

(No Model.)

3 Sheets—Sheet 1.

I. A. TIMMIS & G. FORBES.

ELECTRO MAGNETIC CAR BRAKE.

No. 347,075.

Patented Aug. 10, 1886.

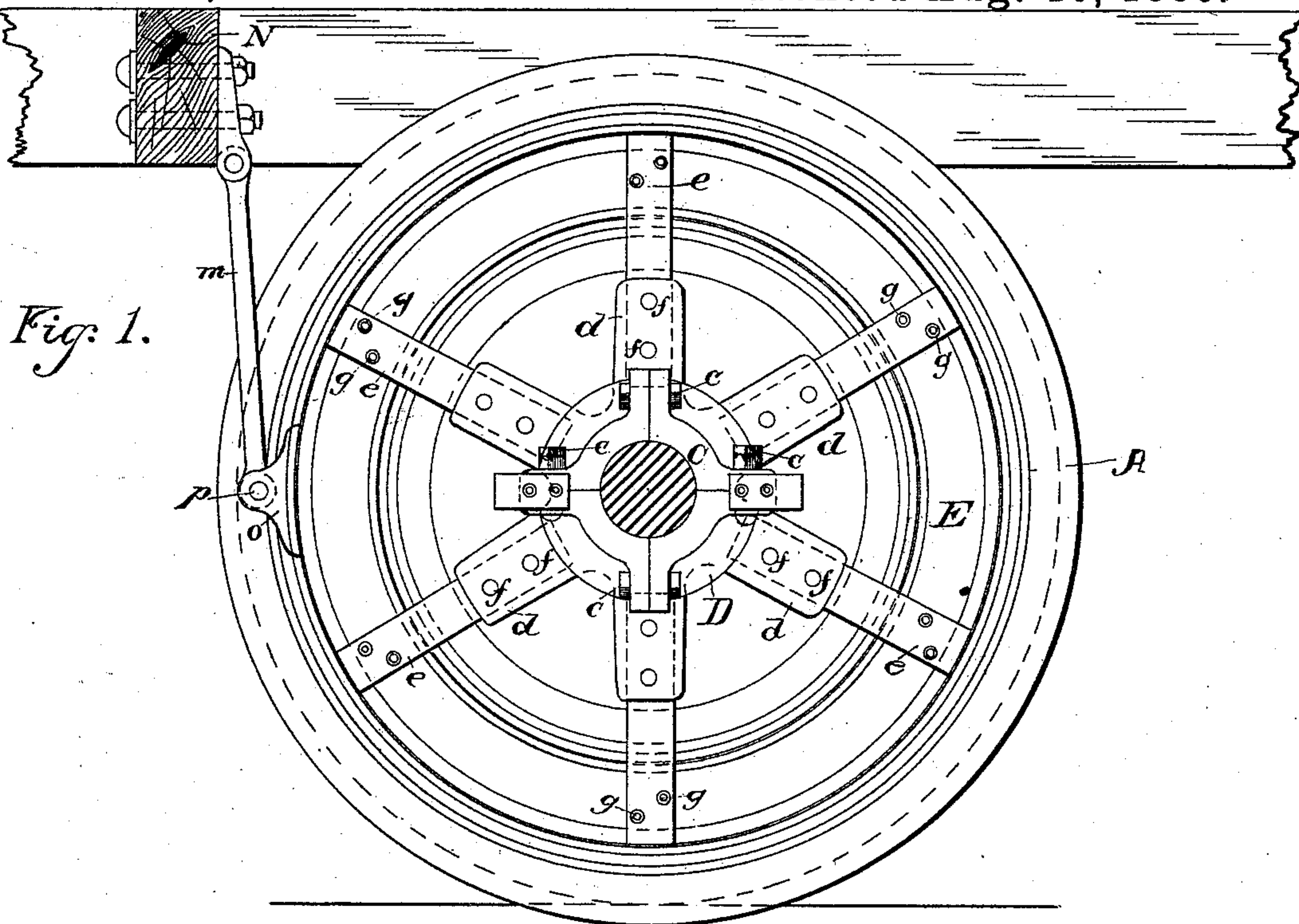
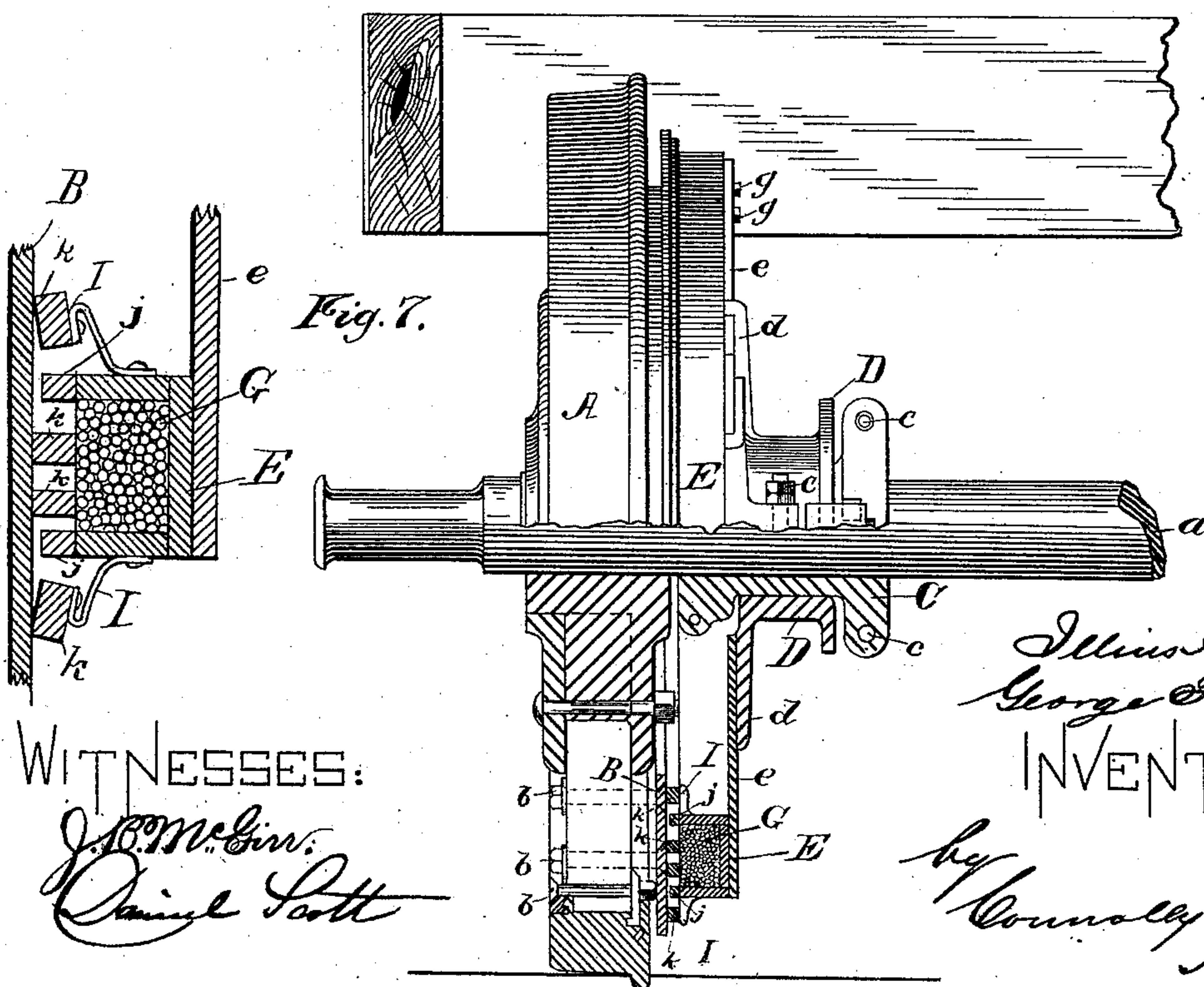


