No. 671,214. Patented Apr. 2, 1901.

S. C. JUDD.

AUTOMOBILE.

(Application filed Aug. 9, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

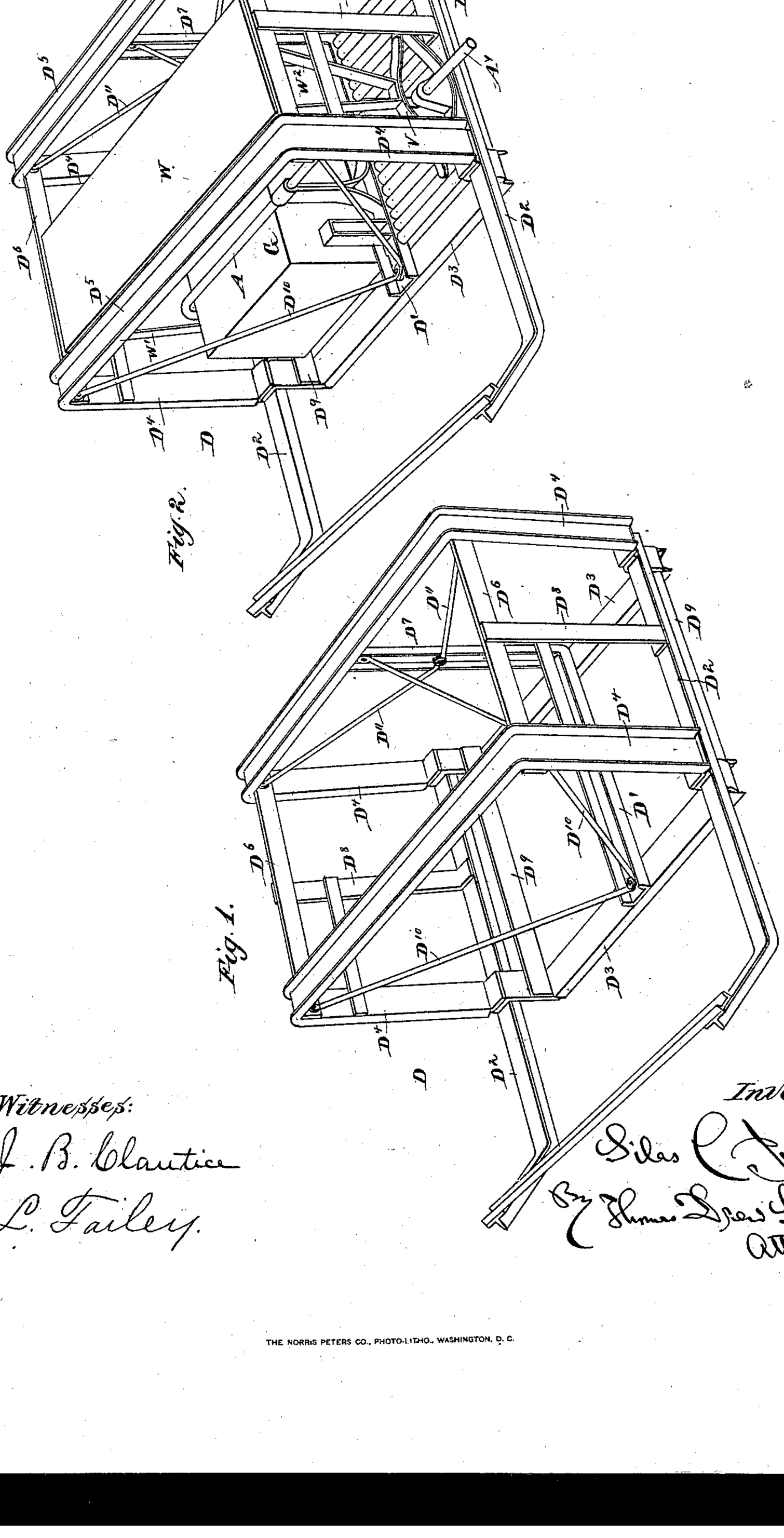

Fig. 2.

