T. E. DROHAN.

DRIVING MECHANISM.

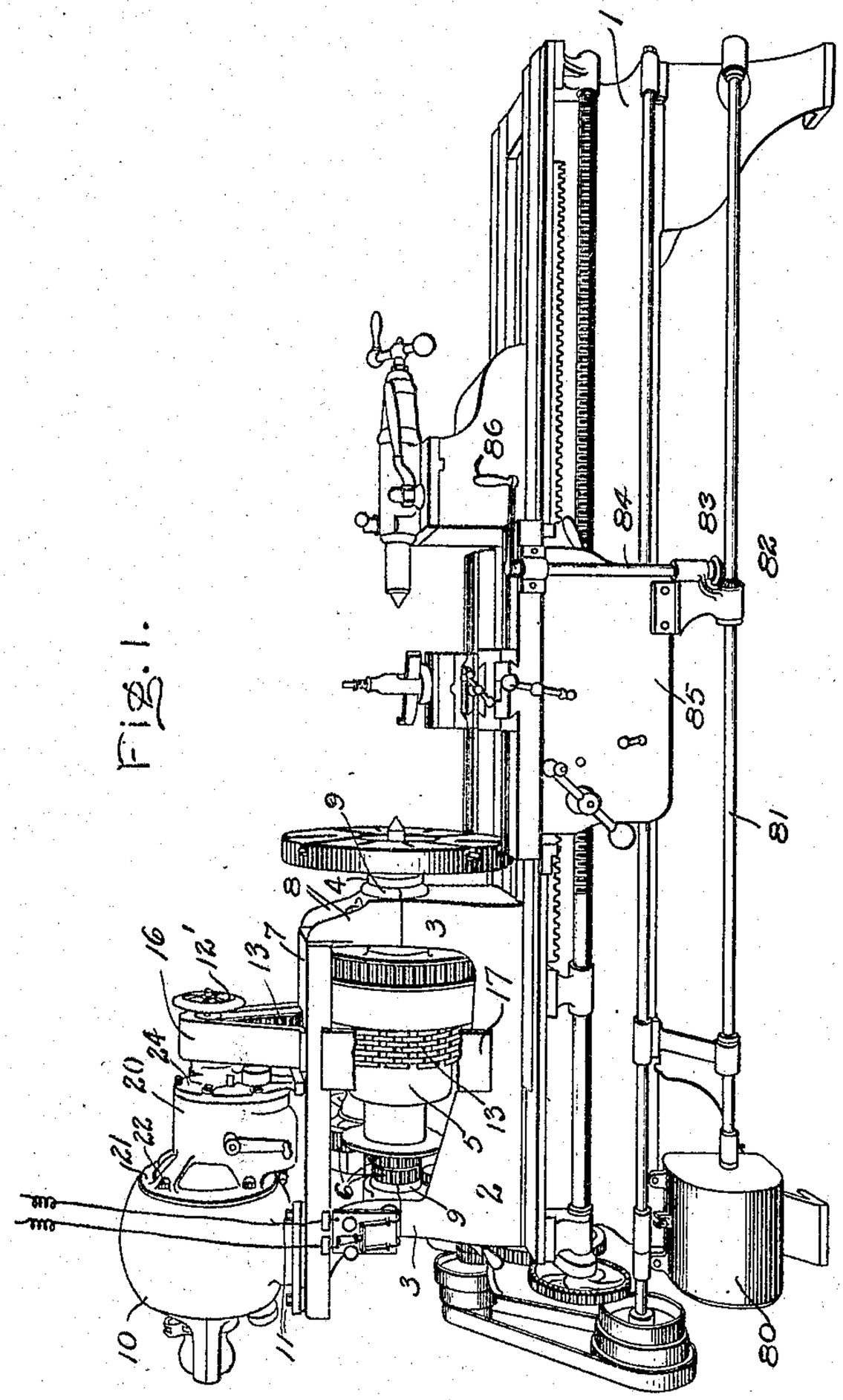
APPLICATION FILED OCT. 6, 1904.

919,836.

Patented Apr. 27, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 3.

