(No Model.) 2 Sheets—Sheet 1.

F. HART.

DRIVING GEAR.

No. 550,390 Patented Nov. 26, 1895.

Fig. 1.

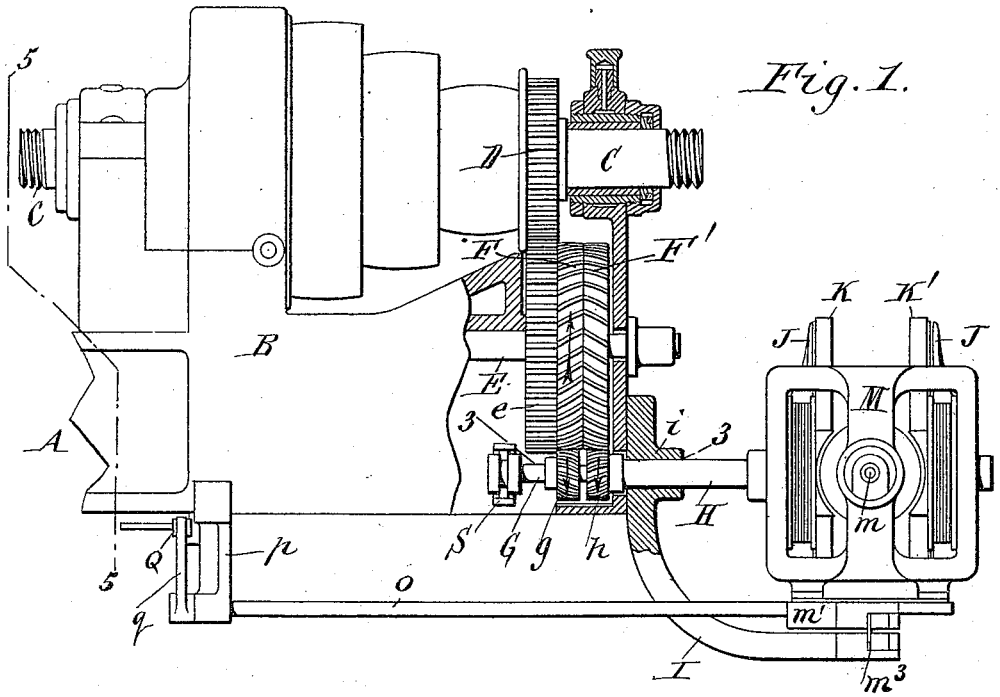

Fig. 2.

