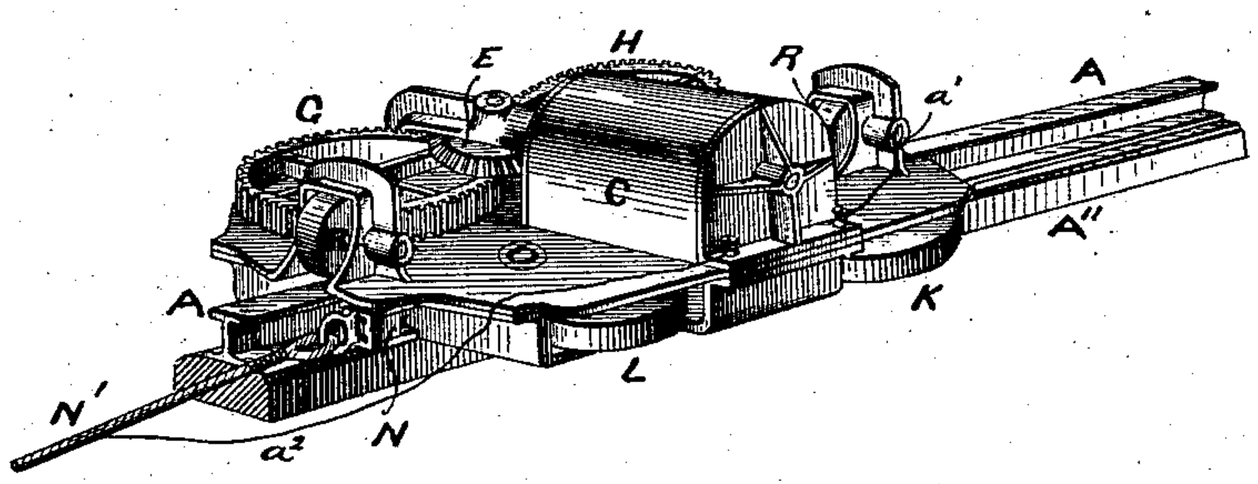
(No Model.) 4 Sheets—Sheet 1.

W. E. AYRTON & J. PERRY.

ELECTRICAL TRACTION MOTOR.

No. 292,529. Patented Jan. 29, 1884.

Fig. 1.



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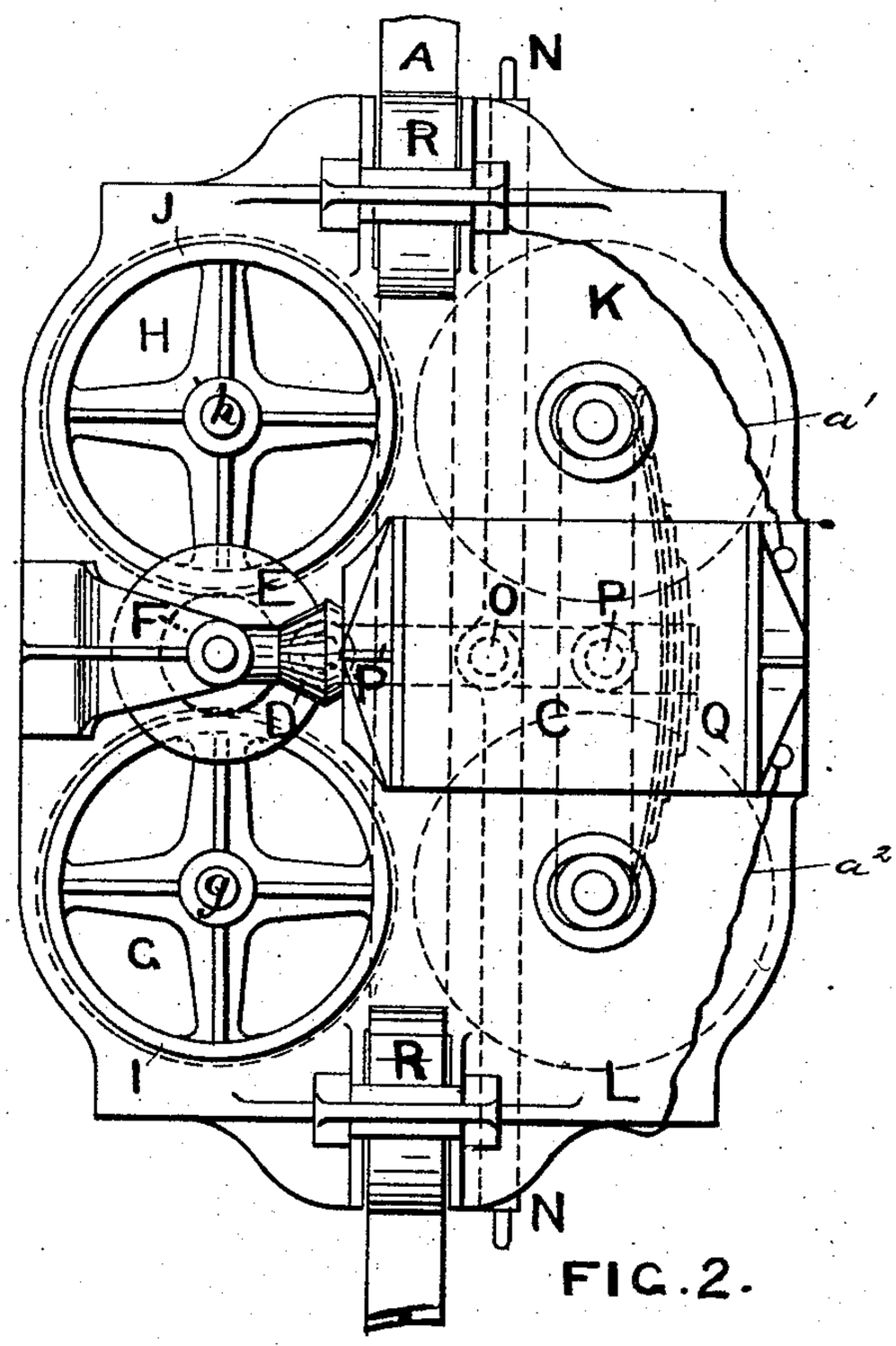

FIG. 2.

