(No Model.) 6 Sheets—Sheet 1.

C. J. VAN DEPOELE.

TELPHER SYSTEM

No. 458,871. Patented Sept. 1, 1891.

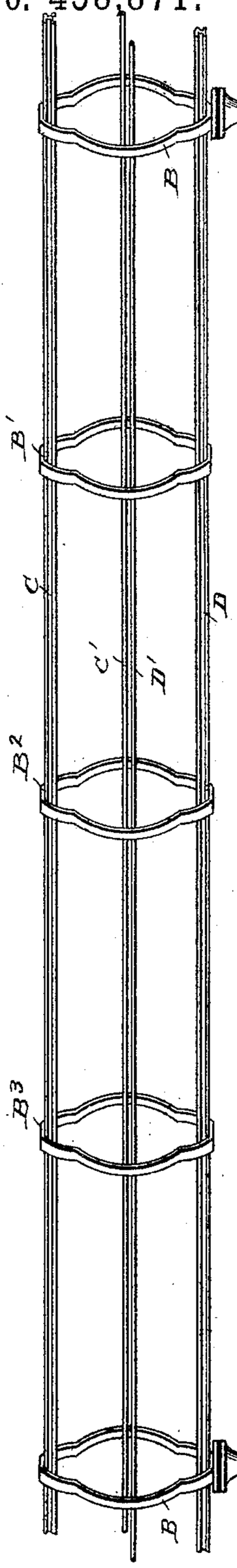


Fig. 1.

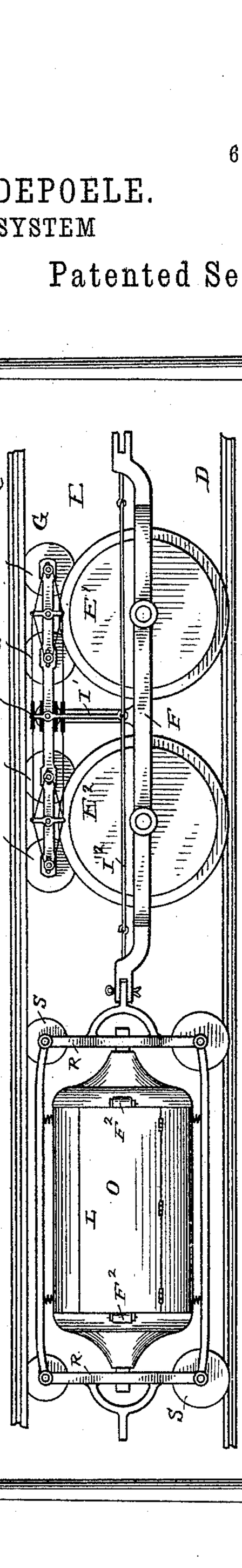


Fig. 2.

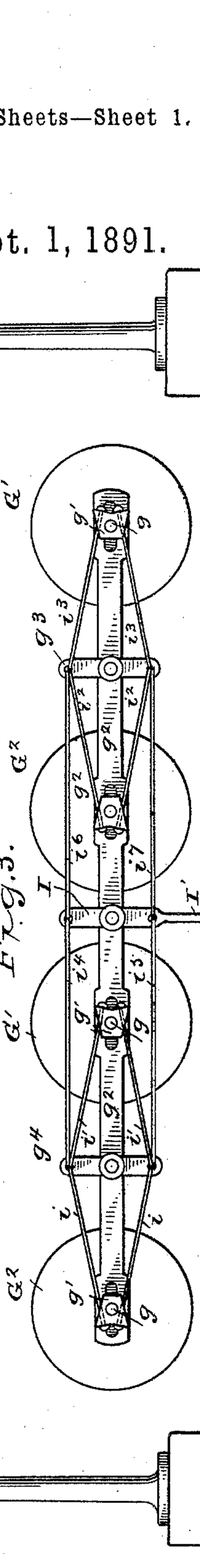


Fig. 3.

Witnesses
H. A. Lamb
Stephen Jarmus

Inventor
Charles J. VanDepoele
By Frankland Jarmus.
Attorney

(No Model.) 6 Sheets—Sheet 2.

C. J. VAN DEPOELE.

TELPHER SYSTEM.

No. 458,871. Patented Sept. 1, 1891.

Fig. 4.