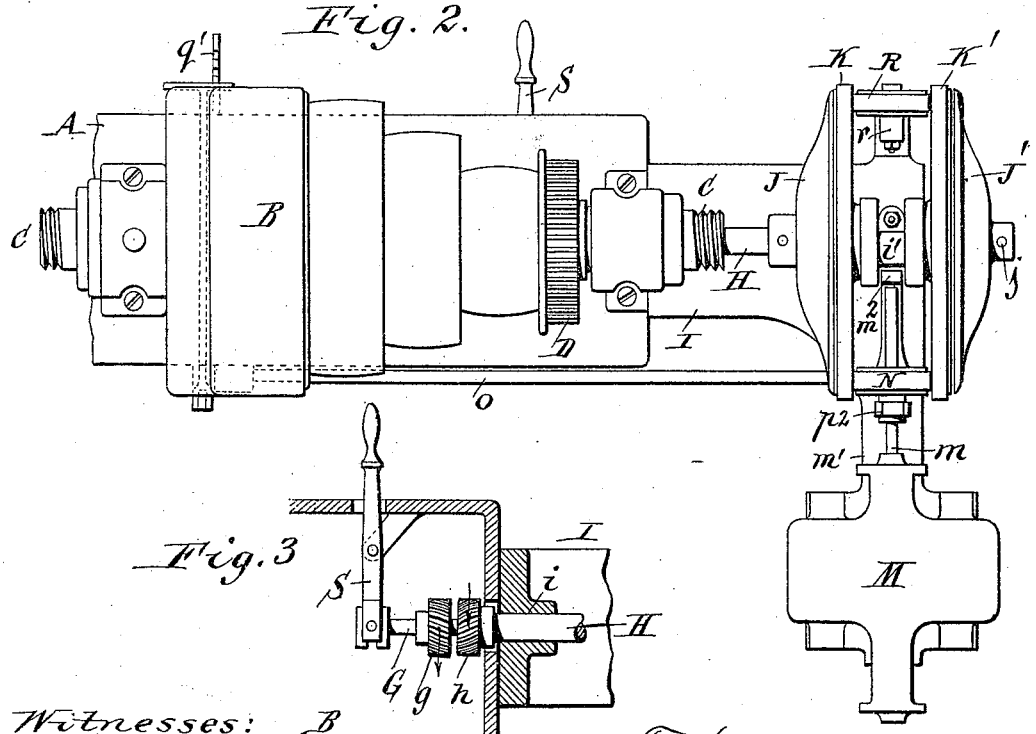

Fig. 3

Witnesses:
Chas. F. Burkhardt
Thos. L. Popp.

F. Hart Inventor.
By Wilhelm & Bonner
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

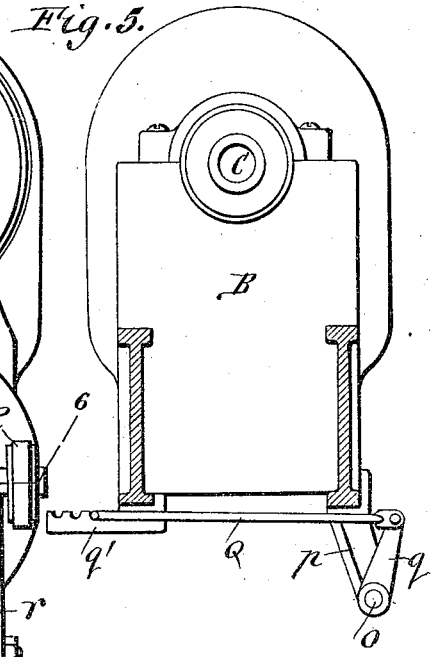

Fig. 4.

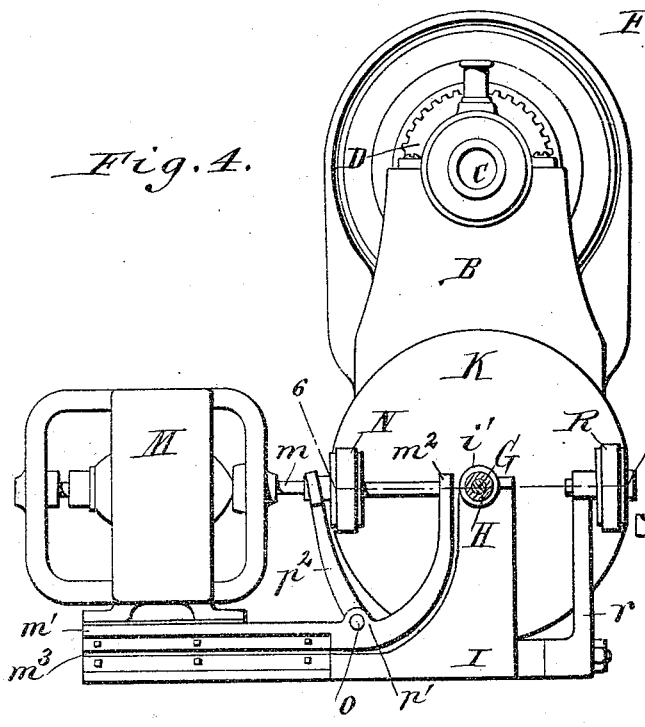

Fig. 7.