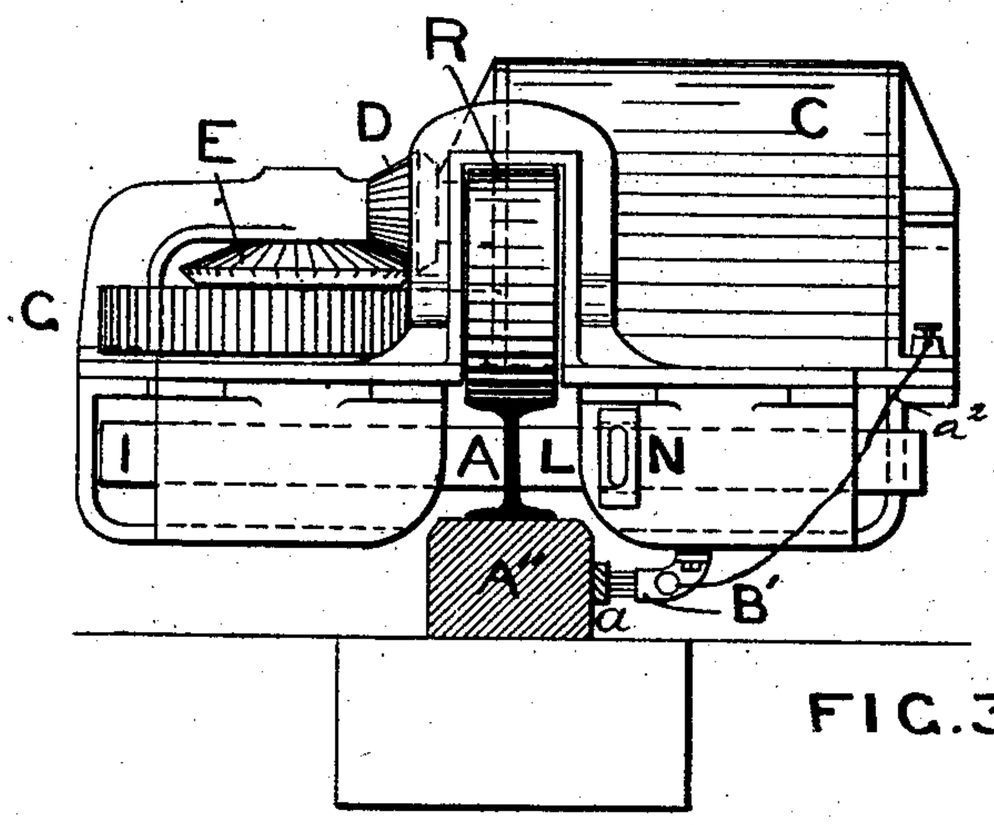

FIG. 3.

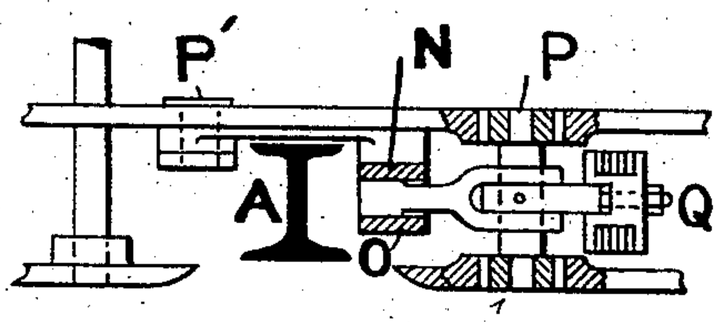

FIG. 4.

