(No Model.)

4 Sheets—Sheet 1.

A. WILKE.

CAR STARTER.

No. 446,725. Patented Feb. 17, 1891.

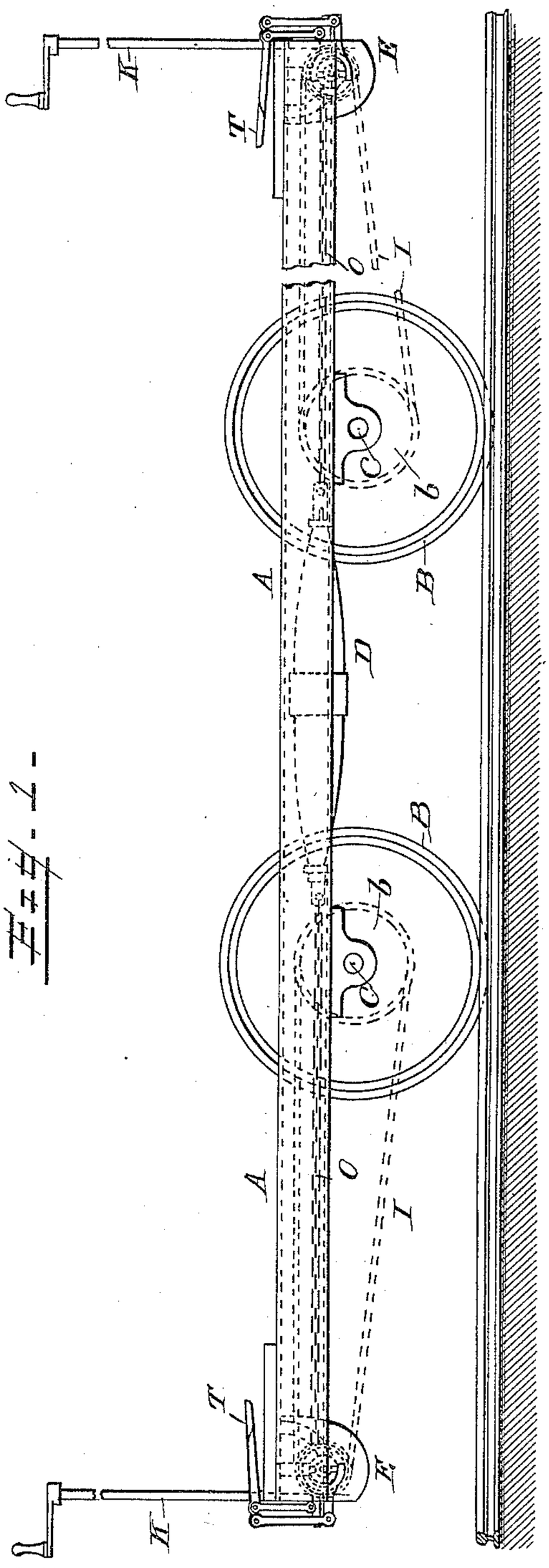


Fig. 1.

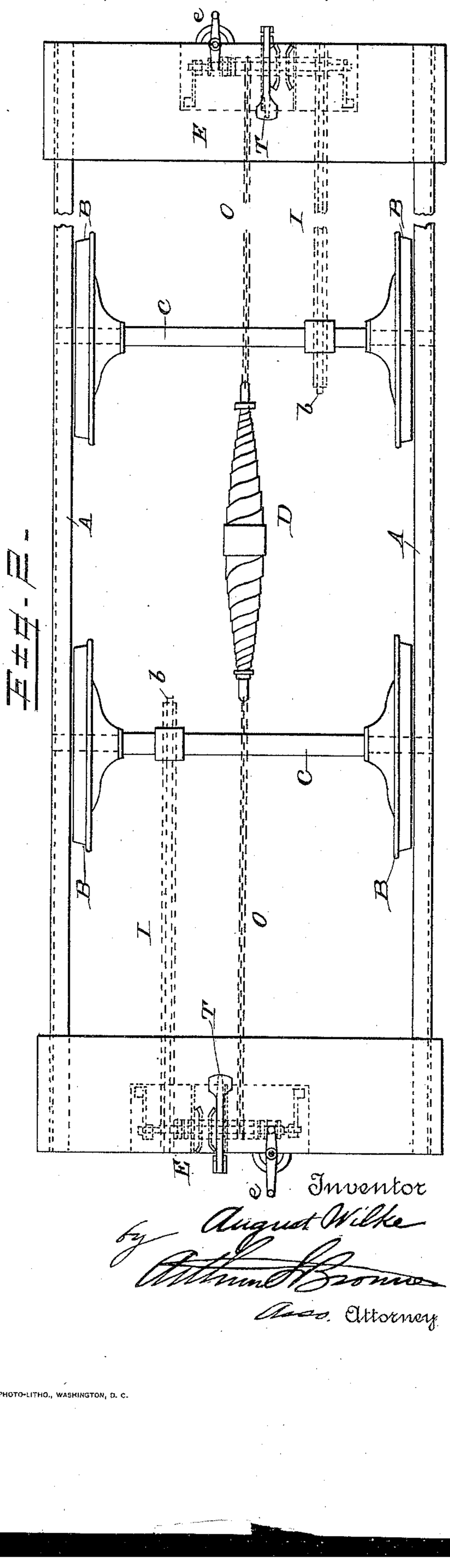


Fig. 2.

