No. 794,211. PATENTED JULY 11, 1905.

W. J. BELL.

DRIVING MECHANISM.

APPLICATION FILED MAR. 4, 1902.

2 SHEETS—SHEET 1.

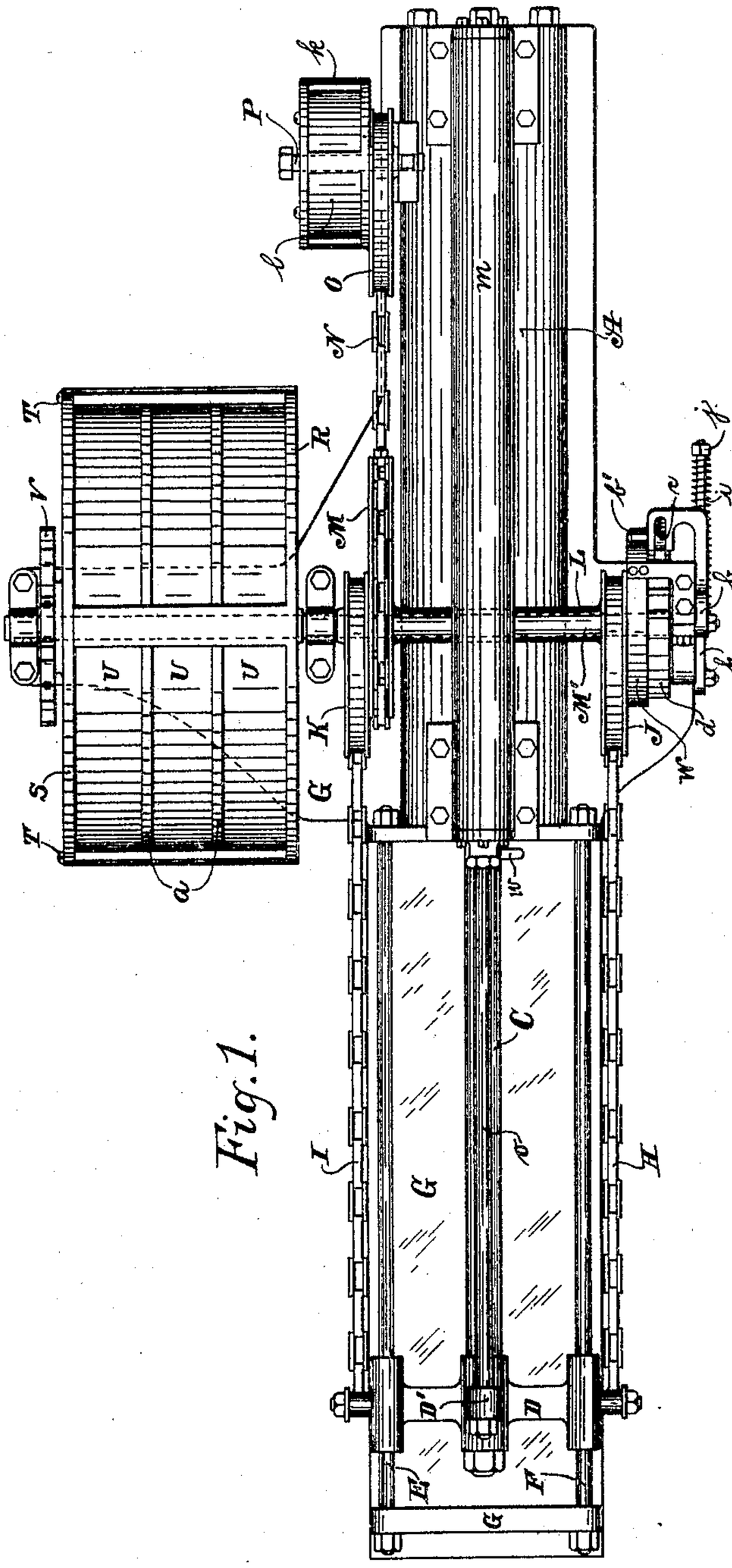


Fig. 1.

