No. 697,850. Patented Apr. 15, 1902.

L. H. KENYON.

LOCOMOTIVE DRIVING WHEEL.

(Application filed Feb. 4, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

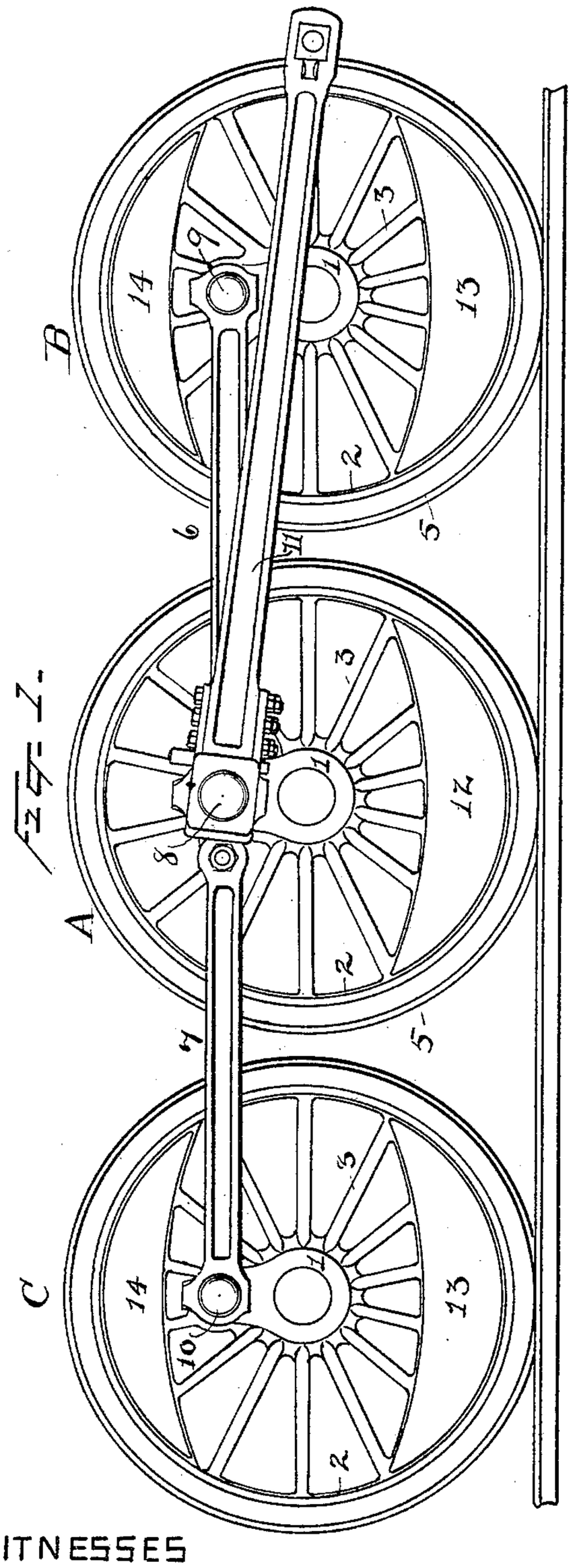
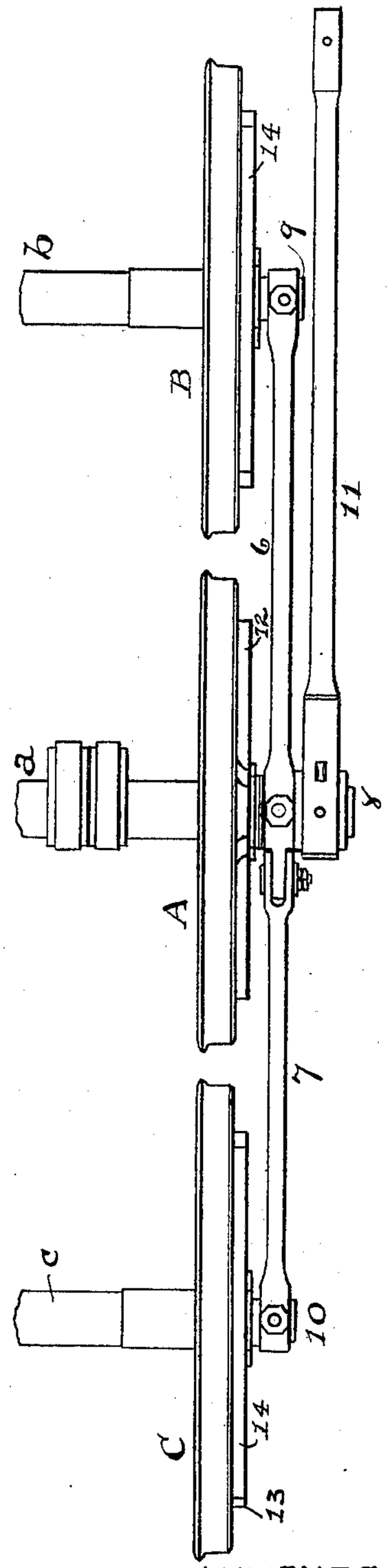


