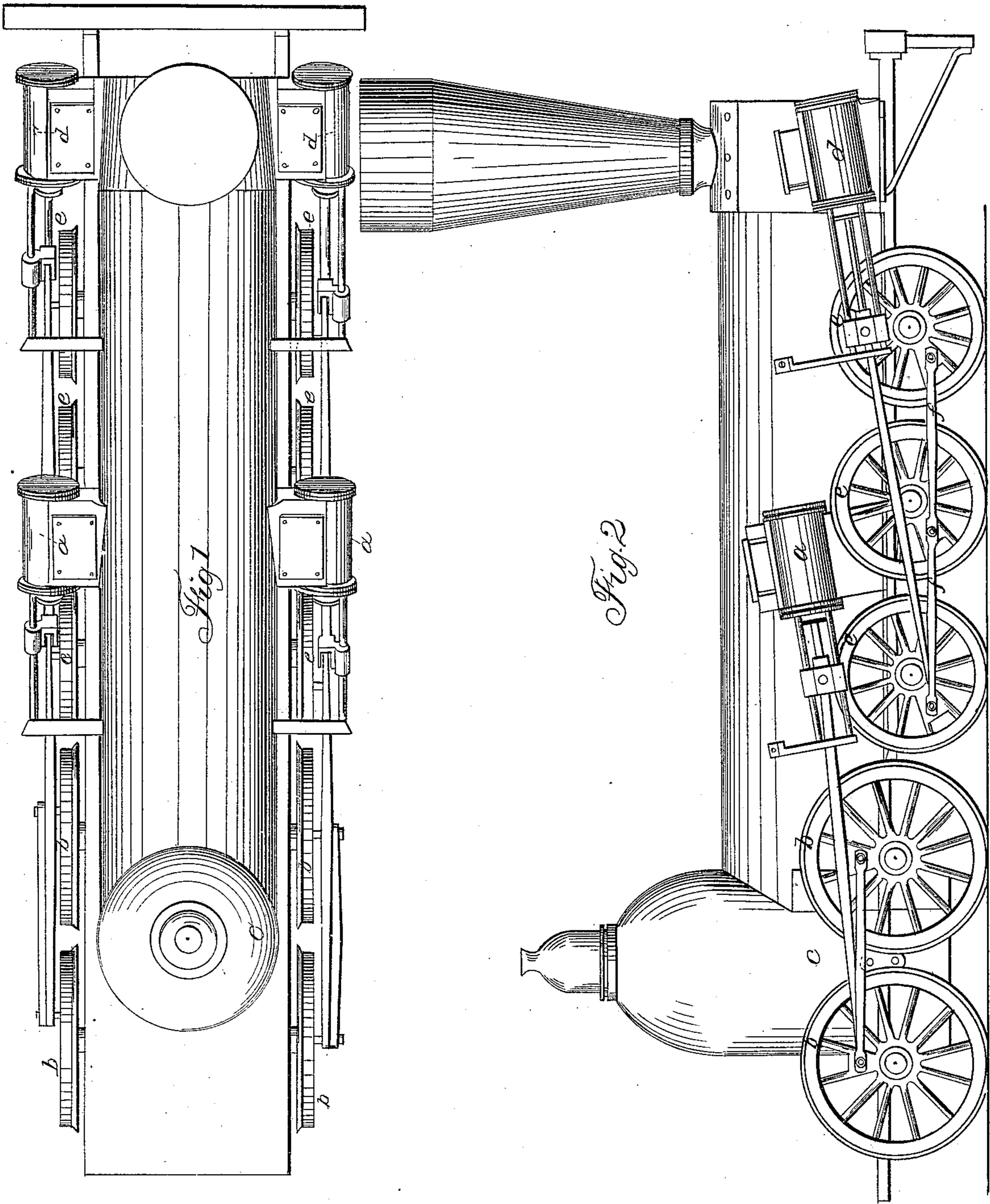


G. A. NICOLLS.
Locomotive.

No. 5,532.

Patented Apr. 25, 1848.



UNITED STATES PATENT OFFICE.

GUSTAVUS A. NICOLLS, OF READING, PENNSYLVANIA.

IMPROVEMENT IN LOCOMOTIVES.

Specification forming part of Letters Patent No. 5,532, dated April 25, 1848.

