

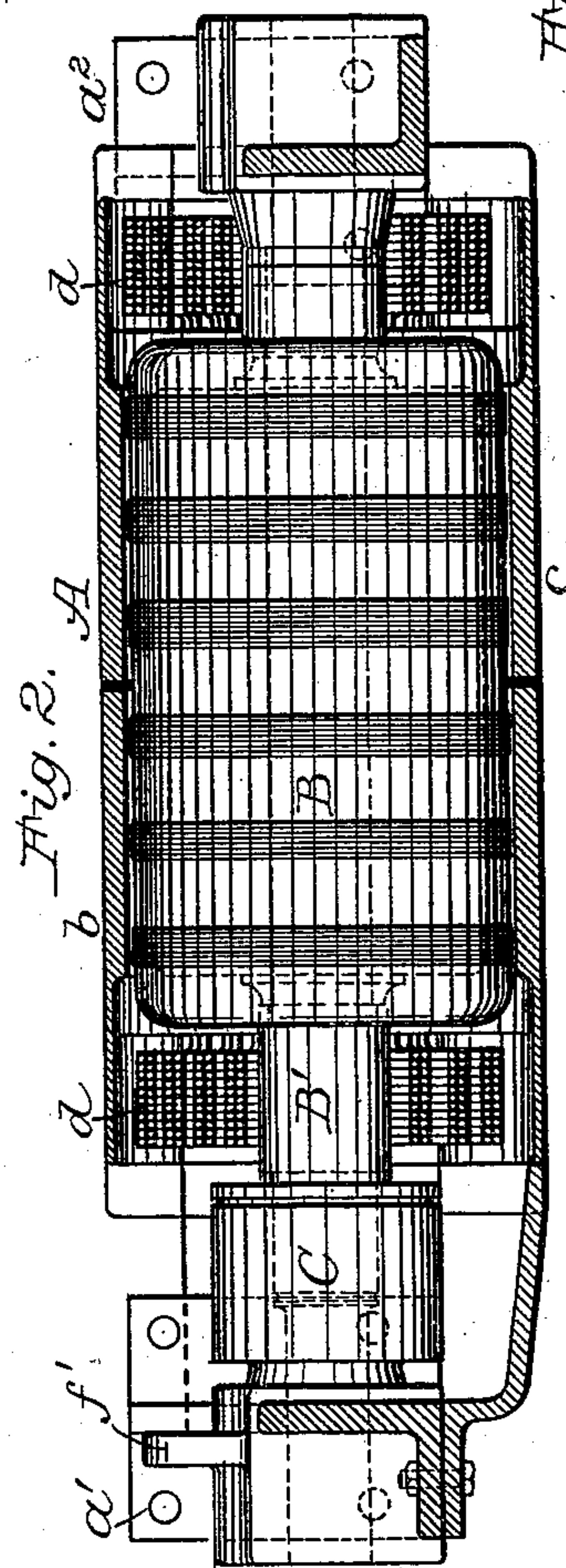
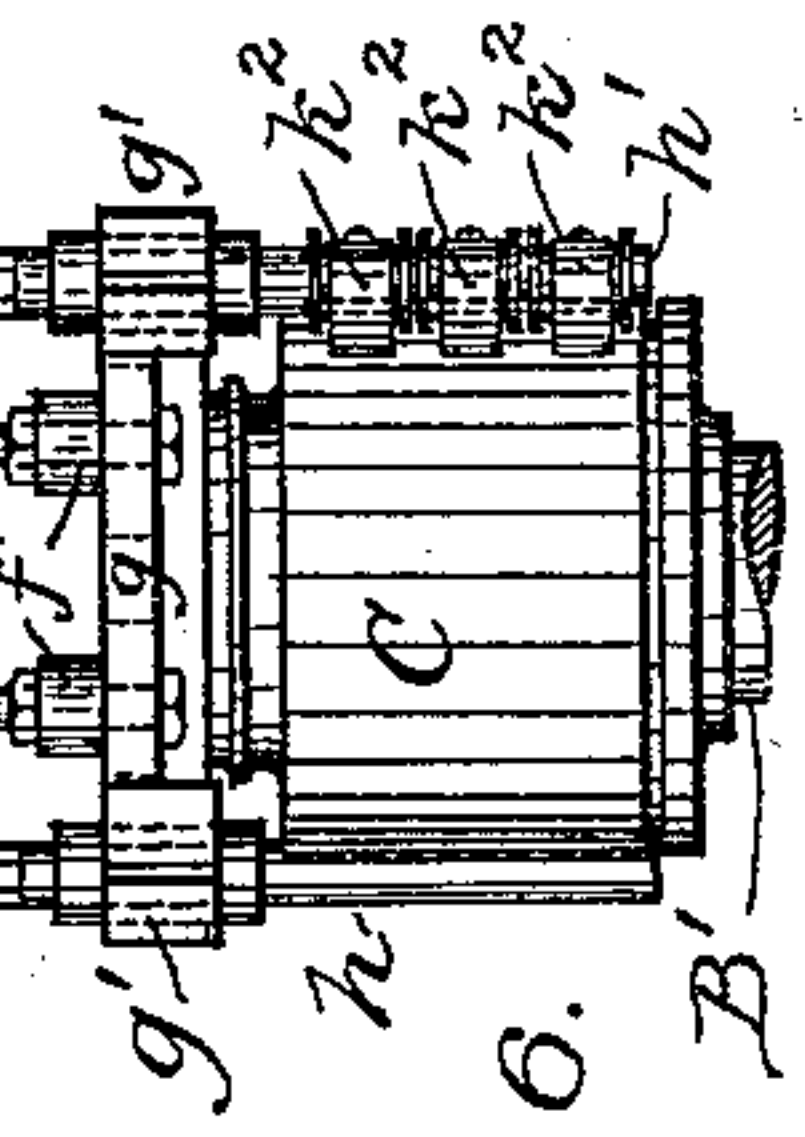
