Aug. 14, 1945. J. L. CONNELL 2,382,608

HEADSTOCK

Filed Oct. 19, 1942 2 Sheets-Sheet 1

FIG.1.

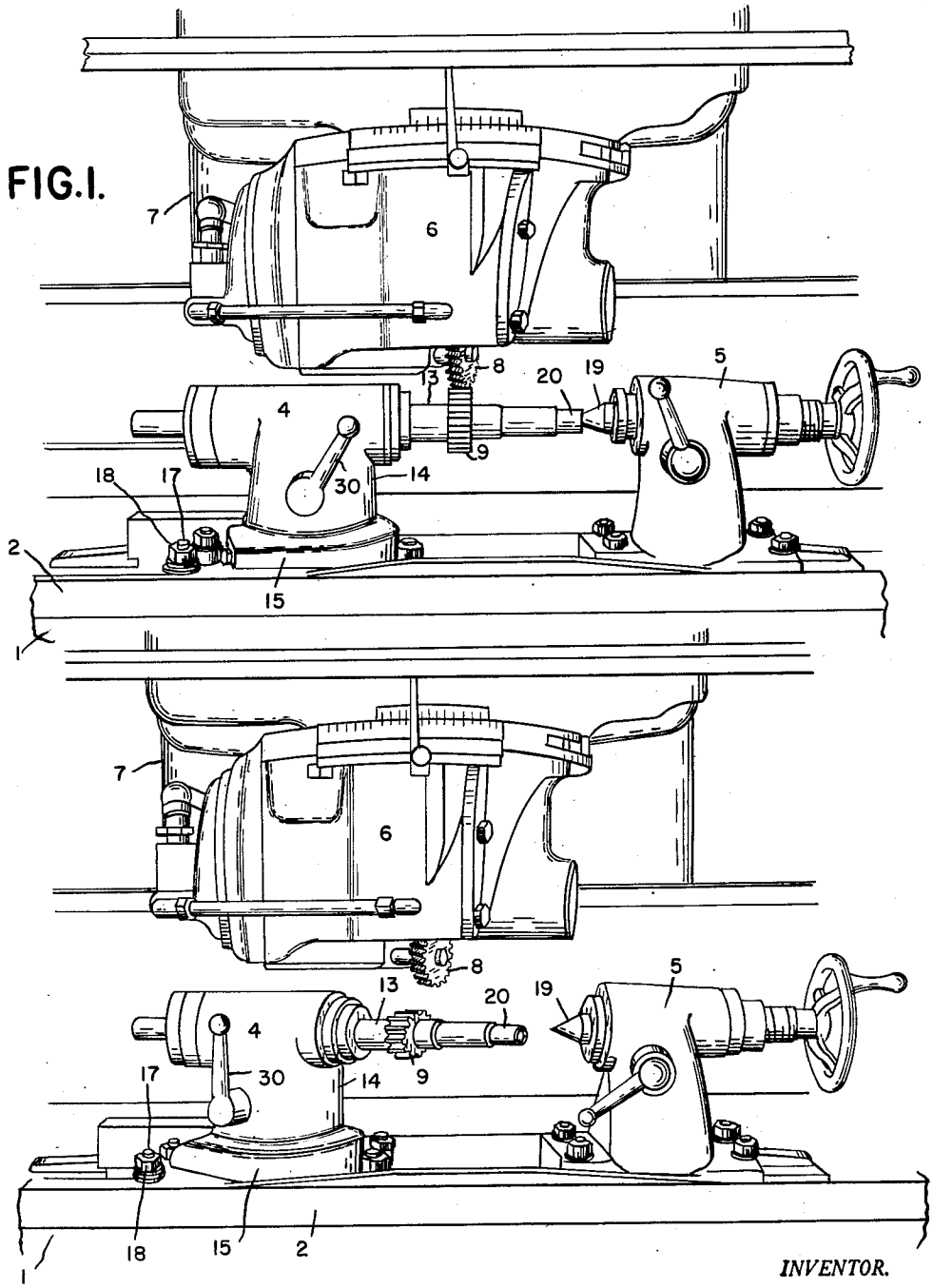


FIG.2.