Fig. 2.



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Fig. 3.

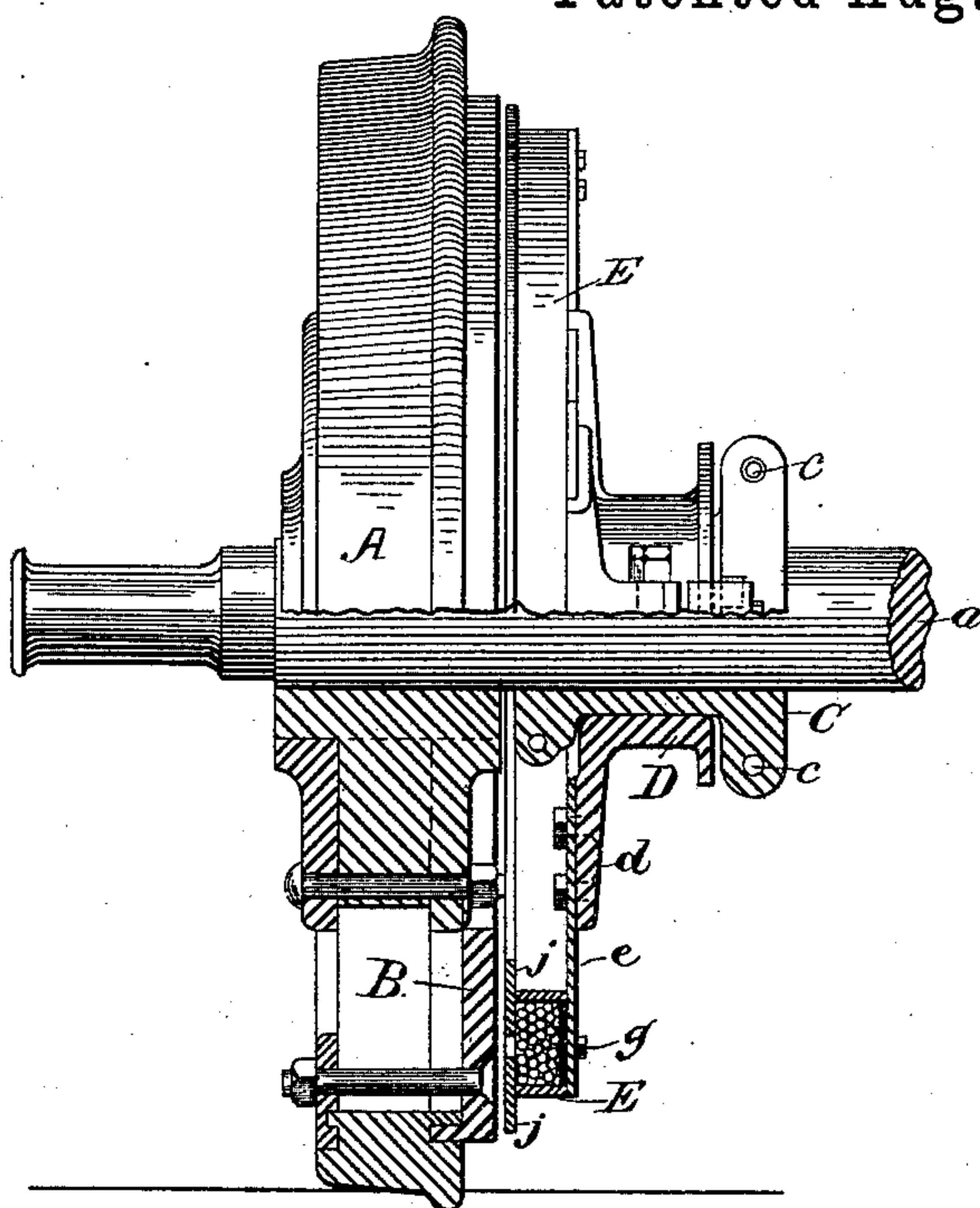
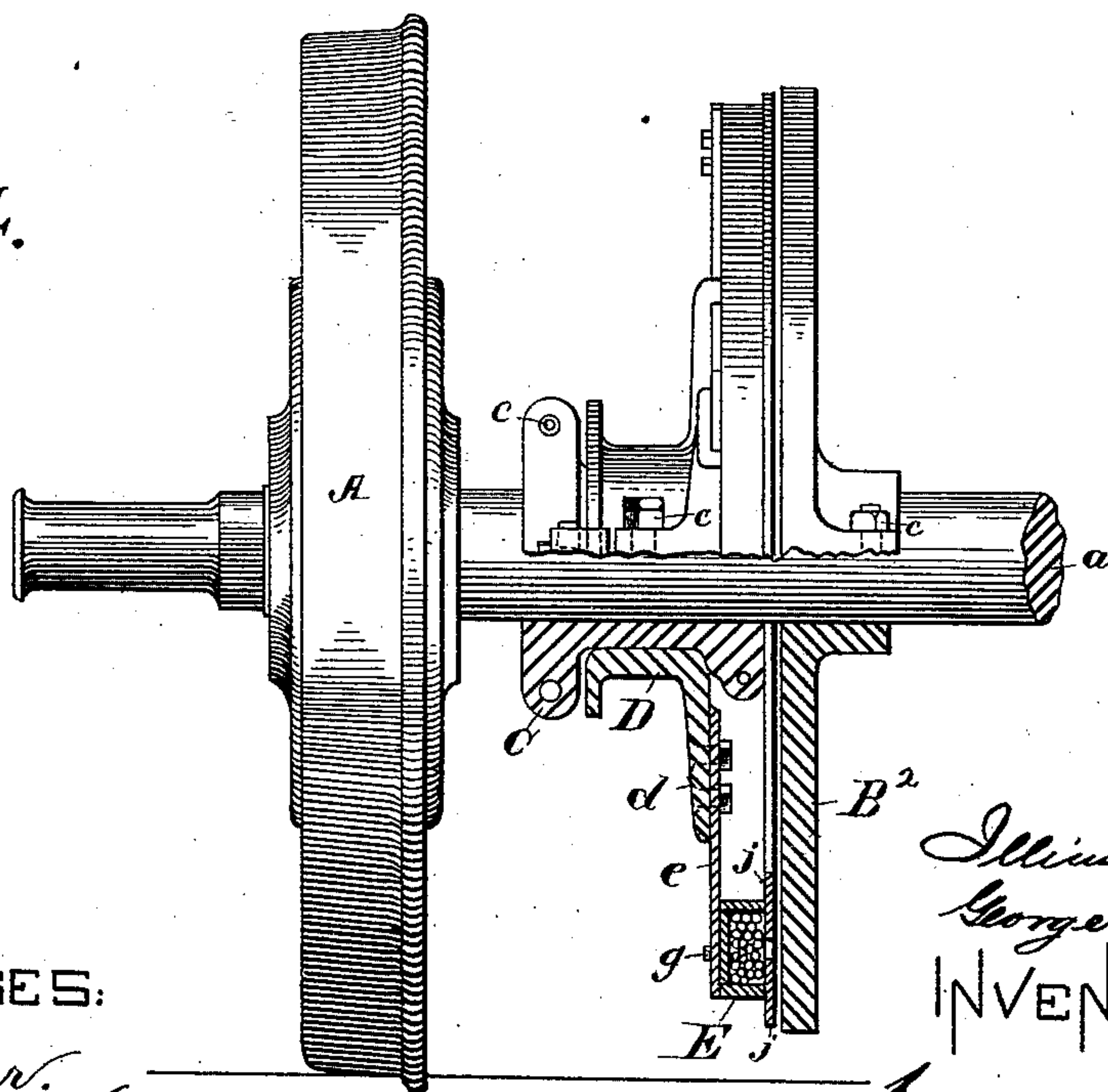


