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PATENTED MAY 1, 1906.

J. B. ALLFREE & I. C. HUBBELL.
LOCOMOTIVE DRIVING WHEEL OR THE LIKE.

APPLICATION FILED JUNE 14, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

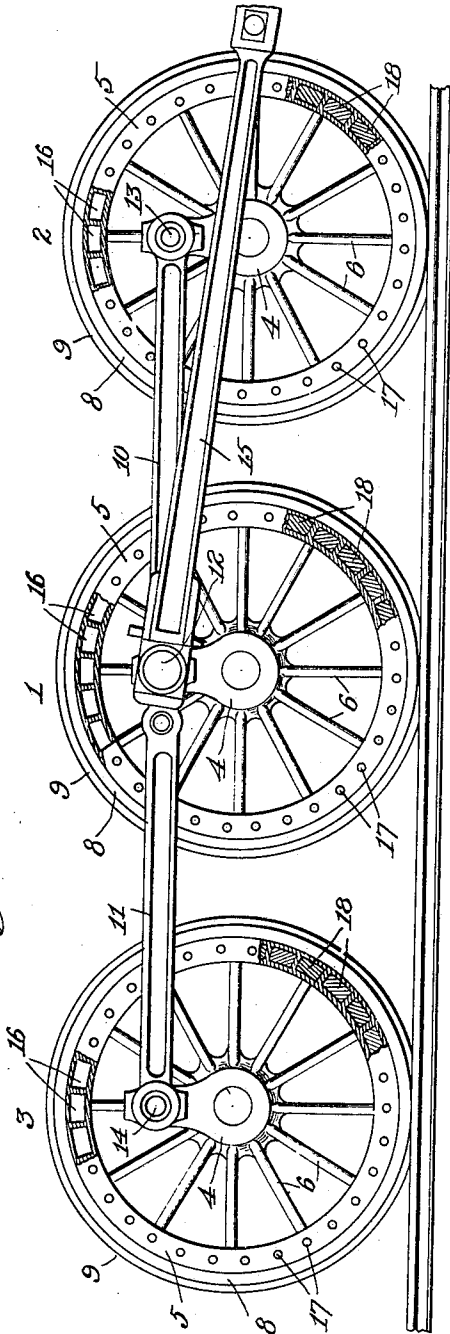
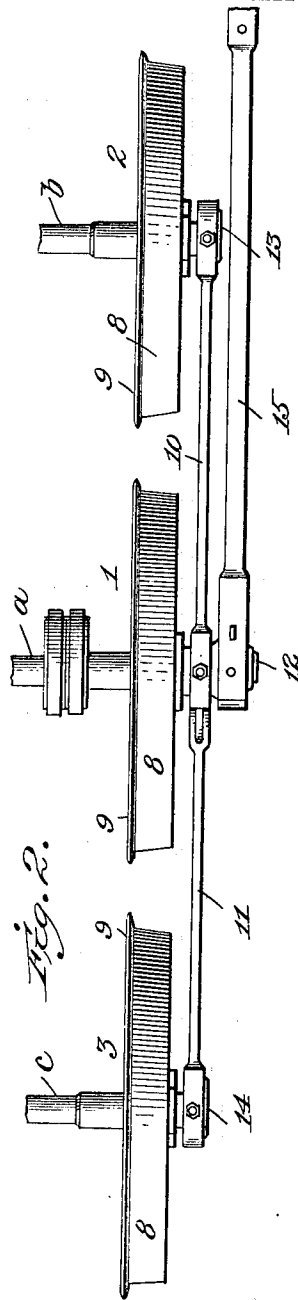


Fig. 2.



Witnesses
Edwin L. Jewell
John H. Hall

By

W. F. Schoenborn

Attorney

Inventors
James B. Allfree
Ira C. Hubbell

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2 SHEETS—SHEET 2.

Fig. 4.