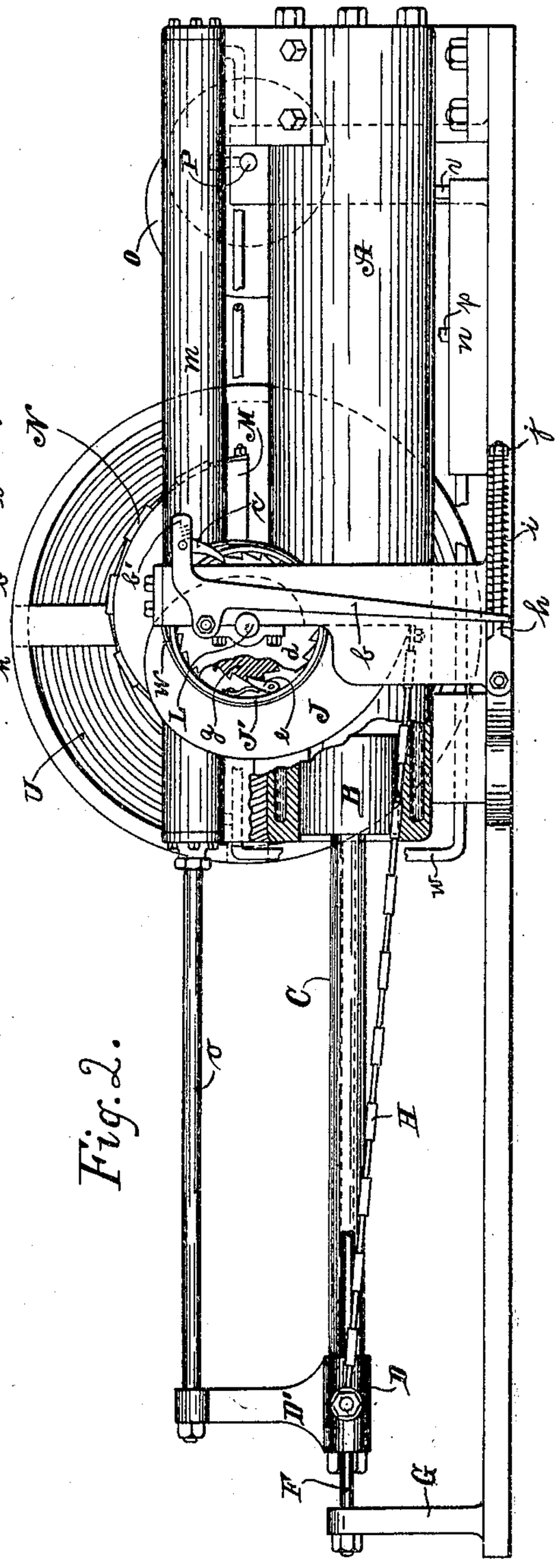


Fig. 2.

WITNESSES

Chas. L. Hyde.

H. C. Dickerson.

INVENTOR

Walter J. Bell

BY Hazard & Harpham
ATTORNEYS.

No. 794,211. PATENTED JULY 11, 1905.

W. J. BELL.

DRIVING MECHANISM.

APPLICATION FILED MAR. 4, 1902.

2 SHEETS—SHEET 2.

Fig. 3.

