

No. 664,386.

Patented Dec. 25, 1900.

S. C. DAVIDSON.

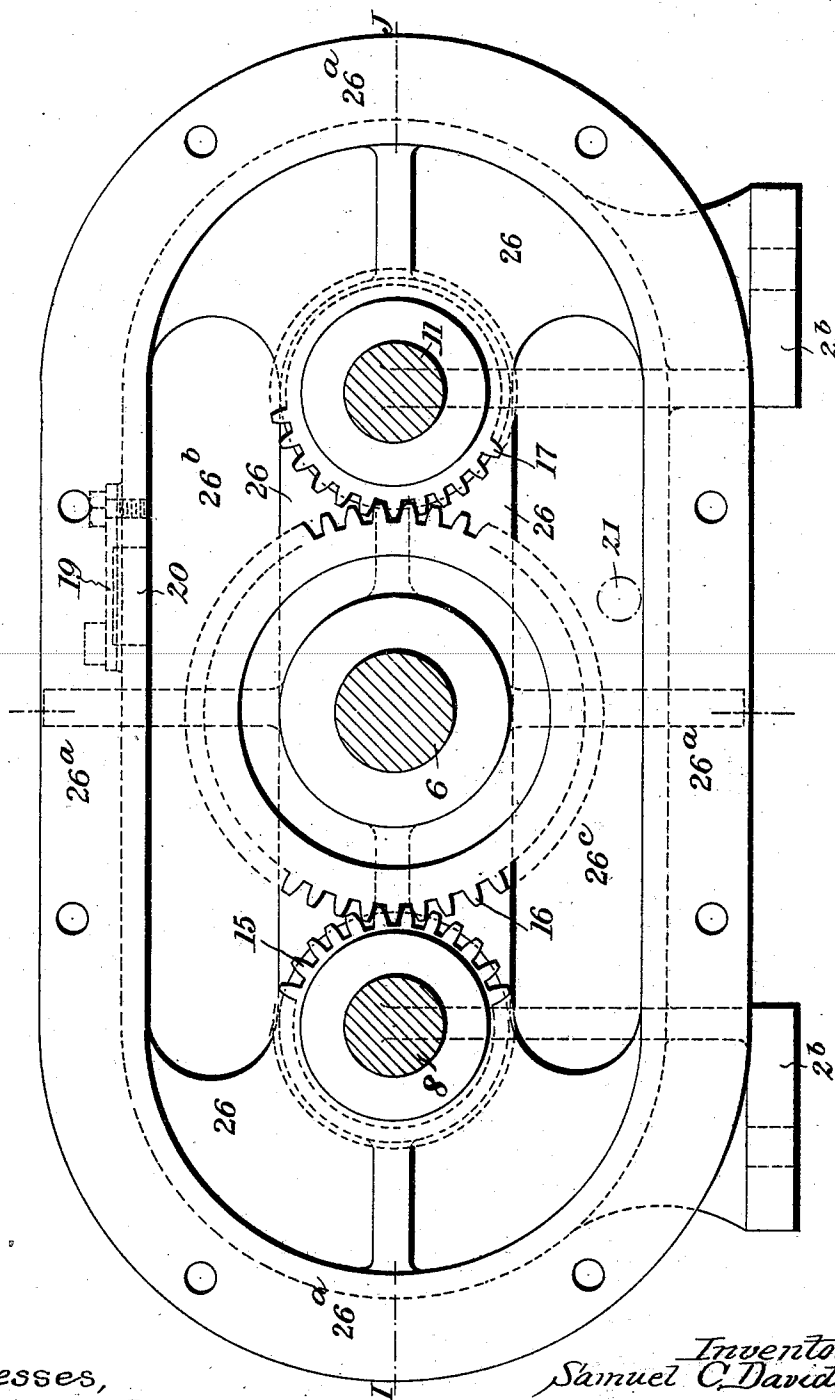
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

(Application filed July 21, 1900.)

(No Model.)

8 Sheets—Sheet 1.

Fig. 1.