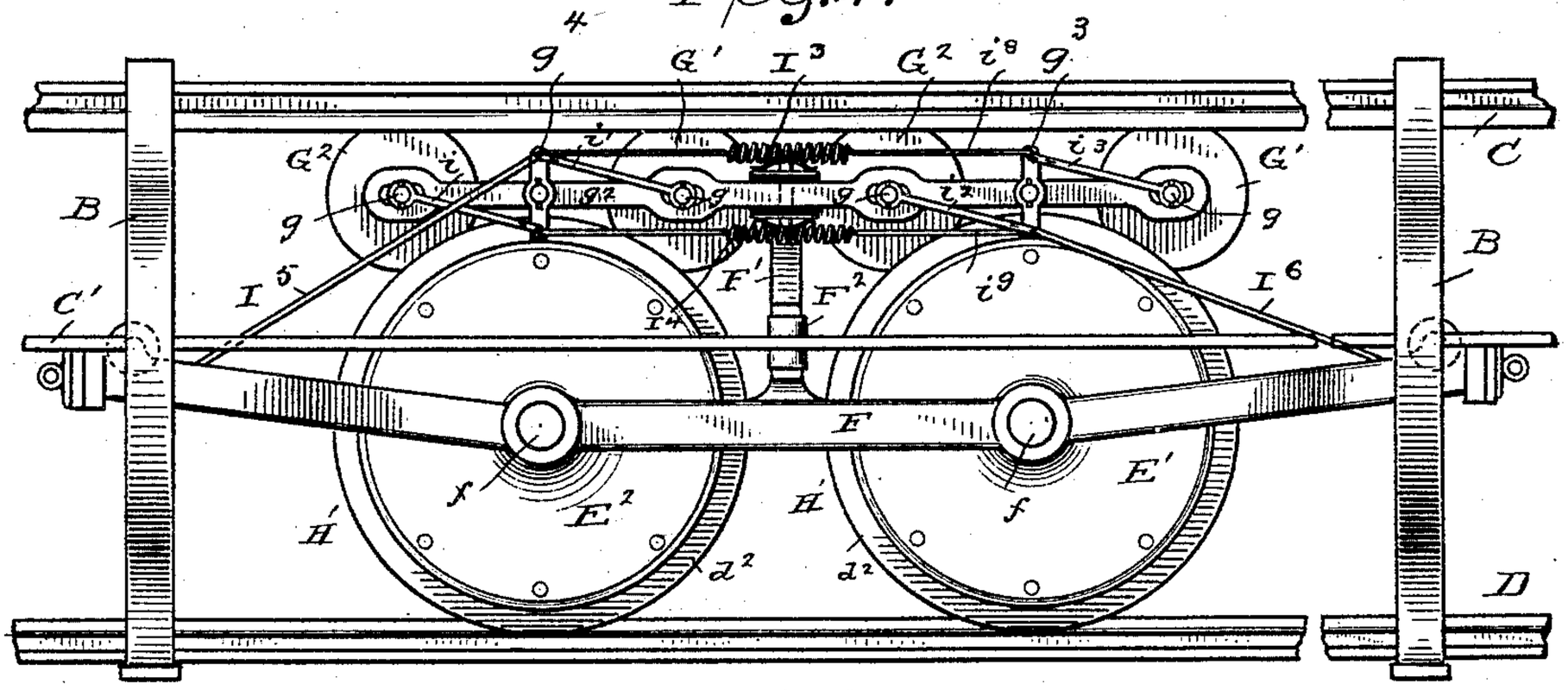
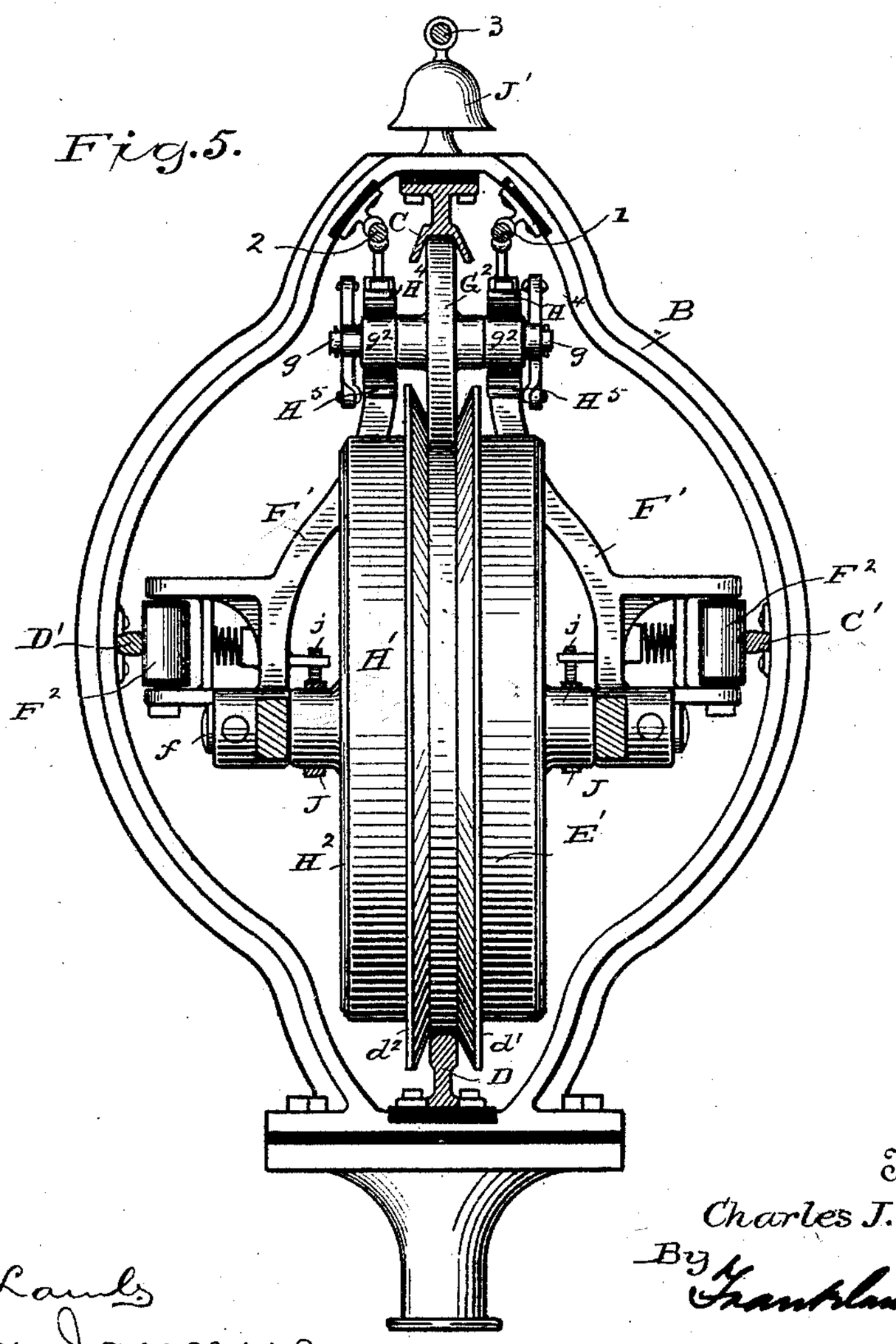


Fig. 5.



Witnesses
H. A. Lauls
Stephen Jarmus

Inventor
Charles J. VanDepoele
By Frankland Jarmus.
Attorney

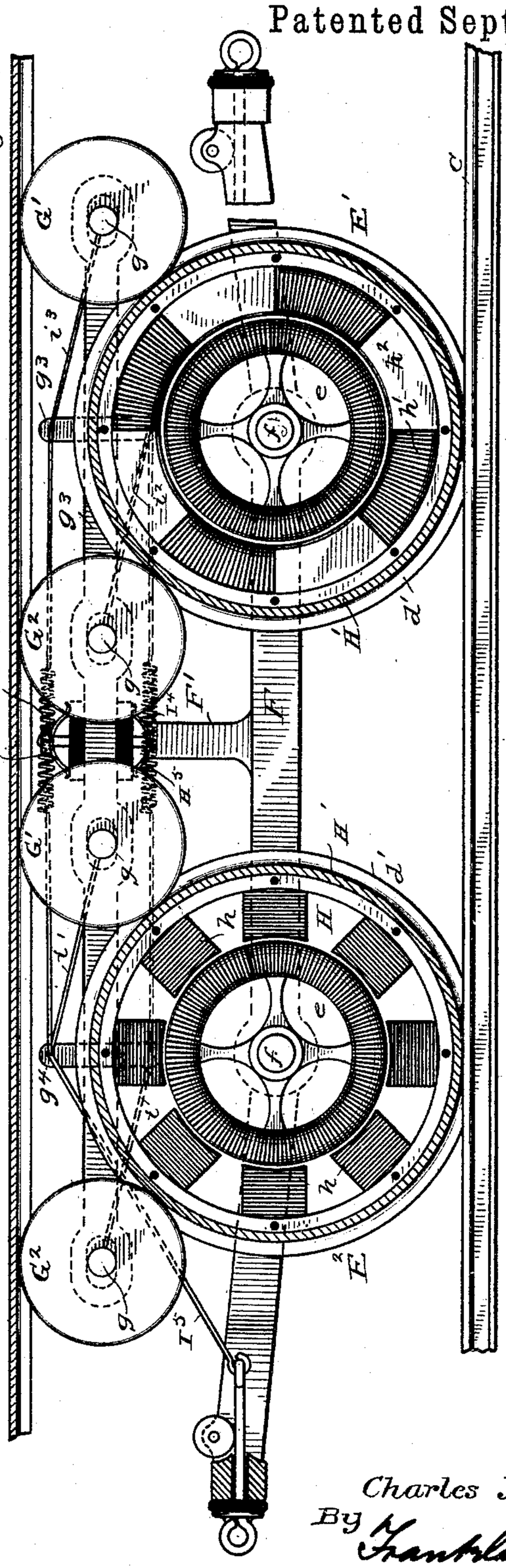
(No Model.) 6 Sheets—Sheet 3.

