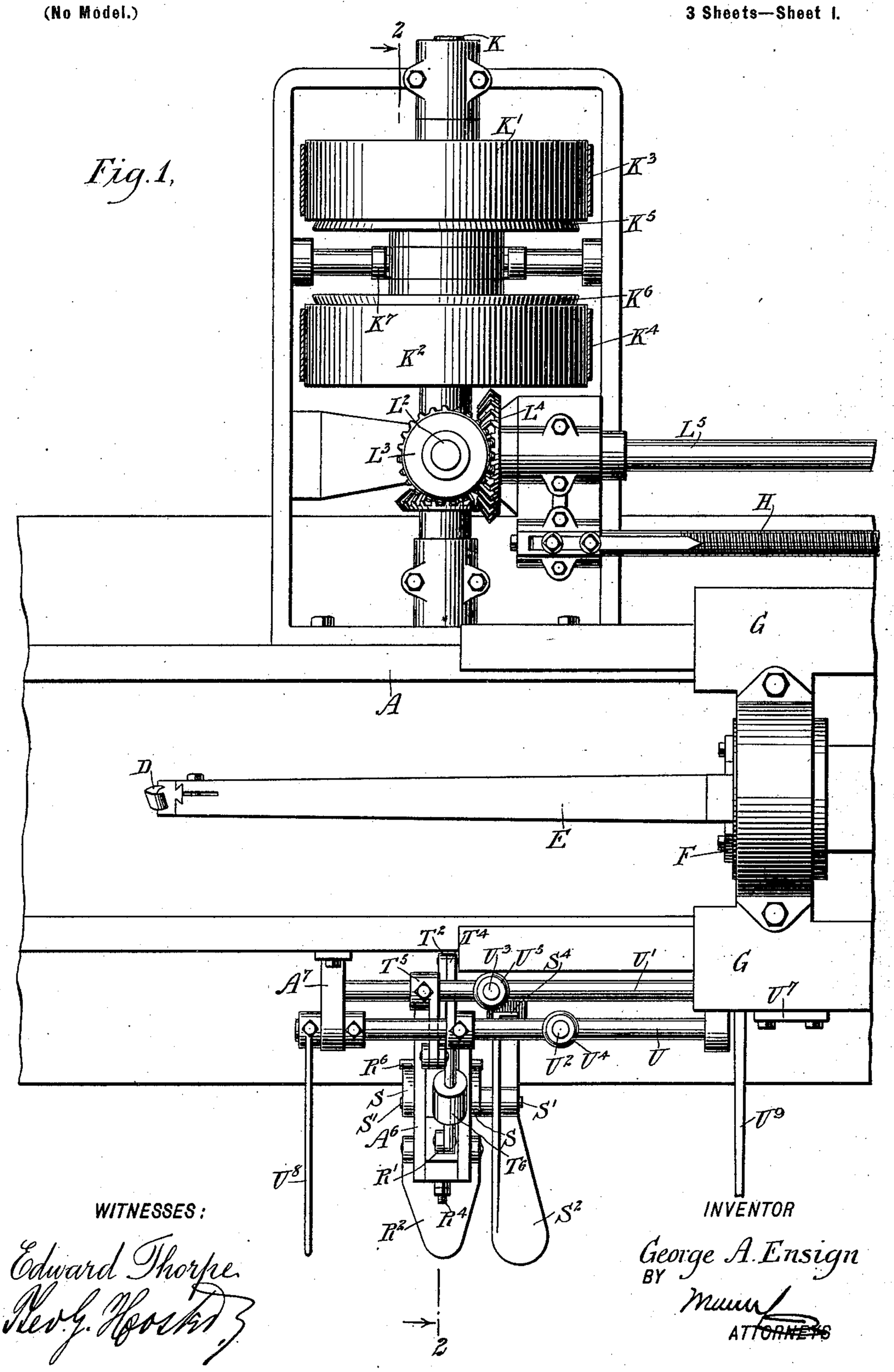
# G. A. ENSIGN.

