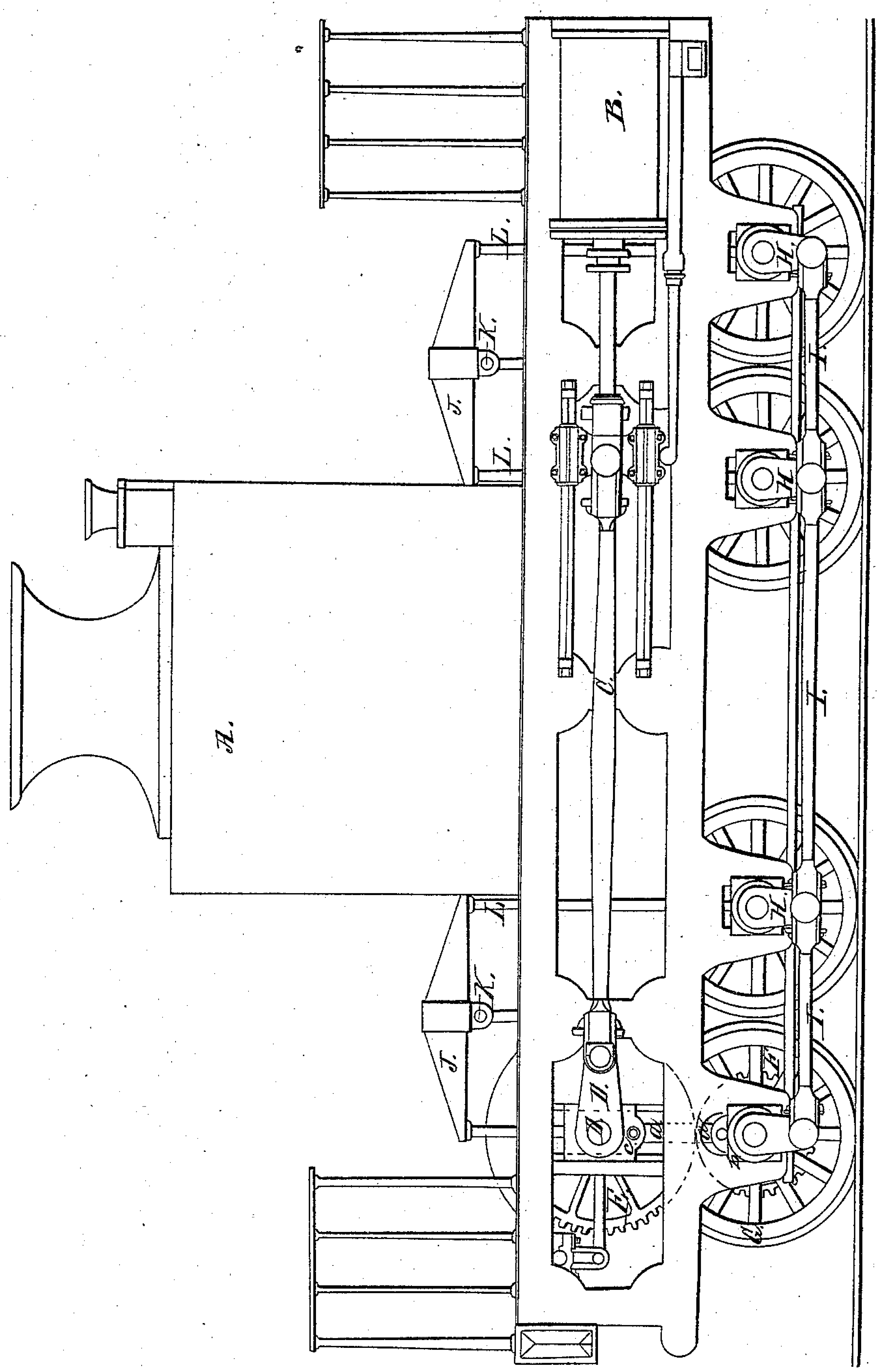
R. Winans,

Locomotive.

No. 3,201.

Patented July 28, 1843.



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UNITED STATES PATENT OFFICE.

