

No. 618,979.

Patented Feb. 7, 1899.

O. J. BEALE.  
MACHINE FOR GENERATING GEARING.

(Application filed June 8, 1898.)

(No Model.)

2 Sheets—Sheet 1.

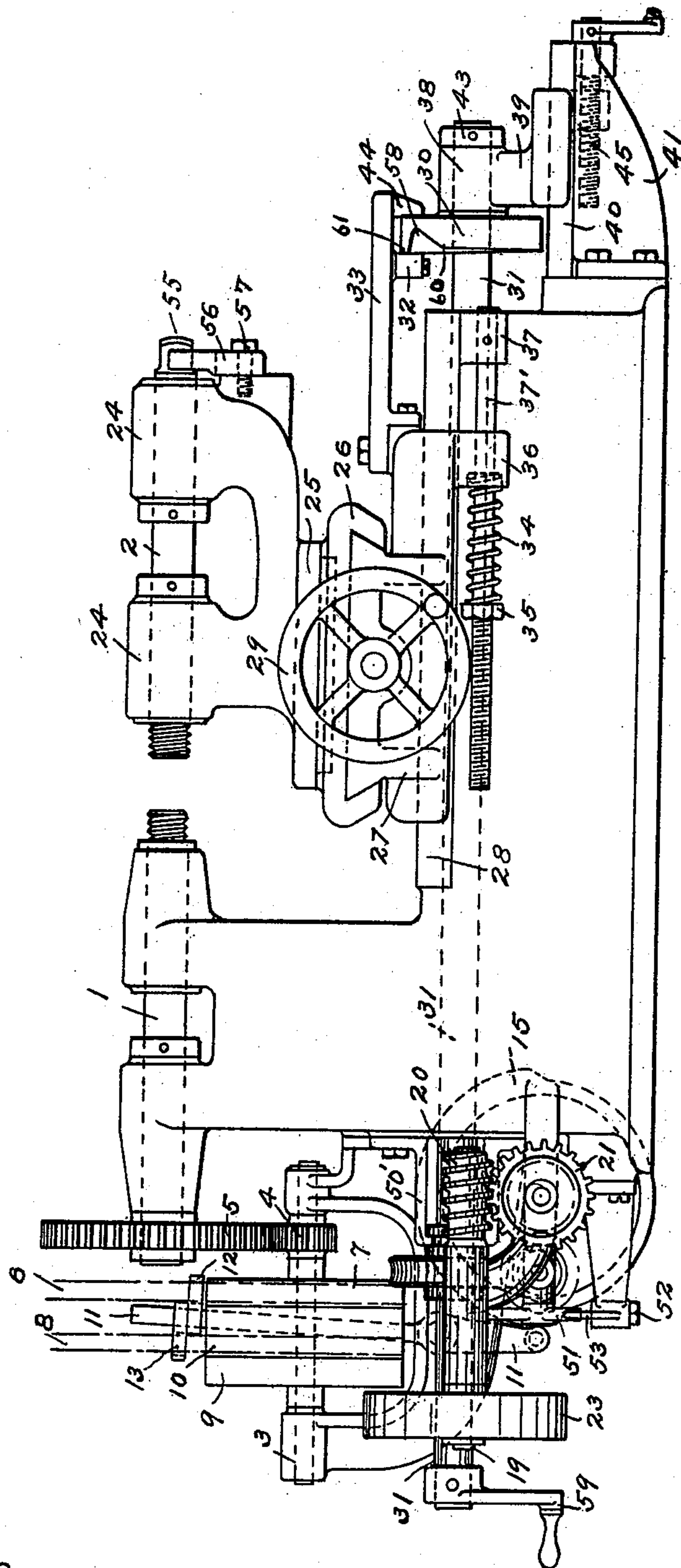


FIG. 1.

WITNESSES,

*R. A. Pates*

*Era L. Fish*

INVENTOR,

*Oscar J. Beale*

By *Hibbard C. Thurston*  
ATT'Y.

**No. 618,979.**

Patented Feb. 7, 1899.