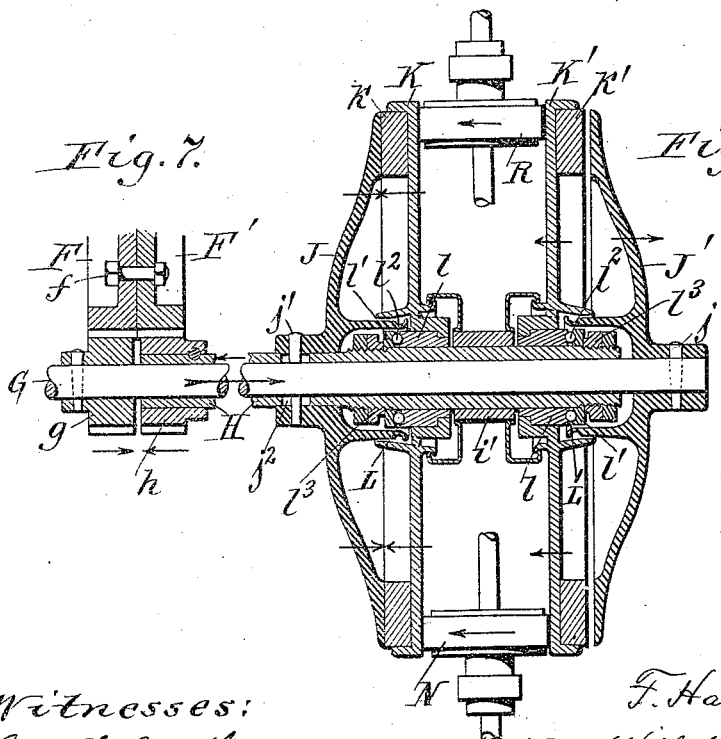

Fig. 6.

Witnesses:
Chas. F. Burkhardt
Theo. L. Popp.

F. Hart Inventor.
By Wilhelm Bonner
Attorneys.

UNITED STATES PATENT OFFICE.

FREDERICK HART, OF POUGHKEEPSIE, NEW YORK.

DRIVING-GEAR.

SPECIFICATION forming part of Letters Patent No. 550,390, dated November 26, 1895.

Application filed April 12, 1895. Serial No. 545,433. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HART, a subject of the Queen of Great Britain, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented a new and useful Improvement in Driving-Gears, of which the following is a specification.

This invention relates to a driving-gear which is designed more especially for driving, by an electric motor, lathes, and other machines in which the movement of the rotating parts is required to be reversible or in which the speed is required to be variable, and particularly to a driving-gear which is described and claimed in an application for patent filed by me of even date herewith, in which the driving-gear is so constructed that the speed of the driven part can be varied or the direction of its movement can be reversed, or both, while the motor runs in the same direction and with uniform speed.

The object of this invention is to modify several of the features of construction which enter into this driving-gear.

In the accompanying drawings, consisting of two sheets, Figure 1 is a fragmentary rear elevation, partly in section, of a lathe provided with my improved driving-gear. Fig. 2 is a top plan view thereof. Fig. 3 is a fragmentary horizontal section in line 3 3, Fig. 1. Fig. 4 is an end view, partly in section, of the lathe provided with my improved driving-gear. Fig. 5 is a vertical cross-section in line 5 5, Fig. 1. Fig. 6 is a fragmentary horizontal section, on an enlarged scale, of the driving-gear, taken in line 6 6, Fig. 4. Fig. 7 is a fragmentary vertical section of the spiral gear wheels and pinions and connecting parts.

Like letters of reference refer to like parts in the several figures.

A represents the bed of the lathe, B the head-stock, C the mandrel or spindle which carries the work to be turned, D the gear-wheel mounted on the mandrel and coupled therewith, and E the counter-shaft provided with a gear-wheel *e*, which meshes with the gear-wheel D of the mandrel, all of which parts may be of any well-known and suitable construction.

F F′ represent two gear-wheels which are mounted side by side on the counter-shaft, and each of which is provided on its periphery with spiral gear-teeth, which are arranged obliquely with reference to the axis of the wheel. The two wheels are secured together by bolts *f*, Fig. 7, and their teeth diverge or trend in opposite directions and form together an annular row of V-shaped teeth.

G represents an inner driven shaft, and H an outer hollow driven shaft or sleeve, which surrounds the inner shaft, Figs. 1, 3, 6, and 7, both shafts being arranged parallel with the counter-shaft and partly underneath the same. The inner and outer driven shafts are capable of turning together and also of a limited lengthwise movement upon each other in opposite directions. The inner driven shaft is provided near one end with a spiral gear-pinion *g*, having spiral teeth which mesh with the teeth of the spiral gear-wheel F, and the outer driven shaft is provided at one end with a spiral gear-pinion *h*, having spiral teeth which trend in an opposite direction to that of the teeth on the spiral pinion *g* on the inner driven shaft, and which mesh with the teeth of the other spiral gear-wheel F′. Upon turning the inner and outer driven shafts in one direction the wedge or cam action of the teeth of spiral pinions against the teeth of the spiral wheels causes the spiral pinions to move axially toward each other, which produces a corresponding movement of the inner and outer driven shafts upon each other in opposite directions, while upon turning the inner and outer driven shafts in a reverse direction the spiral pinions connected therewith are forced apart and produce a corresponding reverse lengthwise movement of the driven shafts upon each other in opposite directions.

