Apr. 17, 1923. 1,451,722

F. A. VALENTINE

SPEED CHANGING MECHANISM

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Fig. 1

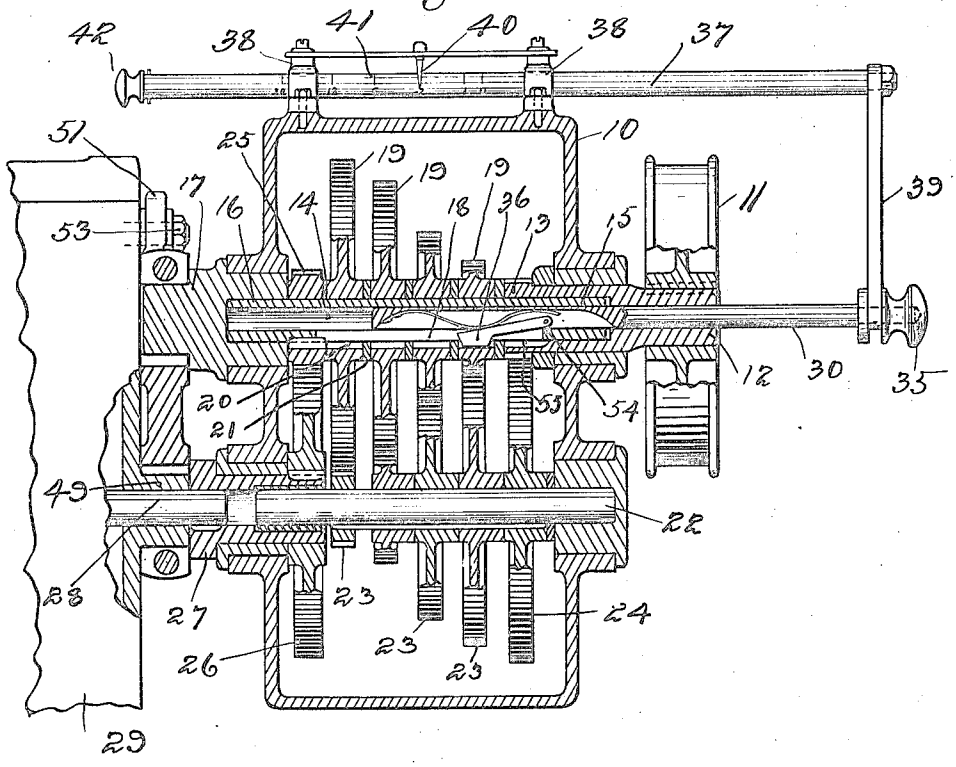



Fig. 2

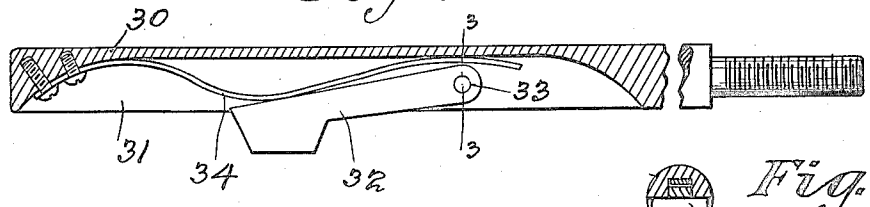



Fig. 3

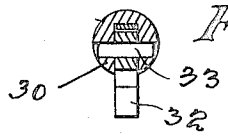
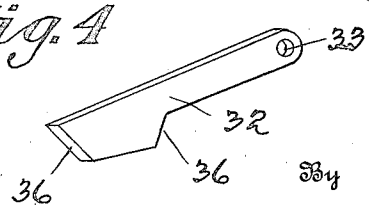