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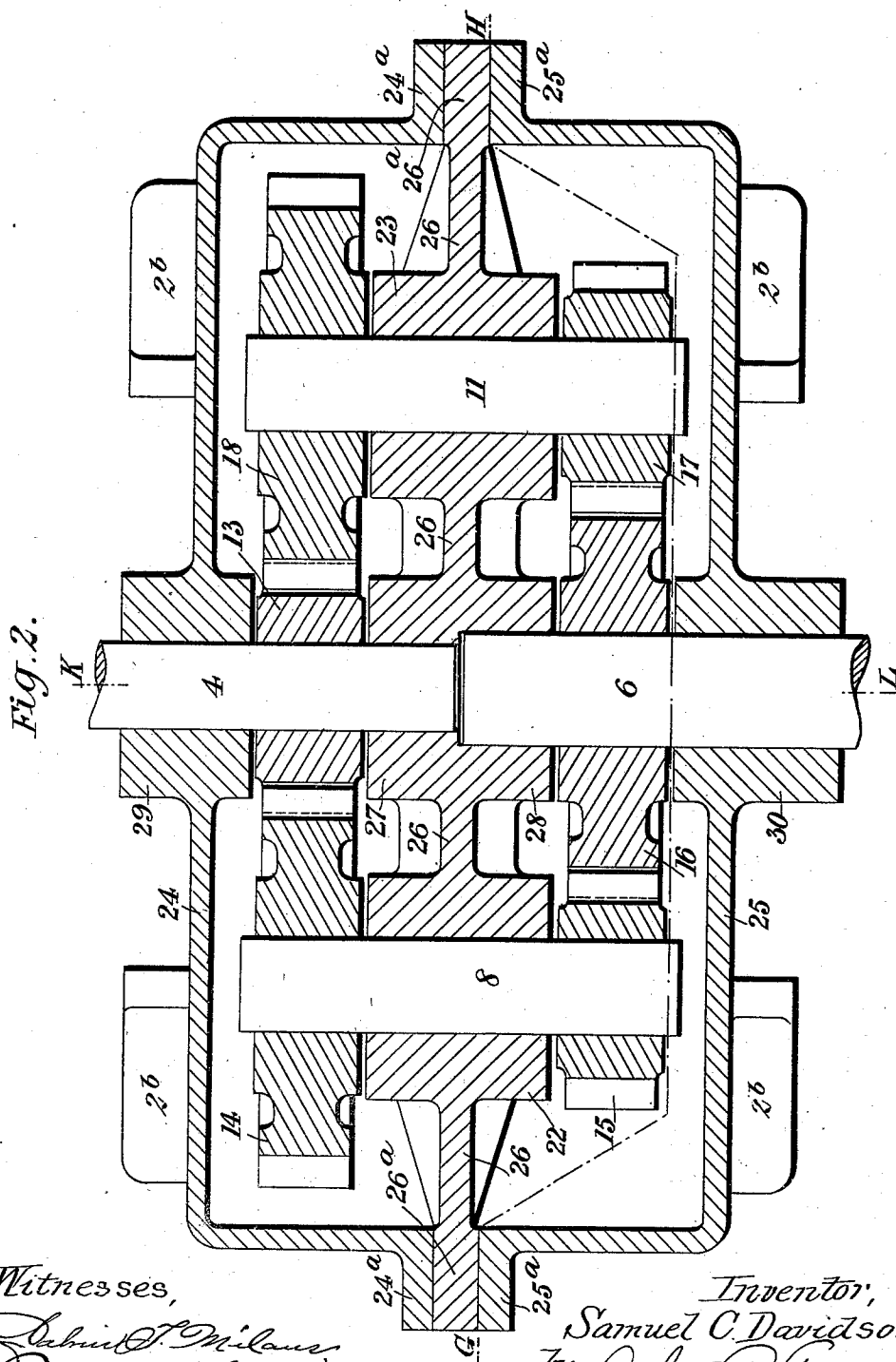
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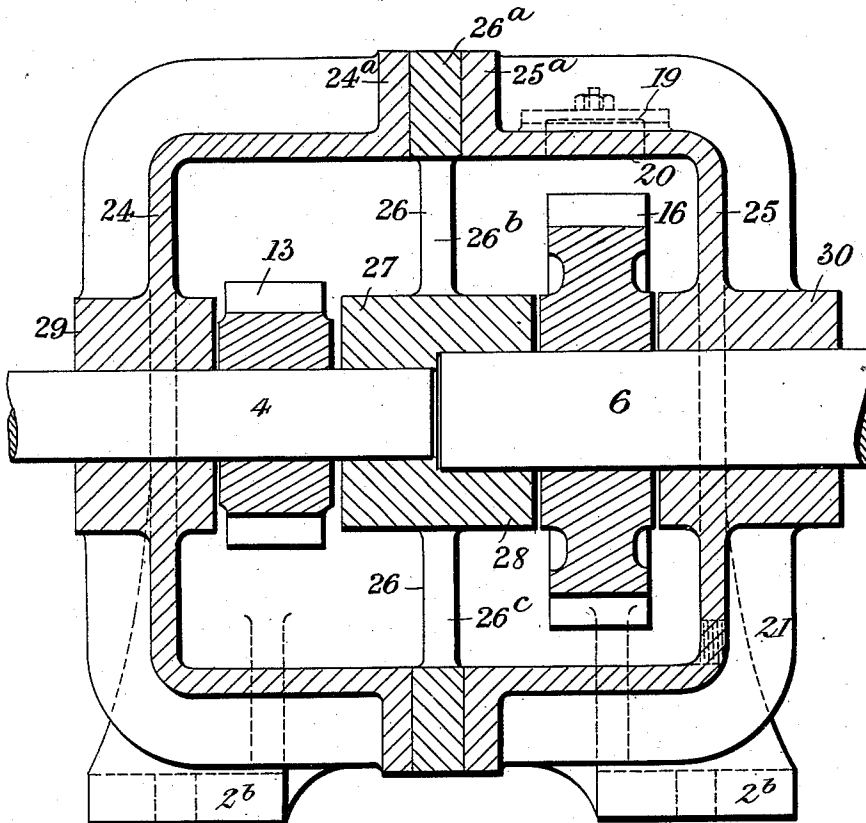
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