I represents a bracket or support secured to the end of the bed and provided with two bearings *i i′*, in which the outer driven shaft is journaled near its inner and outer ends, respectively.

J J′ represent two driven friction-disks which are secured to the inner driven shaft on opposite sides of the outer bearing *i′*, and which partake of the rotary and lengthwise movement of said shaft. The outer end of the inner shaft projects beyond the outer end of the outer hollow shaft, as shown in Fig. 6, and the outer driven disk J′ is secured directly

to the end of the inner shaft by a pin j. The inner driven disk J is journaled upon the outer hollow shaft and secured to the inner shaft by a pin j', which passes transversely through that shaft and through longitudinal slots j^2, formed in the surrounding hollow shaft.

K K′ represent two driving friction-disks which are adapted to be brought in contact, respectively, with the driven friction-disks J J′ for driving the same in either direction. These driving friction-disks are mounted on the outer hollow shaft between the bearing i' and the driven friction-disks, and are provided at their peripheries with friction-faces k k', of wood, adapted to bear against the inner peripheral faces of the driven friction-disks. The driving friction-disks are held against movement in a direction which would separate them by means of two thrust-bearings L L′, each of which consists of inner and outer cones or collars l l', mounted on the outer hollow shaft, and an annular row of balls l^2, interposed between the cones and seated in the ball-races formed in the opposing sides of the cones. The inner cones l are arranged in the bore of the driving friction-disks and are provided with shoulders which fit corresponding shoulders formed in the bore of said disks, while the outer cones bear against screw-nuts l^3, arranged upon externally-screw-threaded portions of the outer hollow shaft.

M represents an electric motor of any suitable construction having its driving-shaft m extending radially between the driving friction-disks. This motor is mounted on a base-plate m', which is provided adjacent to the bearing i' with an upwardly-projecting arm having a bearing m^2, in which the outer end of the driving-shaft of the motor is journaled. The motor is preferably yieldingly supported, so as to be capable of a slight lateral movement by means of a flexible metallic plate m^3, which is arranged vertically on edge and parallel with the driving-shaft, and which connects the base of the motor with the supporting-bracket.

N represents a main friction-wheel mounted on the driving-shaft and bearing with opposite sides against the driving friction-disks. The friction-wheel is connected with the driving-shaft by means of a feather which compels said wheel to turn with the shaft, but permits the same to be shifted lengthwise thereon for moving the wheel toward or from the axis of the driving friction-disks, and thereby varying the speed of the latter.

O represents a rock-shaft whereby the main friction-wheel is shifted, and which is journaled in a hanger p, secured to the bed, and in a bearing p', formed in the base of the motor. This rock-shaft is provided with a shifting-arm p^2, which is connected with the hub of the main friction-wheel.

Q represents a shifting-rod connected at one end to a rock-arm q on the rock-shaft and provided at its opposite end with a pin, which engages with a notched plate q', secured to the bed.

R represents a steadying-wheel arranged between the driving friction-disk diametrically opposite the driving friction-wheel and pivotally supported on the supporting-bracket by a rock-arm r.