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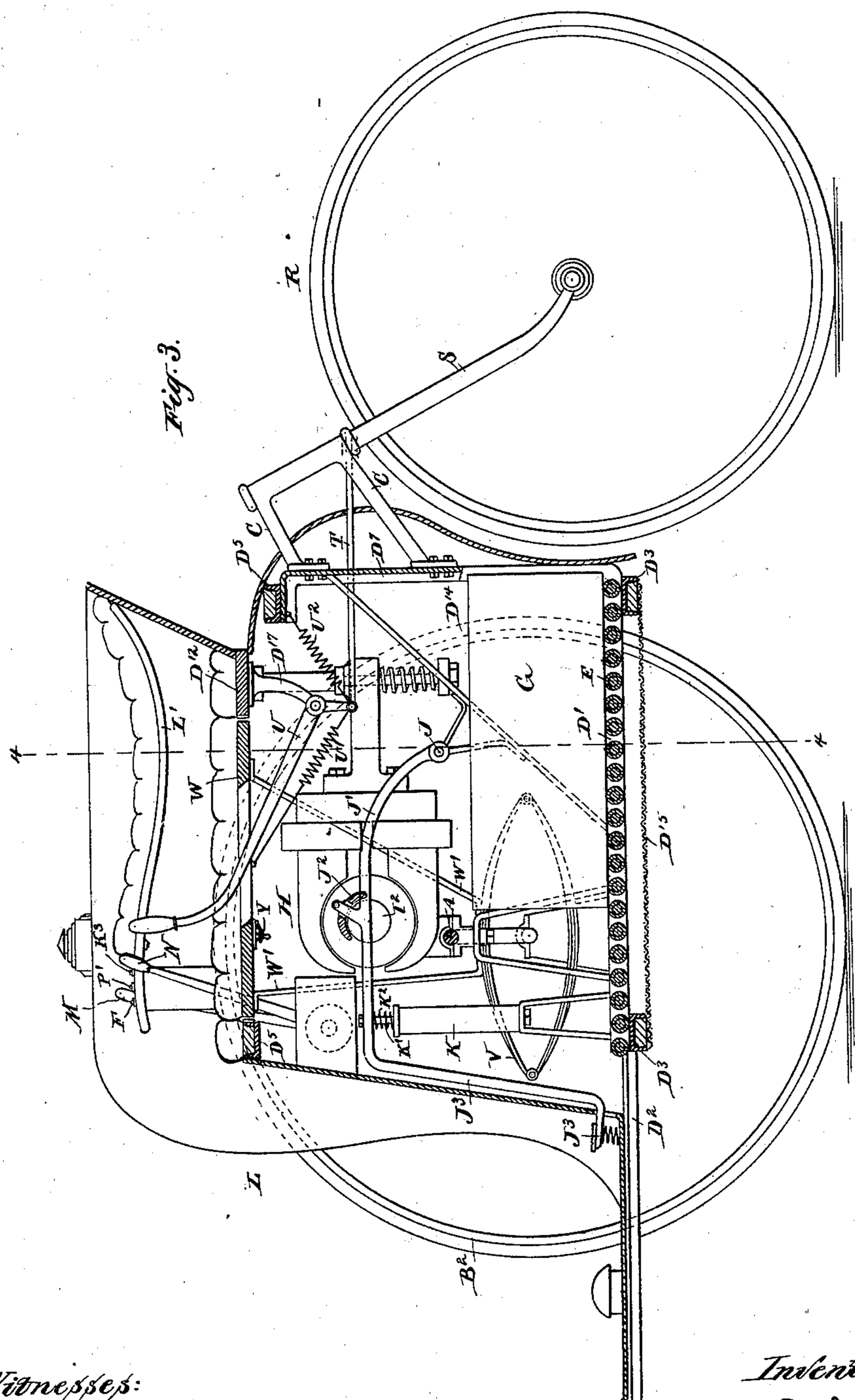
(No Model.) 4 Sheets—Sheet 2.

Fig. 3.



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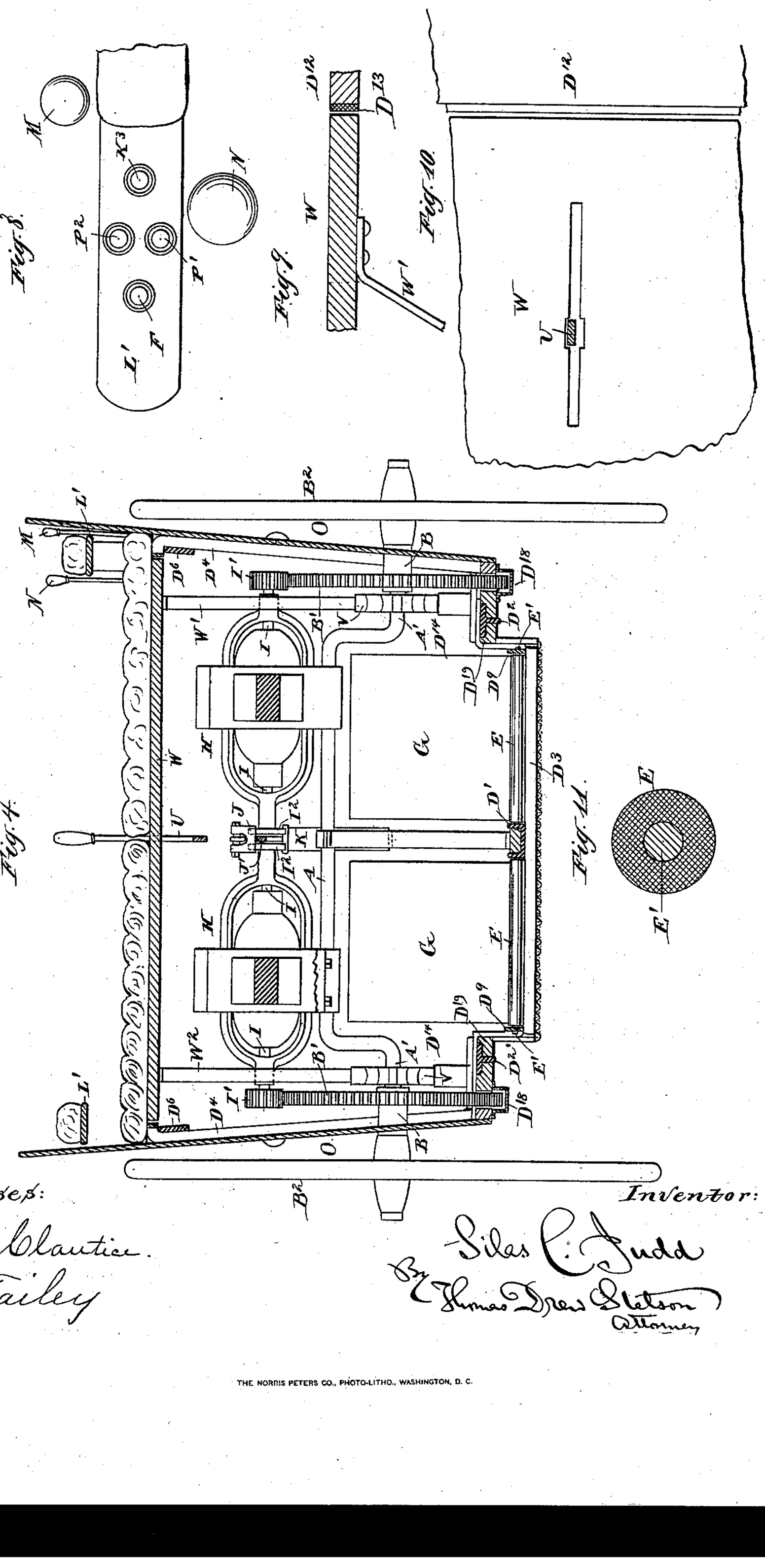
(No Model.) 4 Sheets—Sheet 3.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 7.