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8. Sheets—Sheet 3.

Fig. 3.



Witnesses

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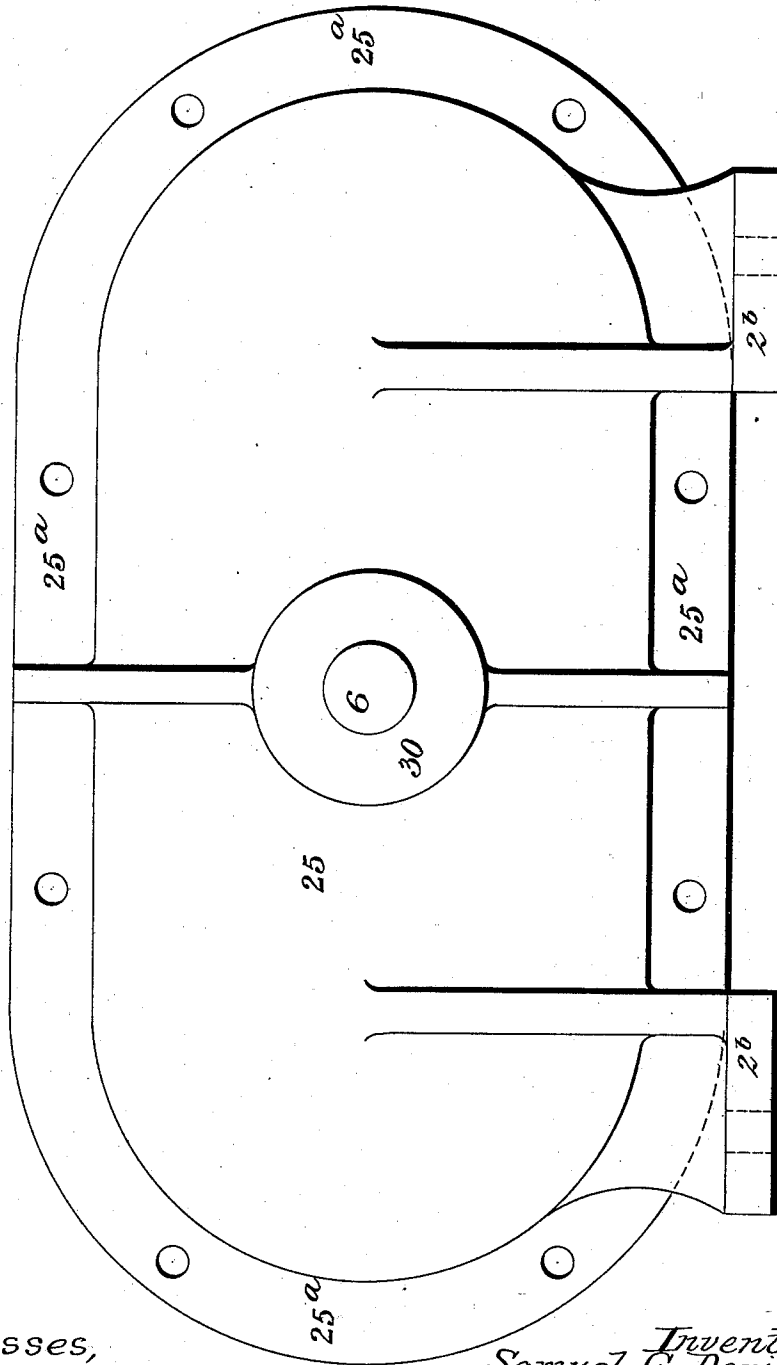
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

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(No Model.)

8 Sheets—Sheet 4.

Fig. 4.



