

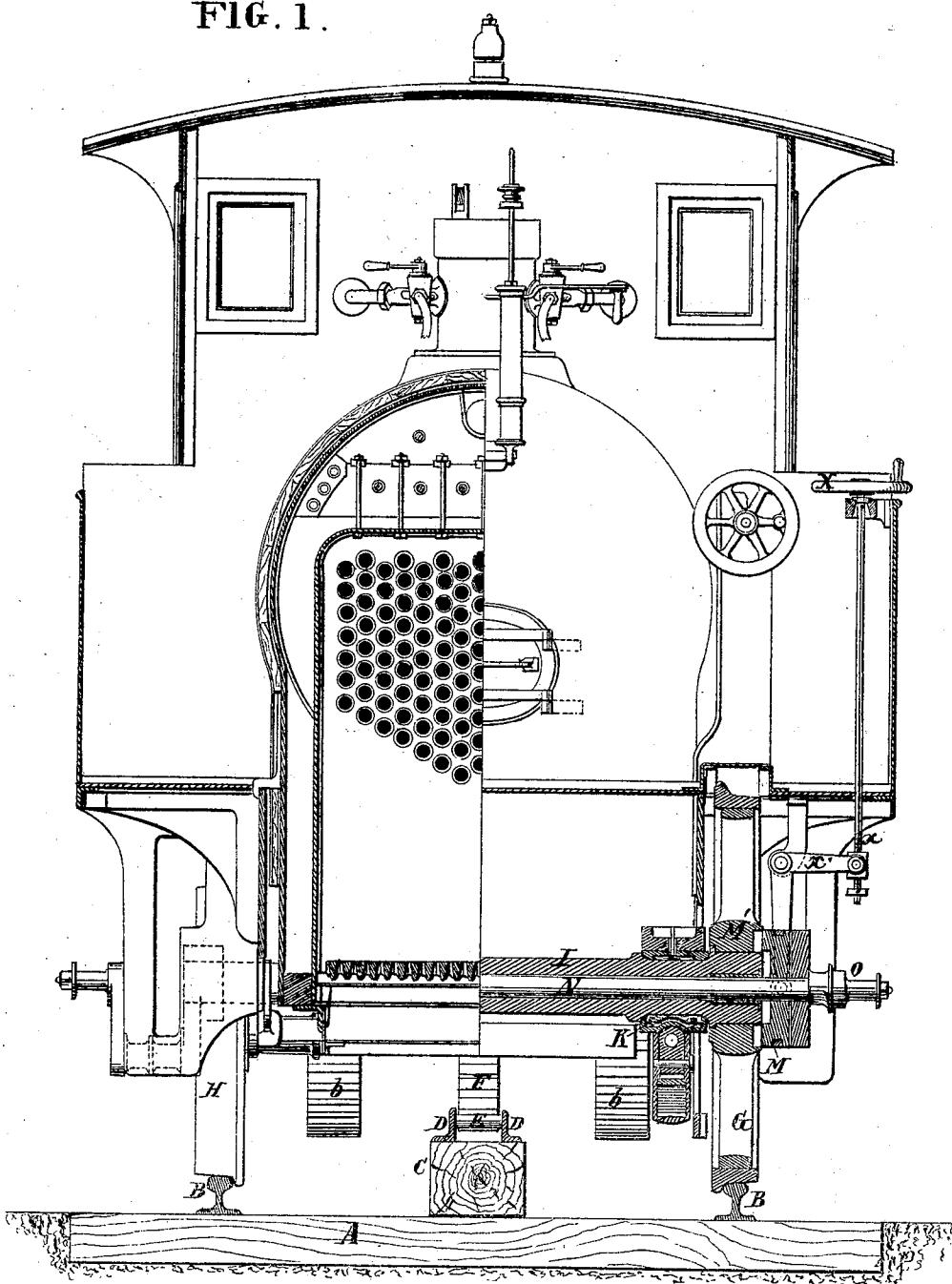
NICOLAS RIGGENBACH.

Improvement in Locomotives for Ascending Inclined Planes.

No. 123,729.

Patented Feb. 13, 1872.

FIG. 1.