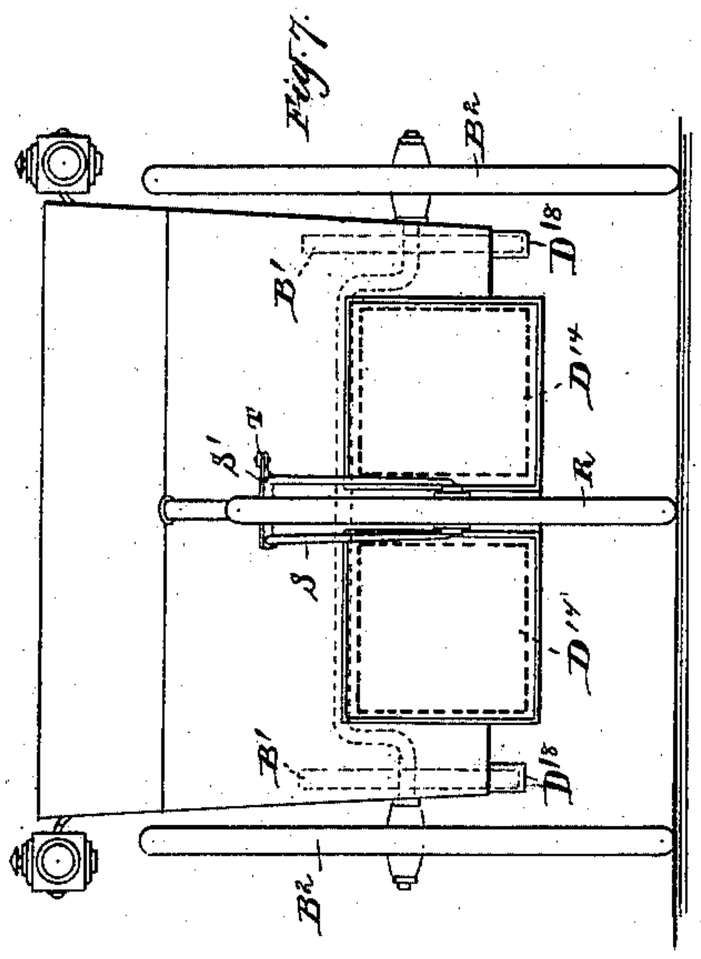


Fig. 12.

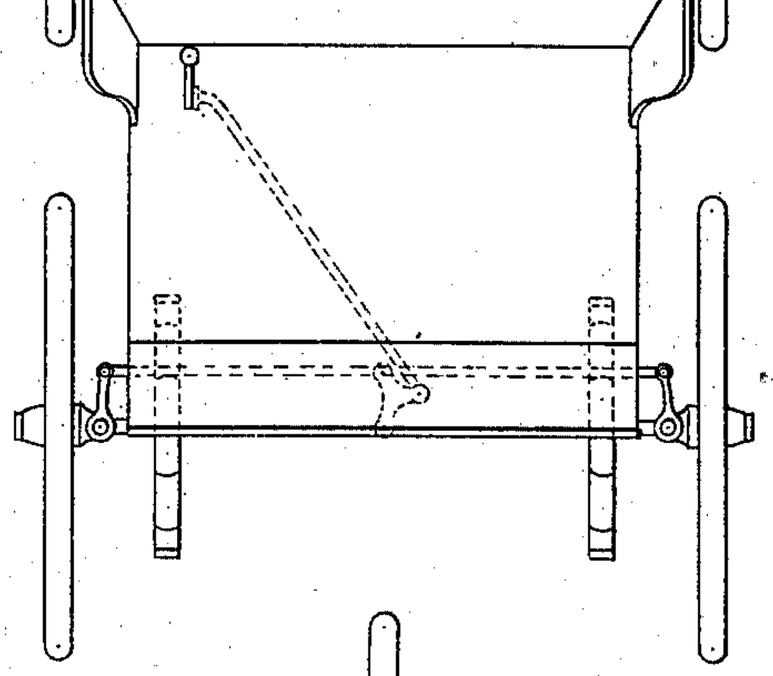


Fig. 5.