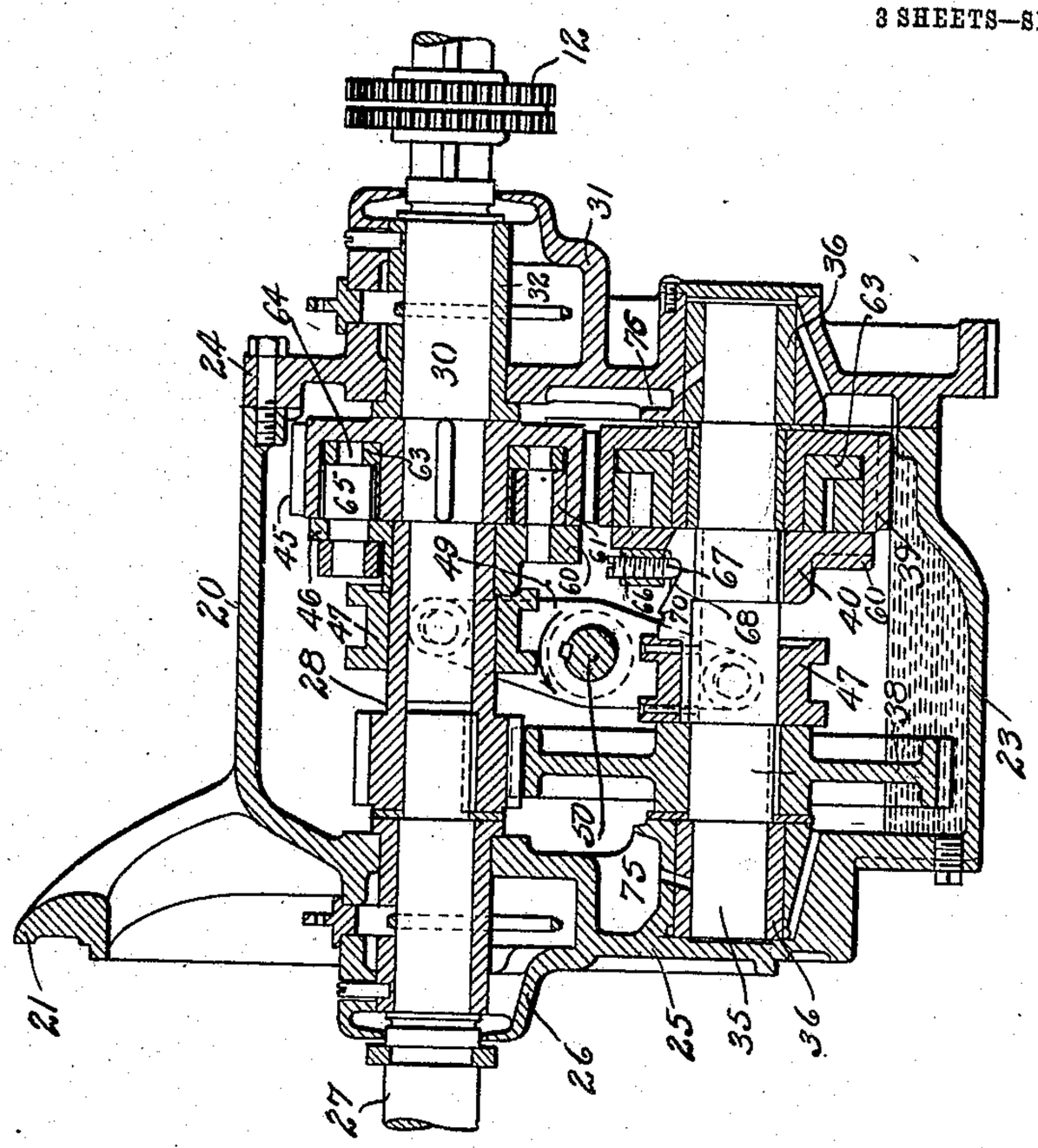