Fig. 2.



WITNESSES

Norris A. Clark.

M. H. Watkins.

INVENTOR

L. H. Kenyon,

By Geo. P. Whittlesey

ATTY

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FIG. 4.

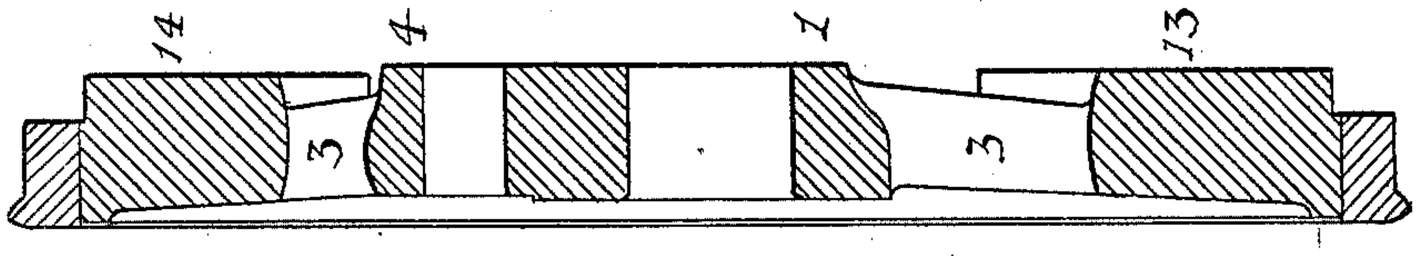
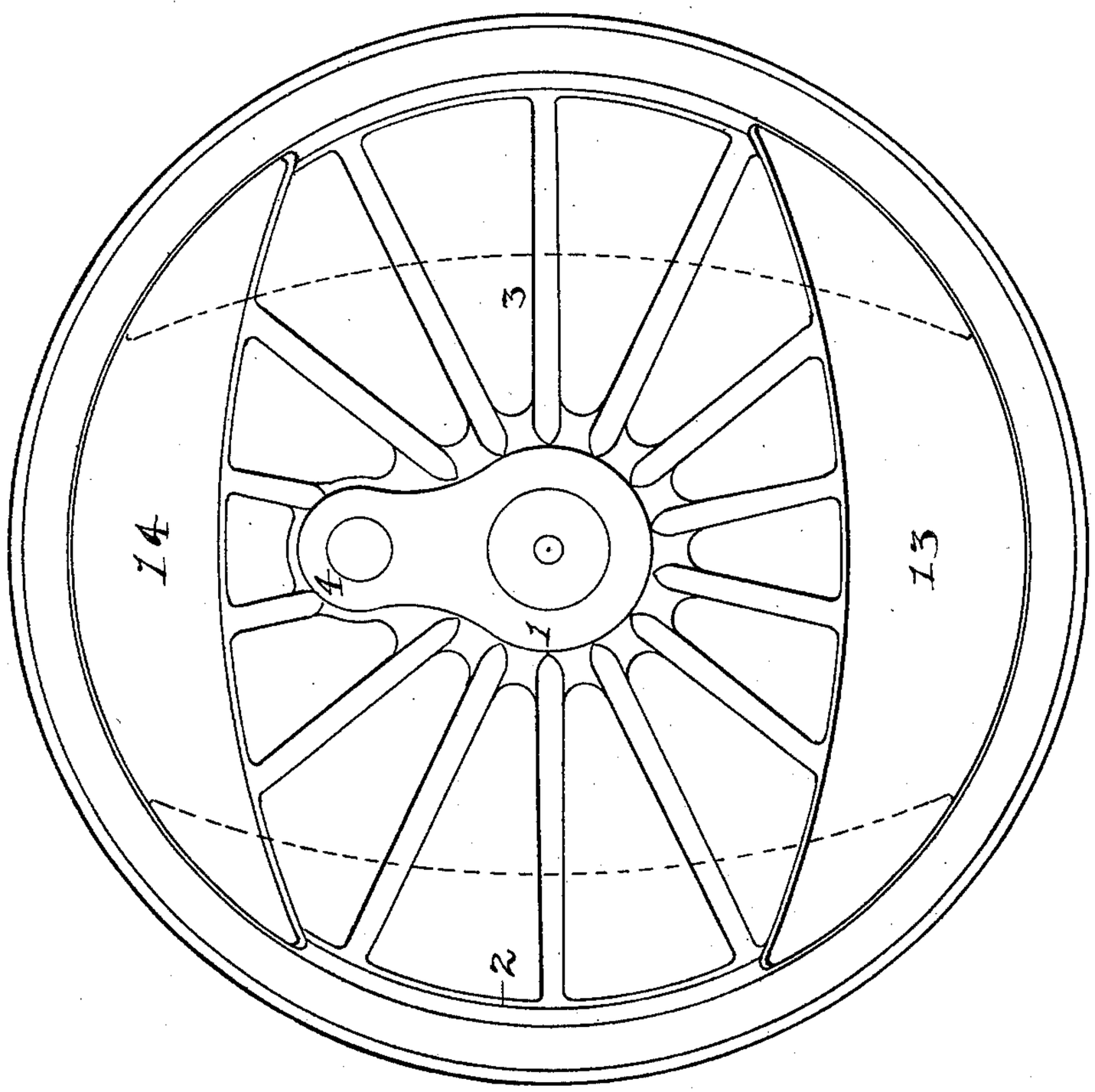