## SPEED CHANGING MECHANISM.

(Application filed July 30, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.




WITNESSES:

Edward Thorpe.

Rev. J. Howard

INVENTOR

George A. Ensign

BY

Munn

ATTORNEYS

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# G. A. ENSIGN.

## SPEED CHANGING MECHANISM.

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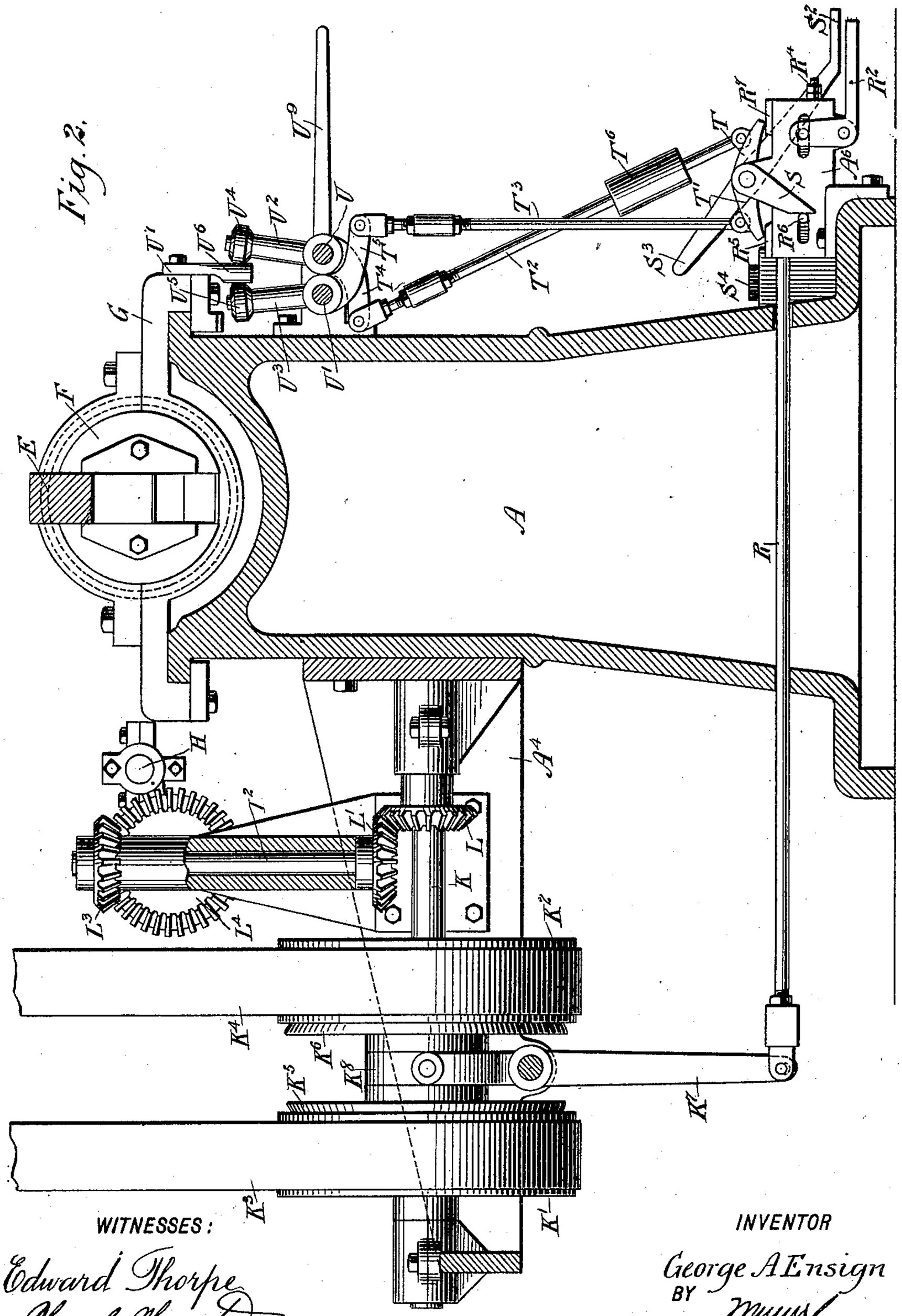
(No Model.) 3 Sheets—Sheet 2.