C. J. VAN DEPOELE.

TELPHER SYSTEM.

No. 458,871. Patented Sept. 1, 1891.

Fig. 6.



Witnesses
H. A. Lamb
Stephen Fanning

Inventor
Charles J. VanDepoele
By Fairbank & Fanning
Attorney

(No Model.) 6 Sheets—Sheet 4.

C. J. VAN DEPOELE.

TELPHER SYSTEM.

No. 458,871. Patented Sept. 1, 1891.

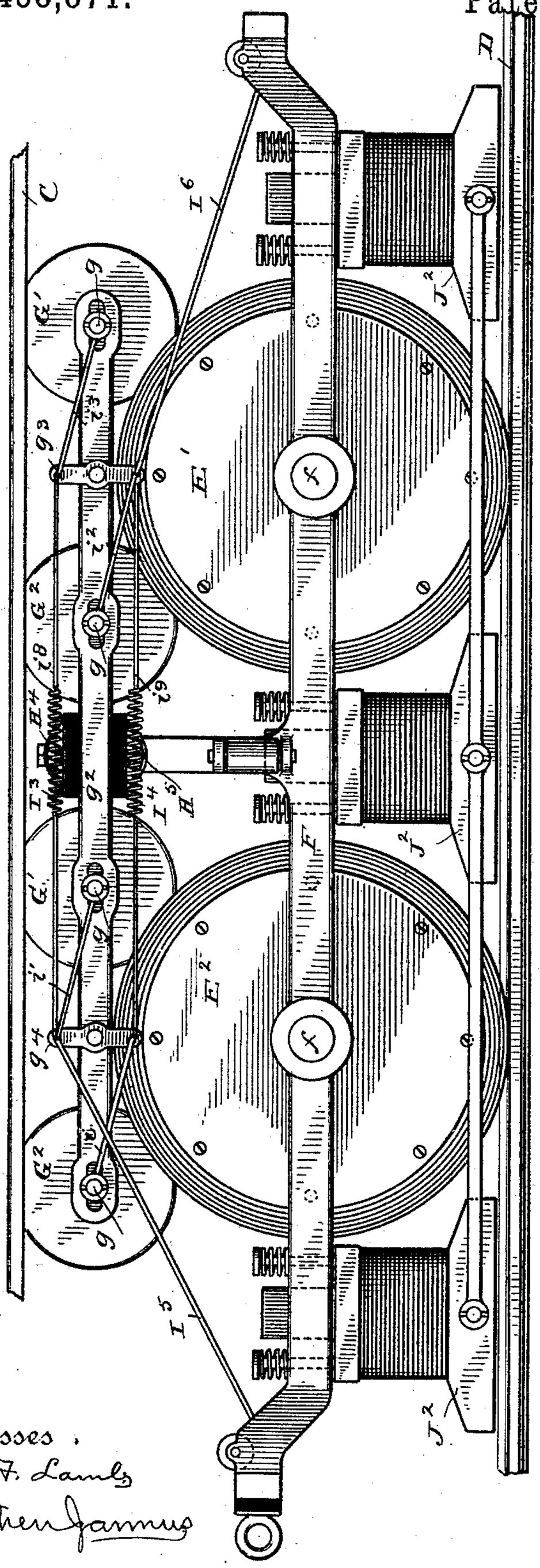


Fig. 7.

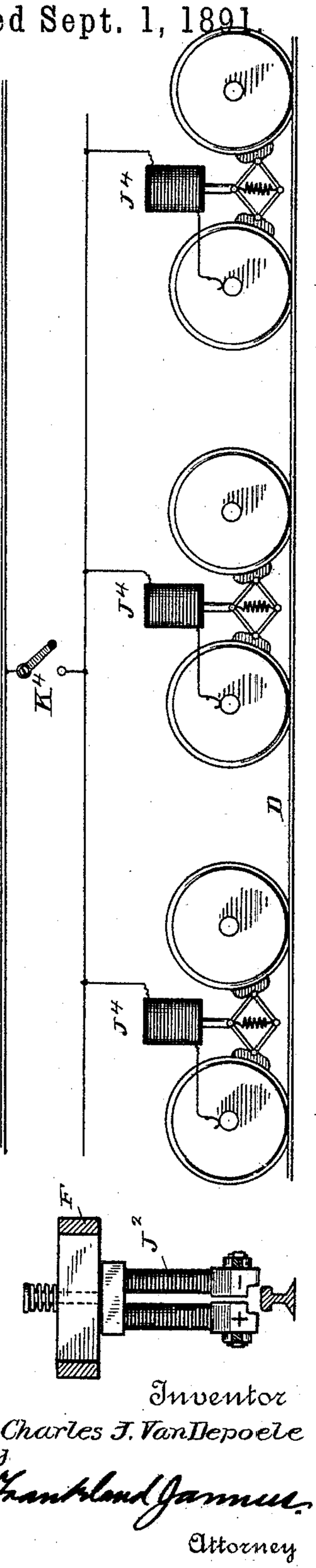


Fig. 9.

Fig. 8.