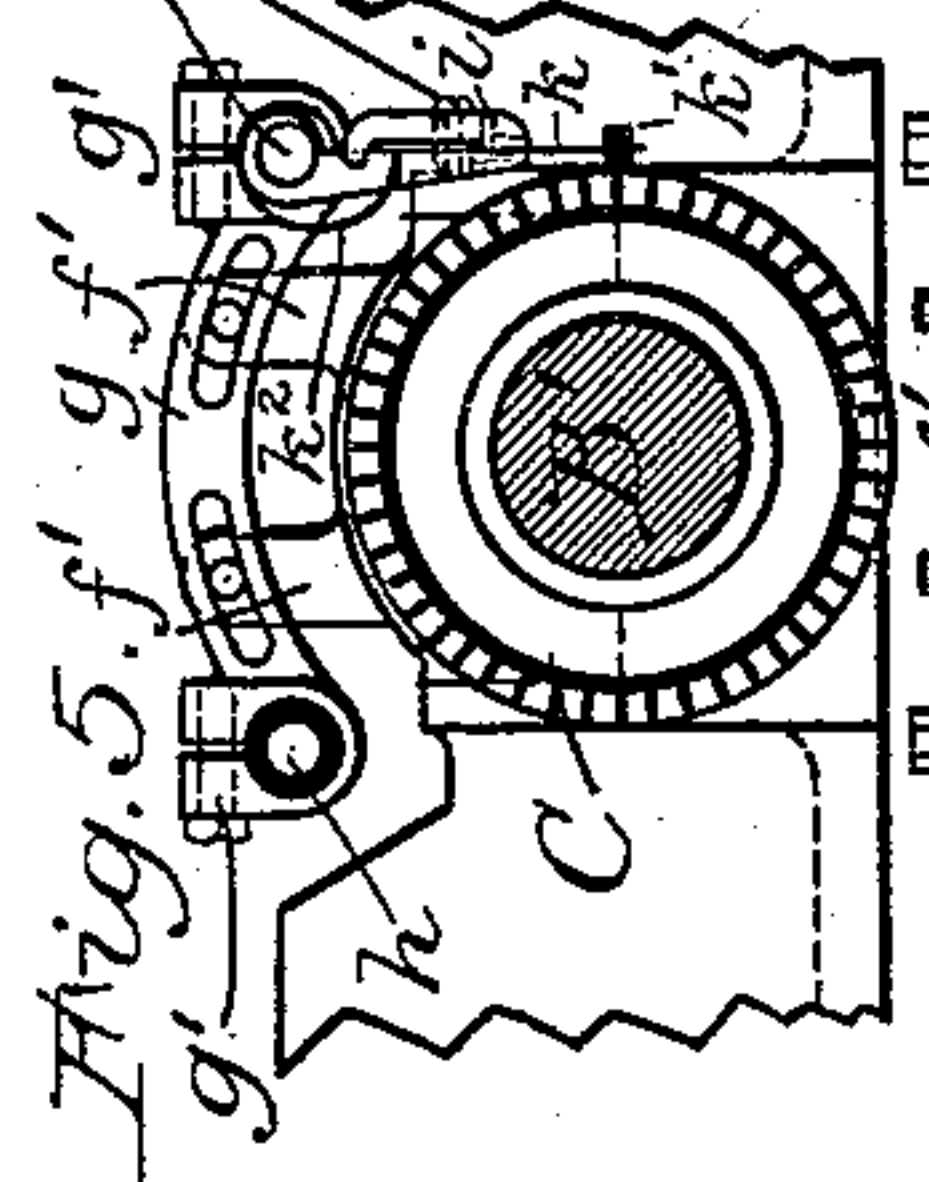
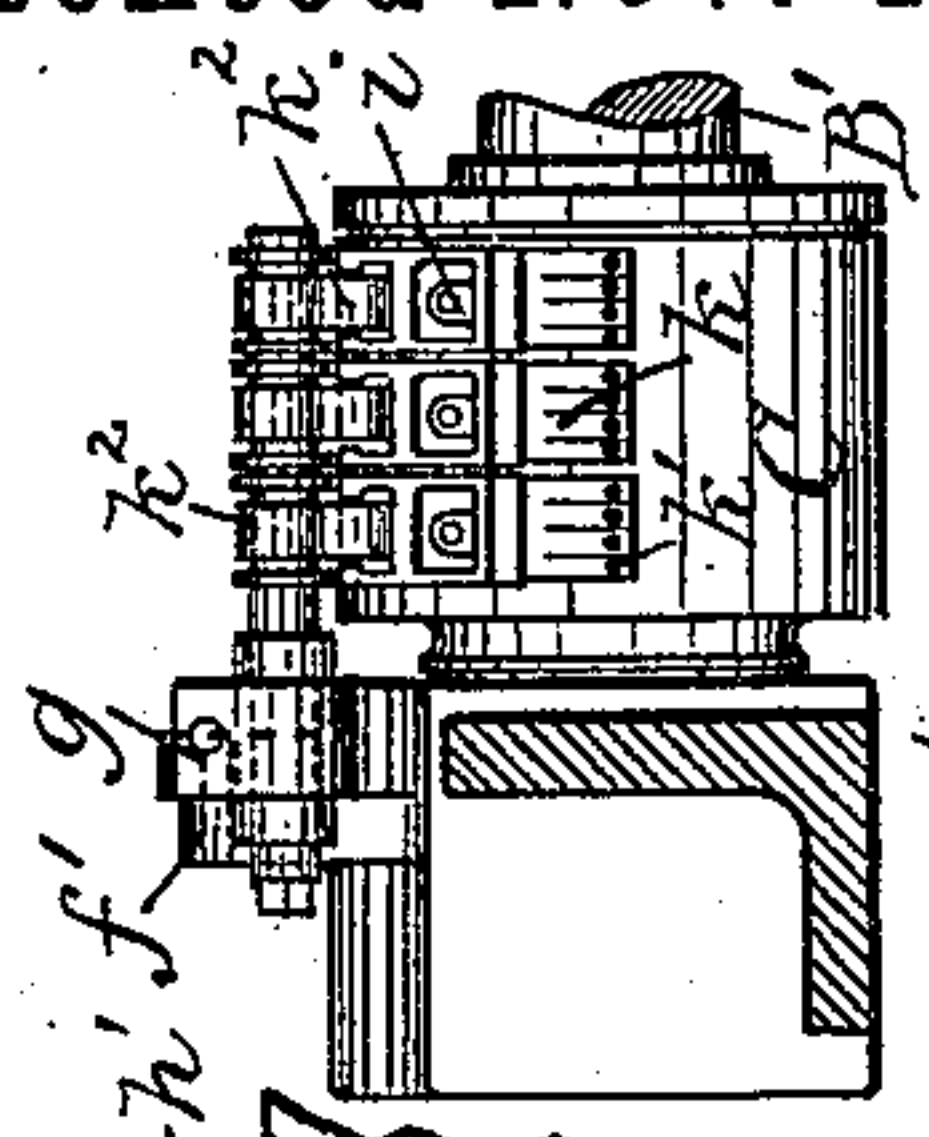