Fig. 4.



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(No Model.)

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I. A. TIMMIS & G. FORBES.

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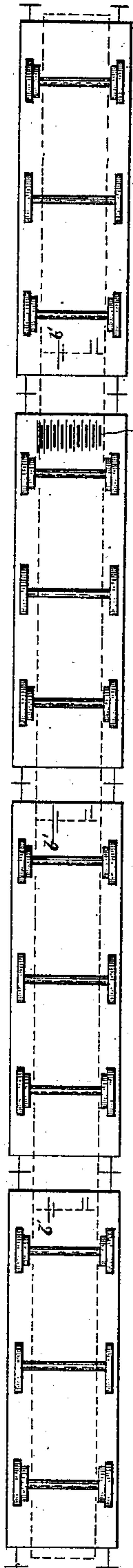


Fig. 5

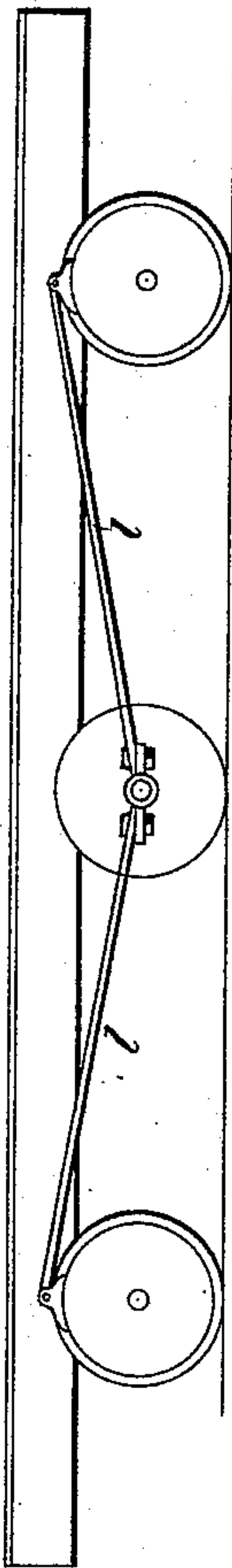


Fig. 6

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UNITED STATES PATENT OFFICE.

ILLIUS AUGUSTUS TIMMIS AND GEORGE FORBES, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

ELECTRO-MAGNETIC CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 347,075, dated August 10, 1886.

Application filed June 7, 1886. Serial No. 204,385. (No model.) Patented in England May 1, 1885, No. 10,852; in France May 1, 1885, No. 168,627; in Belgium May 5, 1885, No. 68,776, and in Germany May 8, 1885, No. 33,634.

To all whom it may concern:

Be it known that we, ILLIUS AUGUSTUS TIMMIS and GEORGE FORBES, citizens of London, residing in the city of London, in the county of Middlesex, England, have invented certain new and useful Improvements in Electro-Magnetic Car-Brakes; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has relation to electro-magnetic car-brakes, and has for its object the provision of a novel form of brake, which shall be instantaneous, automatic, easily regulated, and efficient in its action and economical in maintenance.

Having the above objects in view, our invention consists in the provision of an electric magnetic car-brake wherein an electro magnet of annular form is arranged in juxtaposition to a disk or wheel fixed on a revolving shaft, whereby when said electro-magnet is energized its attraction for the said wheel or disk will tend to brake or stop the same.

Our invention further consists in the combination, with a magnetic disk or wheel applied to a shaft, of an annular electro-magnet arranged in juxtaposition to said wheel or disk, and so constructed that when said electro-magnet is energized it will be brought into contact with said wheel or disk, and will thereby brake the same.

Our invention still further consists in the combination, with a disk or wheel of magnetic material secured to the revolving shaft or axle, of an annular electro-magnet surrounding said shaft and provided with rings or annular plates of magnetic material, which, when the said electro-magnet is energized, will be attracted toward the disk or wheel and brought into contact therewith, thereby braking the wheel or disk.

Our invention still further consists in the combination, with a wheel or disk, of an annular electro-magnet arranged concentrically with relation to the axis of said wheel or disk and provided with two or more annular plates or rings of magnetic material, one or more of said rings being sustained by spring-

arms and arranged with their flat surfaces at an angle to flat surface of the said wheel or disk, so that when said electro-magnet is energized by a feeble current but a small portion of said ring will be brought into contact with the surface of said wheel or disk, and as the current is increased the surfaces in contact are correspondingly increased, thereby increasing the power of the brake.

Our invention still further consists in the combination, with an electro-magnetic car-brake, of means, substantially as hereinafter described, whereby when a train of cars provided with such brakes is accidentally separated or broken the brake will be applied automatically.

Our invention still further consists in the construction, combination, and arrangement of parts hereinafter described and specifically claimed.

While we have in the accompanying drawings illustrated our invention only as applied to the axles or wheels of railway-vehicles, and while it is intended, mainly, for such application, we wish it to be understood that it may be applied to revolving shafts in any position whatever.