Witnesses
Albert B. Blackwood
Jos. H. Blackwood

Inventor
August Wilke
by William Brown
Asso. Attorney

(No Model.)

4 Sheets—Sheet 2.

A. WILKE.

CAR STARTER.

No. 446,725. Patented Feb. 17, 1891.

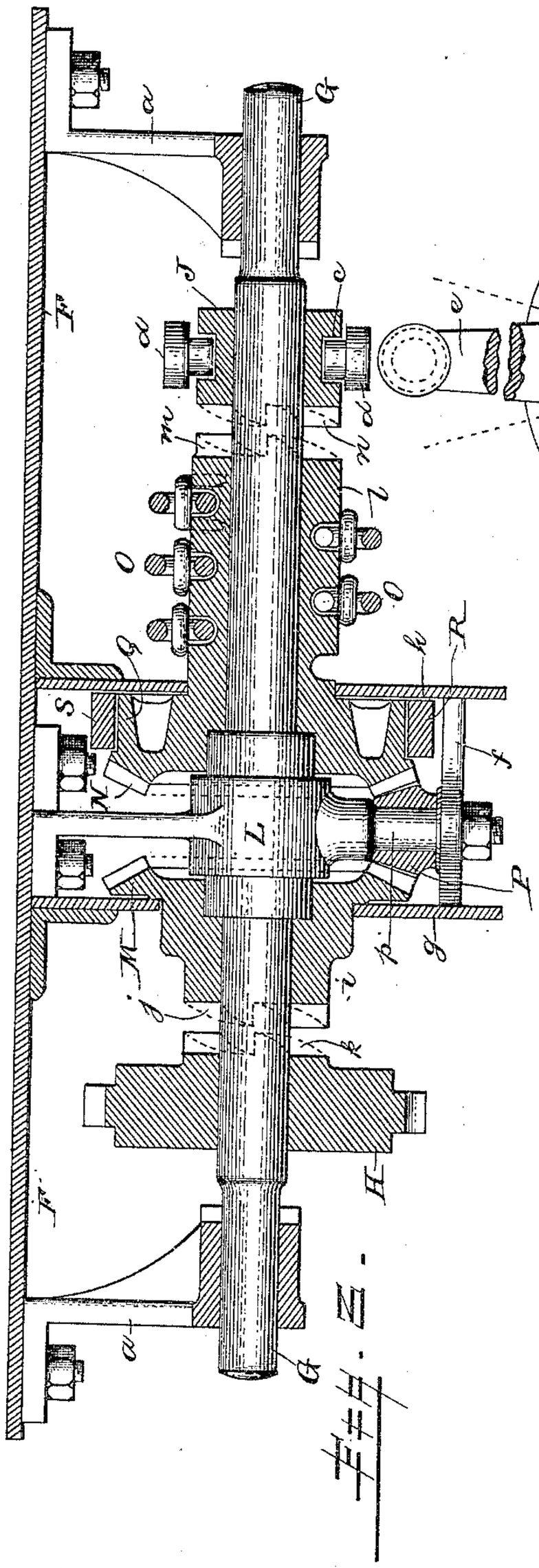


Fig. 2.