Fig. 2.




WITNESSES:

Edward Thorpe

Rud. G. Hoster

INVENTOR

George A Ensign

BY Munn & Co

ATTORNEYS

No. 685,587. Patented Oct. 29, 1901.

# G. A. ENSIGN.

## SPEED CHANGING MECHANISM.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

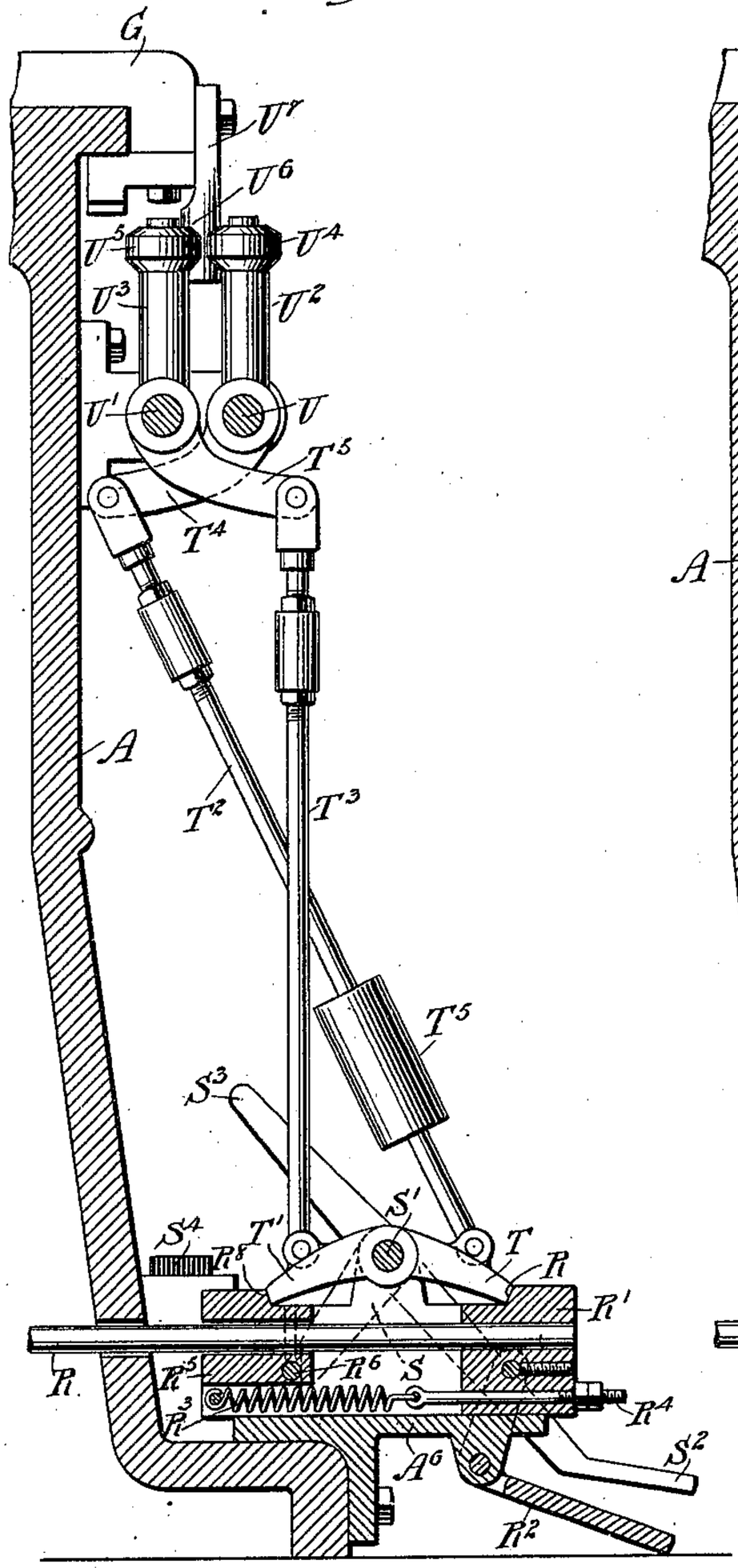
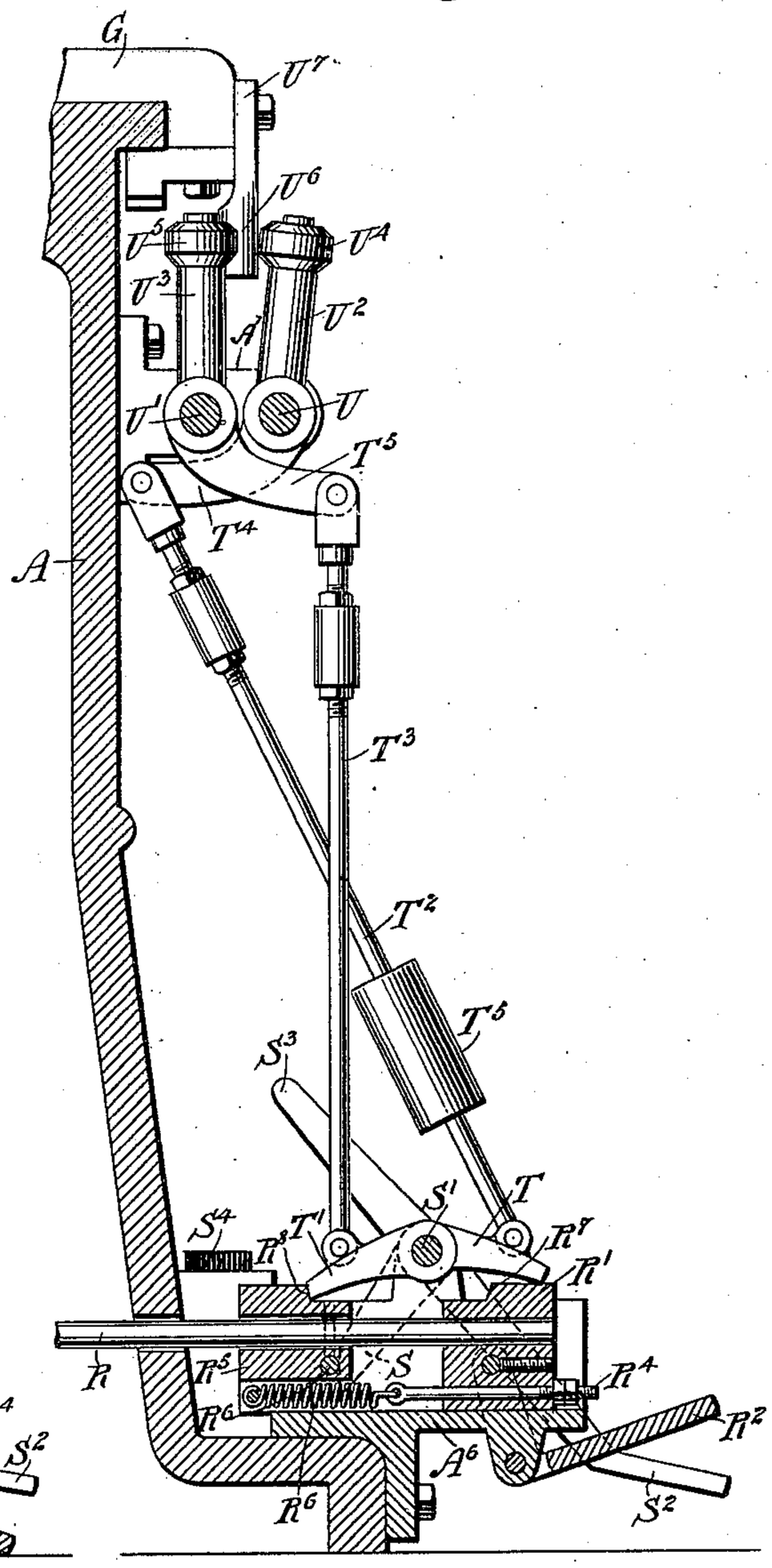



Fig. 4.