Witnesses.
H. A. Lamb
Stephen James

Inventor
Charles J. VanDepoele
By
Frankland James
Attorney

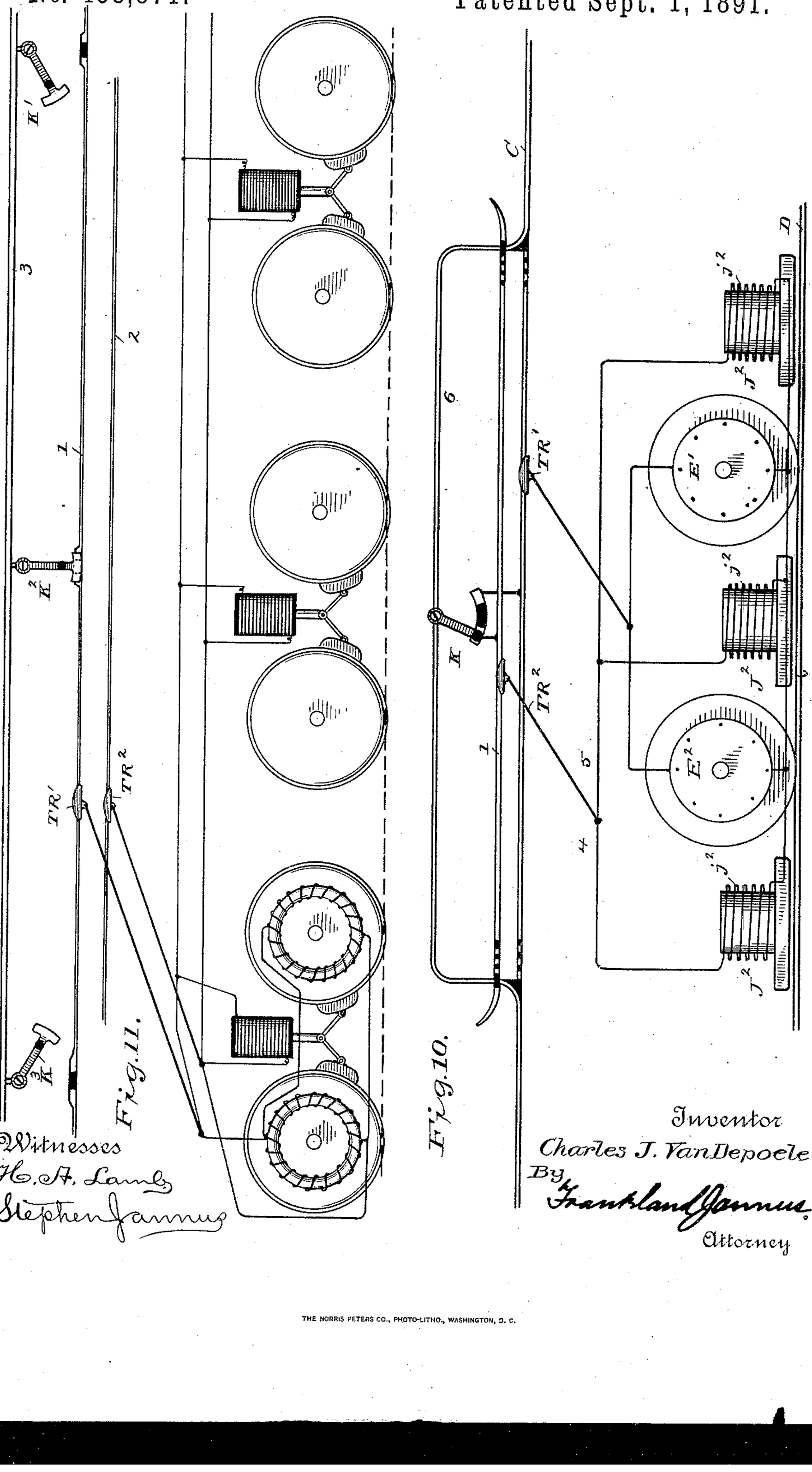
(No Model.)

6 Sheets—Sheet 5.

C. J. VAN DEPOELE.

TELPHER SYSTEM.

No. 458,871. Patented Sept. 1, 1891.



Witnesses
H. A. Lamb
Stephen Jammus

Inventor
Charles J. VanDepoele
By Frankland & Jammus
Attorney

(No Model.) 6 Sheets—Sheet 6.

C. J. VAN DEPOELE.

TELPHER SYSTEM.

No. 458,871. Patented Sept. 1, 1891.

Fig. 12.