In carrying our invention into effect as applied to railway-vehicles, we take a railway-wheel and to one side of the same firmly attach a rim or disk of magnetic material, by preference rolled or cast steel. This ring is faced up smoothly, and is of any convenient width or thickness, and is fastened to the wheel by bolts and nuts or other convenient means. The outer edge of this ring is fixed as near as it can be to the outside rim or edge of the wheel, having regard, if it be on the back of the wheel, to "guard-rails," cross-ties, &c. To a boss upon the axle of the wheel we attach, by arms, projections, or a disk, an annular hollow ring or box of soft iron, open upon that side which faces the wheel, and within said box or casing we place a coil of insulated wire or tape, the said box or casing forming an electro-magnet whose poles are respectively at the two edges of the open side of the box or casing. The axle of the wheel is free to revolve within the boss, and the latter is so placed that the annular electro-mag-

net will be sustained at a short distance from the ring on the wheel, rotary motion of the boss and the annular electro-magnet being prevented by means of arms or stops attached to the frame of the vehicle, or, by preference, to the other axle or axles, as by this means the brake vibration is not communicated directly to the body of vehicle. The thrust of the brake-levers are utilized in breaking other axles. On or near each edge of the annular electro-magnets, we place brackets, (by preference of spring-steel,) and on these brackets we fasten four rings, one ring being outside the outer annular box-edge, the second inside the same, the third inside the inner annular box-edge, and the fourth outside the same edge, so that one ring is on each side of the two edges of the annular box. These four rings are made, by preference, of hard rolled steel, and project farther toward the wheel than the edges of the annular electro-magnet. These projecting surfaces are inclined at a suitable angle, so that when the rings are drawn toward the wheel only a small surface touches the ring on the wheel, but as they are pressed still more, and give way by reason of the pressure causing the supporting-springs to give, the surface in contact with the ring on the wheel increases till the maximum surface-contact is reached, when these rings and the edges of the soft-iron electro-magnet are all in contact with the ring on the wheel. It will be evident that special means must be provided to allow this spring action of the rings, and we prefer to divide them in such number of parts (and these parts may be slid in contact or not in absolute contact) that they may work easily.

These springs, described above, may be made of a non-magnetic metal, or they may be made of any suitable spring metal; and instead of being in the shape of brackets they may be arranged in any convenient way, and be in any suitable shape, so long as they enable the rings they support to give under a pressure which is more powerful than the power in the springs. There may be four rings, as before described, or there may be any other convenient number.

Referring, now, to the accompanying drawings, illustrating our invention and the manner in which the same is applied to a car or other railway-vehicle wheel, Figure 1 is an elevation of a railway-car wheel having our invention applied thereto; Fig. 2, an edge view of the same with the lower half in section; Figs. 3 and 4, similar views showing, respectively, a modified form of brake and the same applied to a disk on the car-axle, instead of to the disk or plate on the wheel; and Fig. 5, a detail of a train, showing main battery X and smaller or emergency batteries, *b' b'*; Fig. 6, a side elevation of a car, showing the thrust of the brake-levers *l l* taken up by the next axle; and Fig. 7, an enlarged detail view, in section, of a portion of the braking mechanism.

A designates a car-wheel of the ordinary or

any suitable form, mounted upon an axle, *a*, to which it is fastened, and with which it turns.

B designates a flat ring, of magnetic material, fastened to the wheel A by bolts *b b b*.

C designates a metallic boss or bush fastened upon the axle *a*, a short distance from the wheel A, by means of bolts and nuts *c c c*. Upon the boss C is placed another boss, D, which is free to move laterally a short distance upon the boss C, and is provided with six radial arms, *d d d d d d*, onto each of which is fixed another arm, *e*, by means of bolts *f f*.

At or near the extremities of the arms *e e* is secured by bolts *g g* an annular box or casing, E, open on one side, and containing a coil of insulated wire, G.

Against the two edges of the open side of the box or casing E are fixed, by means of screws or other convenient means, two annular flat rings, *j j*, and on either side of these two edges are fitted four rings, *k k k k*. These latter are attached to the annular box or casing E by means of springs *l l*.

The box or casing E is kept from revolving by means of a bar, *m*, which is fixed to the frame N of the vehicle and to the outside of the annular box by means of a casting, *o*, and pin *p*, or, by preference, to the axle of the next pair of wheels. (See Fig. 6.)

In Fig. 3 of the drawings we have shown a special form of car-wheel adapted for the reception of our improved brake, the ring B being made to fasten into the tire of the wheel, as shown, and so help to secure it on the well-known "Mansell" principle. The electro-magnetic brake shown in this figure differs from that shown in Figs. 1 and 2, in that the four rings *k k k k* are omitted, and the rings *j j* are made much broader on the face, so as to present a greater braking-surface to the ring B.

In Fig. 4 a special disk, B², takes the place of the disk B in Figs. 1, 2, and 3, and is secured directly to the axle *a* in operation.