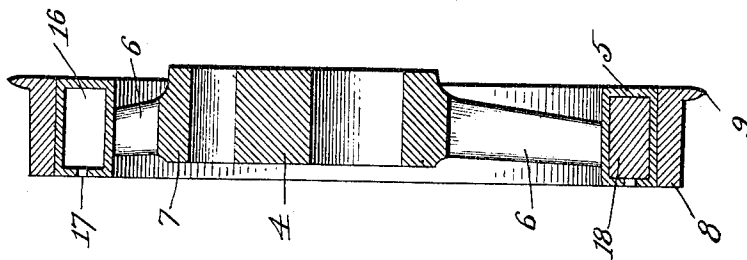
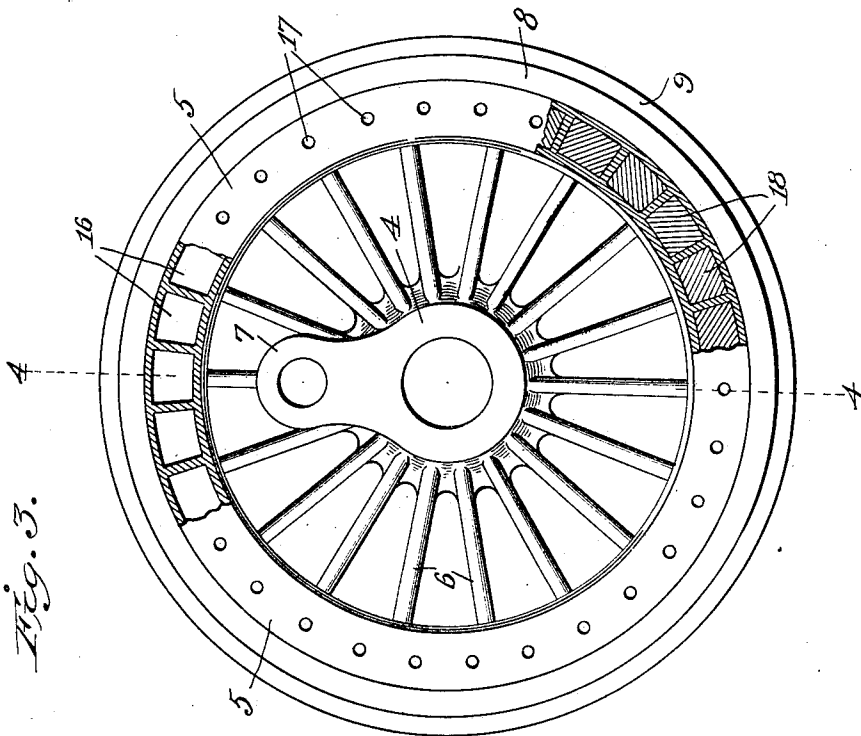


Fig. 3.



Witnesses
Edwin L. Jewell
John H. Holt

Inventors
James B. Allfree
Ira C. Hubbell
By *W. J. Schornborner*
Attorney

UNITED STATES PATENT OFFICE.

JAMES B. ALLFREE, OF IRONTON, OHIO, AND IRA C. HUBBELL, OF CHICAGO, ILLINOIS.

LOCOMOTIVE DRIVING-WHEEL OR THE LIKE.

No. 819,199.

Specification of Letters Patent.

Patented May 1, 1906.

Application filed June 14, 1905. Serial No. 265,230.

To all whom it may concern:

Be it known that we, JAMES B. ALLFREE, residing at Ironton, in the county of Lawrence and State of Ohio, and IRA C. HUBBELL, residing at Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented certain new and useful Improvements in Locomotive Driving-Wheels or the Like, of which the following is a specification.

Our invention relates to means for balancing locomotive driving-wheels or the like.

The objects of our invention are as follows: first, to provide a simple and effective means whereby the driving-wheels of locomotive-engines may be so counterbalanced that the disturbing action of the connected reciprocating parts—such as the connecting-rods, pistons, and piston-rods—may be eliminated; second, to so proportion and distribute the weight in the hollow rim of the driving-wheel that the same, taken in connection with the cooperating reciprocating parts, will act the same and have the same effect as a fly-wheel and be in perfect-running balance; third, to reduce the weight and cost of the driving-wheels to a minimum by doing away with the heavy counterweight which has heretofore been employed to counterbalance the reciprocating parts and which reduction in weight will enable a lower degree of compression to be employed in the cylinders for the smooth and at the same time more efficient running of the locomotive; fourth, to provide a form of wheel whereby one pattern may be utilized to form and equalize the weight of the main and the coupled driving-wheels in a locomotive having more than one pair of driving-wheels, and thereby attain a more uniform wear of tires, and consequently a longer period of service before they require to be turned, as well as to increase the hauling capacity of the engine and obviate loss of power through binding and slipping of wheels by reason of unequal diameters of tires; fifth, to so provide a perfect-running balance and fly wheel effect as to avoid the evils of nosing of the so-called "hammer-blow" on the rails and the "bucking" and uncomfortable vibrations of the locomotive when running; sixth, to so construct the driving-wheel that one set of patterns will enable a wide range or set of wheels to be quickly and cheaply manufac-