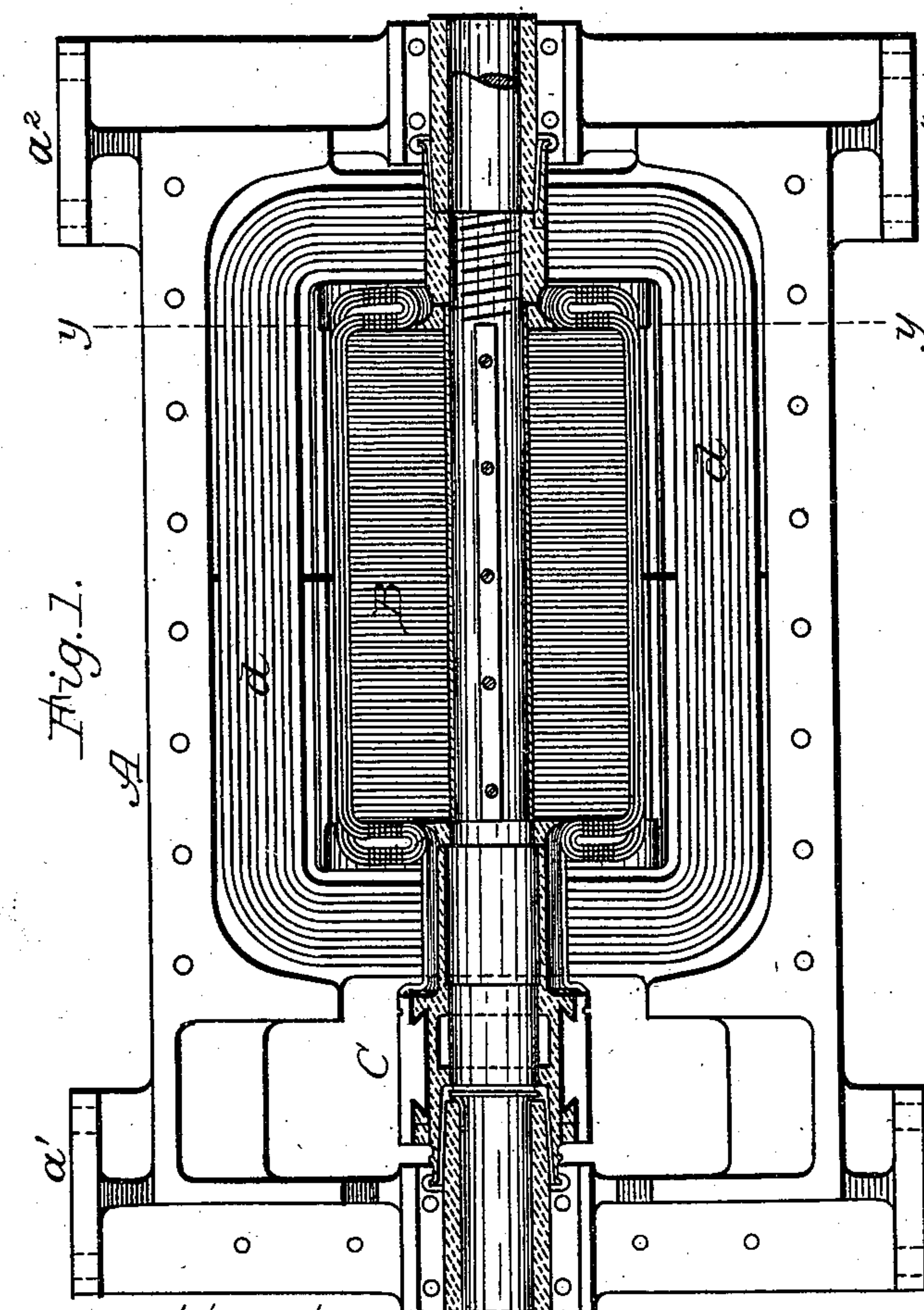