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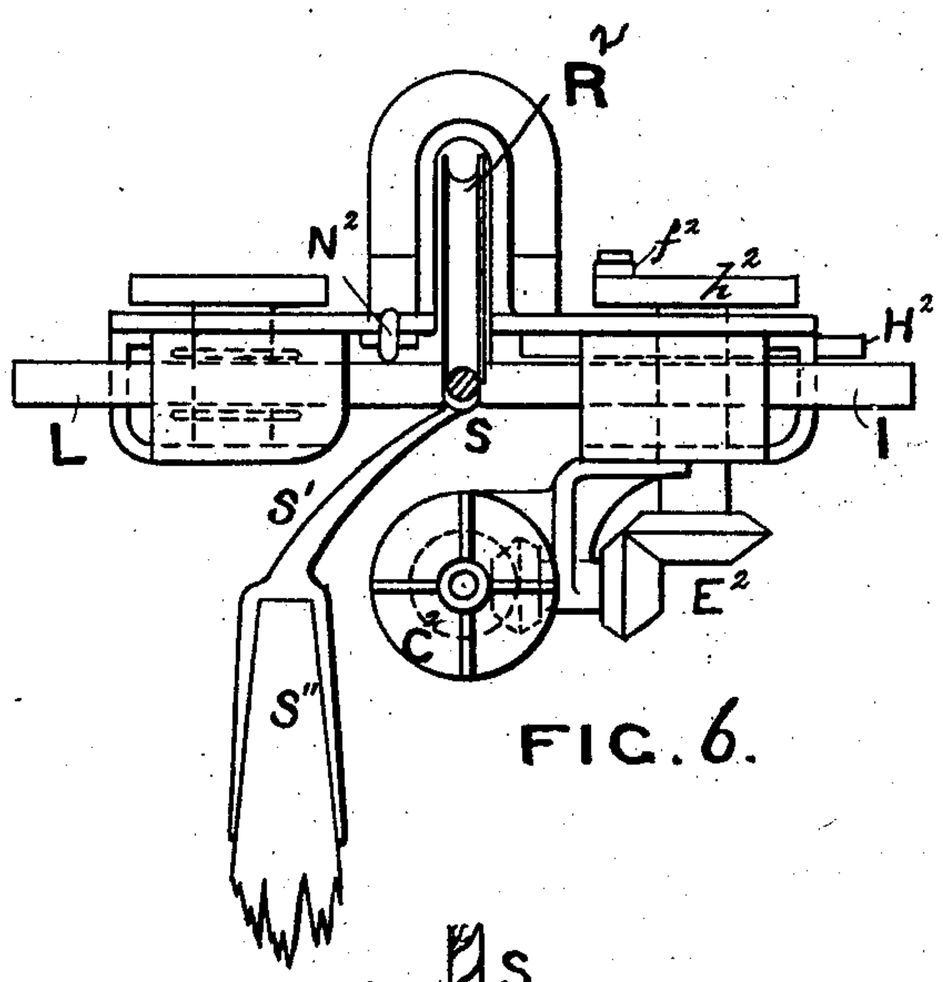

FIG. 6.

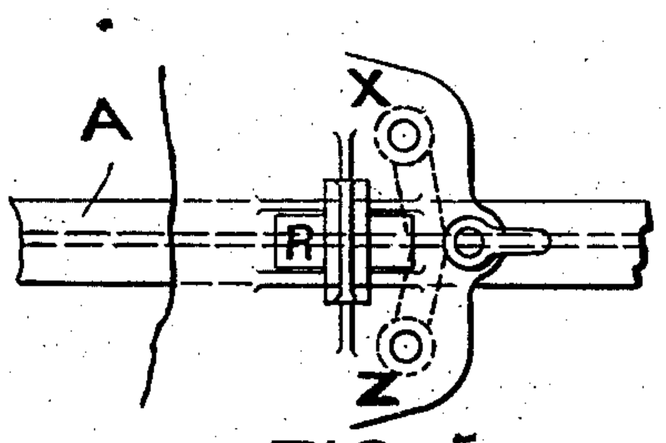

FIG. 5.

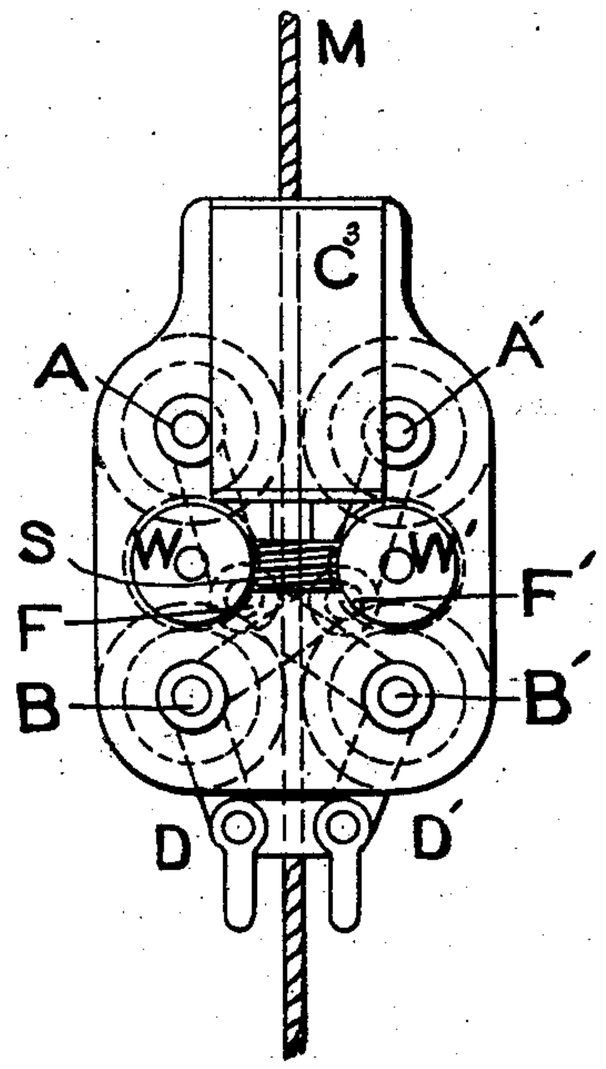

FIG. 8.