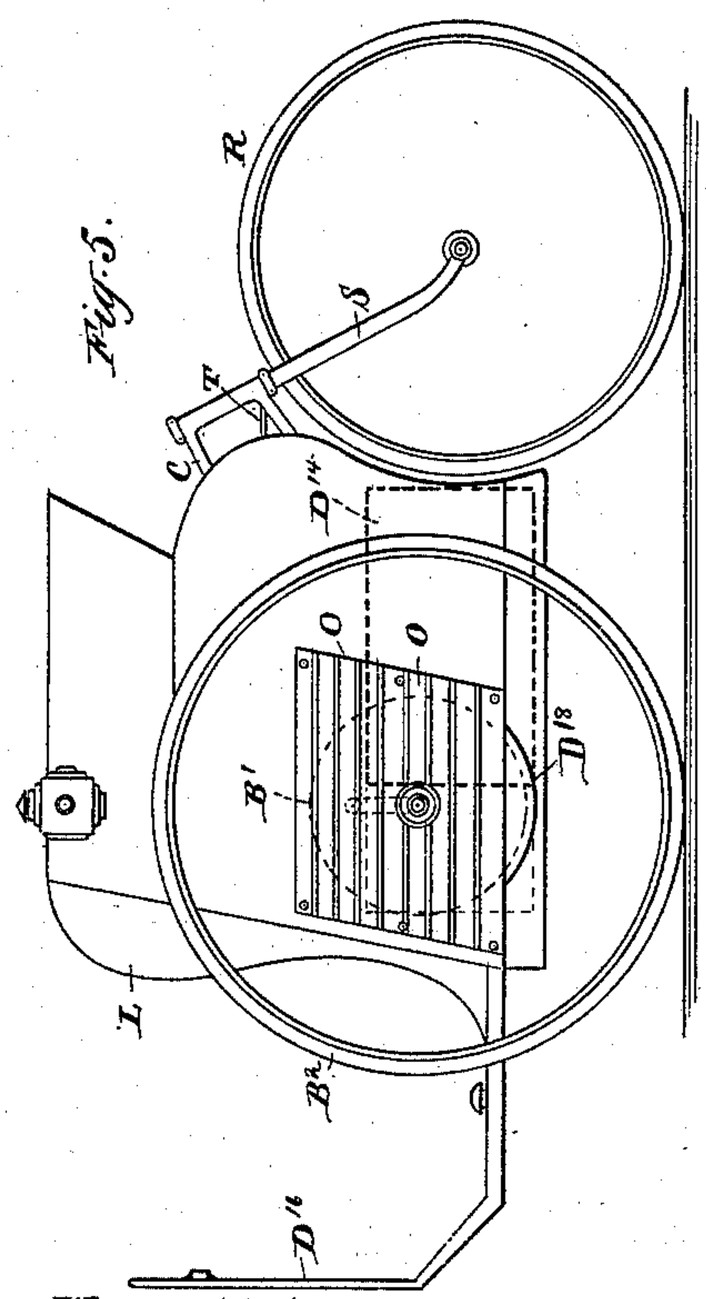
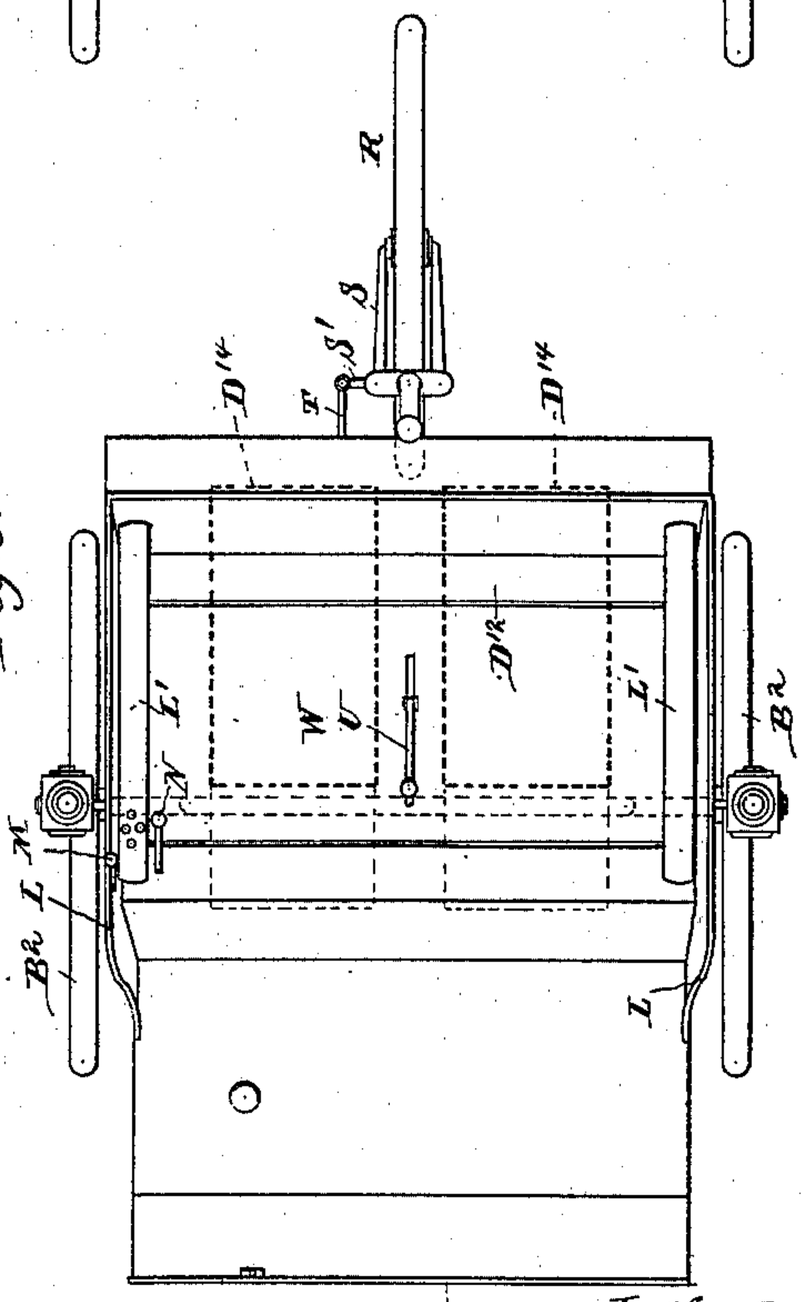


Fig. 6.