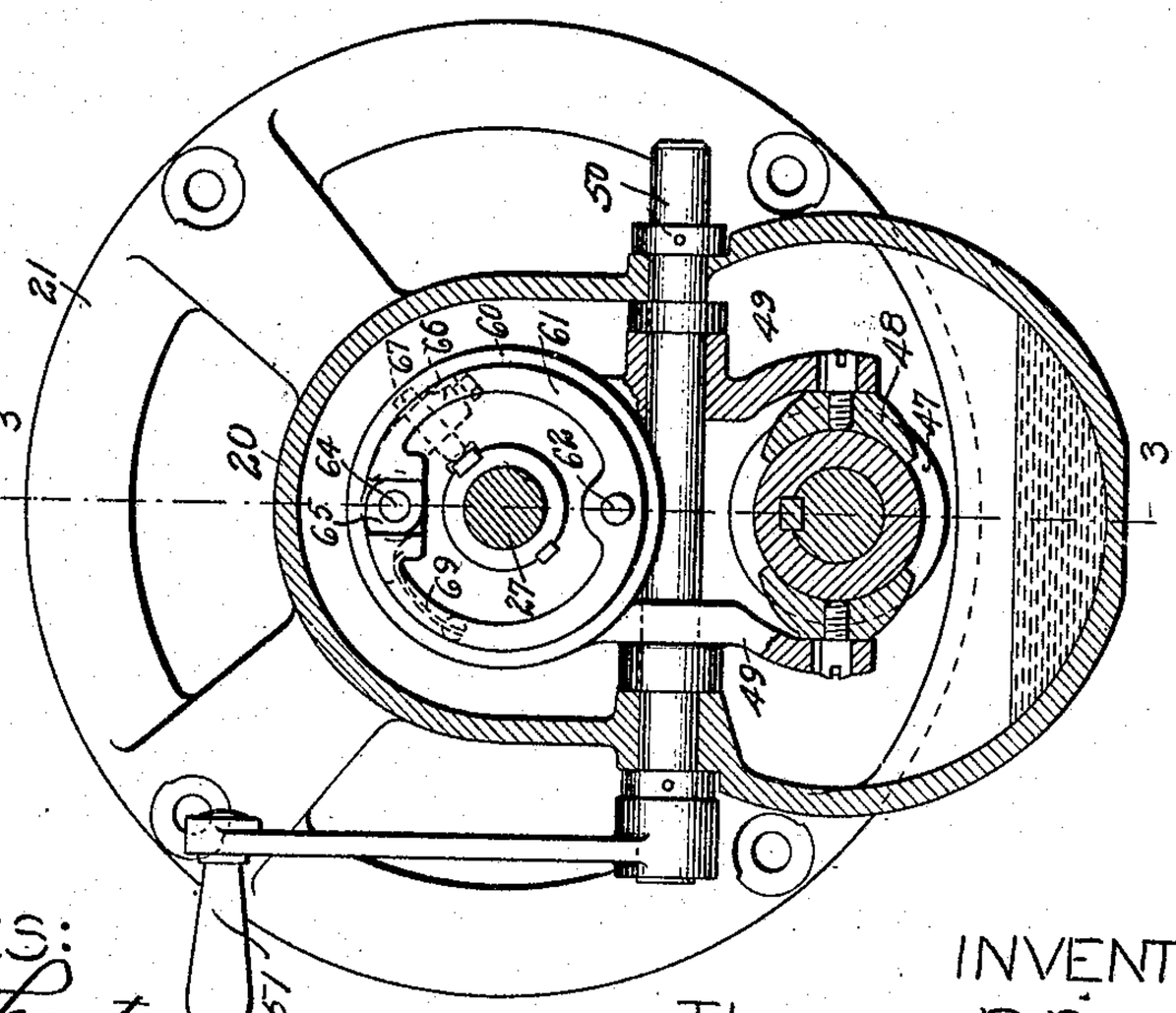


Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

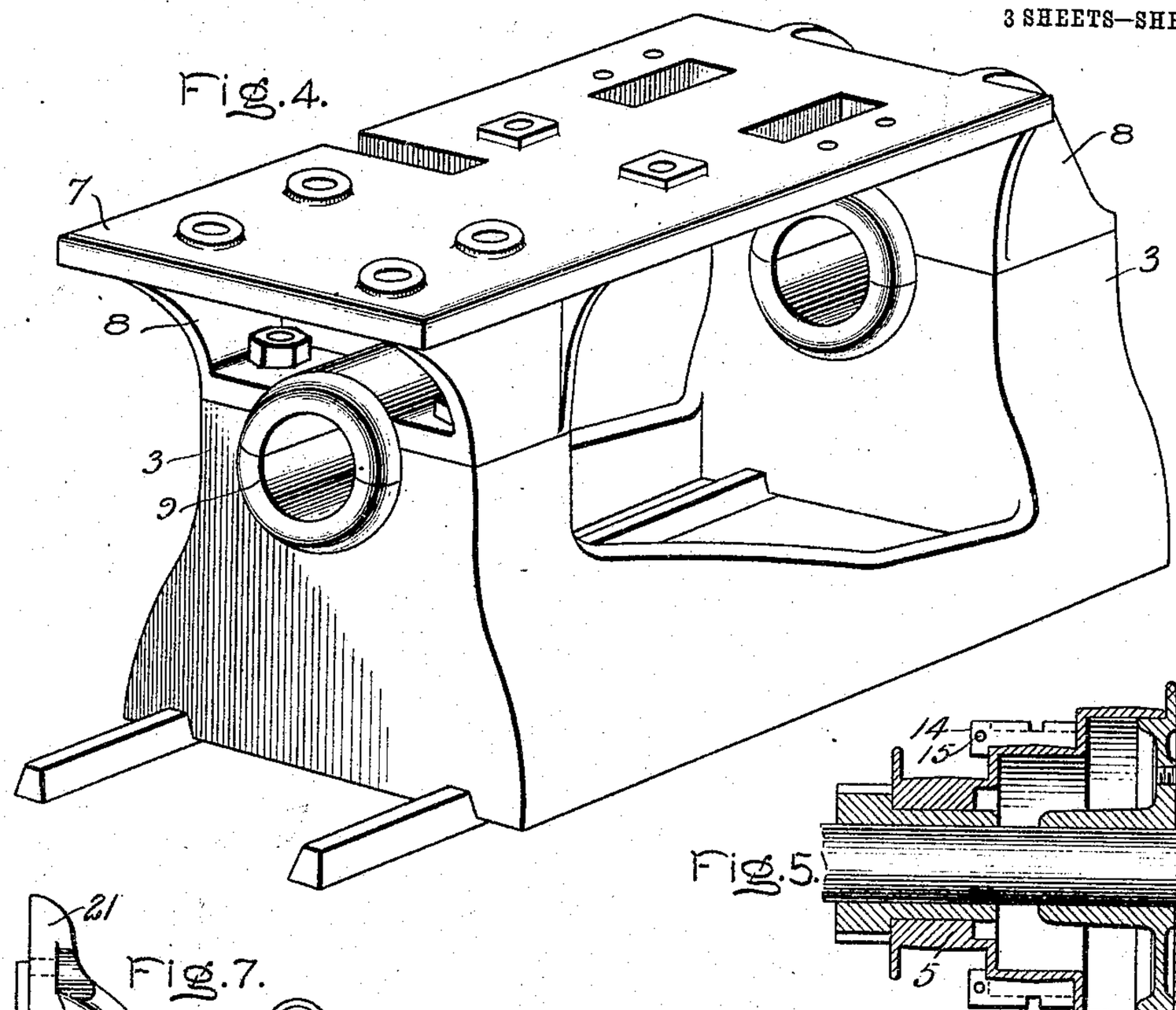


Fig. 5.

Fig. 7.