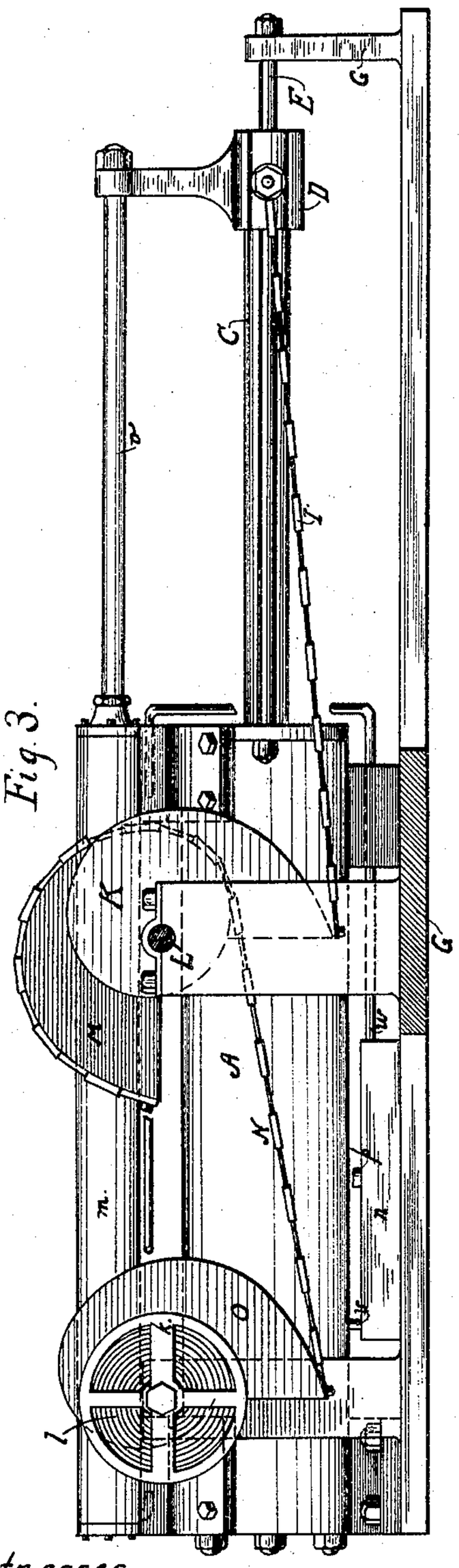


Fig. 5.

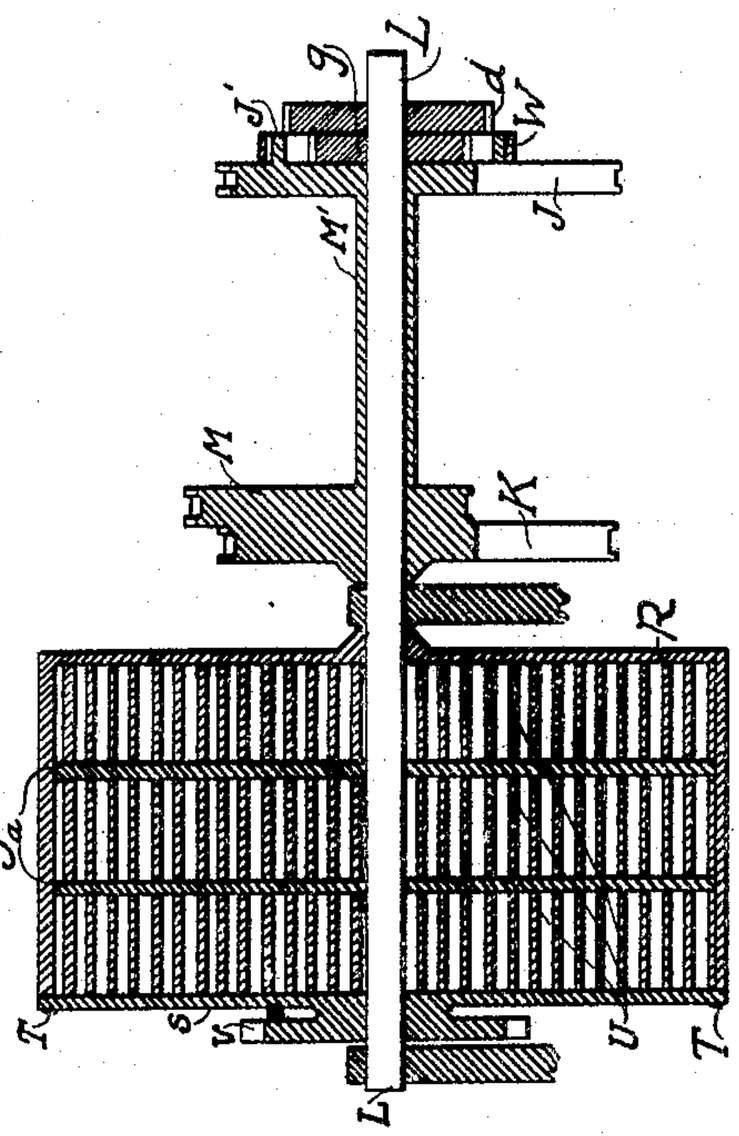
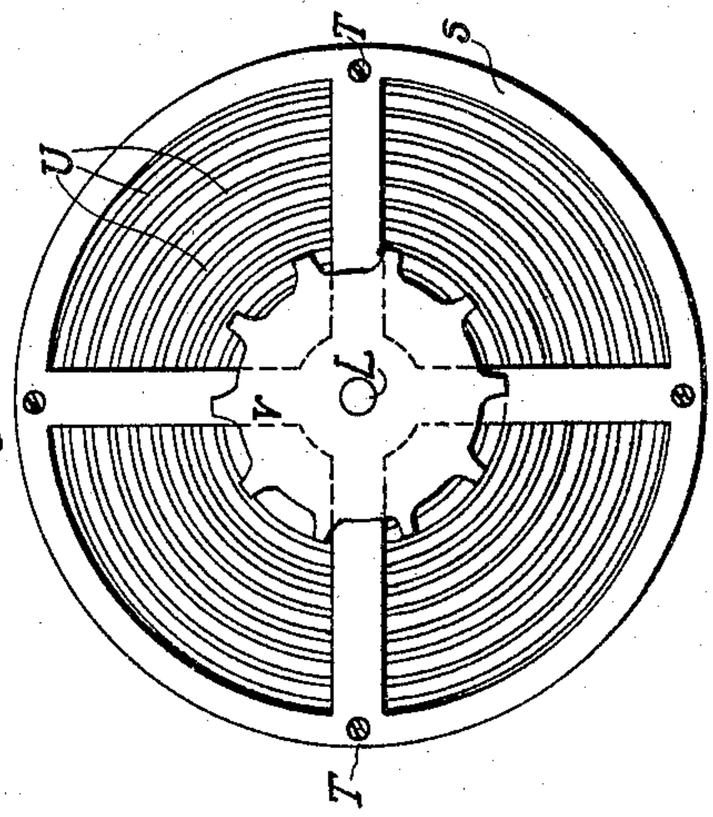