Fig. 4




Inventor

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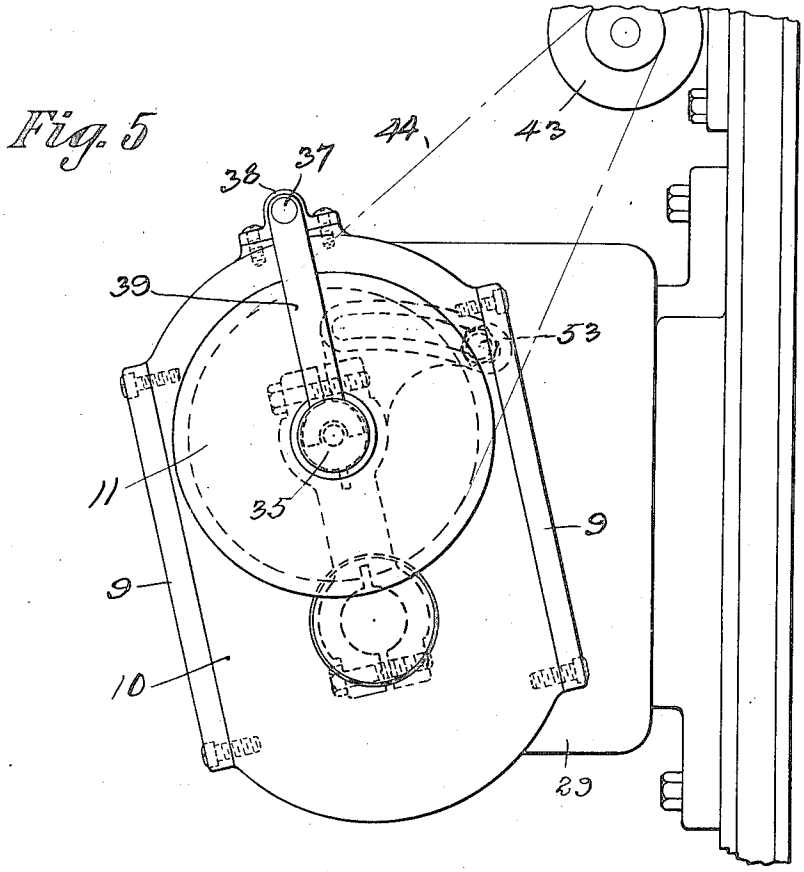
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Fig. 5



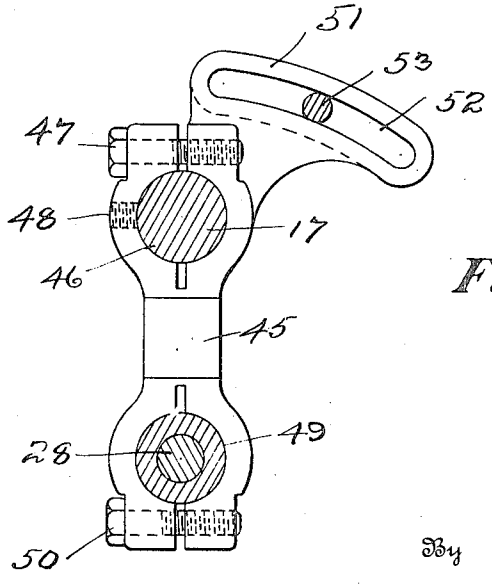




Fig. 6

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Patented Apr. 17, 1923. 1,451,722

# UNITED STATES PATENT OFFICE.

FRANK A. VALENTINE, OF APPONAUG, RHODE ISLAND, ASSIGNOR TO HENRY L. SCOTT & COMPANY, OF PROVIDENCE, RHODE ISLAND, A COPARTNERSHIP COMPRISING HENRY L. SCOTT AND DAVID C. SCOTT.

## SPEED-CHANGING MECHANISM.

Application filed April 27, 1920. Serial No. 376,904.

*To all whom it may concern:*

Be it known that I, FRANK A. VALENTINE, a citizen of the United States, and resident of Apponaug, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Speed-Changing Mechanism, of which the following is a specification.

This invention relates to speed-changing mechanism, and has for its object to provide an improvement in such mechanism, which comprises essentially a casing in which a plurality of gears of different speed ratios are mounted, means also being provided for readily engaging any one of the several sets of gears for varying the driving speed through this mechanism, and an indicating device being also connected to the changing mechanism for indicating the speed ratio whereby the desired driving speed may be at once readily obtained.

A further object of the invention is the provision of means whereby the casing in which the mechanism is mounted may be readily adjusted for the purpose of tightening the belt on the driving pulley.