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UNITED STATES PATENT OFFICE.

SILAS C. JUDD, OF NEW YORK, N. Y., ASSIGNOR TO FREDERICK A. CAMP, OF SAME PLACE.

AUTOMOBILE.

SPECIFICATION forming part of Letters Patent No. 671,214, dated April 2, 1901.

Application filed August 9, 1900. Serial No. 26,342. (No model.)

To all whom it may concern:

Be it known that I, SILAS C. JUDD, a citizen of the United States, residing in the borough of Manhattan, in the city of New York and State of New York, have invented a certain new and useful Improvement in Automobiles, of which the following is a specification.

My improvement is intended more particularly for the lighter class; but it may be used with the parts properly proportioned for the heaviest kinds of automobile vehicles.

I have devised a construction of frame which gives unusual strength with little weight and have succeeded in producing thereby a form which is well adapted to serve with several different styles of vehicles. I will describe the invention as carried out with three wheels, a single wheel in the rear traversing under ordinary conditions at the mid-width of the road serving as means for adequately supporting the rear of the structure (which with this construction is the most heavily weighted) under ordinary and extraordinary conditions and also as a means for steering.

I operate by electricity, providing two corresponding electromotors and two driving-wheels turning independently, each wheel operated by one of the motors. Each wheel is mounted on a sleeve which extends within the carriage and is connected with the driving-gear. None of the mechanism of the motor appears on the exterior of my vehicle-body.

I arrange the parts so that the principal weight—the storage batteries—shall be carried at the lowest practicable point.

I provide the bottoms of the battery-spaces in the body with freely-turning rollers having metal cores and soft-rubber surfaces. These facilitate the introduction and removal of the batteries from the rear and by their elastic yielding contribute to support the batteries with delicate resilience in traveling over irregularities in the road, and especially over the continuous irregularities of some kinds of stone pavement.

A fixed axle of proper strength extends across the vehicle and is formed upward along its mid-length. I carry the motors on the fixed axle at high points, which latter is important in several respects, especially by insuring against water, under all conditions of the weather and of the road.

I have devised a brake with provisions for applying it to both of the motors at will. I operate it either electrically or by the power of the attendant, or both.

My motor-vehicle adapted to accommodate two passengers is lighter and from its several peculiarities of construction runs easier than ordinary carriages of this class. I can traverse a given distance with much less electromotive force or power of battery than is ordinarily required. I find it practicable to use shunt-wound motors with the advantage, among others, of recuperating the storage batteries, and thus accumulating power, in descending inclines.

My steering is effected by electricity and also by hand. It is practicable to alternate from one mode of steering to the other according as the road may be straight or subject to sharp turns.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a perspective view of the framing. Fig. 2 is a corresponding view of the same with parts further added. Fig. 3 is a longitudinal section of the entire machine with certain parts in elevation. The section is on a plane nearer the eye than the center line. Fig. 4 is a transverse section on the line 4 4 in Fig. 3. The storage battery and wheels are in elevation. Figs. 5, 6, and 7 are on a smaller scale. Fig. 5 is a side elevation. Fig. 5 is a plan view, and Fig. 7 a rear end elevation. Figs. 8, 9, and 10 represent certain details on a larger scale. Fig. 8 is a plan view. Fig. 9 is a vertical section, and Fig. 10 is a corresponding plan view. Fig. 11 is a transverse section through one of the elastic rollers. Fig. 12 is a plan view showing a modification with four wheels. A portion of the seat is broken away to show the rollers which support the storage battery. These are the same as in the principal form. A portion of these rollers is broken away to show the wire-gauze below.

Similar letters of reference indicate corre-

sponding parts in all the figures where they appear.

I will use the letter A to indicate the fixed axle, employing supernumerals when necessary to designate special parts thereof. The ends A′ carry sleeves B B, which are mounted on roller-bearings and constitute the inner linings of the boxes of the bearing-wheels. These sleeves extend inward and are provided with large spur gear-wheels B′, through which the motive power is received in traversing under ordinary conditions and through which motive power is communicated from the bearing-wheels inward to reinforce the batteries when a favorable inclination in the road is sufficient to induce such action.

B^2 B^2 are the supporting and driving wheels. These being free from the ordinary encumbrance of gearing bolted thereon may have any required degree of elasticity and may be nearly as slender as simple bearing-wheels. They may present the ordinary long-approved appearance of well-proportioned and nicely-finished adjuncts to the carriage. I can employ broad concave rims with large pneumatic tires, as such are found to soften the concussion and are much approved on automobiles; but I prefer for carriages made in stock solid rubber tires of less thickness.

I attach much importance to the construction of the body. I have devised a frame of nickel-steel, rolled in Carnegie shapes, channel, T, and angle steel. I take much care in fitting the parts very accurately and securing them with unusual firmness by hot rivets. Using the letter D for all the parts of this cross-barred frame and attaching supernumerals to designate certain portions when necessary, D′ is a central longitudinal bar of channel-steel. D^2 D^2 are side bars of T-section, extended farther forward and bent upward to constitute the framing of the dashboard. D^3 D^3 are cross-bars of channel-steel. D^4 D^4 are uprights, and D^5 D^5 are the upper cross-bars. D^6 D^6 are longitudinal top bars, one at each side. D^7 is an upright at the mid-width of the back, and D^8 D^8 are uprights at the mid-length of the sides.