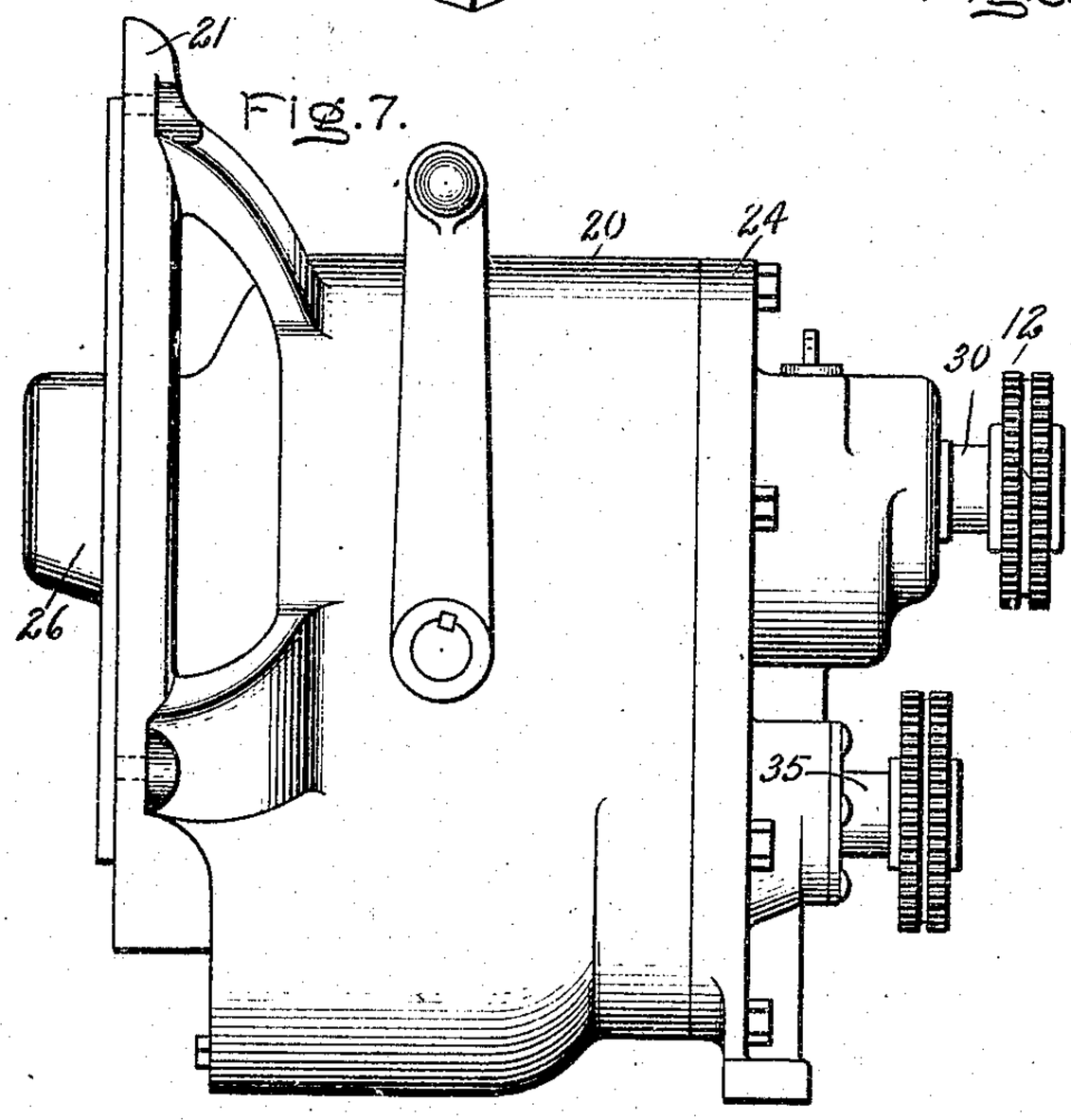
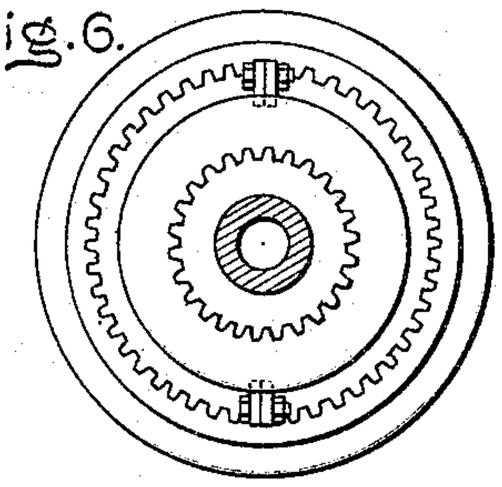


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS E. DROHAN, OF MADISON, WISCONSIN, ASSIGNOR TO NORTHERN ELECTRICAL MANUFACTURING COMPANY, A CORPORATION OF WISCONSIN.

DRIVING MECHANISM.

No. 919,836. Specification of Letters Patent. Patented April 27, 1909.

Application filed October 6, 1904. Serial No. 227,410.

To all whom it may concern:

Be it known that I, THOMAS E. DROHAN, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Driving Mechanisms, of which the following is a specification.

One of the objects of my present invention is the production of a simple and compact self-contained motor structure capable of driving the machine tool or other load driven by it at different speeds without varying the armature speed of the motor. In carrying out this feature of my invention I prefer to have the mechanism, by means of which speed variation referred to is obtained, supported by one of the bonnets or end members of the motor.

