T. AGUDIO.

Car Propeller

No. 38,800. Patented June 9, 1863.

Fig. 1.

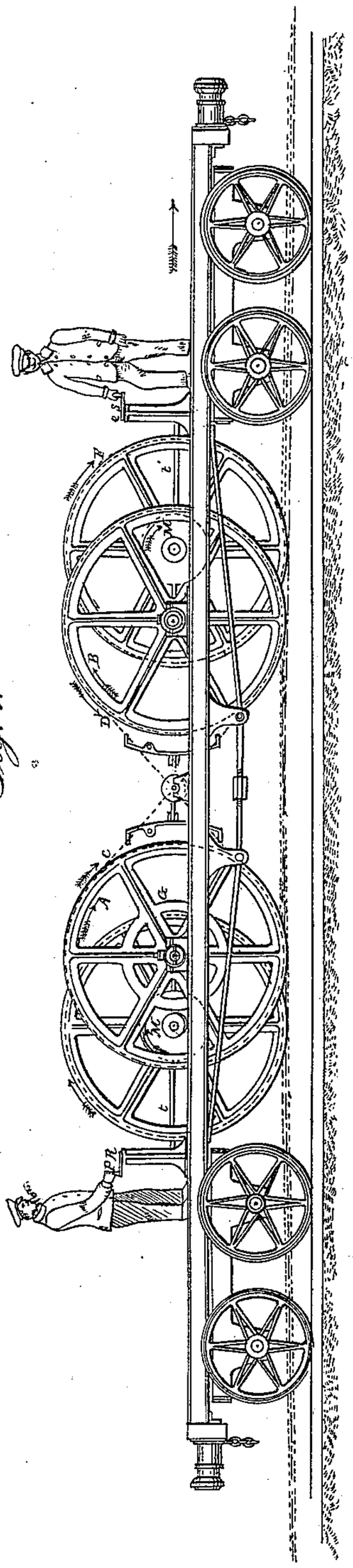
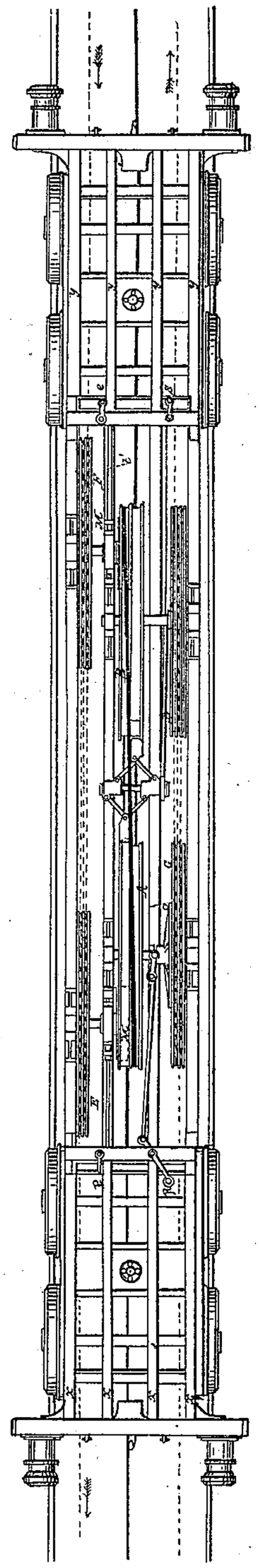


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

TOMASO AGUDIO, OF TURIN, ITALY.

IMPROVEMENT IN DEVICES ATTACHED TO RAILROAD-CARS FOR FACILITATING THE PASSACE TRAINS UP STEEP GRADIENTS OR INCLINED PLANES.

Specification forming part of Letters Patent No. **38,800**, dated June 9, 1863.

To all whom it may concern:

Be it known that I, TOMASO AGUDIO, of Turin, in the Kingdom of Italy, engineer, have invented certain new and useful Improvements in Apparatus for Facilitating the Passage of Trains up Steep Gradients on Railways; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters and figures marked thereon; that is to say—

My said invention relates to a peculiar construction, arrangement, and combination of machinery or apparatus for enabling heavy railway-trains to ascend and descend steep gradients, whereby considerable economy is obtained over the ordinary endless-rope system, while at the same time the apparatus is more certain and effective in its action.