tured, and the counterbalancing can be expeditiously effected or varied without disturbing in any way the form, construction, exterior appearance of the wheel, or unnecessarily extending the crank-pin hub beyond the plane of the wheel; seventh, to so construct the wheel that the metal in the same is uniformly distributed, whereby in its casting from the molten metal the wheel cools evenly throughout, no blow-holes are formed, no unusual internal strains developed, and few defective wheels formed; eighth, to construct a driving-wheel in which the fly-wheel effect may be readily increased or decreased and without changing the general appearance of the wheel; ninth, other evident objects and advantages of construction which will appear from the hereinafter-detailed description.

Our invention consists of structural features and relative arrangements of elements which will be more fully hereinafter described, and particularly pointed out in the appended claims.

In the accompanying two sheets of drawings, in which similar reference characters indicate the same parts throughout the several figures, Figure 1 is a view in elevation, with parts broken away, showing three coupled locomotive driving-wheels constructed with our improvement and the connected main and coupling or parallel rods. Fig. 2 is a plan or top view of the same. Fig. 3 is an enlarged detached view of a wheel in elevation, with parts broken away to show the pockets in the rim for receiving the counterbalancing-weights. Fig. 4 is a section on line 4 4 of Fig. 3.

Referring to the drawings, 1 is the main driving-wheel, which is fixed upon a main driving-axle *a*, which is coupled to a front driving-wheel 2 and a back driving-wheel 3, which coupled wheels are fixed, respectively, upon a front driving-axle *b*, and a back driving-axle *c*, and each of the coupled and main wheels is provided with pockets having distributed therein counterbalancing-weights embodying our invention.

While we have shown and herein described our improvement with respect to a main and two coupled driving-wheels, we do not care to limit ourselves to this particular arrangement. As will be readily seen from the hereinafter-described structures and relation of the

elements comprising the invention, the driving-wheel is readily adaptable to locomotives which have not only two, but also more than three, sets of drivers.

5 Each of the driving-wheels 1, 2, and 3 consists of a body or center having a central hub 4 and an enlarged rim 5, of special construction, to be hereinafter described, which are connected by spokes or arms 6 in the usual
10 manner, and a crank-pin hub 7 is formed upon each wheel at a distance from its geometrical center equal to one-half the stroke of the pistons of the engine. The wheel-centers are encircled by tires 8, having the usual
15 flanges 9, and the wheels are coupled to rotate together by the usual back and front parallel or coupling rods 10 and 11, which are connected to a main crank-pin 12, fixed in the crank-pin hub 4 of the main wheel 1 and
20 to front and back crank-pins 13 and 14, fixed in the crank-pin hubs of the front and back driving-wheels. The main connecting-rod 15 is coupled at its rear end to the main crank-pin 12 and at its front end to a cross-head
25 pin (not shown) in the ordinary manner.

The rims of the driving-wheels 1, 2, and 3, as will be seen by reference to Figs. 1, 3, and 4 of the drawings, are formed or constructed so as to comprise a series of equally-spaced
30 and similar pockets 16. Each of the pockets is provided with an opening or openings 17, through which the proper amount of molten metal or other weight-section 18 may be run or inserted when the driving-wheel is
35 to be counterbalanced, and said openings may be provided with any suitable means for closing the same after the counterbalancing-weights have been added. While we have shown thirty chambers or pockets in the rims
40 of each of the wheels, it will be readily seen that this number can be increased or decreased so as to suit the particular purpose, and the size or shape of the chambers or pockets in any one wheel may be different, if
45 so desired—that is, several of the chambers on the side opposite to the crank-hub may be made in one.