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Filed Oct. 19, 1942 2 Sheets-Sheet 2

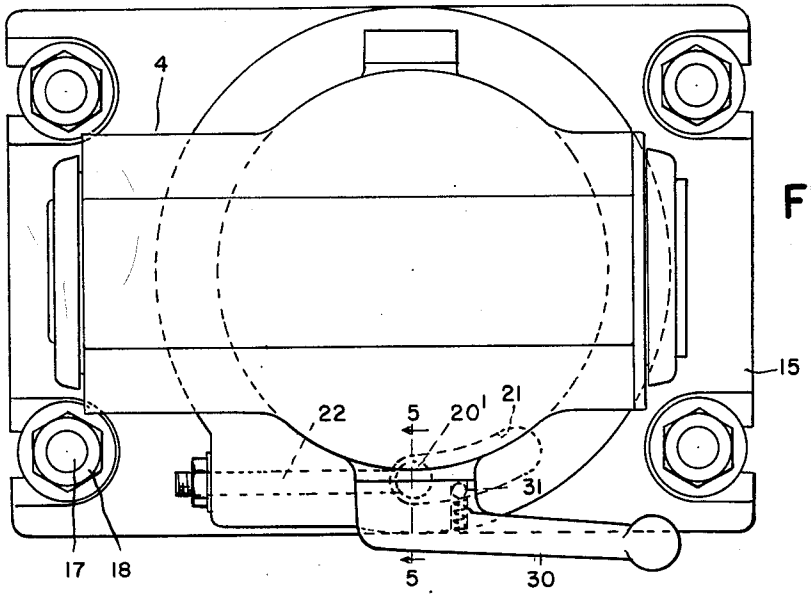


FIG.3.

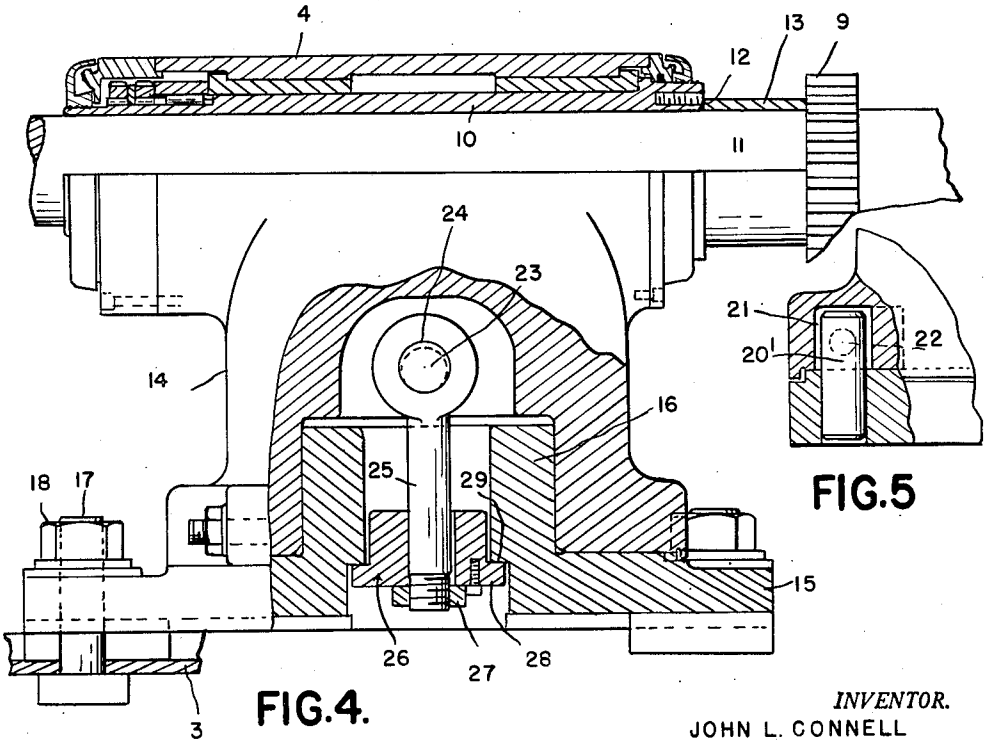


FIG.5.

FIG.4.