**O. J. BEALE.**

# MACHINE FOR GENERATING GEARING.

(Application filed June 6, 1898.)

(No Model.)

**2 Sheets—Sheet 2.**

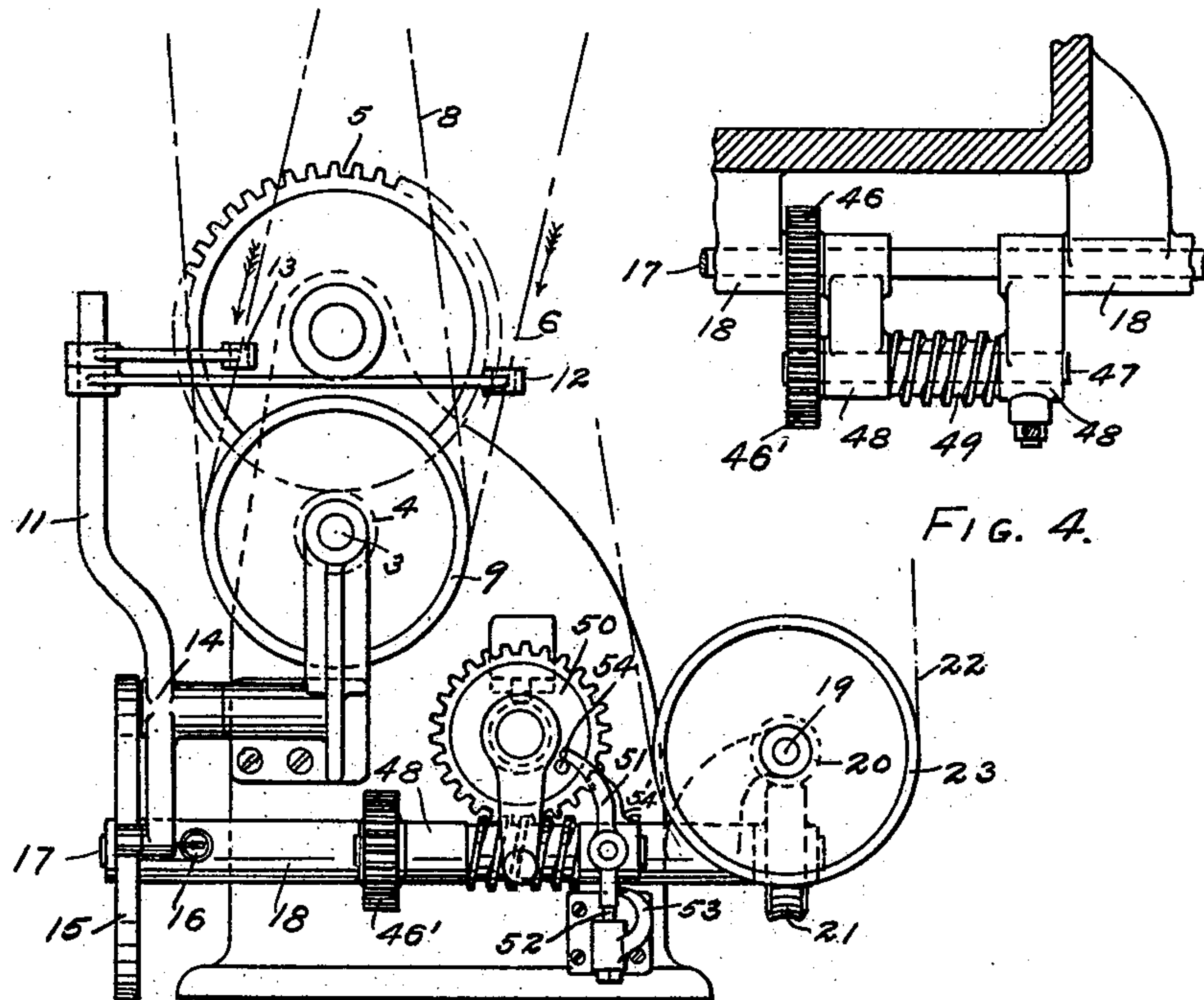
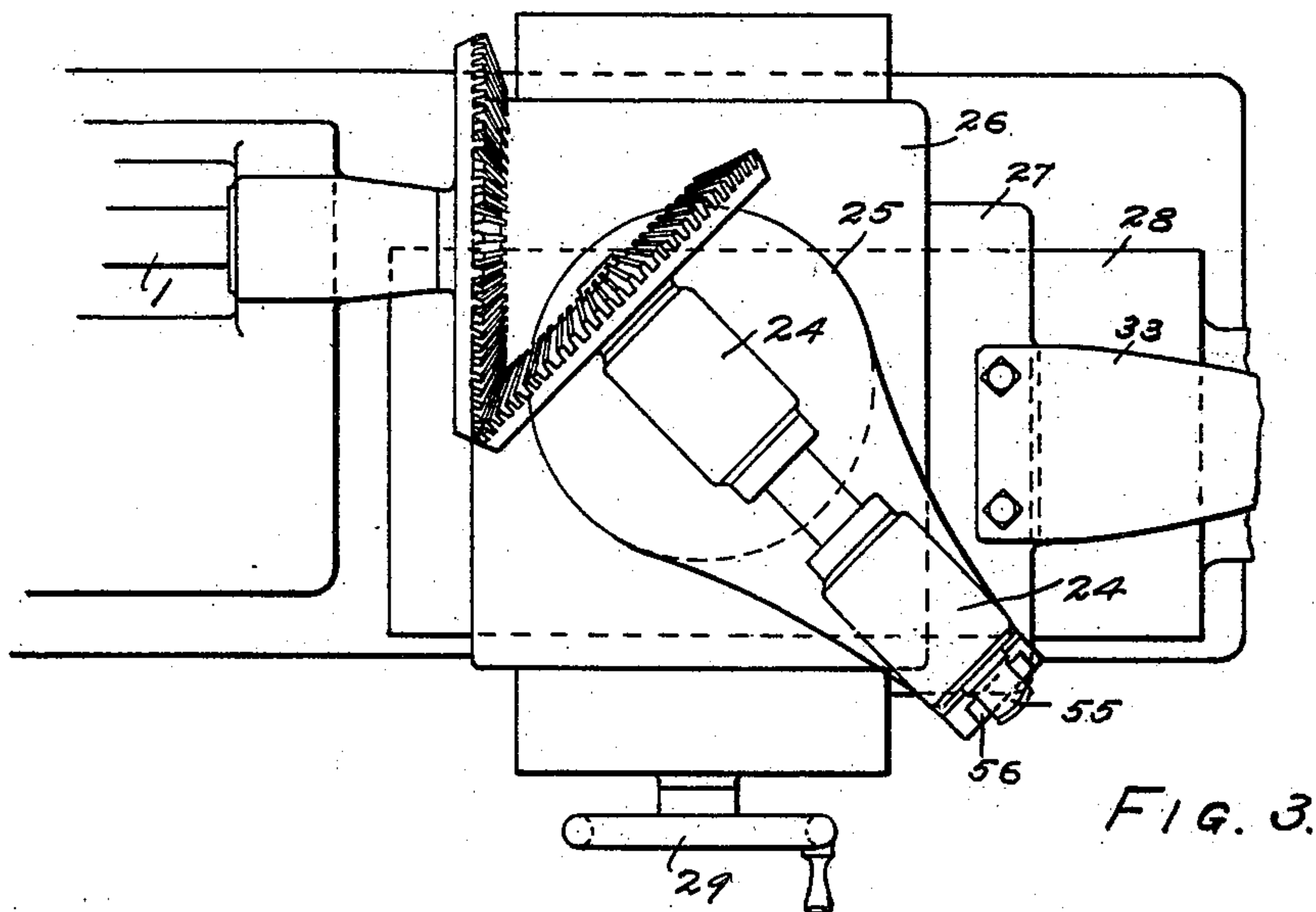


FIG. 2.



F1 G. 3.