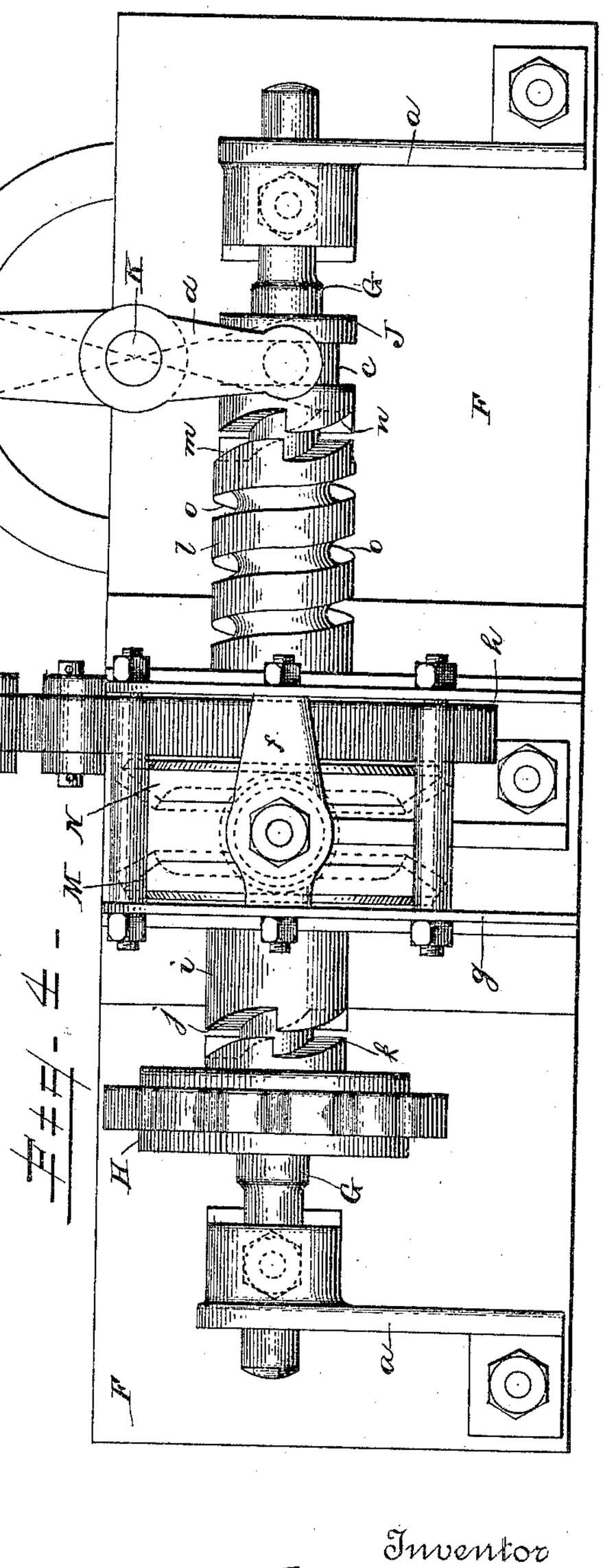


Fig. 1.

Witnesses
Albert B. Blackwood
Jos. H. Blackwood

Inventor
by August Wilke
Wm. A. Brome
Asso. Attorney

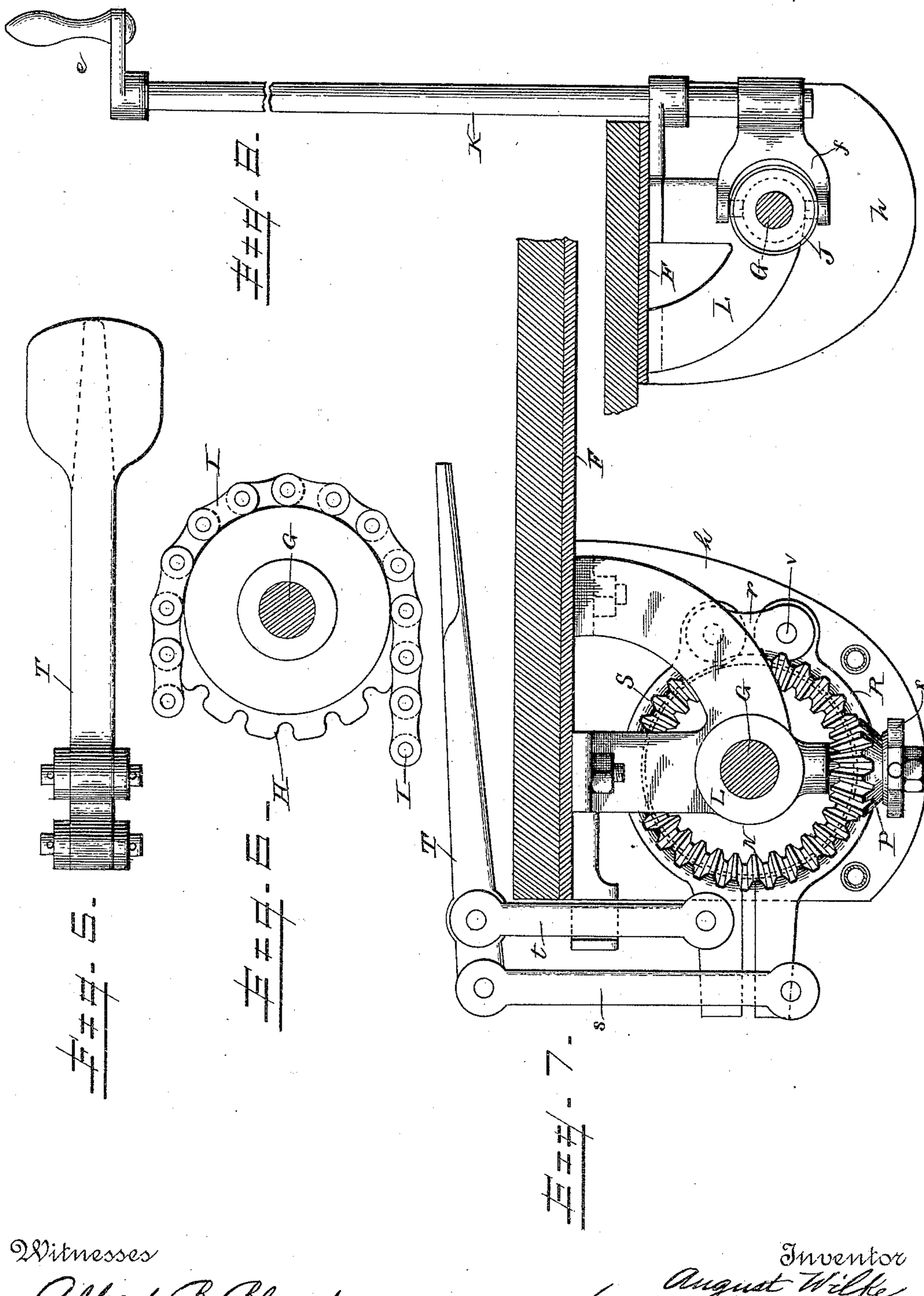
(No Model.)