ATTEST

J. Scherlitz
Walter Allen

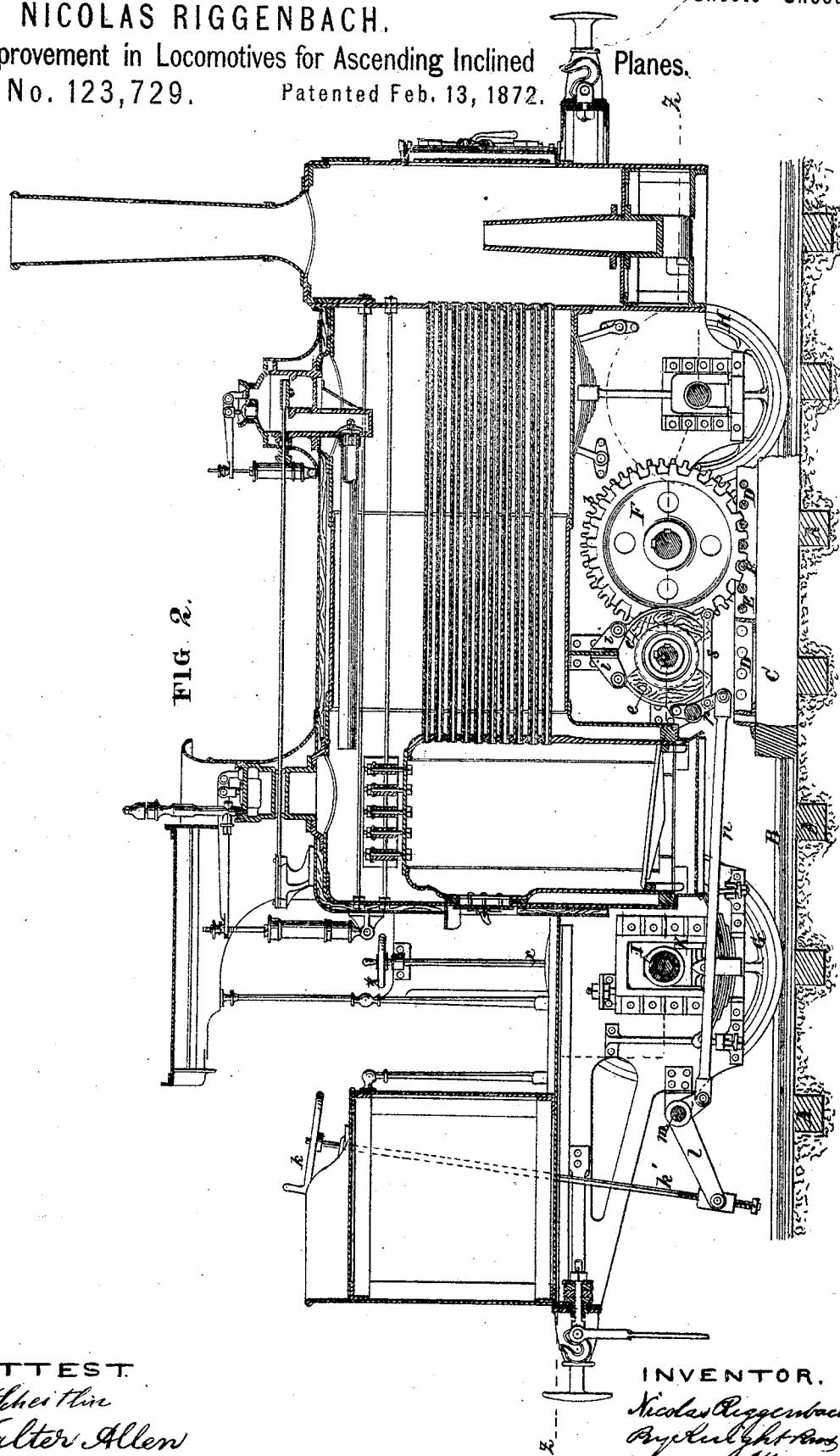
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FIG. 2.