Fig. 4.



Witnesses
Prim H. Barkelew.
Margaret C. Nickelson.

Inventor.
Walter J. Bell
by Hazard & Harpham
Attorneys.

No. 794,211. Patented July 11, 1905.

UNITED STATES PATENT OFFICE.

WALTER J. BELL, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO SAMUEL L. KISTLER, OF LOS ANGELES, CALIFORNIA.

DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 794,211, dated July 11, 1905.

Application filed March 4, 1902. Serial No. 96,708.

To all whom it may concern:

Be it known that I, WALTER J. BELL, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Driving Mechanism, of which the following is a specification.

My invention relates primarily to driving mechanism for use in driving an automobile, but it is equally applicable for driving other machinery; and the objects thereof are, among other things, to provide a light and compact device for operating machinery by the use of a power-spring, which spring is energized by means of a gasolene, gas, or other vapor engine, and in which the energy of the engine over that required for immediate use may be stored in such spring for future use and to apply such power to produce an even and steady motion to the driven machinery, and to provide means whereby the amount of energy stored in such spring is automatically regulated.

Other objects will be hereinafter stated and all will be specifically pointed out in the claims.

I accomplish these objects by means of the mechanism hereinafter described, and illustrated in the accompanying drawings, forming a part hereof, in which—

Figure 1 is a plan of my driving mechanism detached from the driven machinery. Figs. 2 and 3 are side views from opposite sides, with parts broken away for clearness of illustration. Figs. 4 and 5 are details of parts of the mechanism. Fig. 6 is a vertical section of the carbureter.