4 Sheets—Sheet 3.

A. WILKE.

CAR STARTER.

No. 446,725. Patented Feb. 17, 1891.



Witnesses
Albert B. Blackwood
Jas. H. Blackwood

Inventor
August Wilke
by Wilkinson & Browne
Asses. Attorney

(No Model.)

4 Sheets—Sheet 4.

A. WILKE.

CAR STARTER.

No. 446,725. Patented Feb. 17, 1891.

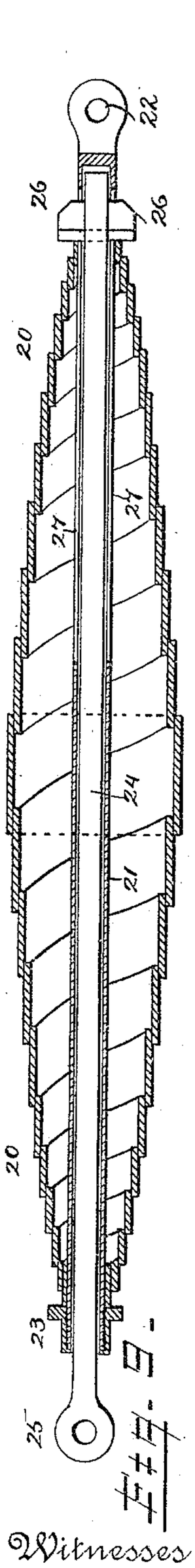


Fig. 5.

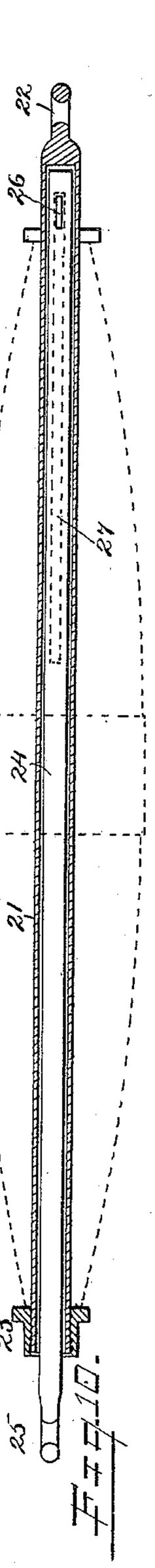


Fig. 10.

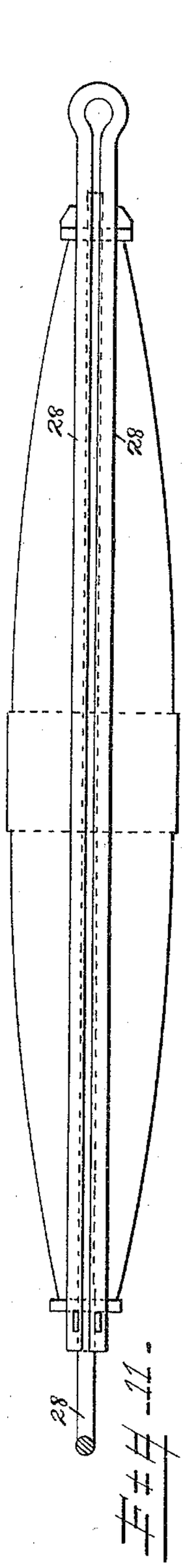


Fig. 11.