The nature and advantages of the invention will be better understood when the following detail description is taken in connection with the accompanying drawings, the invention residing in the combination and arrangement of parts as claimed.

In the drawings forming part of this application, like numerals of reference indicate similar parts in the several views and wherein:—

Figure 1 is a sectional side elevation of my improved speed-changing mechanism shown as applied to the drive shaft of a testing machine.

Figure 2 is an enlarged section through the shift rod, showing the spring-actuated key-pawl carried therein.

Figure 3 is an end section on line 3—3 of Figure 2.

Figure 4 is a perspective view of the key-pawl.

Figure 5 is a side elevation of the casing mounted on an adjustable supporting frame and swung off at an angle for the purpose of tightening the driving belt.

Figure 6 is a side elevation of the adjustable supporting frame on which the gear-casing is designed to be mounted.

With reference to the drawings 10 designates a casing in which the gears of different diameters are mounted to run in oil, which casing is provided with removable plates 9. A driving pulley 11 is mounted on the outer end of the driving trunnion 12, the inner end of which trunnion is provided with a driving pinion 13.

A hollow main driving shaft 14 is provided having one end 15 extending into a socket portion in said driving trunnion while the opposite end has a bearing at 16 in the member 17. This shaft is provided with a longitudinally-disposed, elongated key-way 18 and on this shaft is loosely mounted a plurality of gears 19 of different diameters, each being provided with a key-way 20 and the hubs on these gears are separated by means of a thin washer 21 which shuts off the communication of the key-ways 20 between the different hubs.

A jack-shaft 22 is mounted in the lower portion of this casing 10 and is driven from pinion 13 through large gear 24 and is also provided with a set of gears 23 of different diameters engaging the opposite gears 19 on the main shaft 14, each of which gears is keyed to this jack-shaft. A main driving pinion 25 is keyed to the inner end of this main shaft and a main driving gear 26 is keyed to the power-transmitting hub 27, which hub is shown as being keyed to the drive shaft 28 of a testing machine 29 a portion only of which is shown.

In order to provide a simple means of positively connecting the main shaft to any one of the several sets of intermediate sets of gears whereby the driving speed through gears 25 and 26 may be varied, I have constructed a shift rod 30 having an elongated slot 31 in its side in which slot is mounted a pawl-shaped key 32 pivoted at 33 in said rod, which pawl is pressed downwardly by means of the flat spring 34 to cause it to engage the key-way 20 of any of the several sets of gears 19, the outer end of this shift rod extending through the hollow driving trunnion 12 and is provided with an operating head or handle 35 fixed to its outer end whereby it may receive a longitudinal movement to cause the key-pawl to engage the gear key-way to drive through the desired set of intermediate gears.

In order that this key-pawl may be lifted

out of one key-way to be dropped into the key-way in the next gear, I have beveled the ends of the key at 36 whereby an endways movement of the shift-rod causes this pawl to ride upon the spacing washer 21 located between the different gears and then drop under action of its spring 34 into the next gear key-way and so connect that gear to the main shaft.

It has been found in practice to be of advantage to provide means whereby the different speed ratios transmitted at the different positions of the shift-rod may be visibly indicated, to accomplish which I have constructed a gage-rod 37 and mounted it in bearings 38 upon the casing 10, one end of which rod is connected by means of the arm 39 to the head 35 of the shift-rod. A pointer 40 is mounted on the bearings 38 and the gage rod is graduated at 41 whereby the speed ratio of the set of driving gears engaged, is indicated.

Another advantage of this gage-rod is that by mounting it upon the casing its free end 42 extends in a direction opposite to the shift-rod and in position to be readily engaged by the hand of the operator who may be working on the left side of the machine, to either stop the machine or shift its working speed without being obliged to walk around to the other side of the machine to reach the shift-rod itself.