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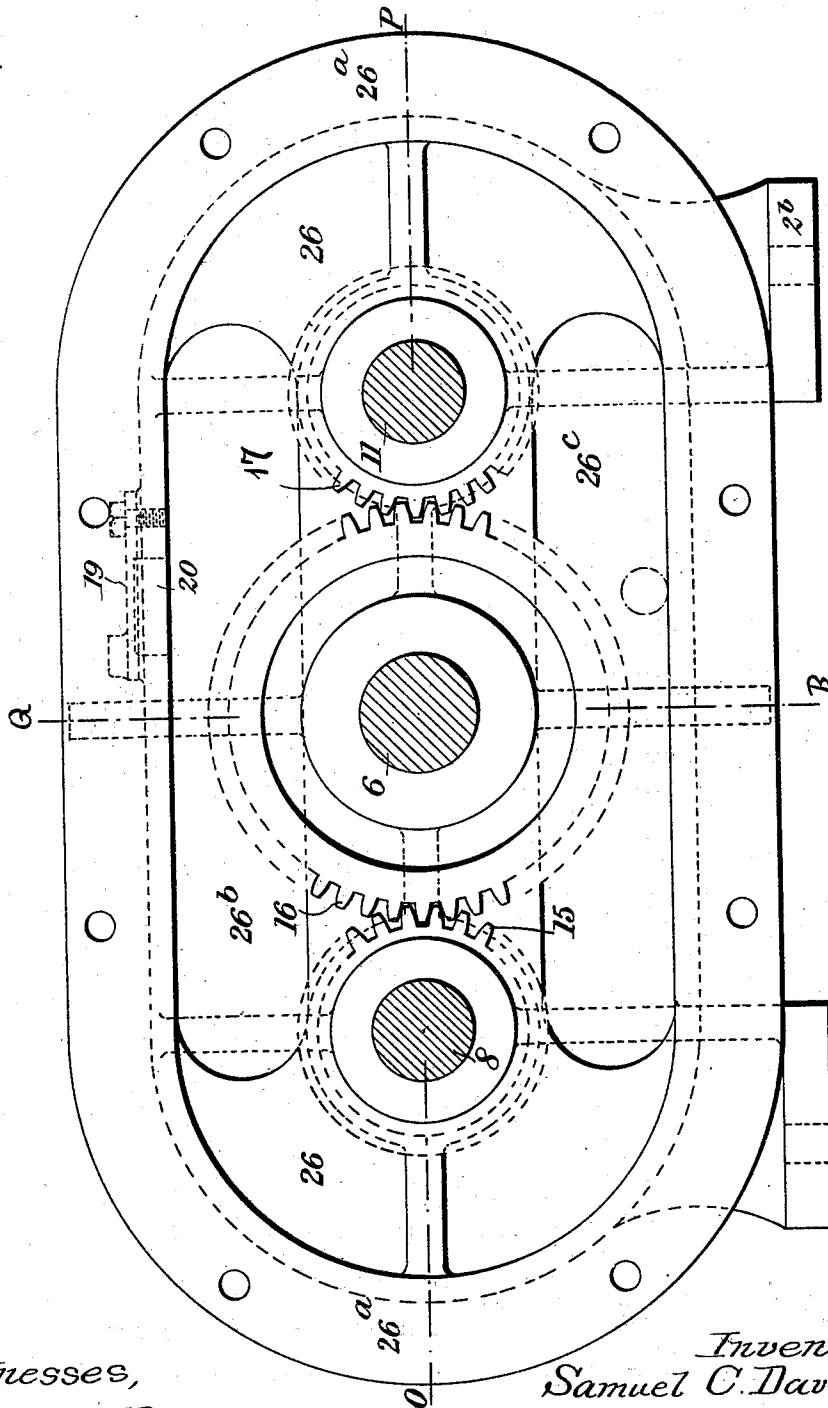
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

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(No Model.)

8 Sheets—Sheet 5.

Fig. 5.