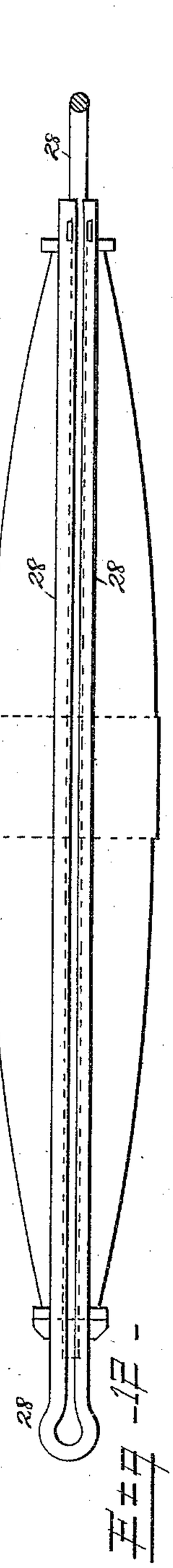


Fig. 12.

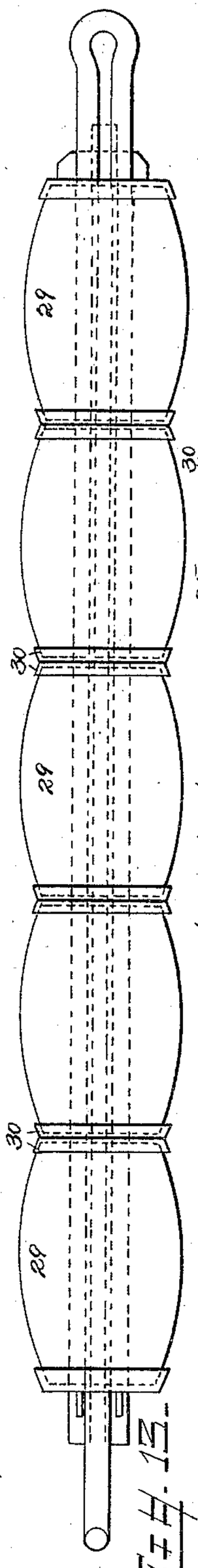


Fig. 13.

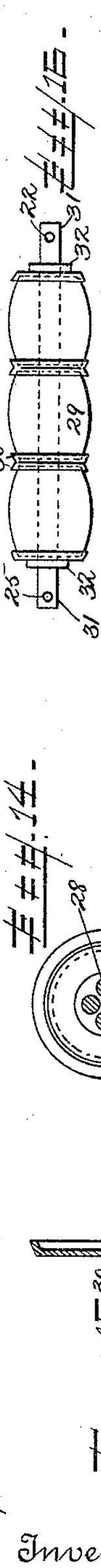


Fig. 14.

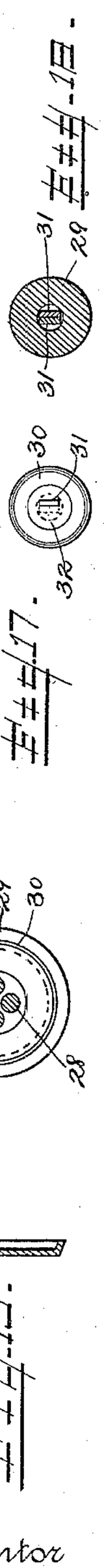


Fig. 17.

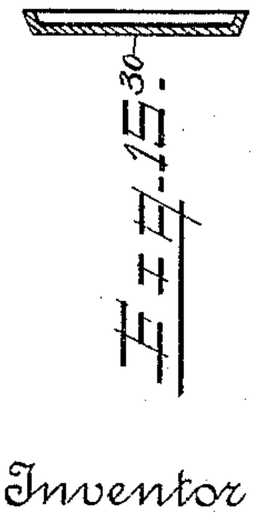


Fig. 15.

Witnesses

Albert B. Blackwood

Josh Blackwood

Inventor

August Wilke

by Arthur B. Brown

Atty.

Attorney

UNITED STATES PATENT OFFICE.

AUGUST WILKE, OF BRUNSWICK, GERMANY.

CAR-STARTER.

SPECIFICATION forming part of Letters Patent No. 446,725, dated February 17, 1891.

Application filed December 2, 1890. Serial No. 373,308. (No model.)

To all whom it may concern:

Be it known that I, AUGUST WILKE, of Brunswick, Germany, have invented certain new and useful Improvements in Apparatus for Starting Street-Cars, of which the following is a specification.