ROSS WINANS, OF BALTIMORE, MARYLAND.

LOCOMOTIVE STEAM-ENGINE.

Specification of Letters Patent No. 3,201, dated July 28, 1843.

To all whom it may concern:

Be it known that I, Ross Winans, civil engineer, of the city of Baltimore, in the State of Maryland, have invented a new and improved manner of constructing locomotive-engines with eight driving-wheels, the parts of which engine are so combined and arranged as to distribute the weight thereof with great equality upon the eight wheels, and consequently upon the rails, more effectively and conveniently than has been heretofore done, while the engine is at the same time peculiarly well adapted to the curved railroads of the United States; and I do hereby declare that the following is a full and exact description thereof.

The efficiency of all locomotive engines, so far as their tractive power is concerned, is dependent upon the friction of the opposing surfaces of the wheels of such engines, and the rails upon which they are to run, or what is commonly called the adhesion of the wheels; this friction, other circumstances being alike, will be proportioned to the weight of the engine; the greater the weight of the engine, therefore, the greater will be its tractive power, provided there be at the same time sufficient steam power to employ, overcome, or arrive at the limit of this adhesion. Were the rails perfectly stable and inflexible, all that would be necessary, therefore, to produce any required amount of friction would be to increase the weight of the engine; but to do this, in the actual state of things, would be to waste a large portion of the power applied, in deflecting the rails, and, eventually, in producing great injury to the road; experience has shown that this must take place unless the increased weight is distributed upon the rail through the intermedium of an increased number of bearing points, hence various plans have been devised for constructing locomotive engines with four, six, or eight, driving wheels instead of the two which have been most commonly employed. I do not pretend, therefore, to have originated the idea of constructing a locomotive engine with eight driving wheels, but limit my claim to invention to the having so brought together, and combined, various known elementary parts of such engines as to have produced one which is substantially new, attaining the desired end in a manner more simple and effective than on any of the plans heretofore devised.

The first device, or element, in my improved locomotive engine, is the constructing it with eight wheels, firmly fixed upon their axles, and the axles preserving their parallelism to each other, whether running upon a straight or a curved road; the bearings, or boxes, of said axles being immovably attached to a single permanent frame upon which the steam engine rests. I will observe, however, that this first device, or element, may be modified by using three pair of driving wheels only, instead of four pair, such six-wheeled locomotive being combined with other of the devices, or elementary parts, to be presently mentioned, in such manner as by their combination to produce a machine having powers and properties which are substantially new.

To allow of the use of six, or of eight wheels, with axles permanently parallel to each other, and at the same time to enable the locomotive to pass around curves, and on turns-out, I introduce a second element, or device, namely, I allow a very considerable lateral, or end, play of the axles in their boxes or bearings. Where each of the axles is allowed to have this unusual end play, about an inch will suffice for passing around the curves of the shortest radius upon our roads. If two of the pairs of wheels have no more than the usual end play allowed to them, the other pairs must have an end play of about two inches. This unusual end play may, however, be dispensed with altogether by making the middle pairs of wheels without flanches. Each of these modes of allowing the engine to run upon curved roads has been resorted to, and neither of them is claimed as new in itself, but is claimed as new in its combination with the other parts, or devices, employed in my locomotive engine.

The third element in the construction of my locomotive engine is the transmitting of the power from the steam cylinders to the first pair of driving-wheels through the intermedium of spur wheels placed upon a distinct shaft, or axle, which spur wheels gear into small spur wheels, or pinions, on the axle of the first pair of driving wheels;

for an exemplification of the arrangement of the parts by which this is effected, I refer to the accompanying drawing.

This drawing represents a side view of an engine having eight driving wheels, and being furnished with a vertical boiler, such as has been patented and built by me, but not in combination with an eight-wheeled engine; nor do I intend to limit myself to this or to any other particular boiler; the combination upon which I depend not rendering this necessary.