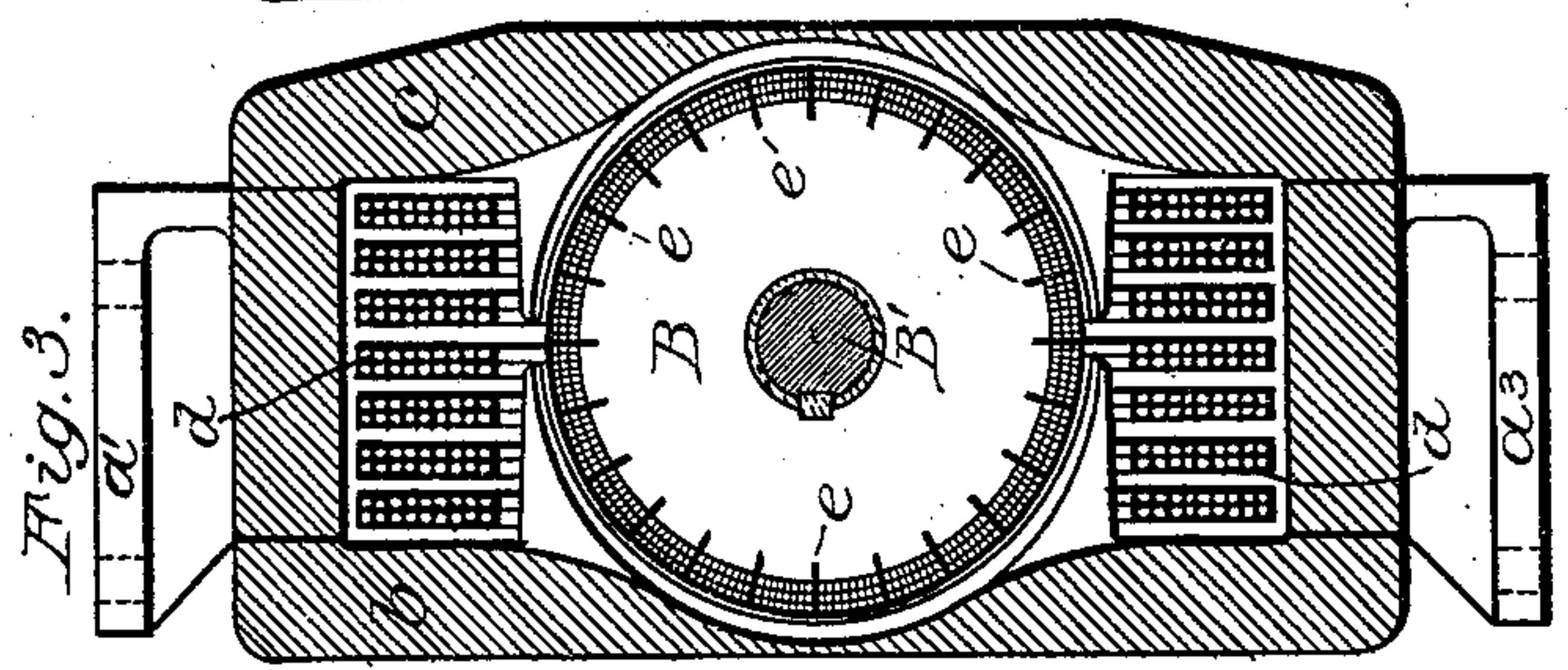
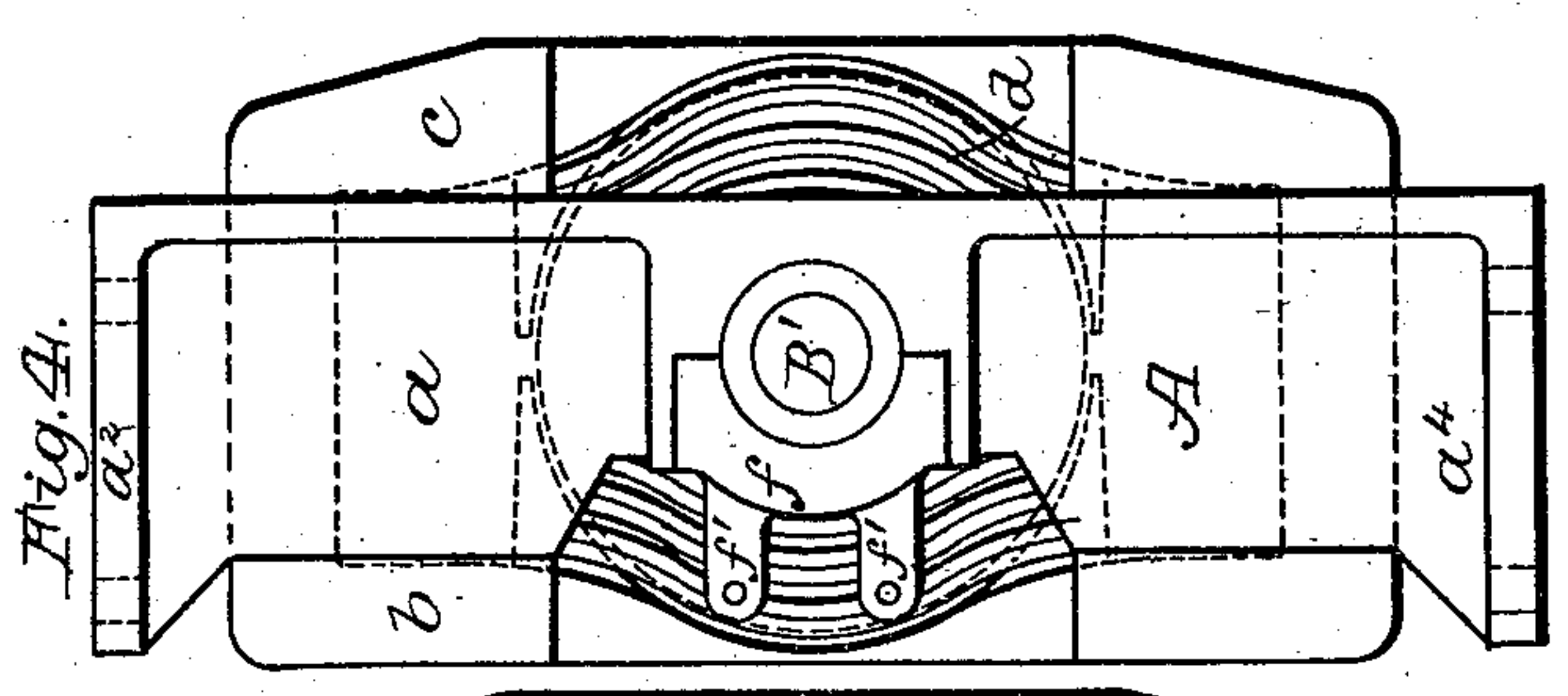
(No Model.)