In the drawings, A represents the cylinder of a vapor explosion-engine, which is provided with the usual water-jacket, and B the piston thereof, to which is attached piston-rod C, the other end of which is attached to cross-head D. This cross-head is slidably mounted upon rods E and F, affixed to the frame G of the machine. To the outer ends of the cross-head are attached chains H and I, which chains are attached at their other ends to cams J and K, respectively, which cams are revolubly mounted upon shaft L. Affixed to cam K and revoluble upon shaft L is cam M, which is connected with cam J by a sleeve M′. Cams J, K, and M and sleeve M′ may be all cast integral, as shown in the drawings, or the cams may be cast separate and rigidly affixed to a sleeve which is revoluble on shaft L. To cam M is attached chain N, the other end of which is attached to cam O, revolubly mounted on shaft P. Shafts L and P are suitably mounted in bearings affixed to the frame. On shaft L is revolubly mounted spiders R and S, the arms of spider R being turned at their outer ends at right angles to the other portions and united to the arms of spider S by screw T, thereby inclosing a portion of shaft L in a segmental drum-shaped cage, within which is mounted the power-springs U, one end of each of which springs is affixed to shaft L and the other is affixed to the cage, as shown in Fig. 5. This cage I will call the "driving-spring cage." The arms of these spiders are braced by portions of the metal out of which they are constructed, extending from one arm to the other, as shown at the edges of the cage. Integral with or rigidly affixed to spider S is the driving sprocket-wheel V, which transmits the power of the driving-springs through a chain (not shown) to the driven machinery. (Not shown.)

I have shown three driving-springs, as I prefer that number, as it provides security against the danger of the whole driving force breaking at one time, as would be the case should only one spring be used and that break; but a greater or less number may be used. These springs are separated and kept from buckling by separating-spiders *a*.

Cam J is provided on its outer side with a circular band-brake projection J′, which forms a bearing for band-brake W. One end of the band-brake is attached to the frame and the other to the short arm *b*′ of the band-brake-operating lever *b*. To the short arm of the lever is pivoted spring-pressed pawl *c*, which engages ratchet-wheel *d*, rigidly mounted on shaft L. Pivoted to cam J near to the band-brake is spring-pressed pawl *e*, which engages ratchet-wheel *g*, rigidly mounted on shaft L within the band-brake projection. If desired, ratchet-wheels *d* and *g* may be cast integral. The lower end of the band-brake-operating

lever *b* is slotted and incloses and moves along rod *h*, affixed to the frame, and is held against such movement by spring *l*, mounted on said rod, the tension of which is regulated by nut *j*, which may be screwed along on said rod for that purpose. Revolubly mounted on shaft P and rigidly attached to cam O is a cage *k*, similar in its construction to the driving-spring cage, which incloses a spring *l*, one end of which is attached to shaft P and the other to the cage. This spring we will call the "vapor-compressing" spring, and its cage the "compressing-spring" cage, as the office of the spring is to compress the vapor in the engine, as hereinafter explained. Mounted above the explosion-engine is the double-acting air-pump *m*, which pumps air through carbureter *n* to supply the explosion-engine with explosive vapor, as in the ordinary two-cycle engine. This air-pump is provided with the usual valves and connections and piston. The piston-stem *o* is connected to arm D′ of the cross-head D, so that the piston of the air-pump moves in unison with the piston of the explosion-engine and only when it moves. Carbureter *n* is connected to a gasolene-supply (not shown) by pipe *p*, having cock *r* to control the supply into the carbureter. This carbureter consists of a chamber which is divided into three compartments by perforated partitions, the upper compartment *s* being the vapor-chamber, the central compartment, which is filled with some porous absorbent material *t*, preferably excelsior, being the generating-chamber, and the lower compartment *u* being a liquid-retaining and air-receiving compartment into which the air is pumped by the air-pump. The vapor-compartment is connected to the vapor-admission port (not shown) of the explosion-engine by pipe *v* and is controlled by valves. (Not shown.)