The present invention relates to that class of street-car starters wherein the momentum of the car in stopping is utilized to apply tension to a spring, thus storing up power which is utilized to assist in again starting the car. This principle of operation is old and well known in car-starters.

The present invention consists in improvements in the construction of the mechanism of such car-starters.

The present improvements are two-fold in character.

One portion of the improvements relates to the construction of the spring apparatus for storing up the power derived from the stopping of the car, and the other portion of the improvements relates to the construction of the transferring mechanism whereby tension is given to the spring as the car stops and the power stored up in the spring is rendered effective in starting the car.

The present improvements are illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of the truck of a street-car provided with the present improvements. Fig. 2 is a plan view thereof. Fig. 3 is a vertical longitudinal section of the power-transferring mechanism. Fig. 4 is a bottom view of the same. Fig. 5 is a detail plan view of the brake-treadle. Fig. 6 is a detail view of a chain and sprocket-wheel constituting part of the mechanism, whereby an axle of the car is connected with the transferring mechanism. Fig. 7 is a vertical cross-section of the mechanism shown in Figs. 3 and 4. Fig. 8 is a detail view of the devices for throwing the starter into and out of action. Fig. 9 is a longitudinal section of a power-storing spring. Fig. 10 is another longitudinal section of the same, taken in a plane at right angles to the plane of Fig. 9. Figs. 11 and 12 are views of a spring similar to that shown in Figs. 9 and 10, but provided with a modified form of devices for connecting the spring to the transferring mechanism. Fig. 13 is a view of a modified form of spring. Fig. 14 is a cross-section of the spring shown in Fig. 13. Fig. 15 is a detail view of a cap constituting a part of the spring shown in Fig. 13. Fig. 16 is a view of a spring similar to that shown in Fig. 13, but provided with a modified form of devices connecting the spring to the transferring mechanism. Fig. 17 is an end view of the spring shown in Fig. 16. Fig. 18 is a cross-section of the spring shown in Fig. 16.

Referring first to Figs. 1 and 2, A is the body-frame of a vehicle, such as a street-car. B B are the wheels thereof. C C are the wheel-axles. D is the power-storing mechanism as a whole, and E E are the transferring mechanisms as entireties.

A transferring mechanism E is located at each end of the car, so that the car can be run in either direction, and both transferring mechanisms are connected to the same power-storing mechanism D, which need not be duplicated, though it may be.

A detail description will first be given of the transferring mechanism and then of the power-storing mechanism. It will suffice at the outset, in order to render the description of the transferring mechanism clearly intelligible, to state that the power-storing mechanism is such that when the car stops a spring is compressed or is otherwise given tension, and that the power thus stored is by the expansion of the spring applied to start the car.

The transferring mechanisms E E at the two ends of the car are identical, so that a description of one will suffice for both. Referring, therefore, to Figs. 3, 4, and 7, F is a metallic plate or platform, which is secured to the frame of the car. Depending from this platform are two brackets *a a*, in which is journaled a shaft G, extending crosswise of the car parallel with the axles C C. This shaft G is so mounted in its bearings as to be capable of a limited longitudinal movement. Rigidly secured near one end of the shaft G is a sprocket-wheel H, which is connected by a chain I (see Figs. 2 and 6) with a sprocket-wheel *b*, rigidly connected with the adjacent axle C. Consequently the shaft G is rotated whenever the car is in motion. Near the other end of the shaft G a collar J is rigidly

secured thereto. This collar has a circumferential groove *c*, into which enter the projecting ends of a forked lever *d*, this connection being a well-known one which does not interfere with the rotation of the shaft. The lever *d* is rigidly secured to the lower end of a vertical crank-rod K, which is suitably journaled to the car, as shown most clearly in Fig. 8, and which carries a crank-handle *e* within convenient reach of the conductor or driver of the car. By turning the crank-handle *e* the shaft G may be moved longitudinally in either direction. Depending from and bolted to the plate F, intermediate between the brackets *a a*, is a block L, which at its lower end is further supported by a cross-bar *f*, connected to two cheek-plates *g h*, which are in turn bolted to the plate F. This block L is centrally bored, so that it constitutes a central bearing for the shaft G. Between the cheek-plate *g* and the block L is a bevel gear-wheel M, which encircles the shaft G, and has its bearing partly on the shaft G and partly on a cylindrical portion of the block L, as shown in Fig. 3. The hub *i* of this gear-wheel extends out beyond the plate *g*, and is provided with a clutch member *j*, which co-operates with a clutch member *k* on the hub of the sprocket-wheel H. Between the cheek-plate *h* and the block L is a bevel gear-wheel N, which encircles the shaft G, and has its bearings partly on the shaft G and partly on a cylindrical portion of the block L, as shown in Fig. 3. The hub *l* of this gear-wheel extends beyond the plate *h*, and is provided with a clutch member *m*, which co-operates with a clutch member *n* on the collar J. To the outwardly-extending hub *l* of this gear-wheel N is attached one end of a chain O, the opposite end of which is attached to the power-restoring mechanism D. The hub *l* serves as a drum on which the chain may be wound, and in order that the winding of the chain may be efficiently accomplished without overlapping the chain the hub is provided with a spiral winding-groove *o*. Journaled on a spindle *p*, formed by the lower part of the block L, is a reversing bevel-pinion P, which meshes at all times with both the gear-wheels M N. Consequently when one of the gear-wheels is rotated in one direction the other will be rotated in the opposite direction.