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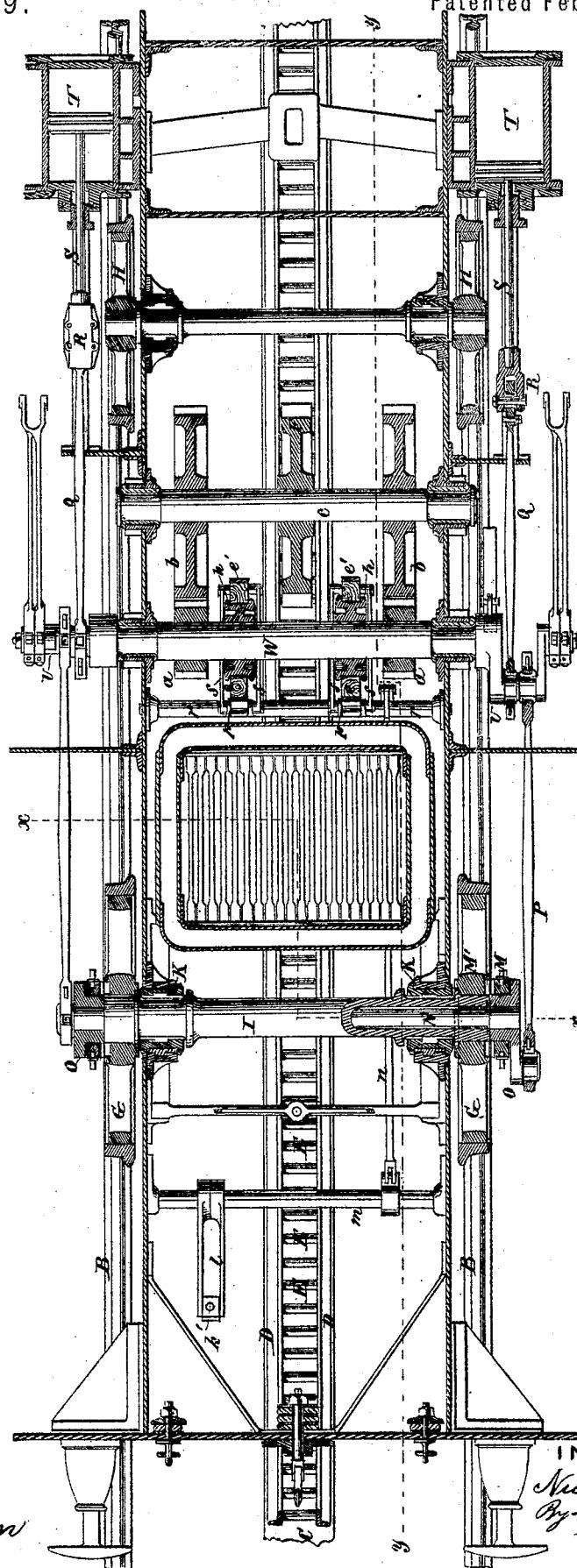
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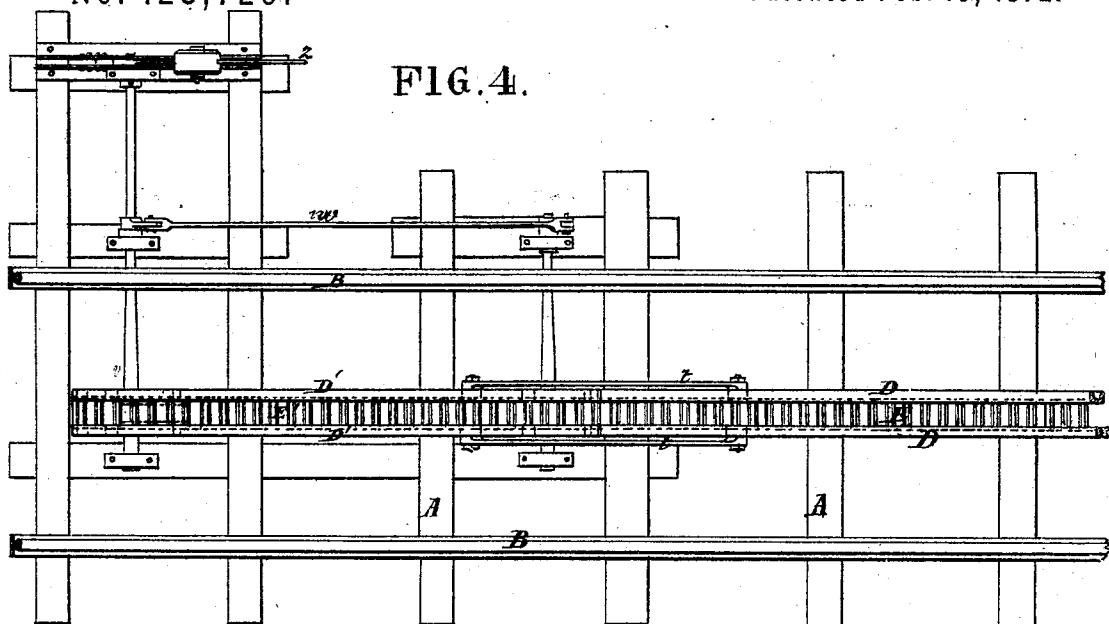


FIG. 4.