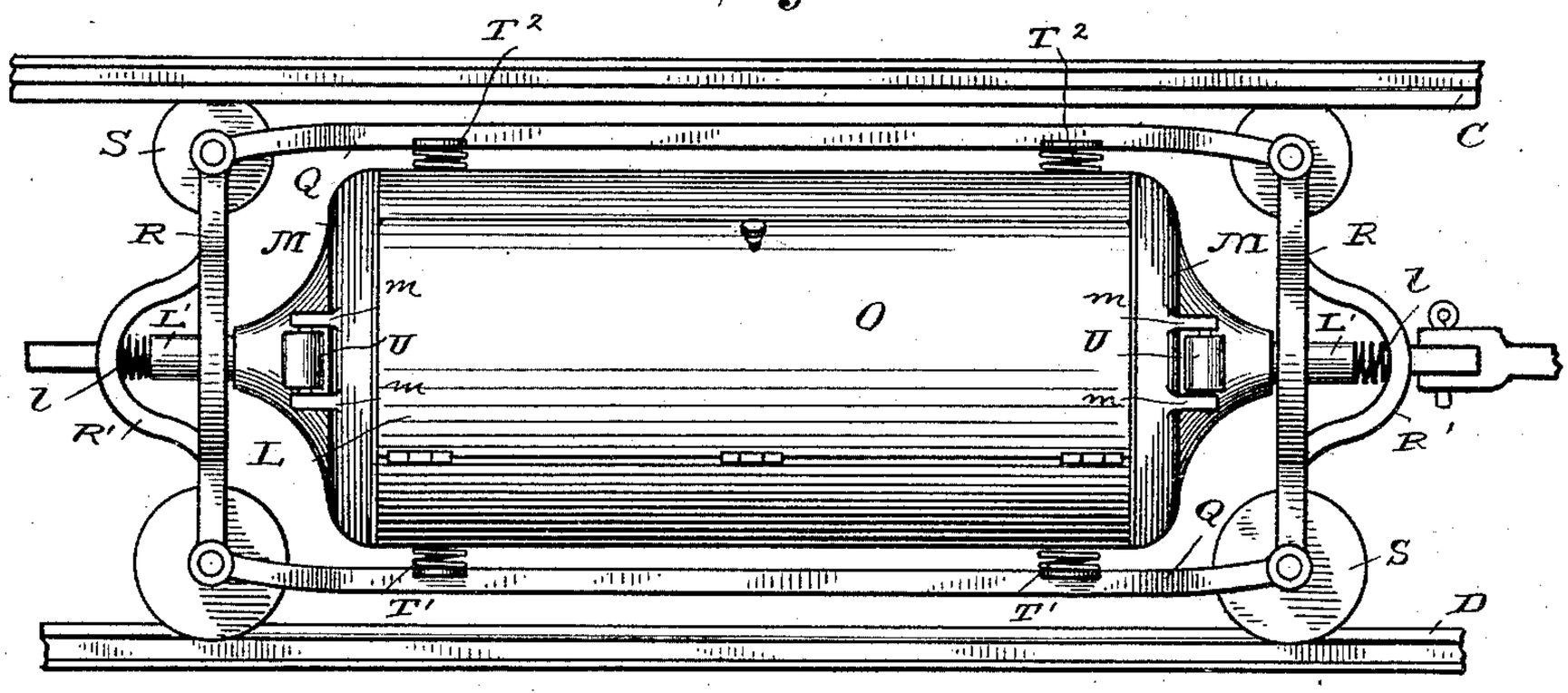
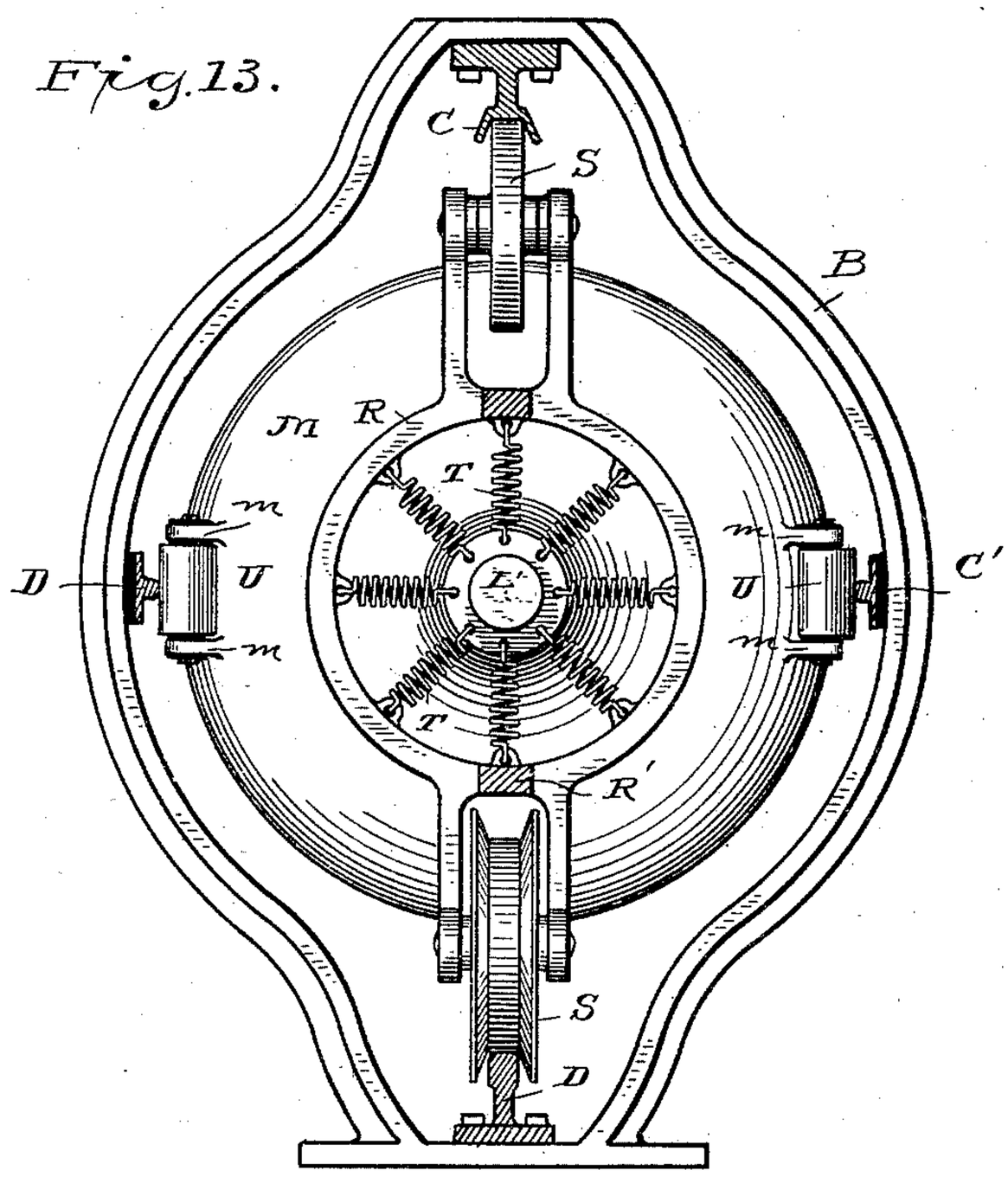


Fig. 13.



Witnesses
H. A. Lamb
Stephen Jarvis

Inventor
Charles J. VanDepoele
By Frankland Jarvis.
Attorney

UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

TELPHER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 458,871, dated September 1, 1891.

Application filed February 28, 1891. Serial No. 383,189. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Telpher Systems, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to improvements in electric telpher systems—that is to say, a system of electrically-propelled vehicles in which a number of light carriages or cars are propelled along a specially-constructed way from point to point and started and stopped and otherwise controlled without direct manual intervention. Obviously such a system might be organized so as to include passenger-carrying vehicles; but several of the novel features of the present invention relate to the automatic means whereby the train is started, stopped, and otherwise controlled, so that the following description and claims refer more particularly to a package or freight carrying system.

The various details of construction, arrangement, and operation will be hereinafter fully set forth and described, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view showing a portion of the permanent way. Fig. 2 is a side elevation showing the permanent way with parts removed, together with a locomotive and car embodying the invention. Fig. 3 is a view in elevation, on an enlarged scale, showing the traction-increasing devices of the locomotive. Figs. 4 and 5 are side and end views, respectively, of my improved telpher-locomotive seen in operative relation to the permanent way upon which it travels. Fig. 6 is a side elevation, partly in section, showing the telpher-locomotive with parts removed. Fig. 7 is a side elevation of the telpher-locomotive, showing also the electric brakes for stopping the same. Fig. 8 is a detail end view of one of the electric brakes shown in Fig. 7. Figs. 9, 10, and 11 are diagrammatic views illustrating differently-arranged means for controlling the electric brakes. Figs. 12 and 13 are side and end elevations, respectively, of one of the cars in which the material to be transported is carried.

In my improved system of telpherage the material to be transported is carried in cars which, by preference, are in cylindrical form and provided with carrying-wheels above and below and at their sides. These cars are drawn along the permanent way by a locomotive, which also has points of traction above and below and at its sides, the vehicle and cars corresponding in this respect. The permanent way consists of a tubular track—that is to say, a track having top, bottom, and side rails, the four rails being placed equidistant and all supported and joined together by strong metallic yokes or frames, and said frames are, as indicated in Fig. 1, mounted upon supports, which, where posts are employed and where other travel takes place, should be of ample height to present no obstruction.