The numerous features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of my specification. For a better understanding of my invention, however, reference may be had to the accompanying drawings and description in which I have illustrated and described embodiments of my invention.

Of the drawings, Figure 1 is a perspective view of a motor-driven lathe equipped with my invention; Fig. 2 is a sectional elevation of the bonnet; Fig. 3 is an elevation on the line 3 3 of Fig. 2, showing the bonnet or end member of the motor containing the speed changing mechanism; Fig. 4 is a perspective view showing the tool head support and motor support; Fig. 5 is a sectional elevation of the cone pulley and gear carried thereby; Fig. 6 is an end elevation of the cone pulley; and Fig. 7 is an elevation of the counter-shaft carrying the end plate or bonnet of the motor showing a modified construction.

The motor-driven engine lathe shown in Fig. 1 comprises the usual frame-work and bedplate 1 at one end of which is located the usual support 2 provided at its ends with posts or pillow blocks 3 in which is mounted the tool-carrying head 4 of the lathe and the cone pulley 5. Gears 6 and the coöperating countershaft, not shown, constitute the back gear of the lathe in the usual manner. A platform or support 7 extends parallel to the lathe bed above the cone pulley 5 and is provided with supporting feet or extensions 8 which rest on the upper ends of the pillow blocks 3. The extensions 8 form cap pieces for the bearings 9 in which the tool spindle of the lathe is journaled, being secured to the pillow blocks 3 in the same manner as and taking the place of the usual separate cap pieces.

An electric motor 10 is secured to the upper side of the support 7 by bolts 11. The power-transmitting shaft 30 of the motor 10 carries a gear 12 which drives a chain 13. The chain 13 passes through apertures formed for the purpose in the support 7 and drives an annular toothed member 14 which is removably clamped on one of the pulley surfaces of the pulley cone 5. The toothed member may be preferably formed of two parts clamped together by bolts 15. The inner surface of the member 14 is shaped to fit the crown of the pulley surface which it embraces. Guards 16 and 17 are employed to shield the chain 13. A hand wheel 12′ secured to the end of the power-transmitting shaft of the motor forms a means by which a tool head of the motor may be manually turned into any desired position whenever such action is desirable.

The motor 10 may be in general of any well known types of electric motor, though when used for the purpose illustrated it is preferably of a type in which the armature speed can be varied more or less by altering the electrical conditions of the motor. The bonnet or end member 20 of the motor, which contains the speed changing device, exhibits many novel features. The bonnet 20 is formed with an annular portion 21, which is connected to the end of the field frame of the motor in the usual manner by bolts 22, and a chambered portion or casing 23. The right-hand end of the chambered portion 23, as viewed in Figs. 1 and 3, is closed by an end plate or member 24. The inner end of the chambered portion 23 is closed by an integral wall 25. The wall 25 is formed with a bearing box 26 in which the end of the armature shaft 27 of the motor is journaled. The end of the armature-shaft has keyed to it a sleeve member or tubular shaft 28 which is preferably formed of brass or the like. The member 28 has spur gear teeth formed on its end adjacent the motor. The driving or power-transmitting shaft 30, which is in alinement with

the armature-shaft 27, has its inner end journaled in the end of the sleeve 28. The end member 24 also carries a bearing box 31 supporting a bearing 32 in which the shaft 30 is also journaled.

A shaft 35 extending parallel to the armature-shaft 27 and the power-transmitting shaft 30 has its ends journaled in bearings 36 mounted in pockets formed for the purpose in the end wall 25 and end plate 24. A gear wheel 38 meshing with teeth on the sleeve member 28 is keyed to the shaft 35. The shaft 35 has loosely mounted on it a gear wheel 39. The gear wheel 39 has an annular pocket concentric with the shaft 35 formed in its inner face, into which the engaging portion of a friction clutch member 40 keyed to the shaft 35 may enter.

The power-transmitting shaft 30 has keyed to it a gear wheel 45 having an annular pocket formed in its inner face, similar to the pocket formed in the inner face of the gear wheel 39. The engaging portion of a clutch member 46 keyed to the sleeve 28 enters the pocket of the gear wheel 45. The clutch members 40 and 46 are similar in construction, but are shown in different angular position in Fig. 3. Clutch-controlling collars 47 are splined one on the member 28 and one on the shaft 35, each collar is formed with a circumferential groove in its periphery into which extend members 48 pivoted to the ends of the cross-arms 49 carried by a shaft 50 which is mounted in the walls of the chamber 23 of the bonnet and extends transversely to and between the shafts 30 and 35. A handle 51, which may be detachably secured to either end of the shaft 50 outside the walls of the chamber 23, serves as a means for rotating the shaft 50 and sliding the collars longitudinally on the shafts on which they are splined.