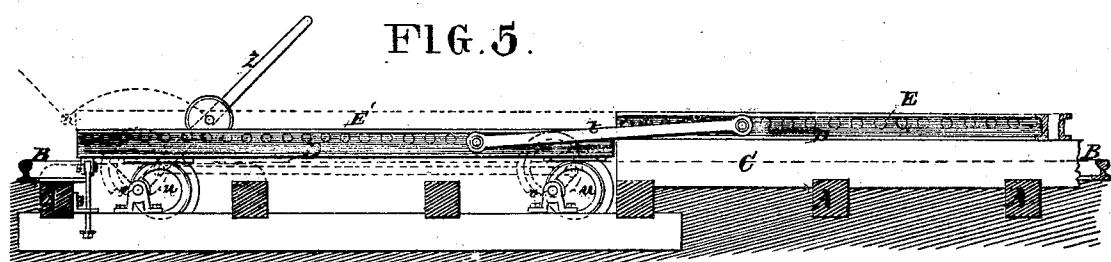


FIG. 5.

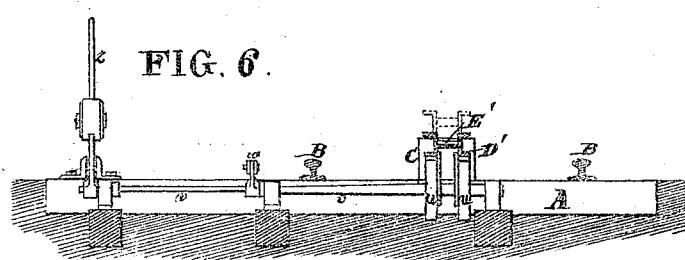


FIG. 6.

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UNITED STATES PATENT OFFICE.

NICOLAS RIGGENBACH, OF OLten, CANTON OF SOLOTHURN, SWITZERLAND.

IMPROVEMENT IN LOCOMOTIVES FOR ASCENDING INCLINED PLANES.

Specification forming part of Letters Patent No. 123,729, dated February 13, 1872.

Specification describing certain Improvements in Locomotives and Tracks therefor, invented by NICOLAS RIGGENBACH, of Olten, Canton of Solothurn, Switzerland.

This invention consists of devices by which locomotives are enabled to ascend and descend grades not readily and safely surmounted by the application of the power of the engine to wheels whose bite is due to frictional contact or adhesion.

The improvements are, first, in the rack-rail; secondly, in the adaptation thereto of the driving-gear of the locomotive; thirdly, the clutch arrangement, by which the locomotive is subjected either to the action of the usual drivers on a level or moderate ascent, or to the action of the climber or cogged driver on relatively steeper grades; fourthly, in a device for guiding the climber into gear.

In the accompanying drawing, Figure 1 is a transverse vertical section on the line $x x$, Fig. 3. Fig. 2 is a longitudinal vertical section on the line $y y$, Fig. 3. Fig. 3 is a horizontal section on the line $z z$, Fig. 2, looking downward. Fig. 4 is a plan of a portion of the track and of the device employed to guide the "climber" into gear with its rack when reaching a steep grade. Fig. 5 is a side elevation of the same. Fig. 6 is a transverse section thereof.

In the drawing, A A represent sleepers on a line of railway. B B the usual edge-rails. C is a longitudinal sleeper, shown as lying upon the transverse sleepers A A, and forming a base for the attachment of the angle-irons D D of the central rack. E E are steel pins, which pass through and span the space between the bars D D, and constitute the teeth of the rack, with which the cogs of the spur-wheel F interlock.

For the purposes of this description, and in fact as regards some places for which my improvement is specially intended, I shall assume that the railway has a number of alternate levels and grades. In this case the level portions, and those but moderately inclined, will be laid with the usual rails B B, and upon this portion of the road the drivers G G will be alone employed for propulsion. The heavy grades on the road will have the rack D D E for the engagement of the spur-wheel F. When traveling along the

level, the spur-wheel F does not reach down far enough to form any obstruction; but when the locomotive reaches the foot of the grade, the spur-wheel is found to be at the exact height to engage the raised rack D E. The two modes of propulsion are not to be used together, but respectively on the levels and on the steep grades.

G G are the usual driving-wheels, and H H are guide-wheels, not driven by the engines. The wheels G G are keyed fast to the sleeve-axle I, which runs in bearings K properly secured in the frame. When the locomotive is to depend for its propulsion upon power imparted to the drivers G G, the clutches M M on the blind axle N are thrown into connection with their counterparts M' M' on the hubs of the wheels G G. On the ends of the axle N are two cranks, O O, set at an angle of ninety degrees with each other. Each of these cranks is driven by pitmen P Q from a cross-head, R, on the end of a piston-rod, S, of a cylinder, T. The pitmen P Q work in parallelism on a wrist belonging to the crank U on the pinion-shaft W.