3 Sheets—Sheet 1.

R. EICKEMEYER.
ELECTRIC CAR OR LOCOMOTIVE.

No. 550,220.

Patented Nov. 19, 1895.



Attest:
Philip T. Lyner
Lowell Zaitte

Inventor:
Rudolf Eickemeyer
By *Wm. O. Wood* attorney

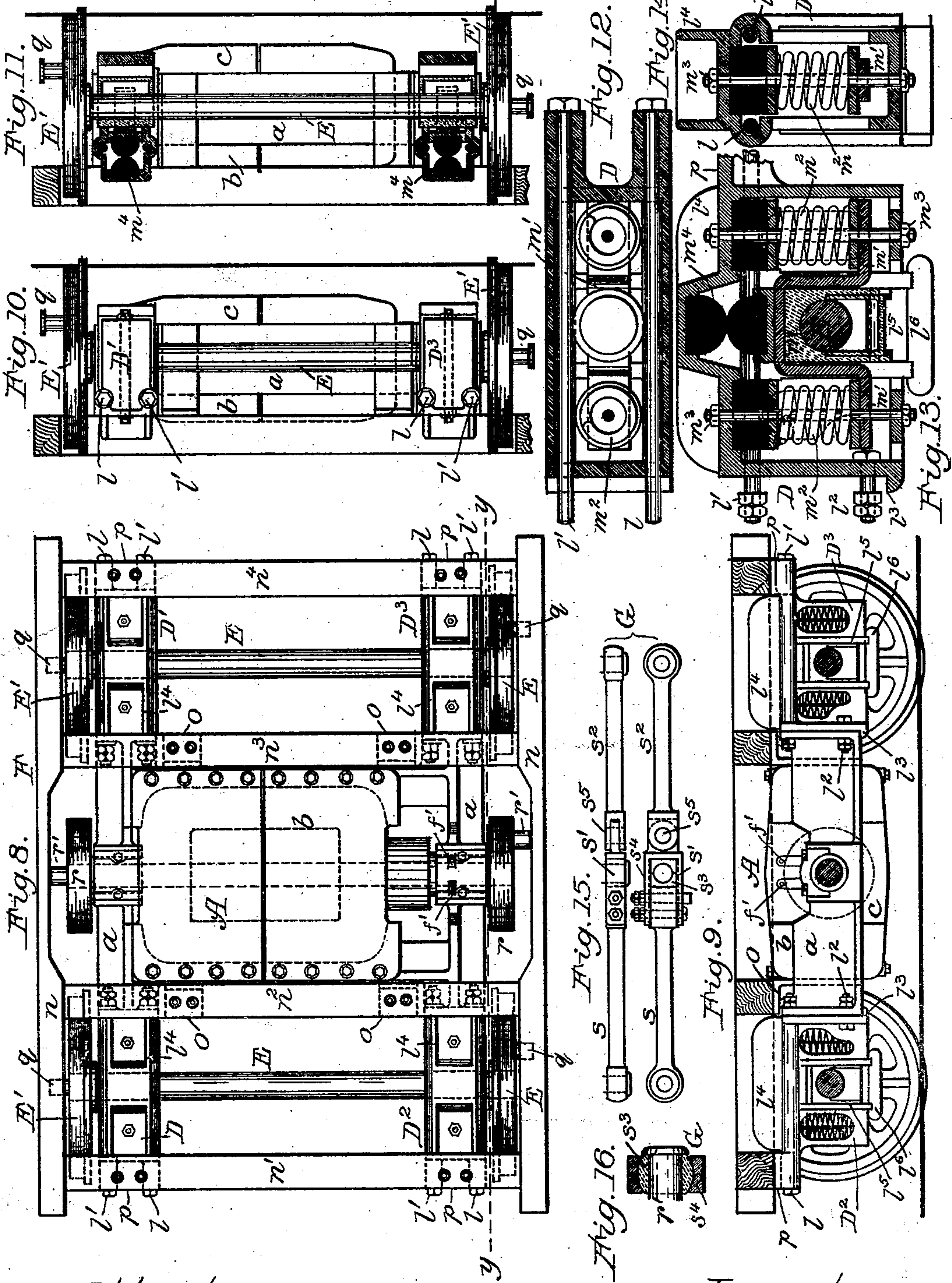
(No Model.)

3 Sheets—Sheet 2.

R. EICKEMEYER.
ELECTRIC CAR OR LOCOMOTIVE.

No. 550,220.

Patented Nov. 19, 1895.



Attest:
Philip F. Larnes,
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By *W. B. Wood* attorney

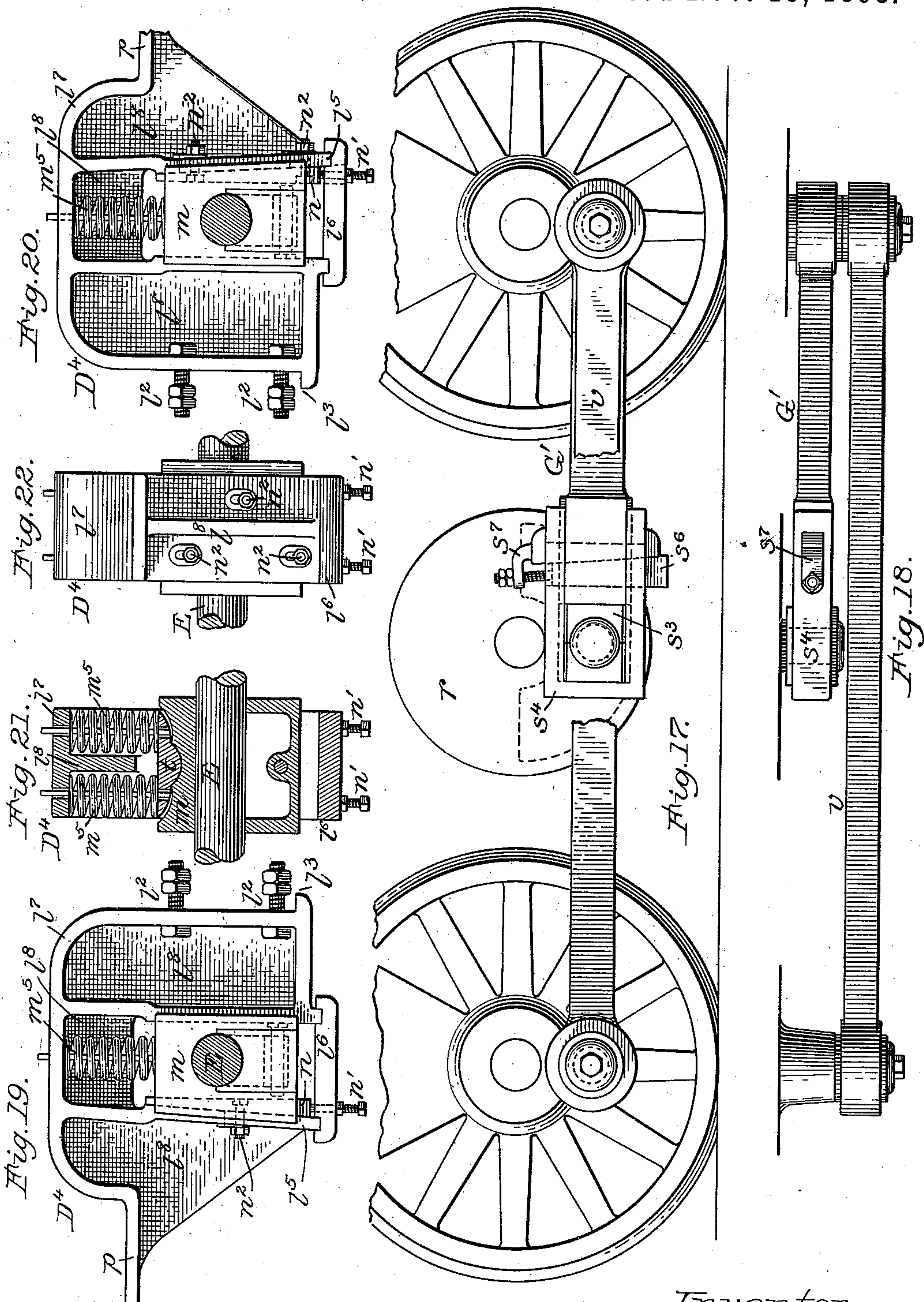
(No Model.)