WITNESSES:

Edward Thorpe.

Rev. G. Hoskins.

INVENTOR

George A. Ensign

BY

Munn & Co.

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

GEORGE A. ENSIGN, OF DEFIANCE, OHIO, ASSIGNOR TO THE DEFIANCE MACHINE WORKS, OF DEFIANCE, OHIO, A CORPORATION OF OHIO.

## SPEED-CHANGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 685,587, dated October 29, 1901.

Original application filed April 9, 1901, Serial No. 55,022. Divided and this application filed July 30, 1901. Serial No. 70,271. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE A. ENSIGN, a citizen of the United States, and a resident of Defiance, in the county of Defiance and State of Ohio, have invented a new and Improved Speed-Changing Mechanism, of which the following is a full, clear, and exact description, this being a division of the application for Letters Patent of the United States for an axle-shaping machine, Serial No. 55,022, filed by me April 9, 1901.

The object of the invention is to provide a new and improved speed-changing mechanism which is simple and durable in construction, very effective in operation, and arranged to automatically change the speed of a carriage or other movable part of the machine while traveling in one direction and to stop the carriage or movable part whenever it reaches the end of its stroke.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the improvement as applied to an axle-shaping machine such as shown in the application above referred to. Fig. 2 is a transverse section of the same on the line 2 2 in Fig. 1. Fig. 3 is an enlarged transverse section of the improvement, and Fig. 4 is a similar view of the same with parts in a different position.

The speed-changing mechanism may be applied to various machines. As represented in the drawings, it is shown applied to an axle-shaping machine having a bed A, on which is mounted to reciprocate a carriage G, automatically fed forward by a suitable feed mechanism, of which the feed-screw H is shown, the carriage being quickly returned by hand. The carriage supports a revoluble carrier F for a cutter-bar E, provided at its free end with a cutter D for cutting and shaping the rough end of a wooden axle. The feed mechanism for the carrier F and the carriage G is driven from the main shaft K, (see Figs. 1 and 2,) journaled in suitable bearings carried on a bracket $A^4$, attached to the rear of the bed A, and on said shaft K are mounted to turn loosely pulleys K' $K^2$, of which the pulley K' is connected by a belt $K^3$ with a large pulley on a counter-shaft, (not shown,) and the other pulley $K^2$ is connected by a belt $K^4$ with a small pulley on said counter-shaft, so that when the latter is rotated the pulley K' is rotated at a higher rate of speed than the pulley $K^2$. The pulleys K' $K^2$ are adapted to be engaged by friction-clutches $K^5$ $K^6$, connected with each other and mounted to slide on and to turn with the shaft K, a shifting lever $K^7$ engaging the hub $K^8$, common to said clutches $K^5$ $K^6$, to move either of the latter into frictional engagement with the corresponding pulley K' or $K^2$, and thereby rotate the shaft K at a high rate of speed during the time the cutter D cuts one portion of the axle C or to rotate the shaft K at a low rate of speed during the time the cutter D cuts another portion of the axle. When the lever $K^7$ is in a central position, as shown in Fig. 2, then both clutches $K^5$ $K^6$ are out of frictional engagement with their pulleys K' $K^2$, and the shaft K is now at a standstill.

On the shaft K is secured a bevel gear-wheel L, in mesh with a bevel gear-wheel L', secured on the lower end of a vertically-disposed shaft $L^2$, journaled in suitable bearings carried by the bracket $A^4$. On the upper end of the shaft $L^2$ is secured a bevel-pinion $L^3$, in mesh with a bevel gear-wheel $L^4$, fastened on the forward end of a shaft $L^5$, extending longitudinally and mounted to turn in suitable bearings carried by the bed A. This shaft $L^5$ is geared to the carrier F and to the feed-screw H by gearing (not shown) to rotate the carrier and the feed-screw for the latter to automatically feed the carriage G forward.