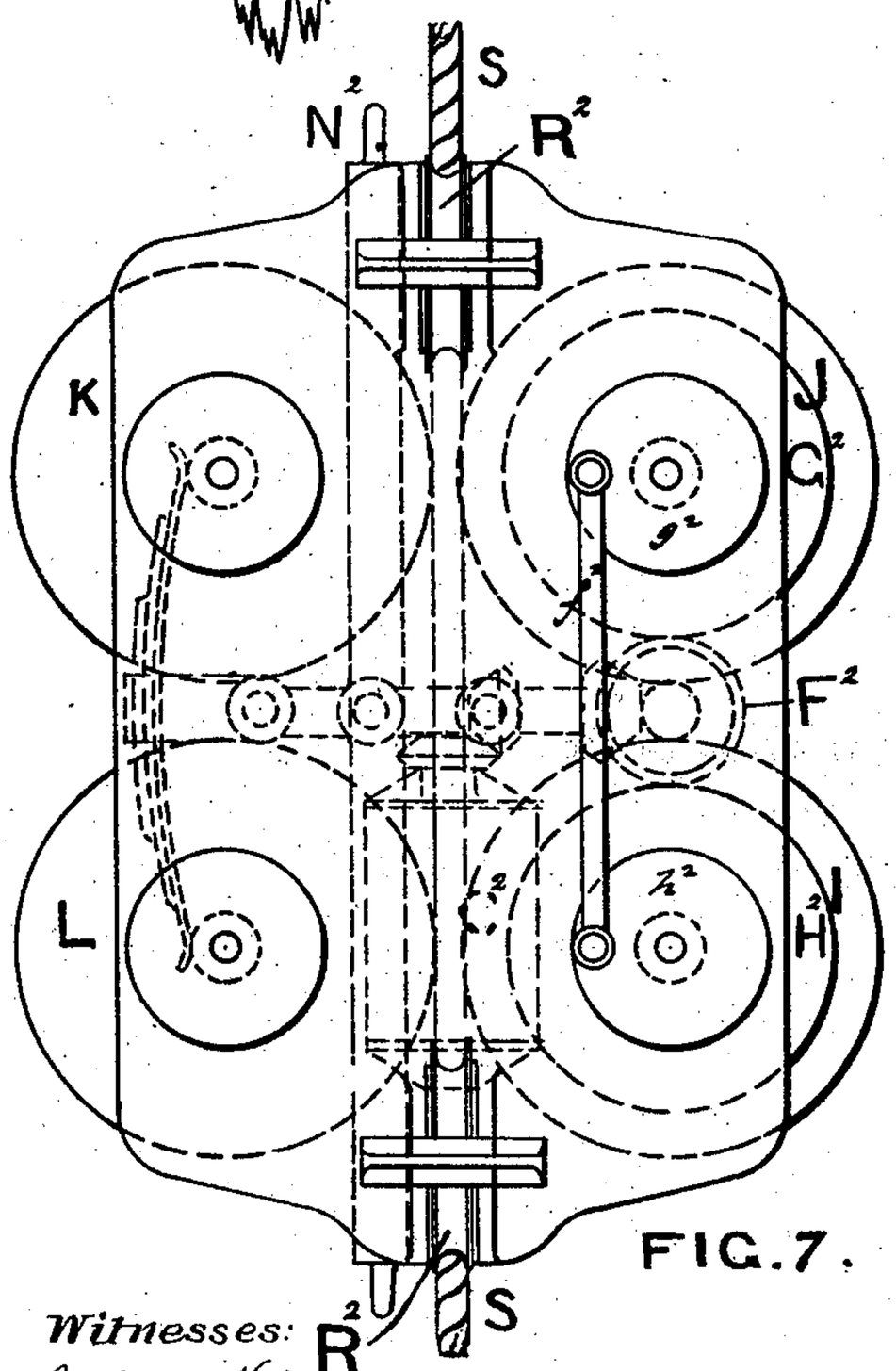

FIG. 7.

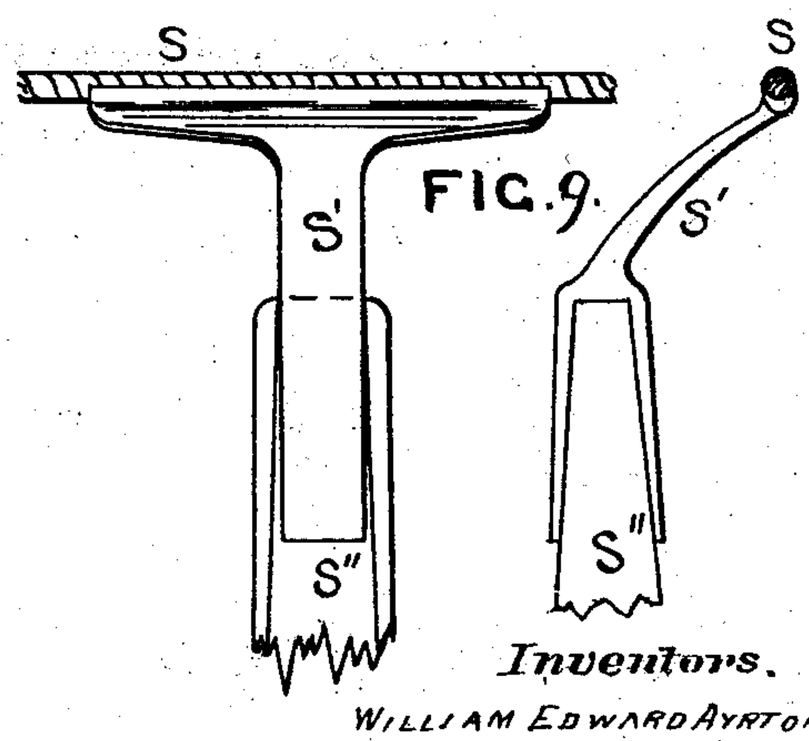

FIG. 9.