The transferring mechanism has now been sufficiently described to enable its operation to be understood. Normally when the car is running the shaft G occupies a central position, as shown in Fig. 3, both of the clutches being out of action. The shaft G rotates freely in the same direction as the axles of the car and the gear-wheels M N are stationary. When, however, it is desired to stop the car, the crank-rod K is turned so as to move the shaft G to the right. (See Fig. 3.) This movement causes the interlocking of the two clutch members *k j*, thus clutching the driven wheel H to the gear-wheel M and rotating the wheel M in the same direction as the car-wheels B. The gear-wheel M, through the intermediate reversing-pinion P, rotates the gear-wheel N in a direction opposite to the direction in which the car-wheels B rotate. As the gear-wheel N turns, the chain O is wound on the hub *l*, thus compressing or applying tension to the spring or other power-storing mechanism. The force required to compress the spring is supplied by the momentum of the car, and as soon as this force is expended and stored up in the power-storing mechanism the car stops. Now, in order that the power thus stored need not at once act (and thereby move the car backward) a brake mechanism is supplied for locking the gear-wheel N and preventing any rotation of the same. This brake mechanism is illustrated in Figs. 3, 4, 5, and 7. Carried by the gear-wheel N is a brake-pulley Q, with which co-operate the two parts R S of a brake-band. The lower part R of the brake-band is pivoted to a stud *v*, fixed to the cheek-plate *h*. To this stud is also pivoted a link *r*, to which in turn the upper section S of the brake-band is pivoted. A treadle T, extending in an approximately horizontal direction above the floor of the car, is connected by links *s t* with the brake-sections R S, respectively. Normally the two brake-sections are out of contact with the periphery of the brake-pulley Q or only touch the same without impeding its movement. When, however, the car stops, the driver or conductor of the car puts his foot upon the treadle T, thereby applying the brake R S, and consequently preventing any rotation of the power-transferring mechanism. When, however, the car is to be again started, the driver or conductor of the car moves the shaft G from right to left, (see Fig. 3,) and then releases the brake. This movement of the shaft disconnects the clutch *j k*, and connects the gear-wheel N directly to the shaft G through the clutch members *m* and *n*. As the brake is now off, the power-storing mechanism acts and unwinds the chain O, thereby causing the gear-wheel N to rotate in the opposite direction to which it rotated during the stopping of the car, and consequently in the same direction in which the car-wheels would rotate if the car were going forward. This movement of the wheel N, being communicated directly to the shaft G and thence to the car-axle C, causes the car to start forward.

The improved construction of the power-storing mechanism D is illustrated in Figs. 9 to 18, inclusive. Figs. 9 and 10 show the preferred construction. In this construction the power is stored up in and furnished by a powerful coiled spring 20, which normally occupies an expanded position, and which is compressed by the action of the transferring mechanism E when the car stops. The spring 20 is shown as a double spring, so that a single power-storing mechanism serves for the two transferring mechanisms E E at the opposite ends of the car. Extending centrally

and longitudinally through the spring 20 is a draft-bar consisting of a tube 21, which is open at one end and has an eye 22 at the other end, to which is attached the chain O, which is connected with the transferring mechanism E at one end of the car. (See Figs. 1 and 2.) At its open end the tube 21 carries a flanged collar 23, against which one end of the spring 20 seats. Consequently, assuming that the spring as a whole is prevented from moving longitudinally, a pull upon the eye 22 will contract the spring 20. Located within the tube 21 is a draft-bar consisting of a rod 24, which at one end projects out beyond the open end of the tube and is provided with an eye 25, to which is attached the chain O, which is connected with the transferring mechanism E at the other end of the car. At its opposite end the rod 24 is provided with a key or pin 26, which projects outwardly through longitudinal slots 27 (see Fig. 10) in the tube 21, and against which the opposite end of the spring 20 seats. Consequently, assuming that the spring as a whole is prevented from moving longitudinally a pull upon the eye 25 will contract the spring 20, the length of the slots 27 determining the extent to which the rod 24 can be moved.