3 Sheets—Sheet 3.

R. EICKEMEYER.
ELECTRIC CAR OR LOCOMOTIVE.

No. 550,220.

Patented Nov. 19, 1895.



Attest:

Philip F. Larnet.
Notary Public

Inventor:

Rudolf Eickemeyer
By *[Signature]* Attorney

UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK; RUDOLF EICKEMEYER, JR., EXECUTOR OF SAID RUDOLF EICKEMEYER, DECEASED.

ELECTRIC CAR OR LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 550,220, dated November 19, 1895.

Application filed April 8, 1891. Serial No. 388,070. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Electric Cars or Locomotives; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My said improvements have been devised with reference to their use in electric locomotives having direct pitmen connections between the electric motor and the driving-axles, and the several features of my said invention will be described in connection with organizations embodying many of the features of invention disclosed in my application for Letters Patent filed October 28, 1890, Serial No. 369,564.

The objects of my present improvements are in part to secure, with reasonable economy in construction and metal, a highly efficient and durable motor-frame. To these ends I have so devised such portions of the frame as are specially liable to breakage while in service that they are detachable parts (and preferably counterparts) readily assembled or applied or removed from the main portions of the frame and from the car. I have also so devised the union of the several parts of the motor-frame and motor with the sill-framing of the car that many of said parts, should they become detached by accident from the main portion of the structure, will, nevertheless, be supported securely by the sill-framing, and thereby obviate much liability of serious breakage and injury to other portions of the car. I have also provided for effectively cushioning the motor, the motor-frame, and the car upon the driving-axles in a manner specially valuable in organizations having four driving-wheels coupled by pitmen to the motor, and which, therefore, require axle journal-bearings inside of the wheels. I have also provided for an adjustment of the axle journal-boxes, which, while permitting the boxes to slide freely in their jaws, confines them against undue vibration under the thrusting and falling action of the pitmen. I have still further so devised and organized

the commutator-brushes that they may be readily applied, removed, and replaced without liability of an imperfect adjustment of the brushes with relation to each other and to the commutator-hub, and I have also devised an organization of the motor, its frame, and the axles which enables the frame and motor to be well elevated above the surface of the ground, although carried upon wheels of such sizes as are commonly used on street-cars and without any undue elevation of the car-floor.

My invention includes other matters of more or less value, and the several features in construction and combination believed to be novel will, after a detailed description, be duly specified in the several clauses of claim hereunto annexed.

Referring to the drawings, Figure 1, in horizontal section, illustrates a motor specially adapted for use with four driving-wheels, the top section, of the motor-casing and one-half of the field-coil being removed and the armature shown in section. Fig. 2 is a vertical section of said motor, with the armature in side view. Fig. 3 is a cross-section of the motor, on line *y*, Fig. 1. Fig. 4 is an end view of the motor without its commutator-brushes. Figs. 5, 6, and 7 are views of the commutator and brush-holder with one of the brushes removed. Fig. 8 is a plan view of the motor, the entire motor-frame, and the sill-framing of a car-body or truck-frame. Fig. 9 is a section of Fig. 8 on line *y*. Fig. 10 is an end view of the machine. Fig. 11 is a lateral vertical section in line with one of the axles. Figs. 12, 13, and 14, in several views, illustrate one of the parts of the motor-frame, which contain an axle-jaw, a journal-box, a yoke, and springs. Fig. 15, in top and side views illustrates one of the two complex pitmen or links for connecting the motor with the driving-wheels. Fig. 16 illustrates in section the wrist-pin connection of the motor crank-disk with the coupling-link or pitmen. Figs. 17 and 18 illustrate a different mode of coupling driving-wheels with the motor crank-disk, the same being adapted to light service and having means for adjusting the wrist-pin boxes. Figs. 19 to 22 illustrate a different form of frame extensions, with axle-

boxes, springs, &c., well adapted to light service and showing means for adjusting the axle-boxes in their jaws.

The motor A, Figs. 1 to 4, inclusive, is of the type heretofore devised by me and disclosed in my Letters Patent No. 358,340; but it embodies several novel features in construction which are of substantial value in electric locomotives, and specially so in those in which direct pitmen connections are employed. This motor-casing has a main central section *a*, which at each corner is provided with a flanged bracket *a'* *a*² *a*³ *a*⁴, specially adapting it to serve as an effective central, longitudinal, and lateral portion of a motor-frame. As shown in Fig. 2, the central portion of this section and the main portions of these brackets are above the central horizontal line of the motor. The top *b* of the casing being quite heavy, is constructed in two parts, divided centrally crosswise of the motor, and the same is true of the bottom *c*, and both are bolted to the central section and afford recesses for the sides of the field-coils *d*, which are constructed in seven sections, and it will be seen that four of these sections are above and three below the central horizontal line of the motor, thus providing for desirable elevation of the motor and its frame above the ground, as will hereinafter be made apparent.

The armature B is clad with detachable coils of the type heretofore devised and patented by me, and its core is, as usual, composed of iron disks; but as a novel feature (fully shown in Fig. 3) the core is longitudinally grooved from end to end at intervals on its periphery and provided with thin strong radial splines *e*, extending from end to end of the core, and preferably composed of vulcanized fiber, which, serving as braces or abutments, secure the coils against displacement under heavy torsional strains, this being a matter of special value in a frequently-reversed slow-speed motor adapted to this line of service.

It is obviously important to have the commutator-brushes in an electric locomotive readily detachable and capable of being promptly removed and applied, even by unskilled persons, without liability of misadjustment. The brushes and their holders are of necessity quite delicate structures, and when, as heretofore, they are mounted upon or carried by the armature-shaft adjacent to the commutator they are frequently injured during the insertion or removal of an armature from its bearings. For these reasons I have mounted the brush-holders upon a foundation which is wholly independent of the armature or motor shaft B', but in as close proximity to the commutator-hub C as when axially mounted upon the armature-shaft.