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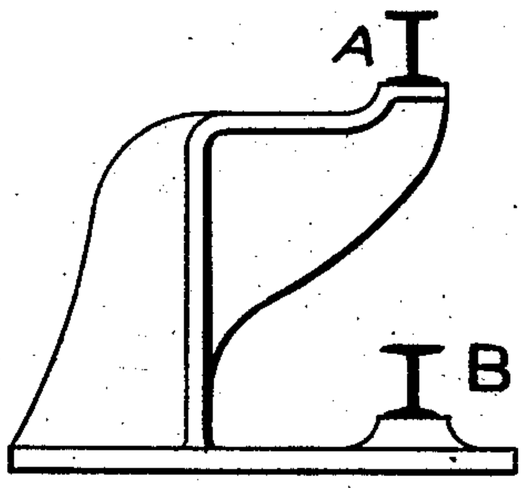

FIG. 10.

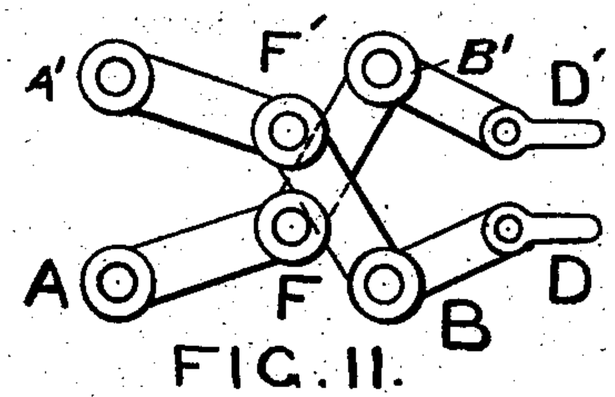

FIG. 11.

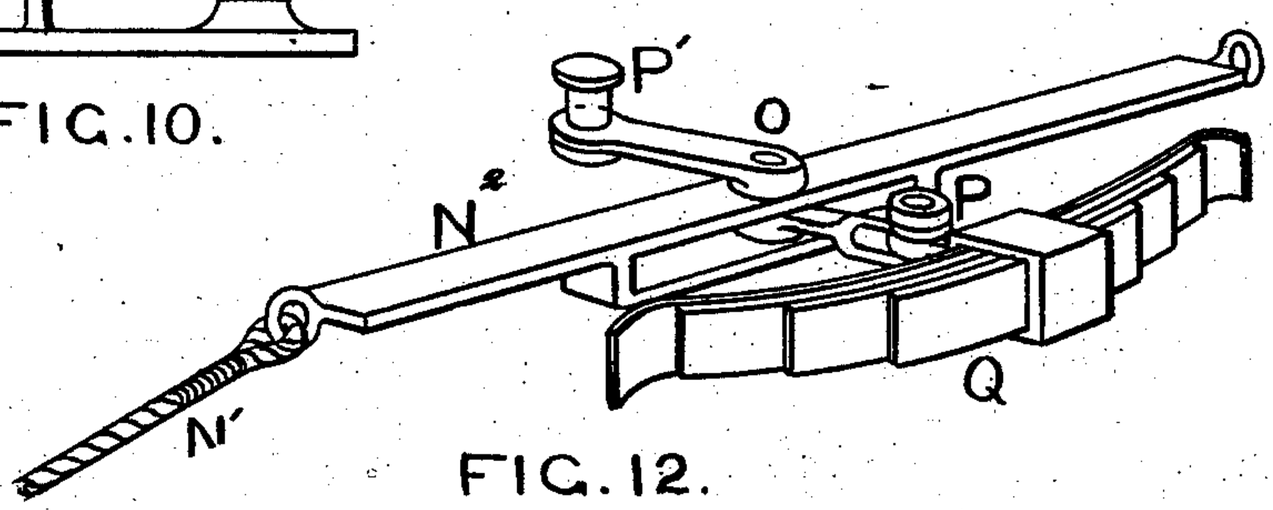

FIG. 12.