WITNESSES,

R. A. Bates

Ira L. Fisher

INVENTOR,

Oscar J. Beale

By Kilmartin & Munro ATT'Y.

ATT'Y.



# UNITED STATES PATENT OFFICE.

OSCAR J. BEALE, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE  
BROWN & SHARPE MANUFACTURING COMPANY, OF SAME PLACE.

## MACHINE FOR GENERATING GEARING.

SPECIFICATION forming part of Letters Patent No. 618,979, dated February 7, 1899.

Application filed June 6, 1898. Serial No. 682,692. (No model.)

### *To all whom it may concern:*

Be it known that I, OSCAR J. BEALE, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Machines for Generating Gearing; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

10 In an application, Serial No. 671,568, filed February 25, 1898, I have described certain novel forms of gear-generating devices which are provided with teeth which engage the teeth of a gear-blank and act to develop or generate the teeth on the blank when the pitch-sur-

15 faces of the blank and generator are rolled together. In using the generating devices the teeth of the generator and blank are brought into engagement, and then either the generator or blank, or both, are rotated and one or both of them gradually advanced until the pitch-surfaces are in contact, the generator acting during this time to cut away or remove the surplus stock on the blank-teeth

20 and reduce them to the correct shape. I have found that the action of the generator is more rapid and the best results are obtained if the direction of rotation of the generator and blank is intermittently changed as the pitch-surfaces are being brought into contact.

25 30

The object of the present invention is accordingly to provide a machine for automatically and intermittently changing the direction of rotation of the generator and blank while the pitch-surfaces are being brought together.

35 40 A further object of the invention is to provide a machine in which the gear-blanks may be quickly and conveniently inserted and removed.

To these ends the invention consists in the features and combinations hereinafter described and claimed.

45 Referring to the drawings, Figure 1 is a side elevation of a machine embodying the invention. Fig. 2 is an end elevation. Figs. 3 and 4 are details.

50 The machine shown in the drawings is provided with two spindles 1 and 2 for supporting the generator and gear-blank. The spindle 1 is rotated first in one direction and then

in the other, while the spindle 2 is advanced to bring the pitch-surfaces of the generator and blank into contact. The spindle 1 is rotated from a shaft 3 by means of a pinion 4, secured to said shaft and engaging a gear 5, secured to the spindle. The shaft 3 is driven in one direction by an open belt 6, which runs over a pulley 7, secured to said shaft, and is driven in the opposite direction by a cross-belt 8, which runs over a pulley 9, secured to said shaft. A loose pulley is mounted between the pulleys 7 and 9, and when belt 6 is on pulley 7 belt 8 is on pulley 10 and when belt 8 is on pulley 9 belt 6 is on pulley 10. The belts are shifted to reverse the direction of rotation of the shaft 3 and spindle 1 by a belt-shifter 11, having two guides 12 and 13, which engage the belts 6 and 8, respectively. The belt-shifter is pivoted at 14, and the lower end of said shifter is held in engagement with a cam 15 by a spring 16. One half of the periphery of the cam 15 has a greater radius than the other half of the cam, and when the end of the shifter rides on the high portion of the cam-surface the open belt 6 is held on the pulley 7 and the cross-belt 8 on the pulley 10. When the end of the shifter passes from the high to the low part of the cam, the belt 8 is moved onto the pulley 9 and the belt 6 onto the pulley 10 and the direction of the rotation of the spindle 1 is reversed. Thus the direction of rotation of the spindle is intermittently reversed, the number of revolutions the spindle makes in each direction before being reversed depending upon the relative speeds of the cam 15 and shaft 3. The cam 15 is secured to the end of a transverse driving-shaft 17, mounted in bearings 18. The shaft 17 is driven from a continuously-running shaft 19 by a worm 20, secured to said shaft 19 and engaging a worm-wheel 21 on shaft 17. The shaft 19 is driven by a belt 22, which passes over a pulley 23, secured to said shaft.