Witnesses,

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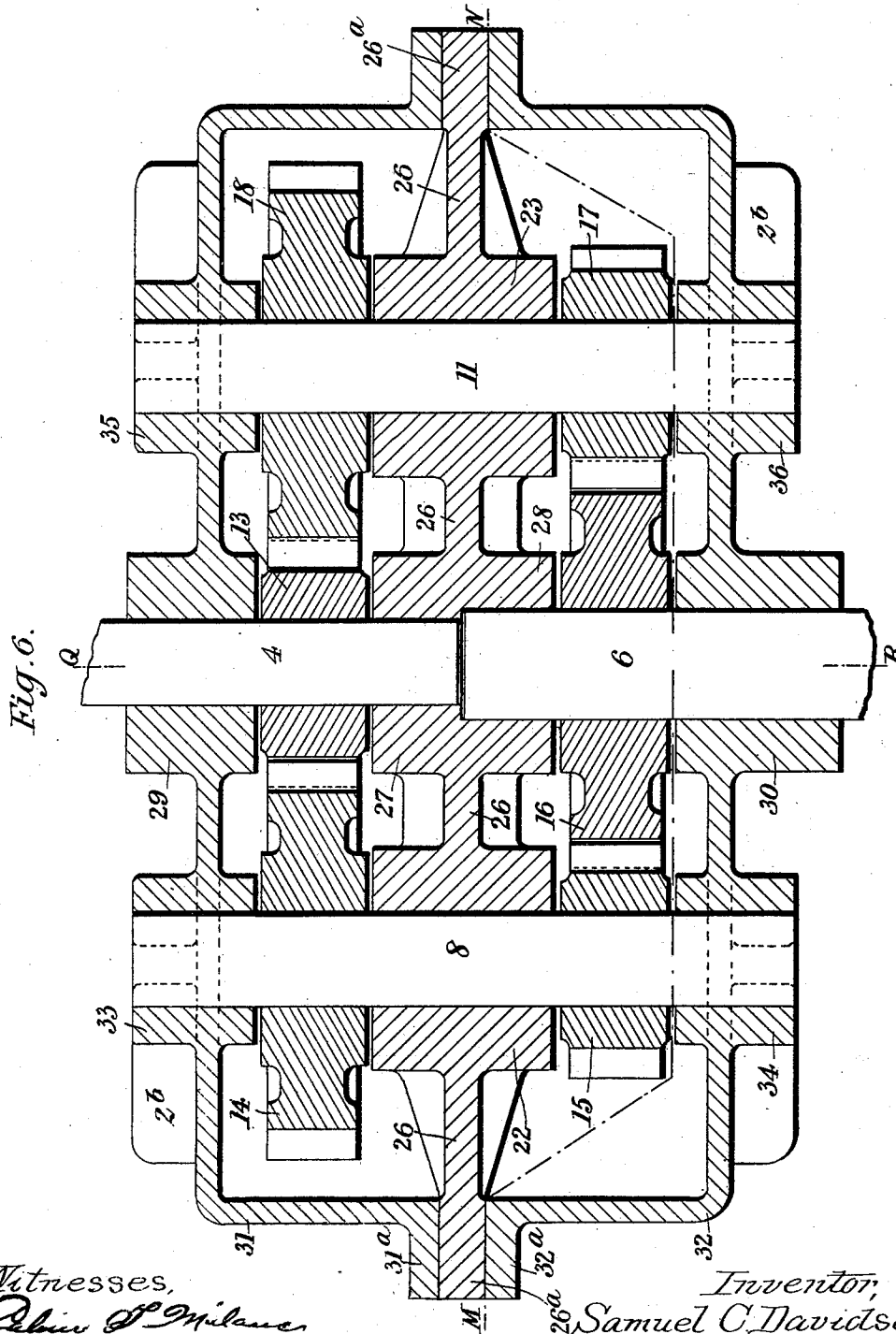
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SPEED REDUCING OR SPEED MULTIPLYING GEAR.

(Application filed July 21, 1900.)

(No Model.)

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Witnesses,
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No. 664,386.

Patented Dec. 25, 1900.

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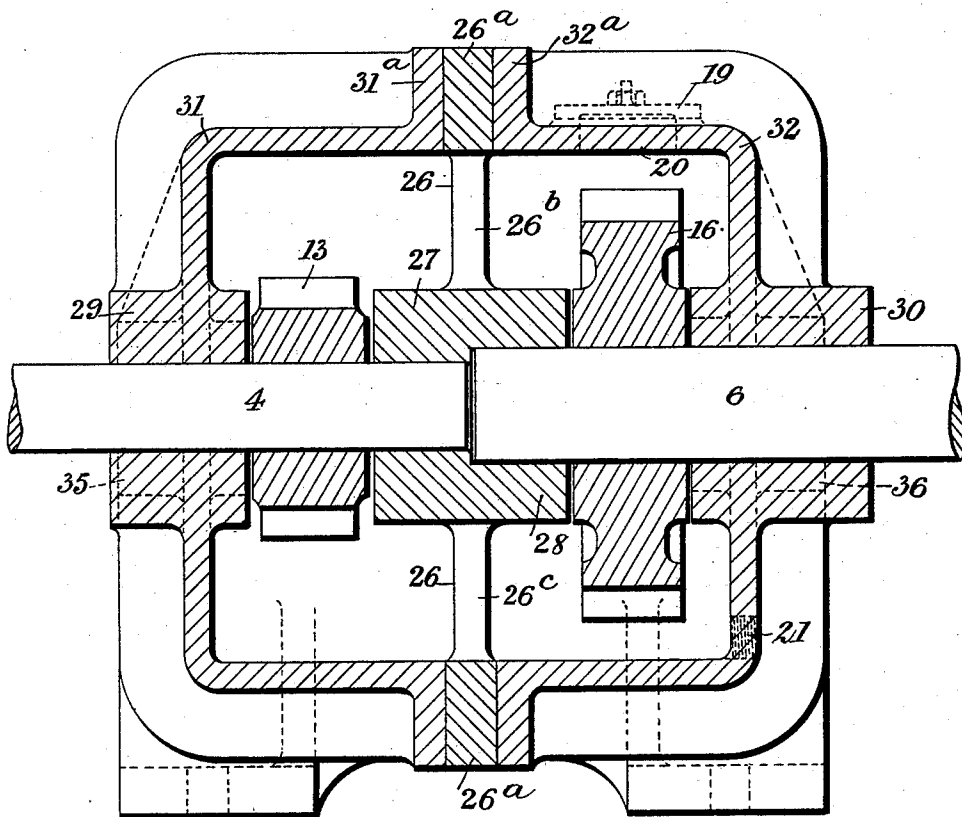
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