Each of the clutch members 40 and 46 comprises a member 60 which is rigidly secured to the shaft on which it is mounted, a split ring 61 located in the pocket in the corresponding gear wheel, and a pin or bolt 62 which serves as a means for securing the split ring between the member 60 and an annular spacing member 63 L-shaped in cross-section which is also located in the pocket in the corresponding gear wheel. A pivot pin or bolt 64 is journaled in the member 60 and 63 at a point diametrically opposite the pin 62. The pin 64 carries a cam 65 which is located between the ends of the split ring 61. A crank-arm 66 rigidly secured to the end of the bolt 64 has adjustably mounted in it a bolt 67, the lower end of which is in position to engage with a cam member 68 secured to the corresponding collar member 47.

In the condition of the mechanism shown in Fig. 3, the cam carried by the bolt 64 of the lower clutch member is turned by the action of a spring 69 into the position in which the split ring is unflexed and relative movement between the shaft 35 and gear wheel 39 is therefore possible. By rotating the shaft 50 in the direction of the arrow shown in Fig. 3, the collar 47 will be moved toward the gear wheel 39 and pin 67 will be moved away from the shaft 35 by its engagement with the cam 68. This will in turn rotate the bolt 64 and thereby spread the ends of the split ring and lock it and the gear wheel 39 together, thus locking the gear wheel 39 to the shaft 35. A pocket 70 is formed in the extreme upper end of the cam member 68, as seen in Fig. 3, into which the end of the pin 67 drops when the gear wheel 39 is locked to the shaft 35. This prevents accidental disengagement between the clutch member and the gear wheel.

As before stated, the upper clutch mechanism is exactly similar to the lower clutch mechanism. In the position shown in Fig. 3 the clutch member 46 is locked to the gear wheel 45. When the shaft 50 is rotated in the direction of the arrow to lock the gear wheel 39 to the shaft 35 the engagement between the gear wheel 45 and the clutch 46 will be broken. The engagement is such that only one of the clutch members can be locked to the corresponding gear wheel at a time. The parts are so proportioned that when the shaft 50 is turned into the position in which the arms 49 stand vertical, each gear wheel is entirely independent of the corresponding clutch member.

It will be observed that when the clutch mechanism is in the position shown in Fig. 3 the shaft member 30 is locked to and practically forms an extension of the armature-shaft 27. The speed of the shaft 30 is then that of the armature of the motor. In this condition of the apparatus, the shaft 35 and gear wheel 39 both turn in the same direction but with different angular velocities owing to the different sizes of the gear wheels 38 and 39. When the shaft 50 is turned to lock the clutch member 40 to the gear wheel 39 and to release the gear wheel 45 from the clutch 46, the gear wheels 38 and 39, then being both locked to the shaft 35, will turn with the same angular velocity. The shaft 30 will then be driven by the armature-shaft 27 through the shaft 35 and coöperating gears. If, as in the construction illustrated, the gear wheels 45 and 39 are the same size and the diameter of the gear-wheel 38 is more than double that of the toothed portion of the member 28, the velocity of the shaft 30 will be less than half that of the armature-shaft of the motor. The armature-shaft and the shaft 30 will, however, continue to turn in the same direction.

An oil-receiving pocket 75 is formed in the end wall 25 above the bearing for the shaft 35. A similar pocket 76 is formed in the end

member 24. Channels convey oil from these pockets to the ends of the shaft 35. The pockets 75 and 76 open into the interior of the casing or chamber 23 and are supplied with oil by the splashing produced by the gear wheels 38 and 39 as they turn through a small quantity of oil kept in the bottom of the chamber 23. This oil also lubricates the gears and renders them noiseless in operation. The bearings 26 and 31 may be of the usual construction.

A controller 80 for the motor 10 is secured to the frame of the lathe.