When the locomotive is to be propelled by the engagement of the spur-wheel or climber F with the teeth E E of the rack, the clutches M are withdrawn from their counterparts M' on the drivers G, and the latter then become mere guide-wheels, supporting the locomotive, but having no connection with the steam-motor. The clutches M are operated by means of a hand-wheel, X, Fig. 1, screw-rod x , and bell-crank x' . When the wheels G G and their sleeve-axle I are thus disconnected from the steam-motor, they may continue to revolve by the impetus already given to the locomotive, or, as the latter is urged forward, by power exerted upon the other system of propulsion, and applied upon the central rack D D E. The axle N and its cranks may also continue to be driven by the steam-motor; but do not under these circumstances impart motion to the wheels G G and axle N.

It is not designed to throw the climber F out of gear, but it continues to rotate, coming into use when it reaches the parts of the railway where the central track is laid, and rotating without efficiency at the parts where the central track is absent. On the pinion-shaft W

are two pinions, *a a*, which engage the spur-wheels *b b* on the axle *c*, and thus rotate the climber *F*.

The brake arrangement is shown in Figs. 2 and 3. It consists of rubbers *e e'*, so placed as to grip drums *h* keyed upon the pinion-shaft *W*. The rubber blocks *e e'* are suspended in pairs from pedestals *i* beneath the car-frame, and are operated as required by a succession of levers. *h* is a hand-wheel, having a shaft, *h'*, extending downward to a bell-crank lever, *l*, on the transverse rod *m*, which serves as its fulcrum. The shorter end of this lever connects by a rod, *n*, with another bell-crank lever, *p*, which is fulcrumed upon the transverse bar *r*. The upper end of the bell-crank lever *p* is connected to the rubber block *e*, and the same lever is connected at a point below its fulcrum and by means of a rod, *s*, with the other rubber block, *e'*. The effect of this arrangement of levers is to make the action of the respective blocks *e e'* coincident as to time, advancing and receding from the rub wheel or drum *h* simultaneously, gripping the said drum on opposite sides, and serving thereby, through the intervention of the axle *W*, pinions *a a*, axle *c*, and spur-wheels *b b*, to lock or retard the climber or spur-wheel *F*.

In order to more easily guide the climber into gear with its rack, the device shown in Figs. 4, 5, and 6 is employed. This consists of a movable or adjustable extension, *D' E'*, of the central rack, constructed in the same form as the stationary portion *D E*, and connected thereto by links *t* pivoted at each end. This extension rests upon eccentrics *u* keyed upon shafts *v*, connected by a rod, *w*, and adapted to be turned by a lever, *z*, on one of them, to throw the eccentrics *u* up or down. These parts are shown in their elevated position in dotted lines in Figs. 5 and 6, and in their depressed position in full lines.

To recapitulate: When engines are in action, motion is constantly communicated to the train of gearing acting upon the climber *F*. The same may be said of the blind axle *N*, whose motion is also constant while the locomotive is in motion. The drivers *G G* on the sleeve-axle *I* are, by means of the clutches described, thrown into engagement with the crank-axle

N when the locomotive is to be propelled by the drivers *G G* and not by the climber *F*. When the locomotive arrives at a grade that is furnished with the central rack-rail, it is stopped for an instant. The extension-rail *D' E'* is then thrown up so as to engage with the climber. The engine is then started again, and, as soon as the climber has taken hold of the stationary parts of the rack-rail, the drivers are again thrown out of engagement, so as merely to run as guide-wheels or supporters.

The brakes are used in stopping on a grade or as a retarder in descending.

The locomotive can be used on any road, as the height of the climber *F* and its gear is such that it will only come in contact with the rail laid in the center of the track, and sufficiently elevated for the specific purpose.

Claims.

I claim as my invention—

1. The continuous supporting-rails *B* and elevated rack-rail *D E*, in combination with the climber or cogged driving-wheel *F*, and with flanged supporting-wheels *G*, which latter are constantly on the track, and are made to serve as drivers or not, as required, by a suitable clutch mechanism.

2. The climber *F* and spur-wheels *b b* fixed on a shaft, *c*, independent of the main driving or carrying wheels, in combination with the steam-driven crank-shaft *W* and pinions *a a* for driving the said shaft *c*, as and for the purposes set forth.

3. The combination of the crank-axle *N*, sleeve-axle *I*, drawing-wheels *G G*, and clutches *M M'*, substantially as described and represented.

4. The adjustable extension *D' E'* of the rack-rail, in combination with the climber *F*, for the purpose of guiding the said climber into gear.

5. The combination, with the climber *F*, of a brake arrangement, acting substantially as described.

NICOLAS RIGGENBACH.

Witnesses:

F. BRUNNER,
T. STUDRY.