(Application filed July 21, 1900.)

(No Model.)

8 Sheets—Sheet 7.

Fig. 7.



Witnesses
John D. Milner
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No. 664,386.

Patented Dec. 25, 1900.

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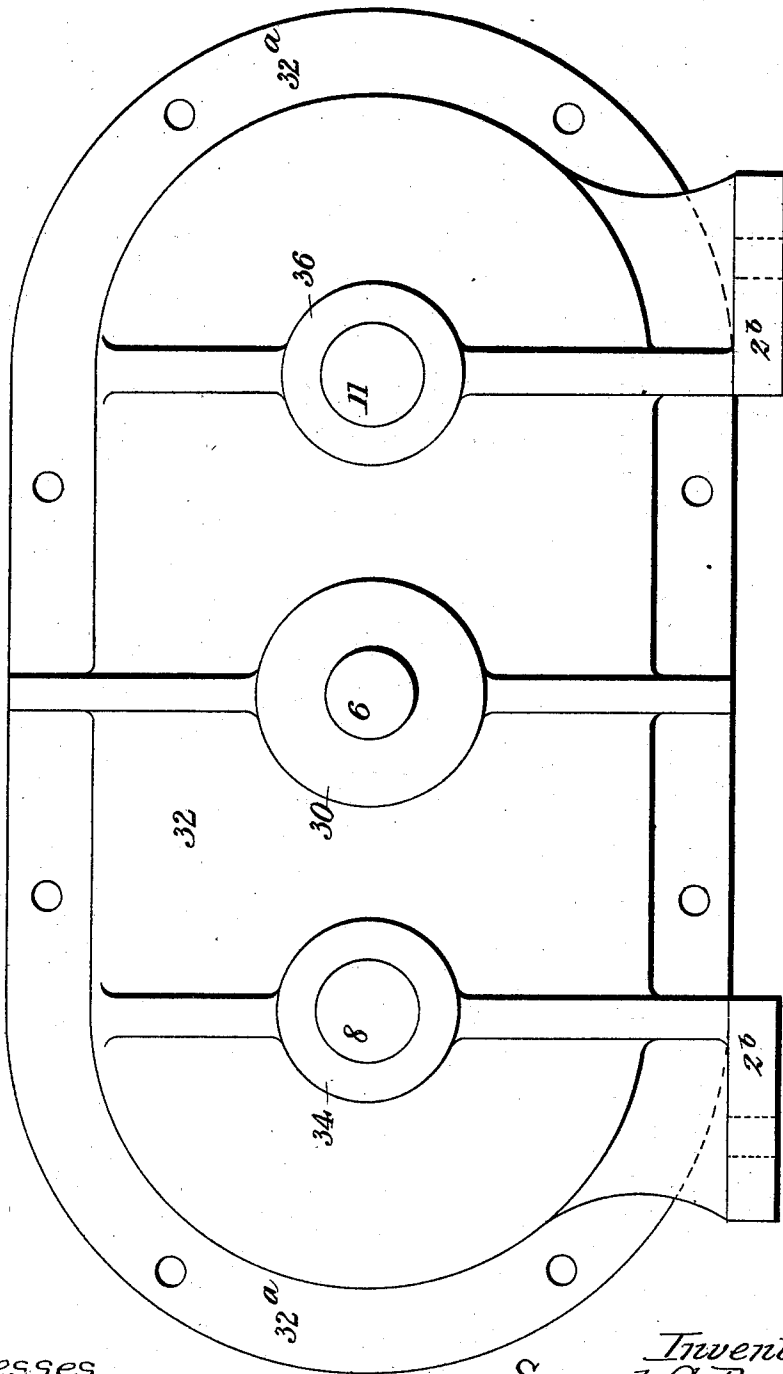
SPEED REDUCING OR SPEED MULTIPLYING GEAR.

(Application filed July 21, 1900.)

(No Model.)

8 Sheets—Sheet 8.

Fig. 8.



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UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

SPEED-REDUCING OR SPEED-MULTIPLYING GEAR.

