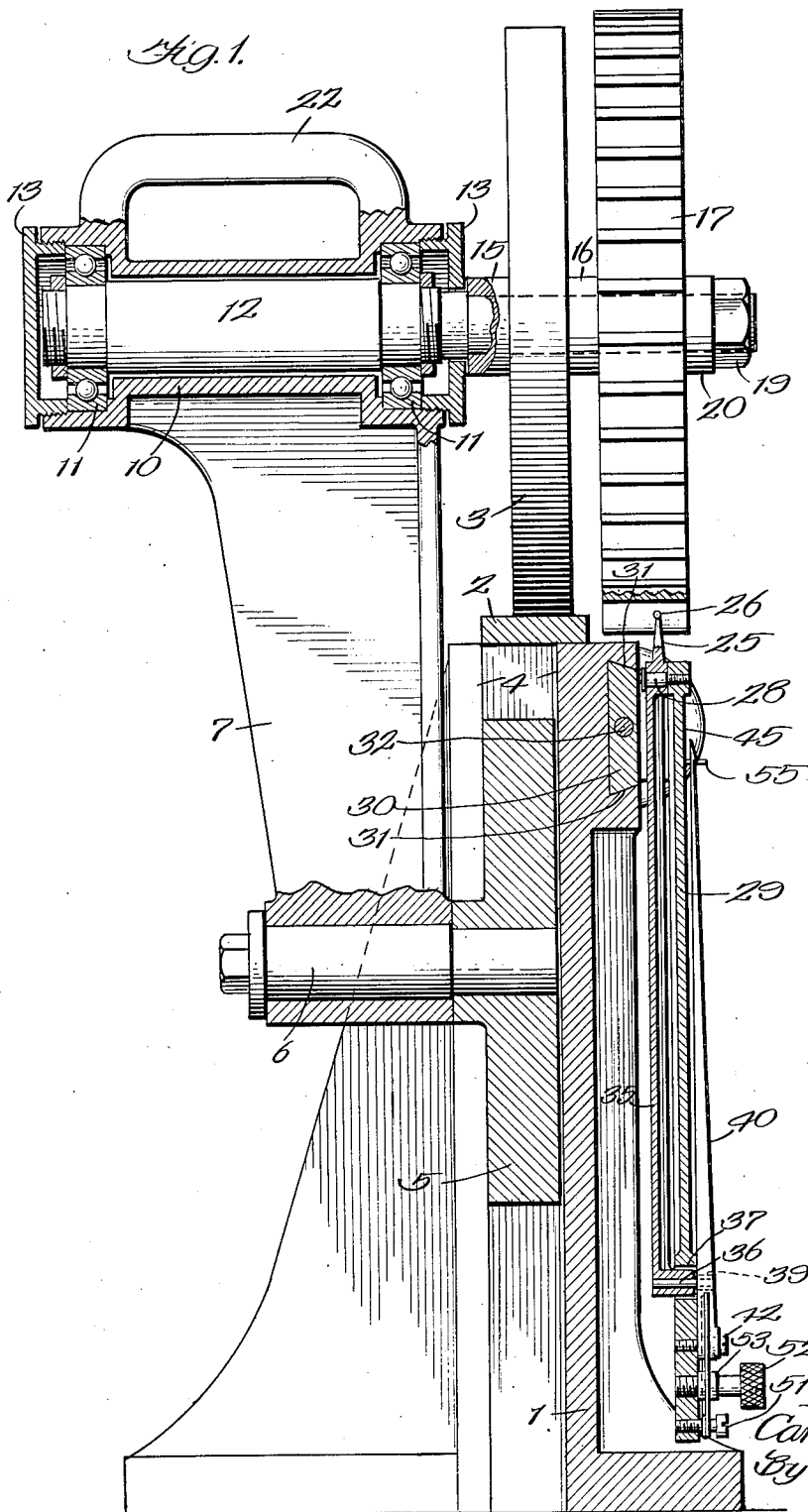


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APPLICATION FILED JAN. 23, 1919.

1,304,592.

Patented May 27, 1919.
2 SHEETS—SHEET 1.