FIG. 3.



WITNESSES

Norris A. Clark.

M. H. Watkins.

INVENTOR

L. H. Kenyon,

By Geo. P. Whittemore

Att'y

UNITED STATES PATENT OFFICE.

LOWELL H. KENYON, OF ALLEGHENY, PENNSYLVANIA.

LOCOMOTIVE DRIVING-WHEEL.

SPECIFICATION forming part of Letters Patent No. 697,850, dated April 15, 1902.

Application filed February 4, 1902. Serial No. 92,505. (No model.)

To all whom it may concern:

Be it known that I, LOWELL H. KENYON, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Locomotive Driving-Wheels; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to means for counterbalancing locomotive driving-wheels. It is a modification of the invention which forms the subject-matter of my application filed January 6, 1902, Serial No. 88,513; and the objects of the present invention are in the main the same as those set forth in said application. Briefly speaking, these objects are, first, to overcome the disturbing action of the connected reciprocating parts and the compression in the cylinders at each end of the stroke; second, to partially or wholly equalize the weights on the main driving-wheel and the coupled wheels in order to attain a more uniform wear of the tires, and thus obviate slipping of the wheels and consequent loss of power; third, to avoid the evil effects of the so-called "hammer-blow" on the rails and the jerky and uncomfortable vibrations of the locomotive when running.

The wheels shown in my prior application required special patterns.

In my present invention I take wheels such as are now in general use, so that railroads and locomotive builders can utilize the patterns they now have, making only slight changes therein.