The main portion of the frame is nearly rectangular, having only the long-approved flare, increasing in width upward about one inch to the foot; but the lower portion is formed with an internal offset. D^9 D^9 are longitudinal bars of nickel-steel, which are applied immediately below the offset. The whole is strengthened by diagonal braces. D^{10} D^{10} indicate such transverse diagonal braces at the front of the body, extending from near the upper angle at each side down to the mid-width of the base. D^{11} D^{11} indicate two partially-corresponding diagonal braces at the rear. They extend each from a point near the upper angle at each side down at a less angle and unite with the central post D^7 at a point sufficiently high to allow the storage batteries to be moved backward and forward under them as required in introducing and removing these important elements of the apparatus.

The elastic rollers E are mounted in two series near the extreme base of the body. The axes E′ extend beyond the rubber portions E^2 and are supported and allowed to turn freely in bearings formed in the central bar D′ and in the side bars D^9.

The storage-battery cells may be of any of the ordinary or suitable styles, packed in the ordinary manner in crates G, received in compartments D^{14} of rectangular form. Fig. 2 shows the compartments extending forward of the position in which I usually terminate them. I allow sufficient space in rear of the axle to accommodate a crate of the proper length and provide crates of just sufficient length to fill the rear portion of the space and fill up the space in front with a chock. (Not shown.) The weight of the batteries is thus all in rear of the axle A. Fig. 2 shows how the battery-compartment may be longer and may be extended forward under the arched axle. It may be extended still farther forward until the front reaches the diagonal brace D^{10}, with the effect to transfer the center of gravity forward. It is preferable with the three-wheel construction to hold the center of gravity to the rear.

The rollers E turn freely in their bearings. When it becomes necessary to remove a crate, the doors at the rear of the frame are opened and the crates are drawn rearward. On replacing the same battery or introducing another the crate is similarly thrust forward, the turning of the rollers making the motion easy. The doors involve no important novelty, and it may not be necessary to represent them. They may be of any ordinary simple construction with means for securing. I attach importance to the thick rubber coating of the rollers in providing additional elasticity for carrying the batteries without concussion. The rollers may be of small diameter, as shown. I prefer that there shall be a less number of rollers and of larger diameter—about three inches in diameter—the main portion being of rubber.

The longitudinal T-section steels D^2 D^2 receive hard ash pieces D^{19}, (see Fig. 4,) secured by bolts and screws. (Not shown.) These wood pieces thus firmly held carry fastenings for the woodwork above. They may also form the necessary supports for an attachment of the wood frame of many other styles of automobile-bodies, either for pleasure or for business, without any change whatever in the steel frame.

H H indicate the motors. The two motors are counterparts each of the other, and a description of one will suffice for both. It may be of any good variety of the shunt-wound, firmly fixed to the axle A. The rapidly-revolving shaft I carries a small pinion I′, which engages with the large gear-wheel B′. On the other end of the axis is a disk I^2, which receives the action of the brake. The shafts

of the two motors are in line, and the two disks I^2 are near together, but not in contact. (See Fig. 4.) A single brake-shoe J^2, carried on a lever J′, turning on a fixed axis J, (see Fig. 3,) is arranged to match on these disks, making contact with both.

K is a solenoid in which the electric current when applied pulls down the core K′ in opposition to the gentle force of a helical spring K^2. The brake-button K^3 (see Figs. 3 and 8) is conveniently located at the right hand of the operator and on being depressed by the operator makes electric connection by the ordinary means (not shown) and excites the solenoid and applies the brake-shoe J^2 electrically. On relaxing the pressure on the button K^3 the lever J′ again rises by the action of the spring K^2 and the brake-shoe is released. I provide additionally for operating the same brake J′ by mechanical means. This is an advantage when for any reason the electrical braking should fail. It may be expedient in some cases to apply the brake by both means. J^3 is an extension of the lever J′, reaching forward and downward and out through a sufficient aperture in the front of the body, where it can be conveniently touched by the foot. I can thus operate mechanically alone, without ever touching the button, or the button may be used alone, or both may be used simultaneously, if desired, in any emergency. The action of the brake is peculiarly efficient, because it contacts with the disks I^2, which are running very rapidly, so that a gentle pressure becomes very effective.

Additions L are secured by ordinary means on the exterior of the frame D to give a graceful appearance. The construction allows the application of pieces of wood or other material having gracefully-curved outlines conforming to the latest and most tasty styles of carriage-body. Important portions of such are the curved arm-pieces L′, of which there is one on each side, shown as padded. (See Fig. 3.) Exterior to such arm on the right side are two controller-levers M and N.

The direction in which the current is applied to the motor, and consequently the direction in which the armature will revolve and the carriage will move, is controlled by the lever N. This is only capable of serving in two positions, forward and back. It is shown in Fig. 3 in the rearward position. This is the exceptional position for running backward. To induce the proper conditions for moving forward, the lever N is set forward in close proximity to the lever M, but entirely clear of the path thereof, and the lever M is adjusted to whatever notch is required to give the desired speed. The lever M, which I term the "speed-lever," (shown in the forward position,) being moved forward and backward, acting through ordinary devices as a controller, (not shown,) applies the current from the batteries with more or less force to the motors as required, according to the condition of the road or the speed desired. This determines the amount of electromotive force applied to the wheels. Other conditions being equal the speed of the carriage will depend on the adjustment of this lever. There may be notches (not shown) to aid the operator in recognizing by the sense of feeling the extent to which he has shifted it forward or backward at any time. Such notches also aid in holding the lever in any one of three or other number of positions in which it may be left. I have in my experiments used four notches adjusted for giving, respectively, speeds of three miles, eight miles, and fifteen miles per hour. The fourth notch, thirty miles, will rarely be used, except for brief periods on extraordinary occasions.