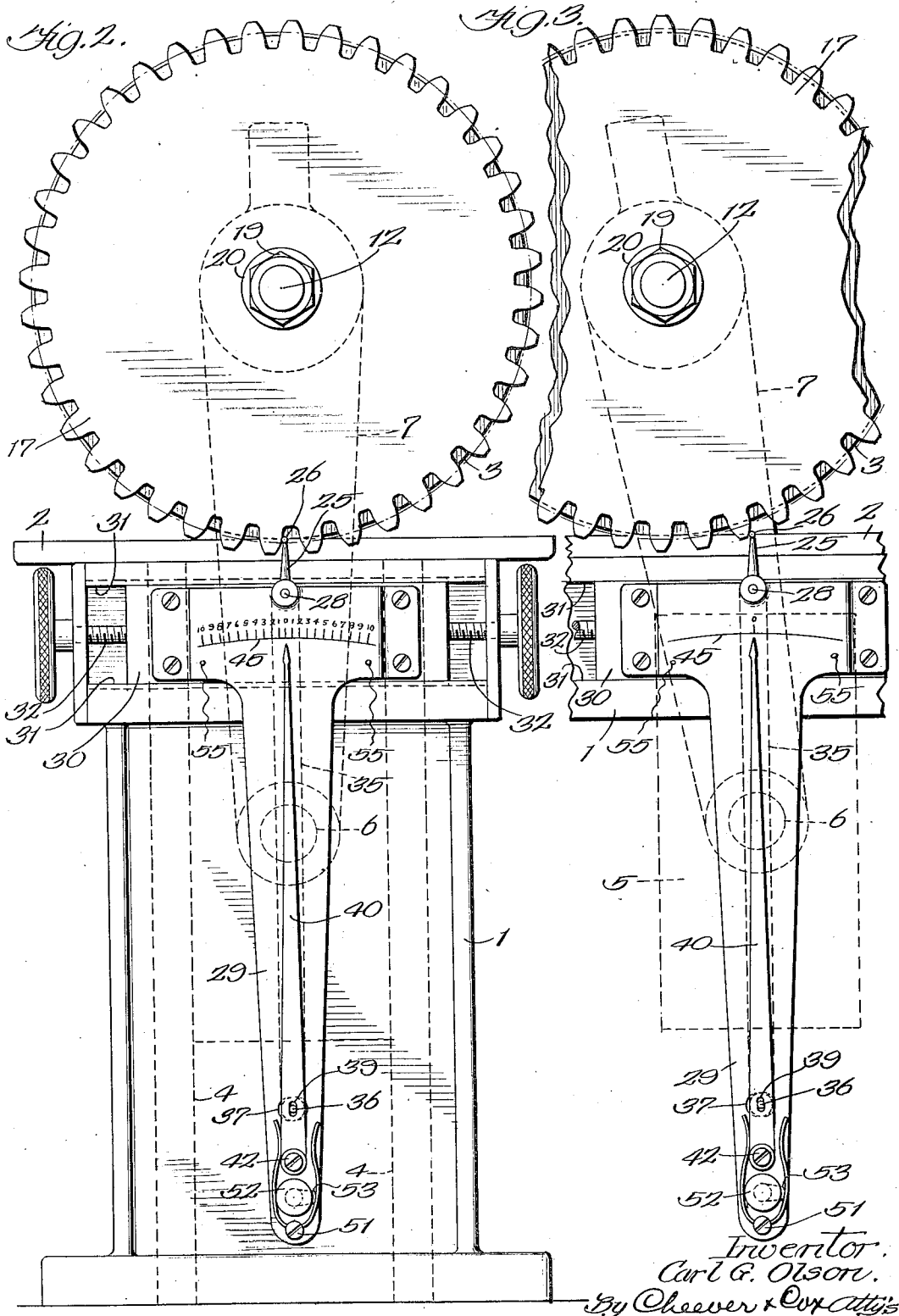


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UNITED STATES PATENT OFFICE.

CARL G. OLSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO ILLINOIS TOOL WORKS, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

GEAR-TESTING MACHINE.

1,304,592.

Specification of Letters Patent.

Patented May 27, 1919.

Application filed January 23, 1919. Serial No. 272,606.

To all whom it may concern:

Be it known that I, CARL G. OLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Gear-Testing Machines, of which the following is a specification.

My invention relates to testing machines and the object of the invention is to provide a machine adapted to test the accuracy of the teeth of involute gears, and to indicate the degree of aberration or inaccuracy of the teeth in case any exists. In accomplishing this object I have originated certain elements and combinations of elements which are illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of the machine, chiefly in central section.

Fig. 2 is a front elevation of the machine, and

Fig. 3 is a front elevation of certain of the cooperating elements in changed position.

Like numerals denote like parts throughout the several views.