The parts being constructed and arranged as described, an electric current is generated, say, for instance, by a primary battery, one being placed in each car to which the brakes are applied, with suitable connections from it to the wire of the annular electro-magnet. These connections are so arranged that the brake of each carriage can have a complete electrical arrangement, including battery, brakes, switches, &c.; or the entire series of brakes on a train may be operated from a single battery, suitable connections between the cars being provided and small emergency-batteries placed in each vehicle. Where a separate battery on each car of a train is provided, the connectors are so arranged at the end of each car that when a separation of the cars accidentally occurs the connectors at the ends of the cars where the separation has taken place will automatically come together, thus completing the circuit through the annular electro-magnets and the battery, and automatically applying the brakes.

Instead of using a primary battery, as here-
 inbefore mentioned, a secondary battery in
 each vehicle may be employed and charged
 in any desired or suitable manner. It may
 5 also, perhaps be found advisable to operate
 all the brakes on a train of cars by means of
 a current of electricity supplied from a single
 battery placed on one of the cars, or from a
 dynamo-electric generator placed upon one of
 10 the cars; but it is evident that in this case the
 brakes would not act on cars detached from
 the train unless emergency-batteries, described
 above, were put in each vehicle, and we find
 this arrangement to be the most economical, as
 15 shown in Fig. 5—principal battery X, emerg-
 ency-batteries *b' b' b' b'*.

Instead of putting the electro-magnetic
 brake on one side of a wheel, we may, if nec-
 essary, place it on both sides, and instead of,
 20 or in addition to, applying the brake to the
 wheels we may, as before described, apply the
 brakes to a disk or disks secured upon the
 axle.

Having thus fully described the construc-
 25 tion and operation of our invention, we claim—

1. In an electro-magnetic brake, the combi-
 nation, with a wheel or disk affixed to a re-
 volving axle, of an annular electro-magnet
 consisting of a continuous helix incased in an
 30 annular box which entirely surrounds the axle,
 arranged in juxtaposition to said wheel or disk,
 a generator of electricity, and suitable con-
 nections, substantially as described.

2. In an electro-magnetic brake, the combi-
 35 nation, with a revolving disk or wheel secured
 to the axle of the car, of an annular electro-
 magnet consisting of a helix inclosed in an
 annular box or case arranged in proximity to
 said wheel, and so arranged, substantially as
 40 described, as to be capable of slight lateral
 motion toward said disk, whereby when said
 electro-magnet is energized it will be drawn
 toward and make frictional contact with said
 disk, as set forth.

3. In an electro-magnetic brake, the combi- 45
 nation, with a wheel or disk fixed to a shaft,
 of an annular electro-magnet arranged in prox-
 imity to said disk, and provided with a ring
 or rings of metal interposed between the elec-
 tro-magnet and the disk and having their sur- 50
 faces next to the wheel or disk at an angle, so
 that their surface-contact will be increased
 accordingly as the strength of the magnet is
 increased, substantially as described.

4. In an electro-magnetic brake, the combi- 55
 nation, with a wheel or disk secured to a shaft,
 of an electro-magnet arranged in proximity
 to said wheel or disk and sustained on spring-
 arms proceeding from a boss on said shaft, the
 said boss having play longitudinally on the 60
 shaft, and the electro-magnet being prevented
 from revolving by means of an arm attached
 to a suitable support, substantially as de-
 scribed.

5. In an electro-magnetic brake, the combi- 65
 nation, with the shaft *a* and the disk *B*, secured
 thereto, of the annular box or casing *E*, open
 on one side and containing a coil of wire, the
 plates or rings *j j* and *k k k k*, secured to said
 box, the boss *D*, having radial arms, to which 70
 said box is secured, and the boss *c*, secured to
 the shaft *a*, all constructed and arranged sub-
 stantially as described.

6. In an electro-magnetic brake, the combi- 75
 nation, with an annular electro magnet mount-
 ed upon the axle of the car, of a lever secured
 to said annular magnet and to the next ad-
 joining axle, substantially as described.

In testimony whereof we have affixed our
 signatures in presence of two witnesses.

ILLIUS AUGUSTUS TIMMIS.
 GEORGE FORBES.

Witnesses:

JAMES NOKES,
 JEREMIAH JOHN EDWARDS.