In order to actuate the shifting lever $K^7$ for starting the machine by the operator and in order to automatically shift the double clutch $K^5$ $K^6$ from the carriage G to run the machine at a low rate of speed at the time the cutter

D has finished one portion of the axle and has started on the other portion, the following arrangement is made: The shifting lever $K^7$ is pivotally connected with the rear end of a rod R, extending transversely through suitable openings in the bed A to connect at the forward end with a block R′, mounted to slide transversely in suitable guideways formed in a bracket $A^6$, secured to the front of the bed A. This block R′ is pivotally connected with a treadle $R^2$, fulcrumed on the bracket $A^6$ and adapted to be pressed by the operator to slide the block R′ into a forward position against the tension of a spring $R^3$, secured at its forward end on a rod $R^4$, adjustably held in the block R′. The rear end of the spring $R^3$ is secured to a second block $R^5$, likewise mounted to slide in the guideway of the bracket $A^6$ in the rear of the block R′, and this block $R^5$ is provided with a longitudinal pin $R^6$, extending through elongated slots in the sides of the guideway of the bracket $A^6$, as is plainly shown in Fig. 2, and the outer ends of said pin $R^6$ are adapted to be engaged by arms S, secured on a shaft S′, mounted to turn in suitable bearings carried on the guideway of the bracket $A^6$. A treadle $S^2$ is secured on this shaft S′ and is under the control of the operator, and said treadle is formed with an extension $S^3$, adapted to rest on a rubber block $S^4$, carried by the bracket $A^6$ and serving to limit the upward-swinging motion of the treadle $S^2$. The tops of the blocks R′ $R^5$ are formed with shoulders $R^7$ $R^8$, respectively adapted to be engaged by dogs T T′, loosely fulcrumed on the shaft S′, so that when the operator presses the treadles $R^2$ and $S^3$ and causes the blocks R′ and $R^5$ to slide in opposite directions then the dogs T T′ drop and by their free ends engage the shoulders $R^7$ $R^8$ to lock the blocks R′ $R^5$ in position against the tension of the spring $R^3$, as is plainly indicated in Fig. 3. The dogs T T′ are pivotally connected by upwardly-extending links $T^2$ $T^3$ with arms $T^4$ $T^5$, secured on longitudinally-extending shafts U U′, mounted to turn in suitable bearings carried by brackets $A^7$, attached to the bed A. On the shafts U U′ are adjustably held upwardly-extending arms $U^2$ $U^3$, carrying at their upper ends friction-rollers $U^4$ $U^5$, adapted to be engaged by a pin $U^6$, depending from a bracket $U^7$, secured to the front of the carriage G. Now when the carriage G moves forward the depending pin $U^6$ first comes in contact with the friction-roller $U^4$ and imparts an outward-swinging motion to the arm $U^2$ to rock the shaft U, and thereby give an upward-swinging motion to the arm $T^4$ to cause the link $T^2$ to swing the dog T upward out of engagement with the shoulder $R^7$, and thereby release the block R′, which is now pulled inward by the action of the spring $R^3$. The inward movement of the block R′ causes the rod R to impart a swinging motion to the shifting lever $K^7$ to move the double clutch out of engagement with the pulley K′ and into engagement with the pulley $K^2$ to rotate the shaft K at a low rate of speed. The arm $U^2$ is so adjusted on the shaft U that the above-described movement takes place at the time that the cutter D has finished one end of the axle and starts on the other portion of the axle. When the oblong portion of the axle has been finished by the cutter D, then the depending pin $U^6$ moves in engagement with the friction-roller $U^5$ to swing the arm $U^3$ transversely, and thereby rock the shaft U′, so that the arm $T^5$ is swung upward, and its link $T^3$ imparts an upward-swinging motion to the dog T′ to release the block $R^5$, so that the block R′ is relieved from the tension of the spring $R^3$, and the said blocks R′ $R^5$, the rod R, the lever $K^7$, and the friction-clutches $K^5$ $K^6$ move to a central position, and the clutches $K^5$ $K^6$ are now out of frictional engagement with the pulleys K′ $K^2$, so that the shaft K comes to a standstill, and with it the working parts of the machine. The link $T^2$ is provided with a weight $T^6$ for holding the dog T securely in a locked position against the shoulder $R^7$ of the block R′. The ends of the shafts U U′ are provided with handles $U^8$ $U^9$, adapted to be taken hold of by the operator to enable the latter to turn said shafts whenever desired to actuate the shifting lever $K^7$ and throw the clutches $K^5$ $K^6$ in or out of mesh with the pulleys K′ $K^2$.