In the form shown in the accompanying drawings the machine has an upright main frame 1 having a horizontal track 2 at the top for supporting the roller 3. The main frame has vertically arranged guides 4, 4 for guiding the cross head 5. This cross head carries a horizontally arranged stud 6 at the back which forms a pivot for the rocker arm 7. The function of the rocker arm is to cause the roller to travel in a predetermined path upon the track, and while the details may be varied I have shown a form in which the rocker arm has a housing 10 at its upper end supporting ball bearings 11 in which an arbor 12 is journaled. Screw caps 13, 13 screw into opposite ends of the housing for rendering the ball bearings dust proof. The roller is fastened to the arbor in such manner as to cause the arbor to rotate in its bearings as the roller rolls upon the track. On either side of the roller are spacing collars 15, 16, the latter forming an abutment for the gear 17 which is to be tested. Said gear is clamped into position by means of a nut 19 screwing on the threaded forward end of the arbor, and abutting the collar 20 which in turn abuts the hub of the gear. The gear is thus rigidly clamped

to the roller and moves in unison with it. The gear, and if desired the gear and roller, may be removed by simply removing the nut 19 and the collar 20 and slipping them and the gear and roller and collar 16 off over the forward end of the arbor.

A handle 22 is preferably formed integral with the rocker arm 7 for affording means whereby the operator may cause the roller to roll back and forth along the track.

At the front of the machine there is a contactor 25 having a head 26 for engaging the acting surface of the tooth being tested. Said head comes level with the surface of the track, the latter forming an analogue of a tangent to the base circle of the gear. The roller is analogous to the base circle of the gear. The contactor is pivotally mounted upon a stud 28 supported at the upper end of a panel 29. Said panel is rigidly fastened to a carriage 30 which travels in horizontal ways 31, 31 near the upper end of the main frame. The position of the carriage is controlled by adjusting screws 32, 32.

The contactor has an extension 35 which descends to a point near the bottom of the machine where it is provided with a pin 36 extending forward through a suitable aperture 37 in panel 29 and into a slot 39 formed in the pointer 40. Said pointer is fulcrumed upon a stud 42, screwing into the panel at a point slightly below pin 36. The pointer extends upward almost to the level of stud 28 where a scale 45 is marked upon the front surface of the panel. Thus any lateral movement of the lower end of the contactor is transmitted to the pointer and the leverages are such that the movement of the free end of the pointer will be greatly amplified. By this construction an amplification of 100 to 1 may be readily obtained.

Means are provided for yieldingly holding the contactor in engagement with the acting surface of the tooth. These are shown at the lower end of the panel, and consist of a double spring 50, which is fastened to the panel by means of a screw 51 and passes to the two sides of the pointer 40. A pin 52 is rotatably mounted in the panel between screw 51 and the lower end of the pointer. It is provided with a finger 53 which may be thrown into engagement with one side or the other of the spring. This causes the spring to press upon one side or the other of

the pointer, and when it is desired to have the spring press the pointer toward the left the finger is thrown toward the left which brings the right branch of the spring into engagement with the right side of the pointer, at the same time holding the left branch of the spring out of engagement with the left side of the pointer. By employing this expedient the contactor may be caused to press toward the left for engaging one side of a tooth, or to the right for engaging the other side of the tooth. Stop pins 55, 55 are placed on the panel near the ends of the scale for limiting the distance to which the pointer may swing.

Operation: When a gear is to be tested, a roller 3 is selected which will have the same diameter as the base circle of the gear. The gear is then secured to the gear carrier and the carriage 30 is adjusted until the contactor is in central position when in engagement with the acting surface of the tooth to be tested. This position is illustrated in Fig. 2. Under these conditions pointer 40 will, of course, also be at central position. When the machine is thus adjusted the operator grasps the handle 22 and slowly moves it in a direction to ultimately move the engaged tooth away from the contactor. Thus, in practice, if the contactor engages the right side of the tooth as in Fig. 2 the operator moves the gear carrier in a direction causing the roller to roll toward the left as in Fig. 3. Now, according to the theory of involute gears, if the tooth is perfect it will not cause any lateral movement of the contactor as the gear rolls away. But if the tooth is imperfect, the head of the contactor will be caused to move in one direction or the other, which will produce a corresponding but greatly magnified movement at the free end of the pointer. Thus the operator is able to readily detect any imperfections in the formation of the tooth. It will be seen that my device affords a simple and yet highly sensitive means for testing involute gears. Gears of various pitch diameter may be tested without changing anything except the size of the roller. If a roller of larger diameter is required the gear carrier automatically accommodates itself to it, for the larger roller will simply cause the cross head 5 to ride at a higher level in the machine. Conversely, a smaller roller will cause the cross head to ride at a lower level. As the parts are comparatively few in number and simple in configuration the machine is durable and comparatively simple to manufacture.

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

1. Gear testing apparatus having a contactor and means including a plane surfaced track, a roller adapted to roll on said track,

and means supported by the roller and adapted to impart a rolling movement to the gear to be tested while one of the teeth of said gear remains in engagement with the contactor, to thereby cause the contactor to move in case the tooth is out of true.