SPECIFICATION forming part of Letters Patent No. 664,386, dated December 25, 1900.

Application filed July 21, 1900. Serial No. 24,426. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL CLELAND DAVIDSON, merchant, of Sirocco Engineering Works, Belfast, Ireland, have invented certain new and useful Improvements in Speed-Reducing or Speed-Multiplying Gear, of which the following is a specification.

This invention has reference to an improved construction and arrangement of speed-reducing or speed-multiplying gear for transmitting driving power at a lower or higher rotary speed from a revolving shaft—such as the driving-shaft of electric motors, turbines, steam-engines, and other motors—to another shaft arranged in concentric alinement therewith and which is driven thereby.

The objects of this invention are to transmit a lower or higher rotary motion from a driving-shaft to a driven shaft in concentric alinement with each other by means of a balanced arrangement of toothed-wheel gearing so mounted as to obviate side thrust on both shafts, and thereby minimize friction in their bearings and loss of power therefrom, and also to have said toothed-wheel gearing partly immersed and revolving in a bath of oil or other fluid lubricant, so as to minimize working friction and noise in said gearing.

In the accompanying drawings, Figures 1, 2, 3, and 4 show one modification in which the gear-box is made in halves bolted vertically and with an intermediate plate bolted in between the gear-box flanges, but without the outside bearings on gear-box for carrying side shafts, Fig. 1 being a vertical section on the line G H of Fig. 2, Fig. 2 a horizontal section on the line I J of Fig. 1, Fig. 3 a vertical section on the line K L of Fig. 2, and Fig. 4 an end elevation of Fig. 1. Figs. 5, 6, 7, and 8 show another modification in which the gear-box is made in halves bolted vertically and with an intermediate plate bolted in between the gear-box flanges and with outside bearings for carrying side shafts, Fig. 5 being a vertical section on the line M N of Fig. 6, Fig. 6 a horizontal section on the line O P of Fig. 5, Fig. 7 a vertical section on the line Q R of Fig. 5, and Fig. 8 an end elevation of Fig. 5.

Referring first to Figs. 1 to 4, inclusive, the gear-box in which the gearing is inclosed is

made in vertical halves 24 and 25, which are connected together with an oil-tight vertical joint by means of bolted flanges 24^a and 25^a, respectively. Each of the halves 24 and 25 is provided with feet 2^b, Figs. 1 and 2, by means of which the gear-box can be bolted to any suitable foundation. A bearing 29 is cast in the half 24 at one end of the gear-box to carry a shaft 4, and a bearing 30 is similarly cast in the half 25 on the opposite end of the gear-box to carry a shaft 6. The shafts 4 and 6 are coaxial and opposite each other and may be provided with the usual couplings. Side shafts 8 and 11 are provided, these being mounted parallel to each other and to the common axis of the central shafts 4 and 6. They are also equidistant from said common axis.

13 is a spur-pinion wheel fixed on the end of the shaft 4 inside the gear-box, and 14 is a spur-wheel fixed on the shaft 8 inside the gear-box and gearing with the pinion 13.

15 is a spur-pinion also fixed on the shaft 8, but gearing with a spur-wheel 16, fixed on the shaft 6.

17 and 18 are respectively a spur-pinion and a spur-wheel fixed on the shaft 11 and gearing, respectively, with the wheel 16 and pinion 13.

All the pinions and wheels 13, 14, 15, 16, 17, and 18 are inside the gear-box. The pinion 13 and wheel 16 gear, respectively, with the wheel 14 and pinion 15 on one side and with the pinion 17 and wheel 18 on the opposite side. The pinions 13, 15, and 17 have equal diameters, and the wheels 14, 16, and 18 have also equal diameters. The side shaft 8 is carried in one bearing only, 22, which is located between the wheels 14 15 on said shaft, and the other side shaft 11 is also carried in one bearing only, 23, which is similarly located between the wheels 17 18 on said shaft. Between the flanges 24^a and 25^a is secured the peripheral flange 26^a of a vertical intermediate plate 26, that extends centrally across the gear-box from end to end. This intermediate plate 26 has cast with it the bearings 22 23, above referred to. It has also cast with it centrally-located coaxial bearings 27 and 28, which carry, respectively, the inner ends of the shafts 4 and 6 between the bear-