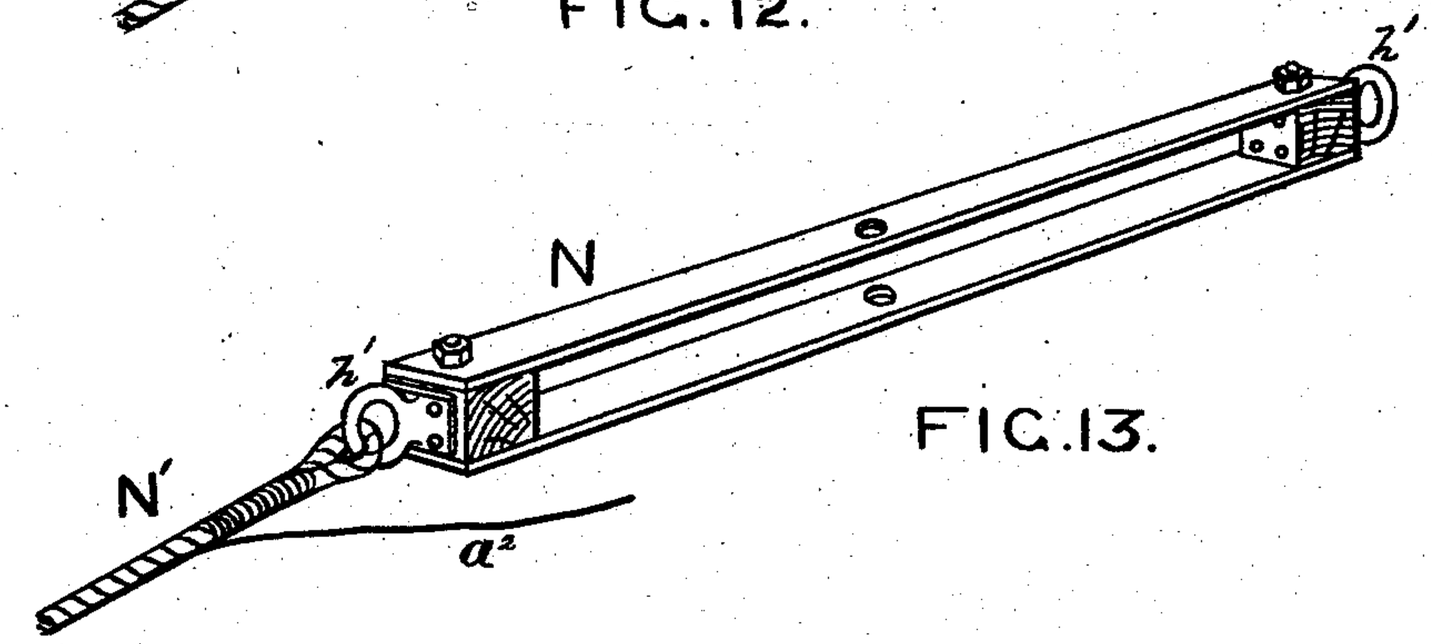

FIG. 13.

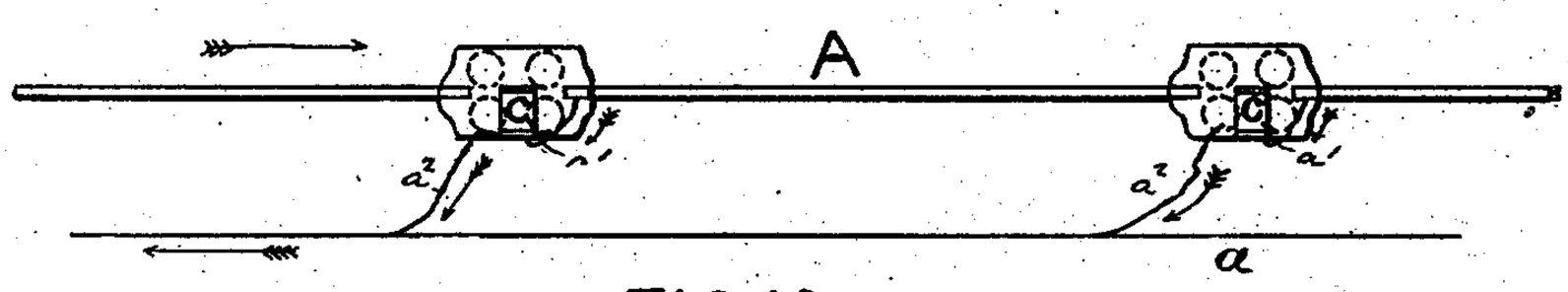

FIG. 14.

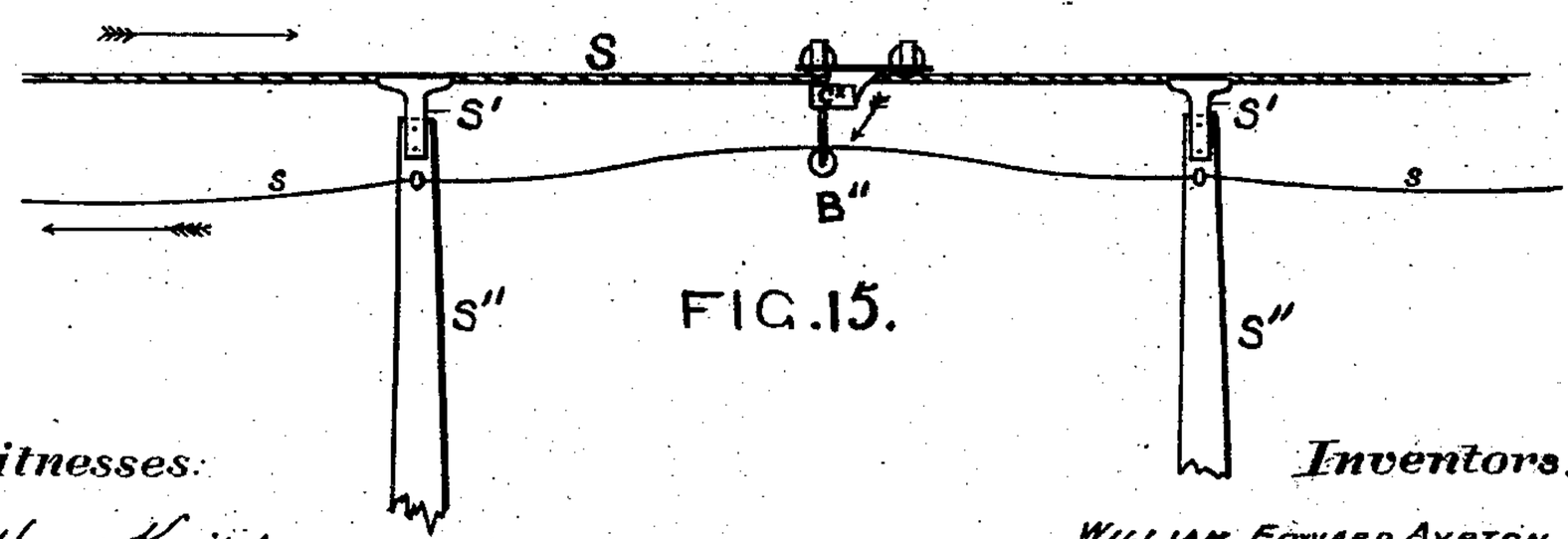

FIG. 15.