Referring now to Figs. 1 to 9, inclusive, it will be seen that the journal-box cap *f*, over the journal-sleeve of the armature-shaft adjacent to the commutator C, is provided with two posts or standards *f'* *f'*, said caps being,

as usual, detachably secured to the seats by readily-accessible bolts. A curved base-plate *g*, having curved slots for the reception of bolts, is secured to the inner faces of the standards *f'* *f'*. This base-plate is preferably an integral casting of brass, with appropriate ears or bosses at its ends, which, on being bored out centrally and split at their upper sides and provided with clamp-screws, afford reliable clamps *g'* *g'* for the reception of the ends of two insulated rods *h* *h'*, which have insulating-sleeves and project parallel with the surface of the commutator-hub C in proper position to serve as supports for pivotal pendent brush-holders *i*, as clearly indicated in Figs. 5 to 7, inclusive. The brushes *k* are pendent, vertical, and in three groups of reversible spring-tongues, provided with carbon contacts *k'*, as disclosed in my Letters Patent No. 397,492, and each holder has a back-spring *k*² for forcing the brushes against the surface of the commutator-hub.

It is obvious that the box-cap must always occupy a certain precise position with reference to the commutator, and the brush-holders and brushes having been first properly adjusted with reference to the commutator it will readily be seen that the box-cap and the brushes may be applied, detached, and replaced without liability of deranging the adjustment of the brushes, and, as a matter of fact, the latter will and do operate without sparking regardless of reversals in rotation and variations in load. These brushes have double-faced carbon contacts, so that when one face has been worn down to the plate-spring the latter may be taken out and reversed, thus putting the other carbon face into service, and these springs are counterparts and of a predetermined length, so that when one has been fully entered into its holder the carbon contacts must occupy their exactly proper positions.

Now, referring to Figs. 8 to 16, inclusive, I will describe the motor, motor-frame, the connections with the driving-axes and with the sill-framing of a car or truck.

The motor-frame includes the central section *a* of the casing of the motor A and four frame extensions D D' D² D³. These frame extensions are counterparts, and hence a description of one will apply to all. Each of these frame extensions embodies a hollow casting of iron or steel, reinforced by long iron or steel bolts *l* *l'*, which occupy ribbed housings and unite the upper portion of the extension to the central section *a* of the motor-casing at either one of its corner brackets, other short bolts *l*² uniting the lower portion of the extension with said casing-bracket, and below the latter bolts the extension is provided with a step-shoulder *l*³, which engages with the coincident lower edge or corner of the motor-casing section *a*, as clearly indicated in Fig. 9. On top of the extension there are longitudinal strengthening-webs *l*⁴, and centrally in each extension and below the long rods

there is an axle-box jaw l^b , bridged by a brace-plate l^c . It will now be seen that the motor-casing and these four frame extensions constitute a complete motor-frame, and that, although said extensions are hollow and may be quite light, they are very strong, and that even if they should be cracked or fractured the long brace-bolts will perform good supporting service and keep the pieces in place. In the box-jaw l^b there is an axle-box m for the journal of an axle E , surmounted by an arched saddle m' , having at its depressed ends lateral seats for a pair of springs m^2 , each preferably embodying a spiral section and a rubber section, as clearly indicated in Figs. 13 and 14. Bolts m^3 serve for centering the springs and as guides for the saddle, and also as vertical braces in the frame extensions.

The springs m^2 should be of ample strength to support all proper loads, but I prefer to reinforce them with a pair of centrally-located buffer-springs m^4 , preferably semispherical and having their round faces in contact and normally slightly compressed, one of these springs being seated in a socket and bearing upon the journal-box, either directly and at each side of the saddle or upon the latter, and the other or upper spring having its seat in a dome provided therefor in the top of the frame extension. With this organization of springs rail-shocks can seldom, if ever, be imparted to the motor-frame even during such extraordinary lateral vibrations of the car as are liable to occur with springs necessarily located between the wheels on an axle, and hence not very widely separated.

It will be seen that the motor-shaft and the two axles may occupy, normally, the same horizontal plane and that the supporting portions of the motor-frame are well elevated above the axles, and also that ample clearance is secured between the bottom of the motor and the surface of the ground, and that the motor-frame with the axles and the driving-wheels E' constitute a complete organization for the reception of a car-body having a suitable sill-framing. So far as relates to its connection with this machine, the sill-framing F need only involve side pieces n and four lateral beams $n' n^2 n^3 n^4$. The centrally-located lateral beams n^2 and n^3 are separated by a space equal to the corresponding dimensions of the central section of the motor-casing, and the latter is attached to said beams by means of bolts and the four angle brackets o . The two lateral beams n' and n^4 are connected by bolts with the outer ends of the frame extensions, suitable seats p being provided for that purpose.

It will now be obvious that many parts of the motor-frame might get cracked or broken, with little, if any, liability of any of them getting away from their proper positions, and thereby causing more or less serious injury to other portions of the machine.

The four wheels E' are used as drivers, each

having a crank stud or pin q , and these are directly coupled to the two crank-disks $r r$ on the ends of the motor-shaft B' , the wrist-pins $r' r'$ on said disks being set quartering to each other, as indicated in Fig. 8.

The pitmen G , of which but one is shown detached and in three views in Figs. 15 and 16, are complex in their structure, being composed of three parts or lengths $s, s',$ and s^2 . The parts s and s^2 at one end of each is adapted to properly engage with its appropriate driving-wheel crank-stud q . The middle part s' is a strap-section containing a journal-box s^3 , rounded on top and bottom, as shown in Fig. 16, the arms s^4 of the strap being correspondingly concaved laterally, so that the sections s and s' , being united by suitable bolts or keys, as shown, constitute a pitman, which can rotate more or less on its longitudinal axis without causing the box to bind either upon the wrist-pin r' or with relation to the pitman, thus providing for a smooth and easy running connection between the motor and driving-wheels, regardless of the lateral rocking movement of the motor-frame on its springs and of the ordinary tilting by the axle incident to an uneven track or slight obstructions thereon.

The sections s' and s^2 of this pitman are pivotally connected by means of a tenon on the section s' , which occupies a fork on the section s^2 and a suitable pin s^5 , this joint also affording torsional flexibility to a desirable degree.