The manner of applying the invention is as follows: Having determined or estimated
50 the proper weight to be added to each driving-wheel in order to properly and efficiently balance the revolving and reciprocating parts which are connected to the different wheels, the same is divided up or distributed in the
55 pockets in such a manner as to have each of the wheels as nearly as possible in perfect-running balance by taking into consideration the weight of the wheels themselves and their connected reciprocating and rotary parts. In
60 the drawings it will be seen that in order to compensate for the weight of the crank-pin, crank-pin hub, and coupling-rods a number of the chambers or pockets in the rim on the same side of the wheel as the crank-hub are
65 devoid of counterbalancing-weight, and while

in practice this is the best manner of effecting the invention a little weight may be added, if so desired, without departing from the invention, so long as the proper proportions are distributed in the other chambers or pockets
70 and effect a counterbalancing of all the different parts heretofore mentioned.

It will be readily seen that with the above-described construction of driving-wheel we have devised a wheel in which all the objects
75 recited in the statement of invention are efficiently effected, and by disposing the counterbalancing-weight almost uniformly in the rim of the wheel the same has the function and operation similar to that of a
80 fly-wheel in a stationary engine and approaching a perfect-running balance. It will also be seen our invention enables one to produce a wheel that may be readily increased in fly-wheel effect and is accomplished
85 in case of a light wheel by filling only sufficient of the pockets or rim-chambers to add the necessary counterbalance, whereas if an extremely-heavy wheel is required the pockets or chambers would all be filled, excepting
90 a sufficient number on the crank side to produce the necessary counterbalance, or every other or every third pocket may be filled.

It is obvious where locomotives have three sets of drivers the necessary fly-wheel effect
95 may be obtained by lighter rims than where two sets are used, and, again, as one of the special functions of all excess weight added over and above which is necessary to put the wheels in perfect rotative balance is for the
100 purpose of resisting compression and as the compression varies for different classes of service and different designs of cylinders and means of steam distribution it is obvious the ordinary method of constructing driving-
105 wheels special wheels would have to be designed for all varying cases, while the flexibility or variability of the weight and its distribution enables all the above conditions to be quickly, cheaply, and satisfactorily fulfilled in a wheel constructed according to the
110 herein-described invention. Furthermore, if at any time there appears to be an error in the correct distribution or proportioning of the counterbalancing-weights more weight
115 can be added or deducted from any particular chamber without disturbing in any way the exterior appearance of the wheel, removing the same from the locomotive, or uncoupling the connecting-rods. It will also
120 be noticed that the wheel 1 has five chambers or pockets 16 without counterbalancing-weight, while the wheels 2 and 3 have only three. This is owing to the crank-pin 12 having additional weight in the connecting-
125 rod 15. Of course this ratio of filled and empty chambers may be changed in many ways, depending necessarily on the kind of transmission-gearing, number or distribution of the motive cylinders, and connecting-rods
130

of the locomotive, and it will be readily seen that owing to the flexibility of proportioning the counterbalancing-weights each wheel may not only be counterbalanced, but every wheel may be made the same in weight as each of the others, so as to insure uniform wear on all the wheels.

Having now fully described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. In a locomotive or the like, a driving-wheel body having a hollow rim, a plurality of pockets formed in the hollow rim and counterbalancing-weights inserted in said

2. In a locomotive or the like, a driving-wheel body having a hollow rim concentric with the hub, a plurality of pockets formed in the hollow rim and counterbalancing-weights inserted in said pockets.

3. In a locomotive or the like, a driving-wheel body having a rim subdivided into a plurality of chambers and means for retaining counterbalancing and variable weights in said chambers.

4. In a locomotive or the like, a driving-wheel body having a rim subdivided into a plurality of independent pockets and means

for retaining congealed molten metal in said pockets.

5. In a locomotive or the like, the combination with a main driving-wheel and one or more coupled wheels, each of the rims in the body of said main and coupled wheels being subdivided into chambers and provided with means for retaining variable and counterbalancing weights.

6. In a locomotive or the like, a driving-wheel body having a rim subdivided into a plurality of pockets concentric with the hub of the wheel and means for retaining a counterbalancing-weight in each of the pockets, the center of gravity of said counterbalancing-weights being eccentric to the center of the wheel and on the opposite side of the wheel from that of the crank-pin hub.

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

JAMES B. ALLFREE.

IRA C. HUBBELL.

Witnesses as to James B. Allfree:

E. L. ALLFREE,

GEO. H. DAVIES.

Witnesses as to Ira C. Hubbell:

V. C. HUBBELL,

GARNER E. HUBBELL.