In carrying out my invention I do not alter the main driving-wheel, using any good form of counterbalanced driving-wheel in which the counterbalance approximately equals the weight of the crank-hub, pin, and rods connected to it. On each of the coupled wheels I place a counterbalance preferably equal in weight to that on the main wheel, and at another point on said coupled wheel, preferably diametrically opposite to the heavier counterweight, I place a lighter counterweight whose weight added to that of the crank-hub, pin, and the weight of the coupled parallel rod on the pin equals that of the heavier counterweight. These two counterweights are separate and independent and render the wheel perfectly balanced in all positions when the rods are coupled on. To compensate for the reciprocating parts also, I add to each of these counterbalances on the coupled wheels the proper proportion of the weight of said reciprocating parts, or, if desired, the main driving-wheel also may have more weight added to it, equally divided on each side of the axle to counterbalance a certain portion of the weight of the reciprocating parts. I prefer to arrange the heavier counterweight with its center of gravity in line with the pin and axle and on that side of the wheel opposite the pin. The lighter counterweight is preferably on the same side as the pin and diametrically opposite the heavier weight. If desired, however, the weights may be set on a diameter at right angles with that of the pin and axle, the heavier weight being in front of the axle and the lighter weight in the rear of the axle when the crank is on the upper quarter.

As the cranks are set quartering on opposite sides of the locomotive, it follows that with either arrangement of the weights there is at every quarter the same distribution of equal weights around the axle. As the following crank passes the rear center its rod and pin and its lighter counterbalance are rising with it, while in front of the axle is descending the heavier counterbalance of equal weight to that of the rod, pin, and secondary weight. On the other side of the locomotive at the same instant the leading crank is passing the upper quarter, its heavier counterbalance being at rest on the rail, but moving with the crank are its pin, rods, and lighter counterbalance, the cross-head, piston-rod, and piston all having a high momentum, which has great effect in overcoming the compression in the front end of the cylinder and carrying the crank over the center. If the proper effect is not produced, the total counterbalance can be increased or diminished, the alteration being divided equally between the heavier and the lighter weights.

If it is found desirable to fully equalize the entire weight on all the wheels, the weight of the eccentrics, straps, and eccentric-rods bearing on the main axle may be included in the amount to be added to the coupled wheels.

A locomotive counterbalanced in the way described will run more smoothly and with more even wear of tires than has been heretofore possible so far as I am aware.

In the accompanying drawings, Figure 1 is a side elevation of three coupled locomotive driving-wheels, the front and back wheels embodying my present invention. Fig. 2 is a top plan view of the same. Fig. 3 is a side elevation, on a larger scale, of one of these specially-equipped wheels; and Fig. 4 is a diametrical section of the same on a line through the hub and crank-pin.

It has heretofore been the practice to estimate the weight of both the revolving and the reciprocating parts which are connected to each of the main driving-wheels of a locomotive and to add to the main wheel a dead-weight or counterbalance (ordinarily of considerable weight) which is calculated to be sufficient to compensate the otherwise unbalanced action of the revolving and reciprocating parts. The counterbalance is concentrated in a mass or body which is located on the opposite side of the center from the crank-pin and whose center of gravity is usually in a plane intersecting the crank-pin and the geometrical center of the wheel. The coupled wheels are counterbalanced in a similar manner; but as the connected revolving parts are much lighter than in the case of the main wheels their counterbalances are made correspondingly lighter, from which there results a substantial inequality in weight between the main and the coupled wheels and a consequent inequality in wear of tires, which is detrimental in reducing their term of service, involving waste of material, as the tires of the heavier main wheels wear more rapidly than those of the lighter coupled wheels, and impairing the efficiency of the engine by reason of the slipping of the wheels, due to the inequality of diameters of the tires as between the main and the coupled wheels.

The essential structural characteristic of the present standard system of counterbalancing is a dead-weight, which is so formed or fixed upon the driving-wheel that its mass is concentrated at and adjoining a segment of the rim thereof on the side of the center opposite to the crank-pin hub.