In speaking of the two first elements, it has not been requisite to make any references to the drawing, as they are familiar to every experienced engineer. In this drawing, A, is the boiler; B, is one of the cylinders, and C, a pitman extending from its piston rod, to a crank D, on the fifth, or spur, wheel axle D′. This axle, or shaft, carries a spur wheel E, at each of its ends, which spur wheels mesh into pinions F, on the axle of the first pair of driving wheels, G. It will be seen that by changing the relative sizes of these spur and pinion wheels, the number of revolutions of the driving wheels produced by a given number of strokes of the piston, may be varied at pleasure. The following is the manner in which I preserve these spur and pinion wheels in the same relative position to each other, notwithstanding the vibration of the driving wheels up and down, from the action of the lever springs, and under the inequalities of the road. By means of a link *a*, *a*, I connect the upper half of the box *b*, of the axle of the driving wheel G, with the lower half *c*, of the box of the spur wheel shaft D′; which arrangement, it will be seen, will produce the desired effect.

My fourth device, or element, is the transmitting of the motive power from the first pair of driving wheels to all the others by means of connecting rods, and cranks on their axles. In the drawing above referred to, H, H, H, are cranks on the axles of the respective pairs of wheels, and I, I, I, connecting rods, for transmitting the motion from one to the other, simultaneously. This mode of transmitting the motion to the respective pairs of wheels, although not new, is believed to be so in its combination with other devices herein mentioned, and is a very important element in my arrangement, as it is not only the most simple, but is considered by me to be the most efficient and durable manner of combining the action of a number of wheels, so as to render them all driving wheels; and it has not, as I verily believe, been used in the combination in which I employ it.

The fifth element in my improved locomotive engine is the using of wheels of small diameter as driving wheels. By wheels of small diameter, I mean wheels of such size as those ordinarily used for rail-road cars, say from thirty three to forty inches in diameter, or about two thirds of the size of those in general use for driving wheels, from which they are therefore readily distinguished, as those used by me belong to the class of small wheels; a designation well understood in common parlance, among machinists conversant with the making and using of locomotive engines. Small wheels pass along curves and turns-out with much greater facility than large wheels, and they admit of the placing of the axles nearer together, and allow the locomotive to be made shorter than when larger wheels are used; while, at the same time, the weight of the engine is sufficiently distributed by them on the road, for its protection and preservation. Such wheels have less tendency, also, to mount the rail when the flange impinges against it, than a large wheel, when striking with the same force.

The sixth device, or element, in my combination, is the employment of wheels of chilled cast-iron, or having flanges of chilled cast-iron. When the engine is to be guided along curves, and by switches, or other means, into turns-out, by the pressure of the flanges against the rail, those wheels the flanges of which are smooth and hard, as is the case with chilled cast-iron, glide off from the rail more readily when the lateral pressure takes place, than can be effected by means of wheels the flanges and treads of which are of wrought-iron. Wheels of chilled cast-iron, also, preserve their uniformity of size and shape much longer than wheels with treads and flanges of wrought-iron; and although the adhesion resulting from the weight of the engine, and on which its tractive power depends, is less with chilled cast-iron, than with wrought-iron, wheels, it has been found that when the whole eight wheels of chilled cast-iron are made available as driving wheels, and the engine is of a corresponding weight, the difference in this respect is more than compensated by the resulting advantages.

The seventh and last element of my combination is the equalizing of the weight, or pressure, throughout the whole system of propelling, or driving, wheels by means of a vibrating spring, or of a balance beam and spring, to operate on two contiguous wheels, as used in an eight-wheeled engine patented by Messrs. Eastwick and Harrison. In the accompanying drawing, J, J, are lever springs, the lower leaves of which are the longest, and which vibrate on a fulcrum pin or bolt, at K; said fulcrum standing midway above two of the driving wheels. The sliding bolts L, L, extend from the upper boxes of the driving wheels to the under sides of these springs near to their ends; the effect of this will be to prevent any ordinary inequality of the rails from destroying, or materially interfering with, the equality of the weight, or pressure, upon the two wheels corresponding with the spring above them.

It will be seen that in the drawing the two wheels toward each end of the engine are represented as much nearer together than the two center wheels. This, however, need be the case only where the vertical boiler is used; and it is done in this case to facilitate the getting at the ash-pan.