The steering, as already briefly stated, may be effected either by the battery-power or by the mechanical action of the operator. There are, in addition to the brake push-button K^3, further push-buttons acting on stems extending, like the stem of the button K^3, down through the arm-piece and connected to suitable wiring in the interior of the body. It will be understood that there are in the interior of the carriage connections by insulated wires and all the ordinary switches and adjustments. The buttons P′ and P^2, side by side, immediately forward of K^3, (see Fig. 8,) are for electric steering. Depressing the left button P′ induces the turning of the carriage to the left. Releasing the left button and depressing the right button P^2 will induce a corresponding turning of the carriage to the right. The electrical steering is effected by applying the battery-power to the motors unequally, so that the motor on the side toward which the carriage is to turn shall be impelled with less force and will make slower revolutions than the other. For steering in this manner the rear wheel R should be free and arranged casterwise, so that it will tend to turn automatically and accommodate the turning of the carriage as induced by the unequal motion of the driving-wheels.

The steering may be effected independently of any inequality of the force of the motors by turning the rear wheel R. (See Fig. 3.) I have shown this rear wheel as smaller than the driving-wheels B^2. It is mounted in a fork S, which is carried in ball-bearings or other easily-turning bearings in rigid rearward extensions or brackets C, firmly set on the central rear post D^7 of the frame. This fork is equipped with a lateral arm S′, from which extends forward a pivoted rod T capable of transmitting either tensional or thrusting strains successively or alternately in any required degree as the conditions of steering may demand.

The hand steering mechanism is simple. The forward end of the rod T is connected to an angular lever U, which is fulcrumed to a fixed bracket D^{17}, set in the interior of the framing. The handle of this lever U extends forward and upward through a slot in the

seat between the two passengers and is normally held in the left hand of the operator. Two spiral springs U′ U², connecting from the angle of this lever U to points in the interior of the framing, with provisions for adjustment, (not shown,) give a tendency to this steering mechanism to stand always in the position for going straight ahead. I provide a notch in the side of the slot, which is adapted to receive the lever U and further contributes to hold it in the central position.

I can vary the curvature of the fork, so that the rear wheel R will serve as a caster and automatically turn to accommodate the steering when effected by variations in the electromotive force of the two motors, or I can make the fork just sufficiently curved to cause the prolonged line of the bearing of the fork where it bears in the brackets C to strike the ground at the same point where the wheel touches, in which case there will be no disposition of the wheel to turn, and the turning must be accommodated by the operation of the lever U or by other means of turning the fork and wheel. These points will be readily appreciated by a practical mechanic.

The proportion of the steering to be done by the unequal action of the motors on the one hand or by the turning of the steering-wheel on the other may be varied as experience shall dictate.

The forward push-button F serves to strike a gong. This may be effected either directly or through mechanism in any of the long-approved manners, as by closing and opening a circuit whereby the gong shall be struck electrically.

A portion of the top of the framing D is covered by a fixed panel D¹². (See Fig. 3.) The space in the front of the top of the frame left uncovered performs the important function of guiding the seat in all directions horizontally and allowing it to move upward and downward subject to the action of springs. Referring to Fig. 2, in which the panel D¹² is omitted to allow the construction of the framing to be more fully shown, the seat W is shown in the correct position, with its upper surface a little above the top of the body. The height of the top may be practically increased by padding, as by the ordinary carriage-cushions. W′ W² are brackets extending down from the lower face of the seat and transmitting the weight of the seat and of any load imposed thereon to elliptic springs V, which are mounted on the bottom side bars D² of the body. The ordinary provisions, as straps, (not shown,) for holding the cushions in place on the seat may be fastened at their ends not to the seat, but to the upper portion of the body, and consequently the seat is restrained against ever rising at one end or otherwise above its proper position. The joint around the seat between its edges and the adjacent portions of the body-framework must be open and sufficiently free to allow the seat to rise and sink easily; but all rattling is avoided by lining the inner face of the body or coating the outer face of the seat, or both, with soft material D¹³. I prefer soft rubber about an eighth of an inch thick.

I use sheet-rubber as a lining for the battery compartments D¹⁴. These latter are rectangular and extend from the rear of the structure forward to a greater or less distance, and the battery-cells are correspondingly modified in their dimensions according as the carriage is to be three-wheeled or four-wheeled.

Removable pieces which perform important functions in this structure additional to their ornamental effect are what I term "panels" O, a pair on each side. They apply against corresponding apertures in each side of the carriage coinciding with the wheels B′ and a little larger than each. To remove a wheel, the ordinary axle-nut, (not shown,) which keeps the sleeve B on the axle, being removed, the pair of adjacent panels O and the bottom piece D¹⁸ are also removed, and the sleeve B with the gear-wheel B′ and driving-wheel B², rigidly and permanently attached, are drawn off bodily from the axle. The liberal aperture thus provided also gives access to the other parts, the motors, &c., within the body when required.

It will be noted that my construction affords a short wheel-base and the weight of the passengers is received very directly on the axle, the frame D only serving to support the seat in the several directions horizontally.

I propose to carry a volt-ammeter on the interior of the dashboard D¹⁶ and to carry lamps on the exteriors of the seat.