A A are posts, which directly support frames B B, and the distance which may properly exist between these posts will depend entirely upon the strength of the permanent way which comprises top and bottom rails C D and side rails C′ D′. Frames B′ B^2 B^3 are located between the frames B B upon the posts A A and serve to bind together and unify the structure composed of the rails and frames. Where it becomes necessary or desirable to carry the permanent way underground, the same relative arrangement of rails and frames is employed; except that in addition thereto an exterior casing of metal or a cement tube or the like is placed upon the exterior of the structure outside of the rail-supporting frames.

The rails of the permanent way form a simple, ready, and convenient means of conveying the actuating-current, and a convenient arrangement thereof is to employ the top and bottom rails as one side of the supply-circuit and to insulate the side rails and utilize them as the return. The frames B B′ are desirably insulated from their supports. Where motors are used of the type in which the supply-current traverses only the field-magnet circuit, the supply-current can be carried by the

top and bottom rails and conveyed from the tread of the motor-wheels and also from the friction-wheels through the casing H′ to the field-magnets, and from there through suitably-insulated contact-rings carried by the said casing through suitable contact-rings J and brushes *j* to the side pressure-rollers F^2, which engage the side rails C′ D′, and are also thoroughly insulated from the metallic parts of the locomotive.

As indicated in Fig. 5, two additional insulated conductors 1 and 2 may be carried along on suitable insulated supports secured to the frames B B′, and in addition thereto an additional conductor 3 may be sustained by suitable insulators J′, supported upon the frame.

The train is to be stopped at desired points or when required by electrically-actuated brakes, which may be rail or wheel brakes, as preferred.

In Figs. 7 and 8, also in Fig. 10, is shown a form of brake which comprises a pole piece or pieces which form the core or cores of electro-magnets normally held out of contact with the rails, but which when magnetized are strongly attracted to and present a large frictional surface, which, being held against the rails by magnetic attraction, serves to overcome the momentum of the traveling vehicle.

As indicated in Figs. 7 and 8, a double electro-magnet J^2 is spring-supported upon the frame F of the locomotive and when energized is attracted toward the rails with sufficient force to stop the train. As indicated, three of the magnets J^2 are shown—one at each end of the locomotive—and one suitably spring-supported upon a cross-piece extending between the side frames at a point midway between the motor-wheels E′ E^2. This arrangement is represented diagrammatically in Fig. 10. It will of course be understood that the hereinafter-described electro-magnetic brake apparatus may be applied to each and every vehicle composing the train, if desired, the necessary electrical connections being made between each of the vehicles by means of any well-known form of detachable connection; but for the sake of simplicity I will describe the same in connection with the locomotive E, although a plurality of vehicles so equipped are shown in both Figs. 9 and 11.

The diagrammatic representation of Fig. 10 relates in part to what is shown in Fig. 5, in which the auxiliary conductors 1 and 2 are employed to operate the brakes J^2. As there shown, the main conductor or top rail C carries the main current, while the bottom rail D serves for the return. The motor-circuits and also the brake-circuits are both connected to the return.

TR′ represents a friction-contact or other convenient method of conveying the supply-current to the motor-circuits, while TR^2 represent any convenient form of sliding or moving contact engaging the auxiliary conductor 1, which might be doubled, as indicated in Fig. 5, if preferred, and said traveling contact or contacts TR^2 are connected by suitable conductors 4 5 with the energizing-coils j^2 upon the brake J^2.

The brake system is designed to be automatic, to which end the main conductor is automatically cut out of circuit at points adjacent to the predetermined stopping-places of the cars, and, as indicated in Fig. 10, the conductor or conductors supplying the brake-circuit are at the same time put in circuit with the source of current. At these points a bridge-conductor 6 is provided, and one or more switches K are arranged to connect the same with the supplemental conductor 1 and at the same time cut out the main conductor C. The switch K can be operated by hand by the person in charge of the station at which the train is to stop, or the switch can be located in the path of some part of the train, so as to be automatically moved thereby, and so switch the current from the motors to the brake-circuit and stop the train, the bridge and auxiliary conductors being of course made long enough to effect this result. The train, having been stopped, can be readily started by the person in charge of the station by turning on the supply-current to the main conductor, and, although said main conductor is necessarily insulated and isolated at the points from which the bridge-conductor starts by giving proper length to the section, the train can have sufficient headway upon reaching the insulated portion to pass the same by its momentum.

Fig. 11 shows the brake-actuating system, in which are used conductors arranged as seen in Fig. 5—as, for example, assuming that conductor 3 carries the main current, while conductor 1 normally supplies both the motor and the brake-circuits, they being in this instance connected in multiple arc. The brakes in this instance are actuated by any desired mechanical power—as, for example, by a spring, as set forth in my patent, No. 348,360, dated August 31, 1886, in which the function of the electrically-actuated part of the brake mechanism is to hold the same away from the wheels until the current is cut off, when mechanical means are set free to apply the brakes. This action occurs, as indicated in Fig. 11, when the current-collecting devices TR′ TR^2 engage the section-conductor 1, which is either automatically by the passage of the train or manually cut out by means of switches K′ K^2 K^3.

The simplest form of circuit for operating the brakes, whether the same be rail or wheel brakes and whether the same are actuated by the current or when the current is cut off, is indicated in Fig. 9, in which the solenoids J^4 are arranged to be connected with the main conductor, which may be the rail C, through a switch K^4, which may be manual or automatic. The return circuit from the brake-solenoid is through the motor-wheels—that

is, through the return circuit provided for the motors—and when it is desired to apply the brakes the switch K is closed, which action at the same time opens the motor-supply circuit. With this form of apparatus the train will come to a stop at any time when the circuits are changed, as stated, and the points of stoppage may readily be arranged by placing a suitable piece to engage the switch near stations, and it will of course be apparent that the station-master should have a switch under his control for cutting out the main conductor at the station while the train is standing there in order to avoid waste of current.