The operation is as follows: When the carriage G has been moved into a lowermost starting position, then the operator presses the treadles $R^2$ $S^2$ to slide the blocks R′ $R^5$ in opposite directions and lock the same in place by the dogs T T′. The outer end of the block R′ causes a pull on the rod R, so that the lever $K^7$ is swung to throw the clutch $K^5$ in engagement with the high-speed pulley K′, so that the shaft K is now rotated, and with it the shaft L′, which in turn drives the screw-shaft H and the carrier F. When the cutter D reaches the end of the first part of the axle, then the arm $U^7$ acts on the friction-roller $U^4$ to shift the clutch device, so that the speed of the shafts $K^7$ and $L^5$ and that of the feed-screw H and the carriage G is reduced, as above explained. The second portion of the axle is now formed under reduced speed on the turning and forward movement of the cutter D. When this portion of the axle is finished, the arm $U^7$ engages the friction-roller $U^5$ to release the block $R^5$ and cause the friction-clutch to assume its former or central position. The shaft K now comes to a standstill.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A speed-changing mechanism, comprising a shaft, pulleys loose on said shaft and driven at different speeds, a double friction-clutch mounted to slide on and to turn with said shaft and adapted to be thrown in mesh with either of said pulleys, a shifting lever for said double clutch, a sliding block con-

nected with said shifting lever, a second sliding block having a spring connection with said first-named sliding block, means for moving said blocks in opposite directions, locking-dogs for engaging and locking the blocks in an outermost position, and means for successively throwing the dogs out of engagement with said blocks, as set forth.

2. A speed-changing mechanism, comprising a shaft, pulleys loose on said shaft and driven at different speeds, a double friction-clutch mounted to slide on and to turn with said shaft and adapted to be thrown in mesh with either of said pulleys, a shifting lever for said double clutch, a sliding block connected with said shifting lever, a second sliding block having a spring connection with said first-named sliding block, means for moving said blocks in opposite directions, locking-dogs for engaging and locking the blocks in an outermost position, and means for successively throwing the dogs out of engagement with said blocks, the last-mentioned means comprising rock-arms adapted to be successively rocked from a moving part of the machine, and links connecting said rock-arms to said dogs, as set forth.

3. A speed-changing mechanism having a setting device for a double clutch, comprising a pair of sliding blocks, one of which is connected with the shifting lever of the clutch, means for moving the blocks apart, and dogs for engaging the blocks when moved apart, to hold the same locked in this position, as set forth.

4. A speed-changing mechanism having a setting device for a double clutch, comprising a pair of sliding blocks, one of which is connected with the shifting lever of the clutch, means for moving the blocks apart, dogs for engaging the blocks when moved apart, to hold the same locked in this position, and means for successively throwing said dogs out of engagement with the blocks, as set forth.

5. A speed-changing machine having a setting device for a double clutch, comprising a pair of sliding blocks, one of which is connected with the shifting lever of the clutch, treadles for moving the blocks apart, dogs for engaging the blocks when moved apart to hold the same locked in this position, means for successively throwing the dogs out of engagement with said blocks, and a spring connecting the blocks with each other, as set forth.

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

GEORGE A. ENSIGN.

Witnesses:

GEO. W. DEATRICK,

JOSEPH BAUER.