To all whom it may concern:

Be it known that I, GUSTAVUS A. NICOLLS, of Reading, in the county of Berks and State of Pennsylvania, have invented a new and useful Improvement in Locomotives or Steam-Carriages for Railroads; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan, and Fig. 2 a side elevation, of the improved locomotive.

The same letters indicate like parts in all the figures.

As heretofore constructed, the locomotive steam-engine for railroads presents many very serious defects. When ascending grades, it requires more power than when descending them or running on levels, and yet from the nature of the general construction of locomotives, as the resistance increases its power decreases, and, therefore, instead of having an increase of power when ascending grades, it actually has less, from the fact that the increased resistance reduces the motion of the wheels, and consequently that of the pistons, and the power of the engine, being due to the pressure of the steam and the motion and area of the pistons, which latter represent the volumes of steam consumed in a given time, it follows that the slower the pistons move the less power the engine will give out.

What are known as "large driving-wheels" possess advantages over small wheels which are admitted and known to engineers—such, for instance, as affording the means of rapid motion without the necessity of "gearing up," as it is termed; but when ascending grades their number of revolutions is greatly reduced, which in turn greatly reduces the effective power of the steam, and therefore renders the engine incapable of ascending grades with such a train as it is capable of drawing on levels.

The object of my invention is to remedy these evils and adapt the engine to the drawing of trains up the usual grades of railroads with the full effective power of the steam generated; and the nature of my invention by which I attain this important end consists in employing, in addition to the usual large driving-

wheels, a set of small drivers operated by an additional pair of engines. By this arrangement, when the engine reaches moderate grades, the steam can be shifted from the engines of the large drivers to those of the small drivers. The difference in the diameter of the two sets will enable the pistons that operate the small drivers to work off all the steam generated in the boiler, and to exert the required force to draw the train up the grade, although with a reduced speed; and when ascending grades of greater inclination, both sets of engines and drivers may be brought into requisition, and thus the locomotive adapted to all the circumstances of the road, and rendered effective in carrying trains over the whole length of the road without waste of power. As heretofore and now constructed, the locomotive has no other variation in the effective application of the full force of the steam than that which is due to the regulation of the furnace and the use of the cut-off, for it has but one standard of effective power, while under the modification due to my improvement it has three standards of effective action—first, the standard of effective action for levels by the use of the large drivers, susceptible of the changes due to the cut-off and the furnaces; second, the standard of effective action for medium grades by the use of the small drivers, under the variations of the cut-off and the furnace; and, third, the standard of effective action due to the use of the two sets of drivers under the variations of the cut-off and the furnace, as in the other cases. By means of these three standards with the variations or changes due to the management of the furnace and the cut-off, the locomotive can be gradually changed, so as to give the full effect of the power generated in the boiler to transport trains along levels and grades of every variation up to the highest range of grades which the traction of the wheels will admit.

In the accompanying drawings, *a a* represent the usual engines, connected with and operating the four large drivers *b b b b*, which are placed, as usual, under the forward part of the engine and under the furnace *c*. All the parts of the engines and the connections between them and the large drivers are the same as ordinary engines, and therefore need no further description. The other engines, *d d*, are placed on each side of the smoke-box, to-

ward the rear of the carriage, and are connected, in the usual manner of forming such connections, with the forward pair of the small drivers *eeeeee*, the three pairs being connected together by connecting-rods *ffff* in the usual manner of forming such connections.

It is not deemed necessary to describe the construction of the carriage, the engines, and the various connections, as these make no part of my invention, and are all well known to engineers under all their variations.

It will be evident from the foregoing that the number of driving-wheels for each set can be increased or diminished at the discretion of the constructor without varying the principle of my invention as above pointed out; but I have given the number for each set which, in my judgment, is best adapted to the ends contemplated, and as more traction is required for ascending slight grades than for levels I have described the use of six small to four large drivers, this being about the proportion which, in my judgment, should be preserved.

From what has been stated it will be obvious

that some of the advantages due to my invention may be obtained without the use of all the features of my invention—as, for instance, the two sets of drivers may be of the same size, and the locomotive thus adapted to the levels and the high range of grades, but not so advantageously adapted to intermediate grades; and therefore I do not wish to confine myself to the use of small drivers for the additional set.

What I claim as my invention, therefore, and desire to secure by Letters Patent, is—

1. The employment of an additional set of driving-wheels and engines, substantially as described, in combination with the usual driving-wheels and engines under any of the variations known or of which they are susceptible, as described.

2. In this combination the use of small drivers for the additional set, substantially as described.

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Witnesses:

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