My present invention differs from the system referred to, as well as from any other which has heretofore been proposed, so far as my knowledge and information extend, in the particular that its essential structural characteristic is a dead-weight or counterbalance, which is divided into two parts, arranged on different sides of the axle. One of these parts weighs less than the other by an amount equal to the weight of the crank-hub, pin, and rod end coupled thereto. The total weight of the two counterbalances, the wheel, crank-hub, pin, and rod end is preferably the same as that of the main driving-wheel and its single counterbalances, crank-hub, pin, and rods, but may be varied, as desired, to accomplish any desired results.

Referring to the drawings, a main driving-wheel A, which is of the ordinary form and is fixed upon a main driving-axle *a*, is shown as coupled to a front driving-wheel B and a back driving-wheel C, which coupled wheels are fixed, respectively, upon a front driving-axle *b* and a back driving-axle *c* and are provided with counterbalances embodying my invention. Each of the driving-wheels consists of a body or "center" having a central hub 1 and a rim 2, which are connected by spokes or arms 3 in the usual manner, and a crank-pin hub 4 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 5 of the usual form, and the wheels are coupled to rotate together by front and back parallel or coupling rods 6 and 7, which are connected to a main crank-pin 8, fixed in the crank-pin hub 4 of the main wheel, and to front and back crank-pins 9 and 10, fixed in the crank-pin hubs of the front and back driving-wheels. The main connecting-rod 11 is coupled at its rear end to the main crank-pin 8 and at its front end to a cross-head pin (not shown) in the ordinary manner.

The main wheel A accords in form and principle with those in ordinary practice, its rim 1 being made as light as will afford proper strength and its counterbalance 12 being of the usual lune form and adjoining and extending throughout a segment of the rim, which in the instance shown includes the outer ends of six spokes. The counterbalance 12 is indicated as being of substantial weight and of the general form and proportions usually employed in present practice.

The counterbalance of each of the coupled driving-wheels B C consists of two separate weights 13 and 14, the former counterbalance being in weight preferably, but not necessarily, equal to the counterbalance 12 on main wheel A. The other or lighter counterbalance 14 is less in weight than the other weight 13 by an amount equal to the weight of the crank-hub 4, pin 9 or 10, and the proportional weight of rod 6 or 7 on said pin. Each weight 13 14 occupies only a segmental portion of the wheel. The rim between their ends may be made flush with the faces of the counterbalances if it is desired to have a smooth surface around the rim, so that there will be no corners to catch on a broken rod or other object.

The counterbalances 13 and 14 are preferably, though not necessarily, integral with the spokes and rim, as shown more clearly in Figs. 3 and 4. They are preferably each made in one piece and arranged as shown, the heavier counterbalance 13 being directly op-

posite the crank-pin, while the lighter counterbalance 14 is on the same side of the wheel as the crank-pin; but, if desired, they may be arranged as indicated by the dotted lines in Fig. 3, the heavier being ahead of the crank and the lighter behind it. The weights when thus arranged act directly on the rods at the end of the stroke and tend to neutralize the unsteady motion of the locomotive when running.

Having thus described my invention, what I claim is—

1. In a locomotive, a driving-wheel having two counterbalances of unequal weights, on different sides of the axle.

2. In a locomotive, a driving-wheel having two counterbalances of unequal weights, one on the crank-pin side and one opposite thereto.

3. In a locomotive, a driving-wheel having two counterbalances of unequal weights, the heavier being opposite the crank-pin.

4. In a locomotive, the combination with a main driving-wheel and one or more coupled wheels, of two counterbalances on each of said coupled wheels, the weight of one counterbalance being less than that of the other by an amount equal to the weights of the crank-hub, pin, and the proportional weight of the rod on that pin.

5. In a locomotive, the combination with a main driving-wheel and its connected parts, of one or more coupled wheels, and a counterbalance for said coupled wheel of such weight that the aggregate of its weight and those of the coupled wheel and its connected revolving parts shall be substantially equal to that of the main driving-wheel, its counterbalance and the connected revolving parts.

In testimony whereof I affix my signature in presence of two witnesses.

LOWELL H. KENYON.

Witnesses:

GEO. P. WHITTLESEY,

E. H. PARKINS.