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2,382,608

HEADSTOCK

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Application October 19, 1942, Serial No. 462,593

3 Claims. (Cl. 90—1.6)

The invention relates to machines for finishing gears and refers more particularly to the mounting for the gears to be finished.

Heretofore, in the finishing of gears unitary with relatively long shafts, the usual practice has been to locate the gear near the headstock with the portion of the shaft at one side of the gear extending through the headstock and the other portion of the shaft engaging the center of the tailstock. To remove the shaft and gear unit the headstock has been moved away from the tailstock a distance sufficient to pull the shaft out of the headstock and then another shaft and gear unit could be mounted in the headstock and the latter moved to a position to provide for engagement of the shaft by the center of the tailstock and to register the gear with the finishing tool.

The present invention has for one of its objects to so construct the mounting for the shaft and gear unit that the unit may be mounted in place and removed without disturbing the normal setting of the machine, whereby the gear will be accurately positioned with respect to the finishing tool.

The invention has for another of its objects to so construct the mounting that the shaft and gear unit may be readily and quickly mounted in place and removed.

The invention has for a further object to so construct the headstock forming part of the mounting that the spindle of the headstock for receiving the shaft is rotatable about the base of the headstock to provide for mounting and removing the unit.

These and other objects of the invention will become apparent from the description and claims, when taken in conjunction with the drawings, in which

Figure 1 is a front elevation of a gear finishing machine embodying the invention and showing the parts in operative relation;

Figure 2 is a similar view showing the parts in inoperative relation;

Figure 3 is a top plan view of the headstock of the machine;

Figure 4 is a side elevation thereof, partly in section;

Figure 5 is a cross section on the line 5—5 of Figure 3.

The gear finishing machine, as illustrated in Figures 1 and 2, is designed to finish external gears by shaving or lapping operations. More particularly, the machine comprises the table 1, the carriage 2 reciprocably mounted on the table and provided with the ways 3, the headstock 4 and the tailstock 5 mounted on the carriage ways, and the head 6 above the carriage. The table and head are mounted on the column 7 of the machine, the table being vertically adjustable and the head being rotatably adjustable about a vertical axis. The head carries the gear-like finishing tool 8 which is adapted to mesh with and finish the gear 9 mounted on the headstock and tailstock. The finishing tool and gear when in operative relation to each other have their axes inclined to each other and mesh at crossed axes, the angle of inclination being determined by the angular position of the cutter head. During the finishing operation, the finishing tool is positively rotated and rotates the gear and at the same time the carriage is reciprocated to relatively feed the finishing tool and the gear axially of the latter.

The above construction of the machine, including the mechanisms for rotating the finishing tool and reciprocating the carriage to thereby reciprocate the gear and its mounting is essentially the same as illustrated in the R. S. Drummond Patent No. 2,270,421, issued January 20, 1942. The finishing tool, as shown in the present instance, is a cutting tool, but a lapping tool may be equally well used.

To finish gears which are unitary with relatively long shafts, the mounting comprising the headstock and tailstock is constructed to provide for mounting the gear and shaft units and removing the same without disturbing the normal setting of the machine which accurately locates the gear with respect to the finishing tool. The headstock has the spindle 10 which is tubular or hollow from end to end to receive with a sliding fit the portion 11 of the shaft at one side of the gear 9. The end of the spindle facing the tailstock forms the abutment 12 for positioning the gear in predetermined operative relation to the finishing tool. The abutment may be directly engaged by the gear or, as shown in the present instance, the abutment is engaged by one end of the tubular spacer 13 which encircles the shaft portion 11 and which has its other end engaging the gear. The spindle is journaled in and extends horizontally through the upper portion of the housing 14 which is mounted on the base 15 and is rotatable about a vertical axis. As shown, the base has the upwardly extending annular flange 16 which is rotatably engaged by the lower portion of the housing. The base is suitably formed to engage the ways on the carriage and it is secured to the carriage in predetermined relation to the finishing tool by means of the bolts 17 and nuts 18 at its corners. The predetermined posi-

tion is such that when the shaft and gear unit is mounted on the headstock and the tailstock it will be accurately positioned with respect to the finishing tool so that the latter can properly finish the gear. This is the normal setting of the machine.