This speed-changing mechanism is usually driven from an electric motor 43 through a belt 44 and as it is found in practice necessary that this belt should be kept at exactly the proper tension during a testing operation it is found advisable to provide means whereby the position of the pulley 11 may be shifted relative to that of the motor. Therefore to accomplish this in a simple and effective way I have provided a frame member 45 having a socket 46 in which the trunnion member 17 is mounted and secured by means of the binding bolt 47 and set screw 48. The lower end of this frame is then mounted on the bearing 49 which extends from the side of the testing machine casing 29 to which it is secured in any desired adjusted position by means of the binding screw 50. This frame is also provided with a segmental guide member 51 slotted at 52 through which a binding bolt 53 is passed whereby after the casing has been swung off at the required angle to tighten the belt this bolt may be set up to bind and secure the device in such adjusted position.

By the use of my improved speed-changing mechanism the different driving speeds may be readily obtained by simply moving the shift-rod either in or out. When desired the fastest speed is obtained by moving the key into engagement with pinion 13 thus driving direct through main shaft, the jack shaft then running idle. The slowest driving speed is obtained by moving this key into engagement with the largest gear at the other end of the main shaft at which time the main shaft is driven from the smallest pinion on the jack shaft. When it is desired to completely arrest the rotation of the driving mechanism it is only necessary to either withdraw the shift-rod to the extreme right which causes the key-pawl to ride up upon the edge 54 of the hollow shaft thereby lifting the key from engagement with the key-way 55 of pinion 13 and the same result is effected when the shift-rod is forced way in causing the key-pawl to ride up on the extreme inner end of the long key-way 18. In either case all of the intermediate gears on the main shaft are disconnected therefrom.

The mechanism is extremely simple in construction and effective in its operation and by its use a positive connection may be made with any one of the different sets of intermediate gears.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. A speed-changing mechanism comprising an oil-tight casing carrying a main shaft and a jack shaft, main drive gears, a plurality of pairs of intermediate intermeshing gears mounted on said shafts, adjustable means carrying a pawl key for positively engaging any one of said several sets of intermediate gears for varying the working speed of said drive gears, and an indicating member supported independently of the adjusting means and operated by the endways movement of said last named means for indicating the speed ratio of that set of gears at work.

2. A speed-changing mechanism comprising an oil-tight casing, a hollow main shaft and a jack shaft in said casing, main drive gears, a plurality of sets of intermediate gears on said shafts, a shift rod in said main shaft, a spring-pressed pawl-key carried by said rod, spacing washers between said gears whereby an endways movement of said rod may lift said key from one gear to drop into engagement with another to engage any one of said sets of intermediate gears to vary the working speed of said drive gears, and a gage rod slidably mounted on the outside of the casing and operable by an endways movement of said shift-rod.

3. A speed-changing mechanism comprising a casing, a hollow main shaft and a jack shaft in said casing, main drive gears, a

plurality of sets of intermediate gears on said shafts, a shift-rod in said main shaft, a pawl-key carried by said rod, means whereby an endways movement of said rod may cause said key to engage any one of said sets of intermediate gears to vary the working speed of said drive gears, and a graduated gage-rod operated by the endways movement of said shift-rod to indicate which set of intermediate gears are working.

4. A speed-changing mechanism comprising a casing, a main and a jack shaft in said casing, a pulley on said main shaft, main drive gears, a plurality of intermediate gears mounted on said shafts, means for engaging any of said sets of intermediate gears to vary the working speed of said drive gears, a power transmission shaft, and means whereby said casing may be adjusted about the axis of said transmission shaft to tighten the belt on said pulley.

5. A speed-changing mechanism comprising a casing, a main and a jack shaft in said casing, a pulley on said main shaft, main drive gears, a plurality of intermediate gears mounted on said shafts, means for engaging any of said sets of intermediate gears to vary the working speed of said drive gears, a power transmission shaft, and an adjustable arm supporting said casing in the desired adjusted position about the axis of said transmission shaft to tighten the belt on said pulley.

6. A speed-changing mechanism comprising a casing, a main and a jack-shaft in said casing, a pulley on said main shaft, main drive gears, a plurality of intermediate gears mounted on said shafts, means for engaging any of said sets of intermediate gears to vary the working speed of said drive gears, a power transmission shaft, an adjustable arm supporting said casing in the desired adjusted position about the axis of said transmission-shaft to tighten the belt on said pulley, and means for locking said arm in adjusted position.

In testimony whereof I affix my signature.

FRANK A. VALENTINE.