Upon starting the motor the driving friction-wheel turns the driving-disks in opposite directions. As represented in Figs. 2 and 6, the driven friction-disk J bears against the driving friction-disk K and rotates therewith while the driving friction-disk J′ is out of engagement with the driving friction-disk K′, which causes the intermediate or driven shafts to turn in the same direction as the driving-disk K. Upon shifting the driven shafts lengthwise upon each other in opposite directions, so that the driven disk J is moved out of engagement with the driving-disk K and the driven disk J′ is moved into engagement with the driving-disk K′, the intermediate or driven shafts will be turned in the opposite direction. The driven disks may be moved toward and from their respective driving disks by means of a shifting hand-lever S, pivoted on the bed of the lathe and connected with the inner end of the inner driven shaft in such manner that the latter is compelled to move lengthwise upon shifting the hand-lever, but is free to turn. When the driven friction-disk J is moved against the driving friction-disk K, the driven shafts and spiral pinions turn the spiral gear-wheels in the direction of the arrow, Fig. 1. The load upon the lathe resists the turning movement of the spiral gear-wheels, which causes the spiral pinions in working with their spiral teeth against those of the spiral gear-wheels to be moved axially toward each other. This movement is transmitted to the driven disk J and driving-disk K for pressing them together, as follows: As represented by the arrows in Figs. 6 and 7, the axial movement of the spiral pinion g is transmitted to the inner driven shaft and driven disks J J′, secured thereto, while the axial movement of the spiral pinion h in the opposite direction is transmitted to the outer hollow shaft H, thrust-bearing L′ at the end of the hollow shaft, the driving-disk K′, mounted thereon, friction-wheels N R, and driving-disk K, which latter meets the opposing pressure of the driven disk J. Upon shifting the inner driven shaft by hand in an opposite direction, so that the driven disk J′ is pressed against the driving-disk K′, the resistance of the load upon the spiral gear-wheels causes the spiral gear-pinions to be forced apart. This movement is transmitted to the driving-disk K′ and driven disk J′ by a movement of the parts which is opposite to that indicated by the arrows in Fig. 6, and which takes place as follows: The movement of the spiral pinion g is transmitted to the inner driven shaft and driven disks J J′. The movement in the opposite direction of

the spiral pinion *h* is transmitted to the outer driven shaft, thrust-bearing L, driving-disk K, friction-wheels N R, and driving-disk K′, which latter meets the opposing pressure of the driven disk J′.

The pressure between the driving and driven disks and friction-wheels varies according to the load upon the lathe, so that these parts are only subject to wear in proportion to the load.

When the lathe is at rest, the spiral gear-pinions can be moved toward and from each other for reversing the driving mechanism by simply turning the article which is being operated upon or the mandrel carrying the same.

For some purposes and where it is not desired to shift the driving-wheel toward and from the axis of the driving-disks the friction-faces may be replaced by toothed faces.

I claim as my invention—

1. The combination with two driven shafts capable of moving lengthwise with reference to each other, of two driven disks mounted on one of the driven shafts, two driving disks mounted on the other driven shaft and adapted to engage with the driven disks, and a driving wheel engaging with both driving disks, substantially as set forth.

2. The combination with an inner driven shaft and a surrounding hollow driven shaft, both capable of moving lengthwise upon each other, of two driven disks secured to the inner shaft, two driving disks mounted on the outer driven shaft and adapted to engage with the driven disks, and a driving wheel bearing against both driving disks, substantially as set forth.

3. The combination with two driven shafts capable of moving lengthwise upon each other, of two driven disks secured to one of said shafts, two driving disks mounted on the other shaft and adapted to engage with the driven disks, a driving wheel engaging with both driving disks, two spiral gear pinions secured respectively to said driven shafts and having their teeth trending in opposite directions, and two spiral gear wheels meshing with said spiral pinions, substantially as set forth.

4. The combination with an inner and an outer driven shaft capable of longitudinal movement in opposite directions, of two driven disks secured to the inner shaft, thrust bearings mounted on the outer shaft and partaking of its axial movement, two driving disks arranged against these thrust bearings, and a driving wheel arranged between the driving disks, substantially as set forth.

5. The combination with an inner driven shaft and a surrounding driven shaft, both capable of longitudinal movement upon each other in opposite directions, of two driven disks connected with the inner shaft, two driving disks mounted on the outer shaft and adapted to bear against the driven disks, thrust bearings on the outer shaft which resist the separating axial movement of the driving disks, a driving wheel engaging with both driving disks, two driving spiral gear pinions secured respectively to said driven shafts and having teeth trending in opposite directions, and two driven spiral gear wheels meshing with said pinions, substantially as set forth.

Witness my hand this 18th day of March, 1895.

FREDERICK HART.

Witnesses:
J. S. VAN CLEEF,
WM. J. KENNEDY.