In some cases I provide the pitman at both ends with similar rolling or ball boxes and with gibs or straps, and although they need not be used in machines intended for ordinary service they are generally well worth the additional expense initially involved in their construction.

It will be seen that the strains incident to the pulls and thrusts of the pitmen cannot be communicated to the car-body, because all of the lines of strain are located below the plane occupied by the top of the motor-frame and by the several seats thereon for the sill-framing.

A motor-frame embodying as its main longitudinal and lateral element the central section of the motor-casing and the four frame extensions is of special value for use with comparatively heavy rolling-stock requiring large motors and four driving-wheels; but such a frame is also desirable for use under light cars, liable on occasion to be heavily loaded, and to that end I have simplified said frame, as illustrated in Figs. 17 to 22, and therewith I employ a pair of simple pitmen and shackle-bars for connecting the wheels at each side of the machine.

It is to be understood that the motor-casing is employed in this frame, as before described, and that it is in like manner secured to the sill-framing of the car. The frame extensions D^4 are, however, much simpler in their construction, and although quite light,

they have great strength. Each frame extension is connected with the motor-casing by the short bolts l^2 , and each has a step-shoulder l^3 , as before described, as well as a box-jaw l^5 bridged by a brace-plate l^6 . These frame extensions are not hollow, but each has a broad lateral web l^7 extending from one side of the box-jaw at the bottom upward at its bolted rear end, and arching at the top extends to the outer end, where it forms a seat at p for the sill-framing. Similar webs are at each side of the box-jaw and merge with the top web. A central vertical longitudinal web l^8 arched over the box-jaw completes the structure. The axle-journals and their boxes m are mainly as before described, but each box is here provided with a rocker-plate in a recess in the top of the box parallel with the journal, as shown in Fig. 21, and two springs m^5 are seated upon the ends of said rocker-plate and are borne upon by the coincident surface of portions of the web l^7 , thus providing for maintaining a uniform bearing by both springs during the tilting movements of the axle. These frame extensions are counterparts and interchangeable, thus reducing to a minimum their cost in casting, machining, and assembling. These frame extensions have axle-jaws, straight at their sides toward the motor and inclined at their other sides to enable the introduction of a wedge-shaped plate n , which is interposed to serve as an adjustable side of the jaw, the journal-box being recessed on that side deeper than at the opposite side. This plate is provided with adjusting-screws n' , passing upwardly through the brace-plate l^6 , and with clamp-screws n^2 , thus enabling the adjustment of the jaw, so that the box may slide freely within it, but without any undue movement, in response to the thrusts and pulls of the pitmen. It is desirable to thus control all journal-boxes in my locomotives, but specially so in light machines, because of the greater possibility of the transmission of disagreeable shocks and jars to a light motor-frame and thence to a light car-body. In this light organization the driving-wheels are coupled together by a shackle-bar v , and on each side the motor crank-disk r is connected by a pitman G' , with a driving-wheel, as indicated in Figs. 17 and 18, and said pitman is provided with a rolling journal-box s^3 , as before described; but in this case the strap s^4 is provided with an adjusting wedge-shaped key s^6 , provided with a screw-threaded stem, which passes through a hole in a bracket s^7 , thus providing for a perfect adjustment of the box s^3 , with relation the wrist-pin r , while retaining a torsional capacity for the pitman.

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

1. In an electric car or locomotive, the combination substantially as hereinbefore described, of an electric motor, having a casing which constitutes central, lateral and longi-

tudinal portions of a motor frame, and four frame extensions, each detachably coupled to the motor casing, and embodying an axle box jaw, the said frame as a whole, being adapted to be spring mounted, on two car axles.

2. In an electric car or locomotive, the combination substantially as hereinbefore described, of a motor casing, constituting central, lateral, and longitudinal portions of a motor frame, and four counterpart frame extensions, each embodying an axle box jaw, and provided with bolts above the jaw, which extend from the motor casing to the outer end of the frame extension.

3. In an electric car or locomotive, the combination substantially as hereinbefore described, of a sill framing for the car body or truck; an electric motor having a casing which constitutes central longitudinal and lateral portions of a motor frame; and frame extensions, provided with axle box jaws for two axles, and rigidly attached to the motor casing, said motor and said frame extensions, being separately attached to said sill framing.

4. In an electric car or locomotive, the combination substantially as hereinbefore described, of a motor casing serving as a central, lateral, and longitudinal portion of a motor frame, and four hollow frame extensions, provided with axle jaws, and bolted to said casing, and each containing a journal box, a saddle on the box, and springs between the ends of said saddle, and the under surface of the top of the hollow frame extensions.

5. In an electric car or locomotive, the combination with a motor frame, adapted to be mounted on two axles inside of the wheels, of axle box jaws in said frame, each containing a journal box, springs at the two sides of the box, and buffer springs above the box, for affording a yielding seat for the motor frame, and a car thereon, under excessive loads, and avoiding shocks, during undue lateral swinging vibrations of the car.

6. In an electric car or locomotive, the combination substantially as hereinbefore described, of driving axles, and wheels, an electric motor beneath the car; direct pitman connections between the motor shaft and driving wheels, or axles, and adjustable jaws for the axle journal boxes, which permit said boxes to freely slide in the jaws, but adjustably confine them against movement, under the pulling and thrusting action of the pitmen.

7. In an electric locomotive, the combination substantially as described, of the motor commutator hub, the pendent vertical commutator brushes and their two pendent holders, both carried upon a base plate, which is in turn mounted upon the detachable cap of the adjacent journal bearing for the armature shaft, whereby the brushes and holders, without liability of varying the relative positions of the brushes to each other and to the commutator hub, may be readily applied to, or removed from, the motor.

8. In an electric locomotive, a slow speed

motor having an armature containing an iron
core, longitudinally grooved from end to end
at intervals on its periphery, and detachable
coils, with interposed splines occupying the
5 grooves in the core from end to end, and lock-
ing the coils against rotative displacement,
substantially as described.

9. In an electric car or locomotive, the com-
bination in a motor carried beneath the car,
10 of field coils within the motor casing, sur-

rounding the armature, and constructed in
sections, some of which are above, and a lesser
number below the central longitudinal line of
the motor, substantially as and for the pur-
poses described.

RUDOLF EICKEMEYER.

Witnesses:

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RUDOLF EICKEMEYER, Jr.