My device being connected to the machinery (not shown) which it is desired to have driven is operated as follows: The vapor-compression spring is first wound to any desired traction strength in any suitable manner and the parts placed in the position shown in the drawings. The explosion-chamber in this position is filled with fresh vapor. The vapor-compressing spring retracts the pistons of the explosion-engine and the air-pump, which causes the compression of the vapor in the explosion-chamber and the pumping of air into the carbureter. As soon as the desired compression of the vapor is reached it is exploded in the usual manner by a sparking device. (Not shown.) The explosion of the vapor causes the outward travel of the piston, which thereby, through the connected parts, operates the several cams and effects the partial winding of the driving and vapor-compressing springs, as follows: Describing the operation of winding the power-spring, it will be observed that when the explosion takes place the chains which connect the cross-head with the cams that are revolubly mounted on shaft L are wound upon the cams, so that the initial power of the piston is applied to the smallest part of the cams, where the leverage thereof is smallest, and that as the piston travels on its outward thrust and as the power of the exploded vapor becomes less the chains are unwinding from the cams, so as to give greater leverage thereto, and that when the outward thrust has been completed the cams have their greatest leverage. Now when cam J is caused to revolve by the outward thrust of the piston of the explosion-engine it is locked to ratchet *g* by pawl *e*, and shaft L is rotated to wind the power-springs. As soon as the outward thrust of the piston is complete pawl *c* engages ratchet *d* and prevents the rotation of shaft L in the direction to permit the power-springs to unwind. As soon as the maximum traction strength of the power-springs is reached the unwinding strength thereof is exerted with such force upon pawl *c* that lever *b* is moved against the strength of spring *i* to apply band-brake W with such force upon the band-brake projection of cam J that the vapor-compressing spring has not sufficient strength to retract the pistons and they remain at the point of their farthest outward thrust until the band-brake is released. When this condition takes place, the further admission of vapor into the explosion-chamber is automatically cut off. As soon as sufficient of the energy of the power-springs is used the pressure on pawl *c* is lessened, so as to permit spring *i* to operate lever *b* to release the band-brake, when the vapor-compressing spring retracts the pistons, automatically opens the cut-off of vapor to the engine, and explosions occur with like effect as before.

It will be observed that the tension of spring *j* will regulate the tension to which the driving-springs are wound, thereby automatically regulating the working of the explosion-engine. The purpose of cam K and chain I is to take off any side strain on the cross-head, and they can be omitted, if desired.

It will be manifest that the vapor-compressing spring is only rewound at each outward thrust of the piston the extent to which it unwound on the inward movement thereof.

A suitable braking mechanism (not shown) is used upon the driving-spring cage to stop its motion when desired.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a gasolene-engine, a cam connected with the piston thereof and operated thereby, revolubly mounted on a shaft; a power-spring affixed to said shaft and to a cage; flexible means to connect said shaft and said cam whereby the outward thrust of the piston will rotate said shaft to wind said spring, and to hold it from rotating in a re-

verse direction on the inward thrust of the piston, a second cam affixed to the first cam flexibly connected with a third cam revolubly mounted on a rigidly-secured second shaft; a second spring affixed to said rigidly-secured shaft and to a cage; said cage and said third cam being united together, whereby the outward thrust of the piston will partially wind said last spring and the retractile force thereof will retract said piston and effect its inward thrust.

2. In a driving mechanism the combination of a gasolene-engine with a cam flexibly connected thereto, said cam being revolubly mounted on a shaft to which is attached a power-spring, which power-spring is also attached to a cage having a power-transmitting sprocket, and flexible means to connect said shaft and said cam, said cam being so arranged in respect to its connection with said engine that the initial force thereof is applied to the smallest diameter of the cam.

3. In a driving mechanism such as described an automatic mechanism for controlling the action of the engine, comprising a ratchet rigidly affixed to a shaft to which is affixed a power-spring; a pivoted lever having a short and long arm; a pawl pivoted to said short arm and engaging with said ratchet; a spring adapted to regulate the movement of the long arm of said lever, a band-brake affixed to the short arm of the lever and to the frame and contacting with a band-wheel affixed to the cam on the power-spring shaft, said cam being connected with the piston of the engine substantially as described.

In witness that I claim the foregoing I have hereunto subscribed my name this 24th day of February, 1902.

WALTER J. BELL.

Witnesses:
G. E. HARPHAM,
CHAS. L. HYDE.