95 The spindle 2 is mounted in bearings 24, formed on a swivel-head 25, which may be adjusted to vary the angle between the spindles 1 and 2 for different gears. The head 25 is mounted on a cross-slide 26, mounted on ways formed on a bed 27, which is mounted on longitudinal ways 28, formed on the frame of the

100



machine. The slide 26 may be adjusted by a hand-wheel 29 in a well-known manner. The bed 27 is moved on the ways 28 to advance the spindle 2 and bring the pitch-surfaces of the gear-blank and generator into contact by a cam 30, secured to a shaft 31 and engaging a roll 32, mounted on arm 33, extending from the bed 27. The roll 32 is held against the surface of the cam by springs 34, which are interposed between stationary nuts 35 and lugs 36 on the bed 27. The springs and nuts are mounted on rods 37', which are secured in lugs 37 on the frame and pass through the lugs 36 on the bed 27. The shaft 31 is mounted in suitable bearings on the frame and in a bearing 38, carried by a slide 39, mounted on ways 40, formed on a bracket 41. The cam 30 is secured to shaft 31 upon one side of bearing 38 and a collar 43 is secured to said shaft upon the other side of said bearing, and when the slide 39 is moved the shaft 31 moves with it. The arm 33 carries a lug 44, which lies behind the cam 30. By adjusting the slide 39 the shaft 31 and the bed 27 may be adjusted longitudinally of the machine for different gears. This adjustment may be effected by a screw 45, engaging a nut on slide 39.

The shaft 31 is driven from shaft 17 through the following mechanism: A pinion 46 is secured to shaft 17 and engages a similar pinion 46', secured to a short shaft 47, mounted in bearings 48, pivoted on shaft 17. The shaft 47 has a worm 49 secured thereto, which engages a worm-wheel 50, splined upon shaft 31 and held in place longitudinally by a finger 50'. The bearings 48 are supported to hold the worm 49 in engagement with the worm-wheel 50 by a latch 51, pivoted on one of the bearings 48 and engaging a shoulder formed by the end of a screw 52, mounted on the frame. The latch 51 is held in position against a stop 53 by a spring 54'. The end of the latch 51 is arranged in the path of a pin 54 on the worm-wheel 50, which strikes said latch and disengages it from the screw 52, when the shaft 47 will drop down and disengage the worm 49 from the worm-wheel 50, thus stopping the shaft 31.

In order to hold the spindle 2 from turning while a gear-blank is being removed from or secured upon the spindle 2, said spindle is flattened at 55 and is arranged to be engaged by a sliding dog 56, which is mounted on the bearing 24 and held by a bolt 57, which bolt passes through a slot in said dog. When a blank is to be secured upon or removed from the spindle 2, the dog is moved up to embrace the flattened end of the spindle, and after the gear-blank has been secured to the spindle the dog is dropped down to free the spindle.

The operation is as follows: The spindle 2 is adjusted to give the proper angle between said spindle and spindle 1, the slide 25 is properly adjusted, and the bed 27 and shaft 31 are so adjusted that the pitch-surfaces of the gear-blank and generator will be in contact when the roll 32 is on the highest part of

the cam 30. The worm 49 is out of engagement with the worm-wheel 50, and the roll 32 is in the recess 58 of the cam 30. The gear-blank is now secured upon the spindle 2, and then the shaft 31 is turned by means of the handle 59 until the roll 32 is on the point 60 of the cam 30. This movement of the shaft 31 and cam 30 advances the bed 27 and brings the teeth of the gear-blank and generator into engagement. The shaft 47 is now raised to bring the work 49 into engagement with the worm-wheel 50 and the power thrown onto the counter-shaft which drives the machine. The spindle 1 is rotated and its direction of rotation intermittently reversed while the spindle 2 is slowly advanced until the pitch-surfaces of the generator and gear-blank are in contact, when the pin 54 operates latch 51 and the shaft 31 is stopped. The roll 32 is now upon the high point 61 of the cam 30, and the spindle 1 is allowed to rotate a short time before the power is thrown off. The power is then thrown off and shaft 31 moved by the handle 59 to bring the recess 58 under the roll 32, when the springs 34 move the bed 27 back and disengage the finished gear and generator. The finished gear is now removed and a new blank secured upon the spindle 2, when the operation is repeated.