The cars or vehicles employed in connection with my improved system are constructed in the form of cylinders L, provided with heads or ends M M and side doors or other means of ingress O. The cylinders L are spring-supported within exterior frames Q, which extend along the top and bottom thereof, and might also, of course, extend around the sides; but this I do not consider essential. The frames Q extend somewhat beyond the extremities of the cylinders L, and the upper and lower parts thereof are connected by end pieces R, which end pieces are formed with central openings and also with forked extremities, within which are mounted traction-wheels S, engaging the upper and lower rails C D. There are of course four of the traction-wheels at each end of the frame, two engaging the upper rails and two the lower. Within the frame so formed the cylinders L are supported. The heads M M of the cylinders should be made of substantial material, and are provided with projecting axes, which extend through the openings in the ends R R of the frame Q, within which they are supported by springs T, eight of which are shown in Fig. 13 as being connected from the central axis of the cylinder to radial points within the openings in the end frame R. Additional springs T′ T² may be placed between the longitudinal portions of the frame Q and the body of the cylinder L. As a further protection against jarring, the end frame R may be provided with extensions R′, extending outward and bridging the opening containing the springs T, the axes L′ extending through said end braces R′ and being provided with buffer-springs *l*. As a means of guiding the cylinders L and sustaining the same against lateral strain, the heads M M are formed with projecting lugs *m m*, between which are pivoted friction-rollers U, bearing against the side rails C′ D′. The said side rollers U may of course be spring-mounted, if desired. The side openings O of the cylinders L should of course be hinged thereto and should be provided with proper locks, and where the train is used to convey mail for different points the mail for each station may be placed in a separate compartment or cylinder locked with a key, the duplicate of which is found only at the station for which it is destined. The master-key is at the termini, serving, of course, to open all the locks.

My improved telpher-vehicle, being entirely spring-supported, affords an extremely desirable medium of transportation for any and all kinds of matter requiring care in handling, and according to my improved system many advantages are gained in the operation of numbers of trains in travel without the immediate control of train-men.

E is the electric locomotive, which is arranged to run between the space bounded by the track rails and their frame. The locomotive comprises two or more driving-wheels E′ E², which in themselves form part of the motor mechanism. Said wheels run astride of the bottom rail D. The said driving-wheels are contained within a strong metal frame F, which carries their axles and is provided at its extremities with draw-heads and detachable couplings. The said frame F also carries the bearing for the rotating parts of the motor mechanism. A traction device G is arranged between the upper parts of the driving-wheels and the top rail C.

The driving-wheels E′ E² each include an electro-dynamic motor within its structure, the rotating part of the motor carrying the exterior bearing surface or tire. Various different forms of electric motor might be adapted to the present use; but I prefer the form heretofore referred to by me as "commutator-less," one of which is shown and described in Letters Patent No. 413,986, dated October 29, 1889. Such a motor comprises a wire-wound closed-circuited armature *e*, which is fixed permanently upon the axle *f*. Exterior to the armature *e* is arranged the field-magnet system H, which comprises a number of magnetizing-coils *h*, which may be wound directly upon radial cores projecting endwise toward the periphery of the armature, as indicated in the motor E², or the said magnetizing-coils may be wound, as seen at *h′*, between polar extensions *h²*, as in the motor E′. With either construction the field-magnet system is secured within a strong metallic shell or casing H′, which may be of magnetic or diamagnetic metal, according to the design of the remaining metallic parts of the field-magnet. The periphery of the outer casing H′ is formed with flanges *d′ d²*, and said casing is completed by sides H², which are centrally provided with sleeved bearings H³ which are sustained upon the axles *f*, by which, therefore, the field-magnets and their outer casings, which practically form the driving-wheels of the locomotive, are carried. As before stated, the axles *f*, which also support the armatures, do not rotate, the locomotive being propelled through the rotation of the field-magnets about the armature, said field-magnets being connected through their bearings upon the axles *f* with the connecting-frame F. The frame F is arranged to be in a horizontal plane a little below the

side rails C′ D′, and, as more clearly shown in Figs. 4 and 5, is provided with upwardly-extending brackets F′, which are provided with suitable extensions carrying friction-rollers F², which are spring-pressed laterally against the said side rails C′ D′, thus sustaining the locomotive in position between the four rails of its track. The motor-wheels E′ E² do not fill the entire space, since they could not engage both the top and bottom rails, and in order to steady the vehicle and to increase the adherence between the motor-wheels and the track I provide an automatic traction device G, which consists of two wheels G′ G², which I have called "friction-wheels," for each of the motor-wheels. The friction-wheels are arranged to rotate in engagement with the upper periphery of the tread of the motor-wheel and the under side of the top rail C. The friction-wheels are mounted upon axles *g*, which are carried in longitudinally movable or sliding boxes *g′*, which are mounted in oppositely-placed longitudinal frames g^2 g^3. Two motor-wheels only being here shown, the description will refer to them, although any desired number of said wheels might be employed when occasion requires it. The two pairs of friction-wheels bear against their respective motor-wheels in front and rear, and they are so arranged that their pressure between the peripheries of the motor-wheels and the top rail will be proportionate to the load to be moved.

As indicated in the drawings, two pairs of rocking levers g^3 g^4 are pivoted midway between the two pairs of friction-wheels G′ G², and the extremities of these levers are connected by rods i i' i^2 i^3 with an operating connection connected and operated by the weight of the load to be moved.

As indicated in Figs. 2 and 3, the friction actuating mechanism comprises a centrally-located lever I, provided with an extension I′, which is flexibly connected with a longitudinal rod I², attached to the coupling between the locomotive and the train. The lever I is attached at equidistant points by draft-rods i^4 i^5 i^6 i^7 with the levers g^3 g^4. The rods i' i^2 i^3 are so connected with their respective sliding boxes *g′* that by passing loosely through openings therein and being provided with heads or nuts on the other side they will pull upon said boxes, but slip through when thrust movement is applied to them. With this arrangement, when the lever I is actuated by the pull of the draft-rod I² the levers g^3 g^4 will be rocked, and with their movement one set of the rods i i' i^2 i^3 will be put under tension, while the others will be thrust through the openings in the bearings *g′*. This action will act to draw the two pairs of wheels G′ G² toward each other and to force them in between the treads of the motor-wheels E′ E² and the upper rail.

Instead of the method of operating the friction-wheels just described, I may in some instances prefer to employ the form seen in Figs. 4, 5, 6, and 7, in which only half the number of connecting-rods are used and springs are employed to give a convenient degree of elasticity to the friction apparatus. As there shown, the sliding journals of the wheels G′ G² are connected with the rocking levers g^3 g^4 by single connections i i' i^2 i^3, and the said rocking levers are connected by two rods i^8 i^9, each one of which includes in its length a strong spiral spring I³ I⁴. With this form the actuating connections comprise rods I⁵ I⁶, connected to the respective draw-heads and to the rocking levers g^3 g^4, respectively, so that if the locomotive is traveling in the direction to pull upon the rod I⁵ it will, through the lever g^4, connection i^8, spring I³, and lever g^3, together with the connection i^9 and spring I⁴ and the connections between said levers and the moving boxes, operate to draw the two pairs of wheels toward each other. The draft-rod I⁶ is connected to the lever g^3, but in opposite relation to the connection between the lever g^4 and the rod I⁵, so that if the vehicle be traveling in the opposite direction the pull upon the rod I⁶ will produce the same action upon the friction-wheels.