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UNITED STATES PATENT OFFICE.

WILLIAM E. AYRTON AND JOHN PERRY, OF LONDON, ENGLAND.

ELECTRICAL TRACTION-MOTOR.

SPECIFICATION forming part of Letters Patent No. 292,529, dated January 29, 1884.

Application filed April 18, 1883. (No model.) Patented in England July 17, 1882, No. 3,380.

To all whom it may concern:

Be it known that we, WILLIAM EDWARD AYRTON, professor of technical physics, Fellow of the Royal Society, and JOHN PERRY, (professor of mechanical engineering and applied mathematics, of the City and Guilds of London Technical College, subjects of Her Britannic Majesty the Queen of Great Britain and Ireland, residing in London, England, have invented a new and useful Improvement in Electrical Traction-Motors, (for which, jointly with other improvements, we have obtained a patent in England, dated July 17, 1882, No. 3,380,) of which the following is a specification.

Our invention relates to improvements in traction-motors operated by electricity, and designed for traveling upon a rail, rod, wire, or wire rope.

The objects of the present invention are to provide, in combination with any known rotary electrical motor, specially-contrived gripping devices for the development of the tractive force, the "grip" being automatically increased by the amount of hauling-strain; and, further, to provide, when required, automatic gripping tail-pieces or "tail-grips," which prevent the motor from being pulled backward upon the rail, rod, wire, or wire rope. We attain these objects by the mechanism illustrated by the accompanying drawings, in which—

Figure 1 is a perspective view of our improved traction-motor, and Figs. 2 and 3 are respectively a plan and an end elevation of the same. Fig. 4 is a transverse section through the hauling-bar and automatic or spring "grip-gear." Fig. 5 is a broken view of the rear of the traction-motor, showing the said automatic tail-grips in dotted lines. Figs. 6 and 7 are respectively an end elevation and a plan of our improved traction-motor adapted to a wire-rope roadway. Fig. 8 is a plan of our improved traction-motor adapted to vertical ropes, with a modified form of automatic grip. Fig. 9 shows two views of an insulated support for the cable-roadway. Fig. 10 is an elevation of a bracket for supporting a double-rail railroad. Fig. 11 is a detail view of the modified automatic grip shown in Fig. 8. Fig. 12 is a detached perspective view of the automatic grip-gear of the motor shown by Figs. 1 to 5, inclusive, with one form of hauling-bar. Fig. 13 is a like view of another hauling-bar, showing the draw-hook insulated from the same and the electrical return-wire attached to the hauling-cable. Fig. 14 is a diagrammatic plan of the electrical circuits, two motors being shown as in "parallel arc." Fig. 15 is a diagrammatic elevation of a rope roadway, showing its electrical circuit with motors in parallel arc.

Like letters refer to similar parts of each modification of our motor in the several views.

The rail on which our improved motor is constructed to run may be either horizontal, vertical, or at any angle, and of any suitable section. For example, as represented in Figs. 1 to 5, inclusive, and Figs. 10 and 14 on the drawings annexed hereto, a double-flanged rail or girder, A, may be employed, the same to be supported and insulated in any known effective manner—as, for example, on timber A″, preferably saturated with creosote or paraffine; or, as illustrated by Figs. 6, 7, 8, 9, and 15, a wire-rope "rail," S, may be used, and a horizontal wire rope may be conveniently supported and its support insulated in the manner illustrated in Figs. 6, 9, and 15, the rope being attached to a metallic head, S′, embracing only a small portion of its circumference, so as to allow the motor to pass freely, and this metallic head conveniently fixed to a wooden upright or post, S″, and a pair of rails, A and B, may be supported, as illustrated by Fig. 10, so that an "up" and "down" traffic may be carried on upon the same, respectively, without mutual interference.

The rotary electrical motor C, C^2, or C^3 may be of any known form, and may receive its electric power in any known manner—as, for instance, by the method published by Professor Fleeming Jenkin, and as published by ourselves. One convenient method of those specified is to drive as many motors as may be upon the line in parallel arc, as shown diagrammatically at Figs. 14 and 15. The bearing-rail A or wire rope S in this case may form the "main cable," by which the electricity is supplied from the usual dynamo-

station at one end. A return-conductor, *a* or *s*, parallel to the main cable or rail, is then required, the traction-motors making bridges or similar parallel contacts through the electrical rotary motors, between the main cable or rail and the return-conductor. This may be carried out by affixing a metallic bar, *a*, or wire *s* to the timber-supports A″ or S″ of the main rail or cable, so as to be insulated from the latter, and the traveling motor may make contact with the return bar or wire by a trailing brush, B′, or a roller-contact, B″, as illustrated, respectively, in Figs. 3 and 15. In the case of canal-boats, one insulated rail or rope only need be used, as the main cable and the return-conductor may be the water of the canal, a continuous electrical connection being made with the water through the hauling-line N′, (which is in this case either metallic or contains a conducting-wire,) or through a cable fastened at intervals to the haulin g-line and the metallic sheathing of the canal-boat. In this case the draw-hooks *h′ h′* are insulated on blocks of wood, as shown in Figs. 1 and 13. a^2 in these figures represents the return-wire, and N′ a metallic hauling-rope to which said wire is attached. We may alternatively employ any convenient method of circuit arrangements, working the motors in "series" or parallel arc, as desired; or the bearing-rail or wire cable may be the return-circuit, and therefore not insulated, the electricity being supplied through a separately-insulated cable.