Instead of mounting the gear-blank upon the spindle 2 and the generator on the spindle 1 the positions may be reversed, the gear-blank being secured upon spindle 1 and the generator being secured upon spindle 2. It is obvious that the part which is driven by engagement with the other, whether the generator or gear-blank, may be run loosely upon a stationary spindle or arbor instead of being secured to a rotary spindle. It will be also understood that the positively-driven spindle might be advanced as well as rotated instead of advancing the driven spindle without departing from the invention. Other changes and variations could be made and other mechanisms used for effecting the movements of the various parts without departing from the invention.

While it is preferred to rotate either the gear-blank or generator and to drive the other by the engagement of the teeth of the generator and gear-blank, it will be understood that both the generator and gear-blank may be positively rotated by driving mechanism other than themselves should the character of the gear-blank or the form of generator make such a course desirable.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, and mechanism for advancing one of said supports, substantially as described.

2. The combination with a support for a generator, of a support for a gear-blank,



mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, and mechanism for advancing the other support, substantially as described.

3. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, mechanism for advancing one of said supports, and mechanism for stopping said advancing mechanism, substantially as described.

4. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, mechanism for advancing one of said supports, and means for manually operating said mechanism to retract said support, substantially as described.

5. The combination with a support for a generator, of a support for a gear-blank, means for varying the angle between the axes of the generator and gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, and mechanism for advancing one of said supports, substantially as described.

6. The combination with a support for a generator, of a support for a gear-blank, means for varying the angle between the axes of the generator and gear-blank, means for adjusting one of said supports laterally, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, and mechanism for advancing one of said supports, substantially as described.

7. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, mechanism for advancing one of said supports, and means for longitudinally adjusting one of said supports, substantially as described.

8. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for intermittently reversing the direction of rotation of said support, mechanism for advancing one of said supports, and means for longitudinally adjusting said support and its advancing mechanism, substantially as described.

9. The combination with a support, for a generator, of a support for a gear-blank, mechanism for rotating one of said supports,

mechanism for intermittently reversing the direction of rotation of said support, a movable bed carrying the other support, a cam for advancing said bed, and mechanism for stopping said cam, substantially as described.

10. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, a movable bed carrying the other support, a cam for advancing said bed, mechanism for stopping said cam, and means for manually operating said cam, substantially as described.

11. The combination with a support for a generator, of a support for a gear-blank, mechanism for rotating one of said supports, mechanism for reversing the direction of rotation of said support, a driving-shaft for operating said mechanism, mechanism for advancing one of said supports embodying a cam-shaft, gearing connecting said shafts, a latch for holding said gearing in engagement, and means carried by the cam-shaft for operating said latch, substantially as described.

12. The combination with a support for a generator, or gear-blank, of a movable bed carrying said support, a cam-shaft, a cam on said shaft for advancing said bed, a driving-shaft, gearing between said shafts, a latch for holding said gearing in engagement, and means carried by said cam-shaft for operating said latch, substantially as described.

13. The combination with a support for a generator, or gear-blank, of a movable bed carrying said support, a cam-shaft, a cam on said shaft for advancing said bed, a worm-wheel on said shaft, a worm-shaft mounted in pivoted bearings, a worm on said shaft engaging said worm-wheel, a latch supporting said worm-shaft, and a pin on said worm-wheel for operating said latch, substantially as described.

14. The combination with a support for a generator, or a gear-blank, of a movable bed carrying said support, a cam-shaft, a cam on said shaft, springs pressing said support against said cam, a recess in said cam, mechanism for stopping said cam-shaft, and means for manually turning said shaft, substantially as described.

15. The combination with a rotary spindle provided with means for securing a gear-blank thereto, flattened surfaces upon said spindle, and a movable dog for engaging said surfaces and preventing rotation thereof while the gear-blank is being secured to or removed from said spindle, substantially as described.

OSCAR J. BEALE.

Witnesses:

R. A. BATES,  
W. H. THURSTON.