Y is a switch-lever arranged under the seat, where it can be easily reached in emergencies and operating on the connections inside through an ordinary make-and-break contact. (Not shown.) Its function is to turn off the current entirely from the motors whenever occasion shall warrant such step.

The lower sides of the rollers E are very nearly down to the plane of the bottoms of the cross-bars D³. There is nothing under the rollers except a simple sheet of wire-cloth D¹⁵. This serves as a protection for the parts above against the entrance of rodents or other enemies.

I can introduce other gas-tight compartments and propose to do so, especially to inclose the controller which is adjacent to the fulcrum of the levers M and N. All the compartments are covered with rubber. They serve both as insulating means to reduce the liability of parts to come in contact which ought not to and also as means for retarding and under ordinary conditions absolutely forbidding the circulating of gases. The batteries are liable sometimes to give off gases which have a corrosive effect on the metals. My partitions, especially those constituting the battery-compartments D¹⁴, are so tight that I can, by simply providing a plug to form

the connection, charge the batteries in place. I prefer under ordinary conditions to remove them to be charged outside and restore them again.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. Instead of having the axle so far forward, as shown, with provisions for having the batteries entirely in the rear thereof, as is required for the three-wheel construction shown and described, I can arrange the axle farther backward in the framing D, or, perhaps, more correctly speaking, can mount the framing D farther forward upon the axle and provide the carriage with one steering-wheel, or, preferably, two steering-wheels in front instead of in rear. I prefer in such case to use two steering-wheels, swiveling not on a single center in the mid-width of the carriage, but on two centers, each well out toward the line of the wheel. I can even carry the two points on which the swiveling is effected quite out to the lines of the wheels. A good construction is shown in Fig. 12. The disposition of the carriage to turn on meeting an obstruction on one side or the other or on entering a portion of the road which offers more resistance on one side than on the other is lessened in proportion as the turning-centers for the steering-wheels are shifted outward from the center line. With either number of wheels and a corresponding arrangement about the weight I can increase the length of the structure and carry two seats or can adapt the body to carry loads of any given form or bulk.

Figs. 1 and 2 show the several channel-steels D′ D^3 D^4 D^5, bent and applied together, with their flat faces inward and their hollowed or flanged faces outward. The framing may be so made and will serve well; but I prefer to oppositely condition them in this regard, having the flange side inward. In either arrangement I fill the spaces between the flanges of the channel-steel with sound wood firmly secured by screws.

I can obtain some of the advantages of the invention with any good form of series-wound motor.

I can mount the sleeves B on the properly rounded and polished ends of the axle A directly with lubricated surfaces or I can employ any efficient and durable antifriction devices, as roller-bearings or ball-bearings.

I claim as my invention—

1. In an automobile, the bent axle A traversing the body and supporting the latter directly, in combination with the operating parts including a battery and motor, and operating-gear, the bends of the axle accommodating the batteries G G at a low level and supporting the motors H H directly at a high level, all substantially as herein specified.

2. In an automobile, the bent axle A traversing the body and supporting the latter directly with battery-compartments D^{14}, arranged at a low level, and one or more motors arranged at a high level, substantially as herein specified.

3. In an automobile, the approximately rectangular cross-barred frame D of metal attached to the axle unyieldingly and inclosing and protecting the motors and all the machinery, in combination with the elastic rollers E adapted to serve the double function of supporting the batteries G yieldingly and of facilitating the introduction and removal of the batteries, all substantially as herein specified.

4. In an automobile, the approximately rectangular cross-barred frame D attached to the axle unyieldingly, and inclosing and protecting the motors and all the machinery, in combination with the supporting-springs V carrying thereon a seat W arranged to move freely up and down guided in such frame and with the rubber D^{13} arranged to soften the action, all substantially as herein specified.

5. In an automobile, the bent axle A traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, adapted to serve substantially as herein specified.

6. In an automobile the bent axle A, traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, and with two motors H H adapted to turn together or independently, all arranged for joint operation substantially as herein specified.

7. In an automobile, the bent axle A, traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, and with two shunt-wound motors, and with the rear wheel R and provisions for allowing the latter to perform the two functions of supporting and aiding to steer the carriage, substantially as herein specified.

8. In an automobile, the bent axle A, traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, and with two motors H H, adapted to turn together or independently, two brake-disks I^2 arranged adjacent side by side but independently, and with a single brake-shoe J^2 and provisions for operating the latter at will, substantially as herein specified.

9. In an automobile, the bent axle A, traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, and with two motors H H, adapted to turn together or independently, two brake-disks I^2 arranged adjacent side by side but independently, and with a single brake-shoe J^2 and provisions for operating such shoe either electrically or by hand or by both means, all substantially as specified.

10. In an automobile the bent axle A, traversing the body and supporting the latter directly, in combination with sleeves B and wheels B′ B^2 fixed thereon, and with two mo-

tors H H, adapted to turn together or independently, two brake-disks I^2 arranged adjacent side by side but independently, and with a single brake-shoe J^2, and with provisions for distributing the power of the batteries unequally and also provisions as the lever U for steering by hand, all arranged for joint operation, substantially as herein specified.

11. The motor-carriage or automobile described having an approximately rectangular body, with removable panels O, on each side coinciding with the positions of the wheels, in combination with an axle A A′, and with sleeves B and wheels B′ B^2 fixed thereon, applied and removed through the apertures secured by the panels, all substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in the presence of two witnesses.

SILAS C. JUDD.

Witnesses:
THOMAS DREW STETSON,
M. F. BOYLE.