The operating shaft 81 of the controller 80 extends the length of the lathe bed 1 and has splined on it a bevel gear 82 which meshes with a bevel gear 83 carried at the end of a short shaft 84 carried by a tool carriage 85 of the lathe. The shaft 84 carries an operating handle 86. It will thus be seen that the operator can control the motor while standing in his usual position by the tool carriage of the lathe. It will be observed that the motor drive shown and described can be readily applied to any ordinary engine lathe by simply removing the ordinary bearing cap members and securing in place the support 6, the only other change being the clamping of the toothed member 14 about one of the pulley surfaces of the cone pulley 5. When it is desired to apply my motor-drive to a motor designed to receive it the cone pulley may, of course, be replaced by a gear wheel. In this case the distance between the pillows blocks 3 may be shortened somewhat.

Though a motor equipped with the special bonnet 20 and speed-changing device carried by it forms a highly advantageous means for driving a lathe of the form shown, it will be readily understood that this feature of my invention is capable of use in many different relations.

In Fig. 7, I have shown a modified form of my invention in which the counter-shaft 35 is extended through the end member 24 of the casing and carries a gear wheel on its projecting end. The gearing and clutch construction within the casing of my invention as shown in Fig. 7 may be similar to that shown in Figs. 2 and 3. In this case when the clutches are in position shown in Fig. 3 the shafts 30 and 35 will rotate in opposite direction and with different velocity. When the clutch mechanism is thrown to the other operating position the shafts 30 and 35 will rotate in opposite direction but with the same velocity. By changing the ratio of the various gears employed the relative velocity of each of the shafts 30 and 35 to the armature-shaft 27 may be varied in many ways. For some uses it may be desirable in the construction shown in Fig. 7 to rigidly connect the shaft 30 to the shaft 27 and to dispense with the clutch mechanism and gears 39 and 40 where it is desired to have two shafts rotating with different speeds carried by the armature-head of the motor.

While I have described and illustrated the best forms of my invention now known to me, it will be obvious to all those skilled in the art that many changes may be made in the form of my invention without departing from its spirit, and that my invention in some of its aspects may be used in many different relations, and I do not wish my claims hereinafter made to be limited to the details of my invention shown and described more than is made necesssary by the state of the art.

What I claim as new and desire to secure by Letters Patent of the United States, is,

1. In combination, an end member or bonnet, a driving shaft journaled therein, a power transmitting shaft journaled therein, a countershaft also journaled in the bonnet, gearing connections between the countershaft and the other two shafts, said end member having pockets containing oil to lubricate the countershaft bearings and an oil containing space into which a gear carried by the countershaft dips, whereby said pockets are supplied with oil through the revolution of the countershaft.

2. In combination, an end member or bonnet, a driving shaft journaled therein, a pinion secured to the shaft, a second shaft in alinement with the driving shaft, a gear keyed to said second shaft, a counter-shaft also journaled in said end member, a spur gear keyed on said counter-shaft and meshing with said pinion, a gear free to rotate on said counter-shaft and meshing with said gear on said second shaft and means for securing either said pinion and said second shaft together, or said gear on the counter-shaft to said counter-shaft, but so arranged not to act simultaneously.

3. In combination, an end member or bonnet, a driving shaft journaled therein, a toothed sleeve secured to the end of said driving shaft, a second shaft in alinement with the driving shaft journaled in the end of said sleeve, a gear keyed to said second shaft, a counter-shaft journaled in said end member, a spur gear keyed on said counter-shaft and meshing with said teeth on the sleeve, a gear mounted but free to rotate on said counter shaft and meshing with said gear on the second shaft, and clutch members for securing either said sleeve to said second shaft, or said gear on the counter-shaft to said counter-shaft, but so arranged not to act simultaneously.

4. In combination, an end member or bonnet, a driving shaft journaled therein, a second shaft in alinement with the driving shaft also journaled in said end member, means within the bonnet including a countershaft and gears for causing the second shaft to be driven at the same speed as the driving shaft

or at a different speed, said end member or bonnet having pockets containing oil to lubricate the countershaft bearings and an oil containing space into which a gear carried by the countershaft dips, whereby said pockets are supplied with oil through the revolution of the shaft.

In witness whereof, I have hereunto set my hand this third day of October, 1904.

THOMAS E. DROHAN.

Witnesses:
CHAS. E. JEWETT,
EDWIN H. WIRKA.