According to this invention it is proposed to attach to the front of a train which is about to ascend a steeper gradient than the ordinary locomotive-engine is competent for a peculiar apparatus consisting of a frame mounted upon two four-wheeled "bogies" at the front and rear ends. The center portion of this frame carries two shafts, which are each provided with a fast-and-loose grooved pulley or drum. Round the two fast pulleys or drums is passed a flat rope, guided onto them by the loose pulleys, and having one end fixed in a permanent manner at the top of the incline or gradient, while it is kept distended by a heavy counter-weight at its opposite end or bottom of the incline. Rotary motion is imparted to the fast pulleys or drums, so as to cause the train to wind itself up the incline by means of an endless traveling rope extending along the incline and actuated both at the top and bottom end thereof by any convenient prime mover, one of which acts upon the ascending part of the endless rope and the other upon the descending part. The ascending side of the endless rope is passed around a grooved pulley fast on the end of one of the drum-shafts, and the descending side of the same rope is passed round a grooved pulley fast on the end of a central shaft situate between and parallel to the two drum-shafts. This central shaft carries a friction-wheel or pinion, which imparts motion to two larger friction-wheels, respectively, keyed onto the two drum-shafts and bearing upon opposite sides of the circumference of the central friction wheel or pinion, against which they are forcibly held by the tension of the flat hauling-rope passing round the drums. On motion being imparted to the endless rope the hauling-drums are rotated, and by acting upon the stationary hauling-rope wind up the train, the rope passing over the drums and being left on the line as the train passes over it. The dimensions of the various pulleys and drums admit of the endless rope traveling at double the speed of the train, and, by reason of the simultaneous combined action of both sides or strands of the endless rope on the pulleys, it is only subjected to about one-fourth the strain that it would undergo under the ordinary system, wherein the train is hauled by the single ascending side or strand of the endless rope attached directly to the train without the intervention of pulleys. Hence, heavy goods trains can be traversed up the steepest gradients with comparatively light endless ropes, whereby a considerable saving in first cost is obtained, while the gradients may be made much steeper than heretofore. By using a separate motor for the ascending and descending side or stand of the endless rope it is obvious that should one engine become deranged the other could still be worked, and hence the traffic on the line need not be stopped.

In order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose I shall refer to the several figures on the sheet of drawings hereunto annexed, the same letters of reference indicating corresponding parts in both the figures.

Figures 1 and 2 of the accompanying sheet of drawings represent, respectively, a side elevation and plan of an improved arrangement of apparatus constructed according to this invention for facilitating the passage of railway-trains along steep gradients.

x y represent a long framing supported at each end upon a four-wheeled "bogie," as shown, and carrying near its middle the bearings for the axes of the two drums A and B. These axes also carry near one side of the framing two grooved pulleys, C and D, the pulley D being loose on the axis of the drum B. while the pulley C is coupled with the axis of

the drum A by means of a conical friction-clutch, G, actuated by the lever-handle R. The ascending side or section of the endless rope passes round and crosses between the two pulleys C D, the motion of the rope being transmitted directly from the pulley C to the drum A through the friction-clutch G. On the opposite side of the framing are situate the two pulleys E F, rotated in the direction indicated by the arrows by the descending side of the endless rope. Upon the end of each of the axes of the pulleys E F, near the center of the framing, is fixed a friction-pulley, M, which transmits the rotary motion of the pulleys E F to the drums A B. It will thus be readily understood that the two sections or sides of the endless rope, although moving in opposite directions to each other, cause the pulleys C E and F to revolve in the same direction, which pulleys transmit their motion to the drums A and B.

This apparatus may be worked in various ways. For example, cranks may be made upon the axis of the two drums A and B, which may be made to act upon the axles of the carriage by means of connecting-rods, the carriage being sufficiently weighted to give the necessary adhesion of the wheels upon the rails. Or racks may be laid down along the incline, into which racks corresponding teeth on the circumference of the drums may be made to gear. The method which I prefer to adopt, however, consists in the employment of a flat wire rope, *a a*, colored blue in the drawings, which is passed round the drums A B, as shown, such rope being permanently fixed at the upper end of the incline and kept distended by a counterweight attached to it at the bottom end thereof. By this arrangement the apparatus is made to wind itself up the incline. The tension of the flat rope causes the inner surfaces of the rims of the two drums to be pressed against the peripheries of the friction rollers or pulleys M M, the friction thus obtained being sufficient to transmit the rotation of the pulleys E and F to the two drums A and B; but should the adhesion thus obtained not be sufficient it may be augmented at will by still further pressing the pulleys M M against the interior of the rims of the drums A B by means of the handles P Q, which act upon the axes of the pulleys M M through the intervention of the rods *t t'*. Supposing it be desired to stop the train on the incline without stopping the endless rope, the handles P Q will be reversed, as well as the handle R, in order to disengage the pulleys M M and move the friction-clutch out of contact with the pulley C, and so leave the latter to turn freely upon the axis of the drum A. By this means the transmission of the motion of the pulleys C, E, and F to the drums A B will be interrupted. On descending an incline this adjustment of the several parts will be maintained, and in addition thereto the brakes *b b*, which are situate between the drums A B, will be applied by the aid of the handle S. According to this arrangement of apparatus, should the endless rope break the train will be retained stationary upon the incline by the combined action of the flat wire or hauling-rope and the brakes, the latter preventing the drums from turning round. The flat rope thus serves the purpose also of a safety-rope, as it can always be kept in good condition, since it is not subjected to the rapid wear and tear of the endless rope. The arrangement, moreover, of the two prime movers, which operate upon the endless rope at the two extremities of the incline, admits of the working of the line even when one of the engines may be under repair.

In order that the two engines shall exert an equal force upon the two sides or sections of the endless rope, which is very important, it is arranged that each tension apparatus applied to the extremities of the rope shall be connected by a lever to the engine, so as to act upon it at each vibration, thus serving the purpose of a regulator or governor.

Having now described and particularly ascertained the nature of the said invention and the manner in which the same is or may be used or carried into effect, I would observe, in conclusion, that what I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited Letters Patent, is—

The apparatus constructed and operating substantially as herein described, to be used as an attachment to the front of a train for the purpose of facilitating its passage along a steeper gradient than the ordinary locomotive engine is competent for.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

TOMASO AGUDIO.

Witnesses:

EMILE BARRAULT,

CORPUCCIO, Y.