The improved construction of our motor for traction upon a flanged rail or girder is shown at Figs. 1, 2, 3, 4, 5, 12, and 13, in perspective, in plan, and in elevation, with details of tail-grips and draw-links, as aforesaid. The electrical connections to the traction-motor is from the main rail A through one of a pair of wheels, R R, which support the weight of the motor-carriage, said wheel forming a rolling contact, and thence through an insulated wire, *a′*, to the rotary electrical motor C, and the return from the motor through a wire, a^2, and the hauling-rope N′, as aforesaid, are clearly shown in the perspective view, Fig. 1. The rotation of the electrical motor C is communicated by bevel-gearing D E to a pinion, F, and thence through cog-wheels G and H to the driving-axles *g* and *h*, on which are the driving-wheels I and J, which bear upon the rail A. Opposite to the driving-wheels, on the other side of the rail A, are two pressing-wheels, L and K, which, being capable of moving in slotted frame-bearings, can be pressed with less or greater force against the rail. Their axles are carried in a frame, which is attached to links O P O P′ by a spring, Q, as shown in sectional detail in Fig. 4, and removed from the motor at Fig. 12.

For canal-haulage we propose to use a metallic bar, N, Figs. 1 and 13, provided with insulated draw-hooks *h′*, as aforesaid. Otherwise a hauling-bar, N^2, all of metal, may be used, as represented in Fig. 12. The hauling-line N′ may be attached to either end of the bar N or N^2. This bar, in either of its forms, carries a pivot or stud passing through the joints of the links O P O P′ at O. The haulage-pull received on the said stud or pivot at O draws the ends P and P′ of the links O P O P′ closer together, thus compressing the spring Q, and forcing the pressing-wheels K and L, and consequently also the driving-wheels I and J, more forcibly against the rail A, in proportion to the increase of haulage-strain. The gripping-wheels I J K L are preferably arranged in two pairs, one on either side of the rail, as shown in Figs. 1, 2, and 3; but there may be only one pair, or more than two pairs; or the wheels may be odd in number, one on one side pressing on the rail in a position between two on its other side, so that the shape of the rail alters by the grip when the former is flexible.

In Figs. 6 and 7 we show in elevation and plan the arrangement we prefer when the motor travels upon a rope, S, as a rail. The relative arrangements of the rotary motor C^2, driving through gearing E^2 F^2 G^2 H^2 two horizontal traction-wheels, I J, paired with two pressing-wheels, K L, (pressed by a spring and by the haulage-tension upon the driving-rail,) remain substantially the same as before described in detail with reference to Figs. 1, 2, 3, &c., the principal modification being the location of the rotary motor C^2 below the rope rail, and a consequent multiplication of the bevel-gearing E^2, with a lowering of all the parts, so as to give a better stability upon the rope.

N^2 is a haulage-bar, with its appurtenances, of the description represented by Fig. 12, as above set forth; and R^2 R^2, weight-supporting wheels, "grooved" to suit the rope rail, so as to travel securely thereon.

F^2 G^2 H^2 may represent frictional gearing, and g^2 h^2 crank-disks, and f^2 a connecting-rod for supplementing the same, as means for driving said traction-wheels I J in unison.

Fig. 8 represents, as aforesaid, an arrangement of our motor to suit a vertical rail, rod, or rope, M. The rotary motor C^3, in this case, drives, by means of a worm or endless screw, S, on its shaft, a pair of worm-wheels, W W′. On the axles of these worm-wheels is suitable gearing, by which two pairs of traction or gripping wheels, A A′, B B′, are driven. These gripping-wheels are centered on two scissor-levers, A′ B and A B′, which have fixed fulcrums at F and F′, as best shown in detail in Fig. 11. At their lower ends these levers are attached to the hauling lines, chains, or rods, supporting the weight to be lifted or hauled, by links B′ D″ and B D. The gripping-wheels, all of which are in this case traction-wheels, are thus pressed together and upon the rail or rope by the haulage-strain.

Our motor is further supplied, when desired, with a pair of automatically-gripping tail-levers, X Z, Fig. 5, which, working on pivots fixed in the frame, are spring-pressed,

so as to rub along the rail, rod, or rope. The angle at which they meet is such, as shown, that they admit of the rail passing freely between them in one direction—that is to say, when the motor is advancing; but so soon as the resistance to haulage is sufficient to overcome the traction-pull of the motor the said tail-levers automatically seize and grip the rail, rod, or rope, preventing the motor from being dragged back.

Having now described and ascertained the nature of our invention and the manner of carrying the same into effect, be it known that what we consider novel, and desire to protect by Letters Patent, is—

1. In an electrical traction-motor, the combination of a known rotary electrical motor and suitable gearing and gripping traction wheels with levers or links and a hauling bar or bars, so that the traction-grip is proportional to the hauling-load, substantially as herein described.

2. In an electrical traction-motor, the combination of a known rotary electrical motor, suitable gearing and gripping wheels, and a pair of inclined spring-pressed tail-levers automatically gripping fast the rail, rod, or rope when the travel of the motor is forcibly reversed, substantially as herein described.

London, March 22, 1883.

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