- ings 29 and 30 of the gear-box. The employment in the intermediate plate 26 of the additional bearings 27 28 for the ends of the driving-shaft 4 and driven shaft 6 is important where high power is being transmitted, as they not only increase the firmness of the pinions on said shaft, but also insure the centers of said shafts being truly parallel to the centers of the side shafts 8 and 11.
- 19 is a movable plate covering the hole 20, which is an inlet to allow of introducing lubricant into the gear-box.
- 21 is an outlet-hole for withdrawing the lubricant from the gear-box.
- The shafts 4 and 6 may be either the driving or driven shafts, according as the speed is to be reduced or increased.
- The pinion 13 on the shaft 4 is either smaller or larger than the spur-wheels, according as the speed of the driving-shaft 4 is to be reduced or multiplied in transmission to the driven shaft 6. The larger wheels dip into the lubricant contained in the gear-box and splash it freely over the smaller wheels and around the ends of the bearings within the gear-box, which are thus all so efficiently lubricated as to reduce friction and noise of the wheels to a minimum. The intermediate plate 26 has within the gear-box openings 26^b 26^a at top and bottom, so as to allow free circulation of the lubricant and contained air through the said openings from one side of the gear-box to the other when the gear-wheels are revolving.
- The side thrusts due to the engagement of the wheels 13 and 14 with each other and of the wheels 16 and 15 with each other on one side of the shafts 4 and 6 are exactly and respectively balanced by the oppositely-directed and equal side thrusts due to the engagement of the wheels 13 and 18 with each other and of the wheels 16 and 17 with each other on the opposite side of the said shafts 4 and 6.
- In the modification shown in Figs. 5, 6, 7, and 8 the gear-box is formed in two vertical halves 31 32, jointed oil-tight by means of bolted flanges 31^a 32^a, between which is secured the peripheral flange 26^a of the intermediate plate 26. The intermediate plate has cast with it bearings 22 and 23 for the side shafts 8 and 11, and also the central additional bearings 27 and 28 for the ends of the shafts 4 and 6. The gear-box half 31 has cast with it the bearings 29 for the shaft 4, and the gear-box half 32 has cast with it the bearing 30 for the shaft 6. The gear-box halves have also cast with them additional bearings 33 and 34 to carry the ends of the side shaft 8, and also additional bearings 35 and 36 to carry the ends of the side shaft 11. The additional bearings 33 34 and 35 36 are provided when extra high power has to be transmitted, so that the wheels 14 15 17 18 are supported by bearings on each side.

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

1. In speed-reducing or speed-multiplying gear, the combination of two central rotary shafts arranged in line with each other, a pinion on the end of the first central shaft, and a toothed wheel on the adjacent end of the second central shaft, a first side shaft and a second side shaft located on opposite sides of the common axis of the two central shafts, a toothed wheel on the first side shaft gearing with the pinion on the first central shaft, and a pinion on the first side shaft gearing with the toothed wheel on the second central shaft, a toothed wheel on the second side shaft gearing with the pinion on the first central shaft and a pinion on the second side shaft gearing with the toothed wheel on the second central shaft, with bearings for the two central shafts, and with an intermediate plate provided with bearings for the two side shafts, and with central bearings for the adjacent ends of the two central shafts, substantially as set forth.
2. In speed-reducing or speed-multiplying gear, the combination of two central rotary shafts arranged in line with each other, a pinion on the end of the first central shaft, and a toothed wheel on the adjacent end of the second central shaft, a first side shaft and a second side shaft located on opposite sides of the common axis of the two central shafts, a toothed wheel on the first side shaft gearing with the pinion on the first central shaft, and a pinion on the first side shaft gearing with the toothed wheel on the second central shaft, a toothed wheel on the second side shaft gearing with the pinion on the first central shaft, and a pinion on the second side shaft gearing with the toothed wheel on the second central shaft, with a gear-box made in halves bolted together inclosing the whole of the toothed gearing and provided with bearings for the two central shafts, and with an intermediate plate provided with bearings for the two side shafts, and with central bearings for the adjacent ends of the two central shafts, substantially as set forth.
3. In speed-reducing or speed-multiplying gear, the combination of two central rotary shafts arranged in line with each other, a pinion on the end of the first central shaft and a toothed wheel on the adjacent end of the second central shaft, a first side shaft and a second side shaft located on opposite sides of the common axis of the two central shafts, a toothed wheel on the first side shaft gearing with the pinion of the first central shaft and a pinion on the first side shaft gearing with the toothed wheel on the second central shaft, a toothed wheel on the second side shaft gearing with the pinion on the first central shaft, and a pinion on the second side shaft gearing with the toothed wheel on the second central shaft, with a gear-box made in halves bolted together and inclosing the whole of the

toothed gearing, and provided with bearings
to carry the two central shafts, and also with
bearings to carry the ends of the two side
shafts, with an intermediate plate provided
5 with central bearings to carry the adjacent
ends of the two central shafts, and also with
bearings to carry the two side shafts, sub-
stantially as set forth.

In witness whereof I have hereunto signed
my name in the presence of two subscribing 10
witnesses.

SAMUEL CLELAND DAVIDSON.

Witnesses:

GEORGE GOOLD WARD,
HUGH TAYLOR COULTER.