Since the two opposite eyes 22 and 25 are connected by the chains O O to the two transferring mechanisms E E at the opposite ends of the car, which never act simultaneously, the spring 20 as a whole is always held from moving longitudinally by the chain O, which is not in action. If, however, only one transferring mechanism E should be employed on the car, it would be necessary to secure one end of the spring to an immovable support carried by the car. The two chains O O also hold the spring 20 in proper position beneath the car. Any suitable housing for the spring can obviously be used, if considered necessary, to protect the same from dust.

The power-storing mechanism shown in Figs. 11 and 12 is the same as that shown in Figs. 9 and 10, except that modified forms of draft-bars are used instead of the tube 21 and rod 24. In this modification each draft-bar 28 is a long rod, more than twice the extreme length of the spring, which is bent so as to form a fork, as shown. Each of the two forked rods carries a cross-pin 26 at its forked end, against which one end of the spring seats.

A second modification of the power-storing mechanism is shown in Figs. 13, 14, and 15. The draft-rods in this modification are the same as in Figs. 11 and 12; but a plurality of rubber buffers 29 are used instead of the coiled spring 20. Each rubber buffer has a central longitudinal bore, (see Fig. 14,) through which the draft-bars extend, and the ends of each buffer are strengthened by the employment of dished metallic plates 30, (see Fig. 15,) into which the ends of the buffer fit.

Figs. 16, 17, and 18 show a third modification, in which rubber buffers are also employed. In this modification the draft-bars consist of two flat metallic bars 31, which lie side by side, each bar having an eye 22 or 25 at one end and a shoulder 32 at the other end, which takes against the outer face of the outer buffer.

I claim as my invention—

1. A wheeled vehicle and a rotatable shaft capable of longitudinal movement, said shaft being connected to the wheels of said vehicle, so that said shaft rotates when the vehicle moves, in combination with a power-storing mechanism which acts by expansion and contraction, two gear-wheels, one of which is connected with said power-storing mechanism, intermediate reversing mechanism connecting said gear-wheels, whereby said wheels rotate in opposite directions, and clutch mechanisms between said gear-wheels and said shaft, whereby when said shaft is moved longitudinally in one direction it is connected with one of said gear-wheels and when moved in the opposite direction it is connected with the other of said gear-wheels, substantially as set forth.

2. A rotatable shaft capable of a longitudinal movement, two gear-wheels geared together so as to rotate in opposite directions, and clutch mechanisms between said gear-wheels and said shaft, whereby when said shaft is moved in one direction it is connected with one of said gear-wheels and when moved in the opposite direction it is connected with the other of said gear-wheels, in combination with a brake-pulley carried by one of said gear-wheels, and a brake co-operating with said pulley to lock said gear-wheels when said shaft is being moved longitudinally, substantially as set forth.

3. The axle of a vehicle, the shaft G, capable of longitudinal movement, sprocket-wheels on said axle and shaft, respectively, a chain I, connecting said sprocket-wheels, a clutch member *k* on the sprocket-wheel on said shaft, a collar J on said shaft having a clutch member *n*, and mechanism co-operating with said collar to move said shaft longitudinally in either direction, in combination with power-storing mechanism which acts by expansion and contraction, two bevel gear-wheels M and N, having clutch members *j m*, which co-operate with said clutch members *k* and *n*, respectively, an intermediate bevel-pinion P, which meshes with both of said wheels M and N at all times, and a chain O, connecting said wheel N with said power-storing mechanism, substantially as set forth.

4. A power-storing mechanism consisting of a spring capable of longitudinal expansion and contraction, said spring being composed of a plurality of elastic buffers placed end to end, substantially as set forth.

5. A power-storing mechanism consisting of a spring capable of longitudinal expansion and contraction, said spring being composed of a plurality of elastic rubber buffers placed

end to end, and each buffer at each end fitting into a dished metallic plate, substantially as set forth.

6. The spring 20 and the tube 21, having slots 27, an eye 22 at one end and a collar 23 at the opposite end, against which one end of said spring seats, in combination with a rod 24 within said tube, said rod having an eye 25 at one end and a cross-pin 26 at the other end, which extends through said slots 27, and against which the opposite end of said spring seats, substantially as set forth.

7. A vehicle equipped with two transferring mechanisms E E, one at each end of the car, in combination with a spring capable of longitudinal expansion and contraction, and two draft-rods extending longitudinally through said spring and movable in opposite directions, each of said rods having a projecting portion, against which one of the ends of said spring seats, said draft-rods being connected, respectively, to said transferring mechanisms, substantially as set forth.

AUGUST WILKE.

Witnesses:
OTTO SCHRODTER,
EMIL SIEBURG.