I find it desirable to insulate the mechanical connections between the friction-wheels and their actuating mechanism, and in some instances, also, I prefer to sustain the frames g^2 g^2 between springs II⁴ II⁵, arranged between their supports and the insulating material by which they are electrically separated from the top rail.

While I have described the system as being operated with commutatorless induction or alternating-current motors, it will be understood that continuous-current motors might be used with good effect, the choice of motor being a matter depending upon the conditions to be met. The motors of whatever type employed are of course rendered reversible by suitable switches affecting one or other of the internal circuits thereof; but with this system of propulsion it is very desirable that a complete double trackway be provided in the first instance, so that trains may always run in one direction on one track and in the opposite direction upon the other.

On roads where steep gradients are found the traction-increasing apparatus will be found extremely useful in ascending such grades, and by a suitable arrangement of circuits and switches to be operated by the moving train or otherwise the brakes can be applied and the current cut off from the motors over such portions of the road as is necessary to prevent the development of speeds beyond that which is desired. Furthermore, one or more of the conductors forming part of or included in the construction of the permanent way may be employed to signal the approach or the vicinity of a train.

Many minor changes in the construction and arrangement of the various parts of the apparatus will suggest themselves to those

skilled in the art and may be made without departing from the spirit or nature of the invention.

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

1. A track for electric-railway vehicles, having a lower supporting or traction rail, an upper grooved guide-rail, lateral guide-rails, and frames surrounding and sustaining said rails in fixed relation to each other.

2. A track for electric-railway vehicles, having a lower supporting traction-rail, an upper guide-rail and lateral guide-rails, and frames supporting all the rails in fixed relation, the said lateral guide-rails being insulated from the traction and upper guide-rails and the supporting-frames.

3. A track for electric-railway vehicles, having a lower supporting or traction rail, an upper guide-rail and lateral guide-rails, and frames sustaining the rails in fixed relation to each other, the traction and guide rails being insulated from the said frames.

4. An electric locomotive having its driving-wheels traveling upon its track in tandem relation to each other and rotating independently, said wheels carrying within their peripheries one element of the driving-motors, the other element thereof being fixed upon the axles of the locomotive.

5. In an electric-railway system, the combination of a lower supporting-rail, an upper rail, lateral guide-rails, a locomotive having driving-wheels engaging the supporting-rail, a tension device between the said wheels and the upper guide-rail, and supporting-rollers carried by the locomotive engaging the lateral guide-rails.

6. An electric locomotive having a main frame, an axle fixed in said frame, an armature fixed upon said axle, moving field-magnets surrounding said armature, having their supporting-frame journaled upon the fixed axle, the said framing forming the periphery of the locomotive-wheels, and a traction device carried by the main frame and actuated by the load drawn by the locomotive.

7. In an electric-railway system, an electric locomotive having a suitable frame, grooved driving-wheels supported in tandem relation to each other by said frame, a supporting rail engaged by said wheels, a guide-rail located above the wheels and supporting-rail, and a traction-increasing device engaging the said wheels and the guide-rail.

8. In an electric-railway system, a locomotive engaging a lower supporting-rail and held in a vertical position thereon by spring-pressed rollers engaging lateral guide-rails, the rollers being held in supports carried by the locomotive and spring-pressed against the lateral guide-rails.

9. In an electric-railway system, a locomotive engaging a lower supporting-rail and held in a vertical position thereon by spring-pressed rollers engaging lateral guide-rails, the rollers being held in supports carried by the locomotive, a third guide-rail located above the driving-wheels, and an automatic tension device bearing upon the wheels and the third guide-rail.

10. In an electric-railway system, an electro-magnetic brake having a double electro-magnet, with abutting poles of opposite polarity upon each side of the supporting rail or rails, the said poles completing their magnetic circuit through the rail or rails.

11. In an electric railway, a locomotive traveling thereon having a main supporting-frame, motor-wheels supported thereby, and electro-magnetic brakes spring-supported upon said frame, the said brakes being adapted to grasp the rail supporting the locomotive when supplied with current and to be returned to inoperative position by their spring-supports.

12. In an electric-railway system, a vehicle or vehicles, a motor upon said vehicle or vehicles, a system of electro-magnetic brakes upon said vehicle, a circuit supplying current to the said motor, insulated sections of conductor connected to the main circuit, and means carried by the vehicle completing circuit between the insulated sections and the brake-circuit, supplying current to the brake-circuit automatically from the said insulated sections of conductor.

13. In an electric-railway system, a vehicle or vehicles, a system of electro-magnetic brakes upon said vehicles, a motor or motors propelling said vehicles, a circuit supplying current to said motor or motors, insulated sectional conductors connected to the main circuit, a traveling contact normally connecting the motor to the main circuit, and means for disconnecting the motors at points where the train is to be stopped.

14. The combination, in an electric railway, of a vehicle traveling thereon, an electric motor propelling said vehicle, electrically-actuated brakes on said vehicle, a main supply-conductor along the line of way in circuit with the motor, and insulated sectional conductors at points along the route traversed by the railway, connected to the main conductor and supplying current to the brake-circuit.

15. In an elevated electric railway, the combination of a continuous conductor parallel with the track, a turn-out therein diverging from the plane thereof, an insulated section in the plane of the said conductor, a contact traveling upon the conductor, a switch connecting the insulated section with the main conductor, a second insulated section parallel with the track and connected to the switch, and a contact therefor connected to the brake-circuit of the motor and train.

16. The combination, with a railway having supporting and guiding rails held in fixed relation to each other by surrounding frames, of a vehicle adapted to pass between said rails and within said frame and comprising a cy-

lindrical chamber, a frame surrounding said chamber, spring-supports between the said chamber and the frame, and supporting and guiding wheels upon said frame.

17. The combination, with a railway having supporting and guiding rails held in fixed relation by surrounding frames, of an electric locomotive comprising a motor wheel or wheels and one or more cylindrical vehicles carried in suitable frames provided with wheels engaging the rails, said locomotive and vehicle drawn thereby adapted to pass between the rails and frames of the structure.

18. An electric locomotive comprising two or more driving-wheels, said wheels including an electro-dynamic motor, a frame surrounding and carrying the axes of the motor-wheels, and suitable circuit connections.

19. The combination, with a railway structure comprising supporting and guiding rails held in fixed relation by surrounding framework, of a frame provided with supporting and carrying wheels and adapted to traverse the structure and a cylindrical car-body spring supported within the frame.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:
JOHN W. GIBBONEY,
CHAS. H. OLIN.