It will be noted that the tailstock 5 is of usual construction and has the axially adjustable center 19 for engaging the end of the portion 20 of the shaft at the side of the gear 9 opposite the portion 11.

To angularly position the spindle 10 in axial alignment with the center 19, the base 15 of the headstock is provided with the upwardly extending pin 20' which projects into the arcuate recess 21 formed in the lower portion of the housing 14 and which is engageable by the set screw 22 adjustably threaded in the lower portion of the housing.

To clamp the spindle 11 in its operative position, there is the shaft 23 extending transversely through and journaled in the housing 14 above the annular flange 16. This shaft has substantially midway of its ends the eccentric portion 24 which is engaged by the eye of the depending rod 25 which supports the clamping block 26 through the nut 27 threaded upon the lower end of the rod. The clamping block is formed with the annular flange 28 which upon raising of the clamping block is adapted to engage the annular shoulder 29 formed on the base 15. It will be noted that the rod extends through the annular flange 16 of the base. 30 is a hand lever secured to one end of the shaft 23 for rotating the shaft to either a position releasing the clamping block from the base or a position holding the clamping block tightly against the base. The hand lever may be yieldably secured in either of these positions by suitable means, such as the spring-pressed ball 31 carried by the hub of the hand lever and adapted to extend into recesses in the portion of the housing opposite the hub.

With this construction and with the parts in operative position, as illustrated in Figure 1, it will be seen that by retracting the center 19 of the tailstock to the position illustrated in Figure 2 and then by swinging the hand lever 30 to release the clamping block 26 from the base 15 the housing 14 and the spindle 10, which at this time supports the shaft and gear unit, can be swung to the position illustrated in Figure 2, at which time the shaft and gear unit may be readily removed by pulling the shaft out of the spindle. Another shaft and gear unit may then be mounted by moving the shaft into the spindle until the gear contacts the spacer 13, at which time the gear is accurately spaced axially of the spindle. Then the housing, spindle, and shaft and gear unit can be swung to their operative positions axially aligning the shaft with the center of the tailstock as determined by the set screw 22 engaging the upright pin 20. Then the tailstock can be advanced into engagement with the shaft, after which the machine may be placed in operation to effect the finishing of the gear. It will be noted that the construction is such that the normal setting of the headstock to accurately position the gear in relation to the cutting tool is not disturbed during either the mounting or the removal of the shaft and gear unit.

What I claim as my invention is:

1. In a machine for finishing a tooth surface of a gear unitary with a relatively long shaft, the combination with a rotary finishing tool for the tooth surface and a tailstock having an axially movable center, of a headstock comprising a housing, a spindle journaled in said housing and hollow throughout its length for the passage therethrough of the gear shaft, said spindle guiding the gear shaft and having an abutment for positioning the gear in predetermined relation to and in mesh with said tool in the operative position of said spindle, a base on which said housing is mounted for angular movement through a path substantially parallel to the axis of said tool to provide for inserting and removing the gear and shaft, and means for securing said housing to said base in a rotative position of said housing locating said spindle in operative position in axial alignment with said center.

2. In a machine for finishing the teeth surfaces of a gear on a relatively long shaft, the combination with a rotary tool for meshing with the gear and finishing the teeth surfaces and a tailstock having an axially movable center, of a headstock comprising a base, a housing rotatably mounted on said base and a spindle journaled in said housing and movable with said housing through a path substantially parallel to the axis of said tool to provide for inserting and removing the gear and shaft, said spindle being hollow for the insertion thereinto of the gear shaft and serving to guide the gear shaft and to position the gear in predetermined relation to and in mesh with said tool when said spindle is in operative position.

3. In a machine for finishing a tooth surface of a gear unitary with a relatively long shaft, the combination with a gear finishing tool rotatable about a horizontal axis and a tailstock having an axially movable center, of a headstock comprising a base, a housing on said base rotatable about a vertical axis and a spindle horizontally journalled in said housing and rotatable about a vertical axis with said housing to provide for mounting and removing the gear and shaft, said spindle being hollow throughout its length for the passage thereinto of the gear shaft, said spindle having a sliding fit with the gear shaft and having an abutment for positioning the gear in predetermined relation to said base, said base being positioned to position the gear in predetermined relation to said tool when said spindle is in axial alignment with said center.

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