2. Gear testing apparatus having a member with a plane surface and a movable contactor adjacent thereto, a roller adapted to roll on said plane surface, and having a diameter corresponding to the pitch diameter of the gear to be tested, and means for mounting such gear concentric with said roller, so as to turn therewith, with one of its teeth in engagement with the contactor, to thereby cause the contactor to move in case the tooth is out of true.

3. A gear testing device having a contactor, a rolling gear carrier for holding the acting surface of a gear tooth in engagement with the contactor, a track upon which the gear carrier rolls, a pointer, and amplifying connections between the contactor and the pointer for exaggerating the amount of displacement of the contactor, if any.

4. In a gear testing machine, the combination of a gear carrier including a roller, and means for rolling it; a track for the roller; a contactor having an acting head opposite to the point of tangency of the roller on the track; and means for indicating the degree of displacement of the contactor, if any.

5. In a gear testing machine, the combination of a gear carrier including a roller, and means for rolling it; a track for the roller; a contactor having an acting head opposite to the point of tangency of the roller on the track; an indicator; and compound levers connecting the contactor with the indicator for amplifying the displacement of the contactor, if any.

6. A gear tester having a contactor, means including a roller and track for rolling the gear wheel relatively thereto with one of its teeth in engagement with the contactor, and means for yieldingly holding the contactor in normal position.

7. A gear tester having a contactor, means including a roller and track for rolling the gear wheel relatively thereto with one of its teeth in engagement with the contactor, an indicator connected to the contactor, and spring mechanism tending to hold the indicator centered.

8. A gear tester having a contactor, means including a roller and track for rolling the gear wheel relatively thereto with one of its teeth in engagement with the contactor, an indicator connected to the contactor for indicating the amount of displacement of the contactor, if any, a scale opposite to the indicator, and means yieldingly tending to hold the indicator centered with respect to the scale.

9. A gear tester having a main frame, a

gear carrier rolling thereon, a contactor for engaging the working surface of the gear teeth, and a carriage mounted on the main frame for supporting the contactor, said carriage being movable in a direction parallel to the tangent of the pitch circle of the gear for positioning the contactor relatively to the gear teeth.

10. A gear tester having a main frame, a gear carrier rolling thereon, a carriage traveling thereon in a direction parallel to the tangent of the pitch circle of the gear, a contactor articulately mounted upon the carriage, means on the carriage for normally holding the contactor in normal position, and means for adjusting the position of the carriage relatively to the main frame to thereby position the contactor relatively to the tooth to be tested.

11. A structure as specified in claim 10 in which there is a scale mounted on the carriage and a pointer adapted to cooperate therewith, the pointer being connected to the contactor for indicating on the scale the amount of displacement of the contactor, if any.

12. A gear tester having a main frame, a track formed thereon, a roller on the track, a gear carrier supported by the roller, means for causing the roller to roll upon the track in a predetermined path, a contactor, and means for supporting said contactor and adjusting it to the acting surface of the tooth being tested.

13. A gear tester having a main frame, a track formed thereon, a roller on the track, a gear carrier supported by the roller, means for causing the roller to roll upon the track in a predetermined path, a contactor, a carriage traveling on the main frame and adapted to support the contactor, and means for adjusting the carriage to bring the con-

tactor into engagement with the surface of the tooth to be tested.

14. A gear tester having a main frame, a track mounted thereon, a roller on the track, a gear carrier supported by the roller, a rocker arm for advancing the roller along the track, a cross head guided by the main frame, the rocker arm being pivoted to the crosshead for guiding the roller on the track, and a contactor mounted on the main frame in position to contact the acting surface of one of the teeth of the gear to be tested.

15. A gear tester having a main frame, a track mounted thereon, a roller on the track, a gear carrier supported by the roller, a rocker arm for advancing the roller along the track, a cross-head guided by the main frame, the rocker arm being pivoted to the crosshead for guiding the roller on the track, a contactor, a carriage mounted on the main frame for supporting the contactor, a pointer mounted on the carriage and actuated by the contactor for registering the aberration, if any, of the tooth being tested.

16. A gear tester having a main frame, a track mounted thereon, a roller on the track, a gear carrier supported by the roller, a rocker arm for advancing the roller along the track, a crosshead guided by the main frame, the rocker arm being pivoted to the crosshead for guiding the roller on the track, a contactor, a carriage mounted on the main frame for supporting the contactor, a pointer mounted on the carriage and actuated by the contactor for indicating the amount of movement of the contactor, if any, and means for yieldingly holding the contactor and pointer centered.

In witness whereof I have hereunto subscribed my name.

CARL G. OLSON