In the eight-wheeled engine above described, I have pointed out seven several integral parts, devices, or elements, each of which has been separately used, or proposed to be used, and the whole of which may be combined together in one engine; and I believe that the combination of the whole of them will produce a more perfect machine than can be made where either of them is omitted. These seven devices are, 1st the use of eight propelling wheels, the axles of which are placed parallel to each other, and are to remain permanently parallel during the action of the engine. 2nd. The allowing of sufficient end play to the whole, or to two or three of the axles, to enable the wheels to adapt themselves to curvatures on the road; or, in lieu of this end play, the omission of flanches on two pair of the wheels. 3rd. The transmitting of the power from the steam cylinders to one pair of the driving wheels, through the intermedium of spur wheels on a fifth shaft, or axle and pinions, on the axle of the wheels, in the manner described. 4th. The transmission of the motive power from the first pair of driving wheels, to all the others, by means of connecting rods and cranks on their axles. 5th. The use of wheels of small diameter, as described. 6th. The use of chilled cast-iron wheels, as described. 7th. The equalizing of the weight, or pressure, throughout the whole system of driving wheels, by means of a vibrating spring, or by a device analogous thereto, as described.

Neither of these seven devices, or elements, is claimed as new taken individually, although I believe that the first has never been reduced to practice until it was done by me, but as it is only in combination with some of the other devices, or elements, that the first is rendered efficient, I do not intend to claim it, excepting in its combination with three, or more, of the others, by which combination an engine substantially new in its operation will be produced. What I consider as essential to the production of such an engine is the combination of the four devices, or elements, first enumerated; to which may be subjoined either, or the whole, of the three last, as may be preferred by the engineer.

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

1. The construction and use of a locomotive engine, having either six or eight driving wheels, the axles of which are placed parallel to each other, and which are permanently to preserve this parallelism during the whole action of the engine, whether running upon straight or curved roads; the said axles having sufficient end play to allow the wheels, when the whole of them are provided with flanches, to adapt themselves to the curvatures of the road; or instead of this end play of the axles, the constructing of two of the pairs of wheels, when eight wheels are used, without flanches, the motive power from the steam engine to be transmitted to the first pair of driving wheels, through the intermedium of a fifth axle, furnished with spur wheels, which gear into small spur wheels, or pinions, or the axle of the said first pair of driving wheels; and the power from these wheels being transmitted to the whole system of driving wheels, by means of cranks on the axles of said wheels, and suitable connecting rods. The respective four parts, devices, or elements, above enumerated being arranged and combined with each other, substantially in the manner set forth in the foregoing specification.

In the case when six driving wheels only are used the locomotive engine may be similar in all respects to that having eight driving wheels, with the exception that one pair of wheels are left out, or are not so connected as to constitute driving wheels, the pair not used as such not having cranked axles and connecting rods, while in all other respects the combination would be the same as when eight driving wheels are used, and a locomotive thus constructed with six driving wheels may be combined with any, either, or the whole, of the devices mentioned in my second and third claims.

2. I claim, in combination with an engine constructed as designated in my first claim, the apparatus for equalizing the pressure upon two contiguous wheels; which apparatus consists of a vibrating spring, connected by rods with the boxes of the driving wheels, or of a vibrating lever and spring, analogous thereto, in the manner described.

3. And although I have, as I believe, fully set forth and designated the combination of parts, devices, or elements, necessary to the construction of a locomotive engine upon the plan invented by me, I do hereby further declare that I do not claim either of the respective parts, devices, or elements, taken individually, but that I claim them only as combined with each other in the manner designated in my first recited claim, and with or without the respective devices designated in my second claim, nor do I claim the

arrangement either of six or of eight driving wheels in a locomotive, the axles of which continue parallel, (and which constitutes the first element of the foregoing claims) when actuated by connecting rods and cranks as in my fourth element, and having a lateral and vertical vibration, described as my second and seventh elements in the foregoing description, but differing substantially in the mode of communicating the power to the first pair of driving wheels forming the third element of my improvements.

ROSS WINANS.

Witnesses:
THOS. P. JONES,
JOS. O. ANDREWS.