(No Model.) 5 Sheets—Sheet 1.

W. GROSVENOR.

TRANSPORTATION SYSTEM.

No. 569,280. Patented Oct. 13, 1896.

Fig. 1.

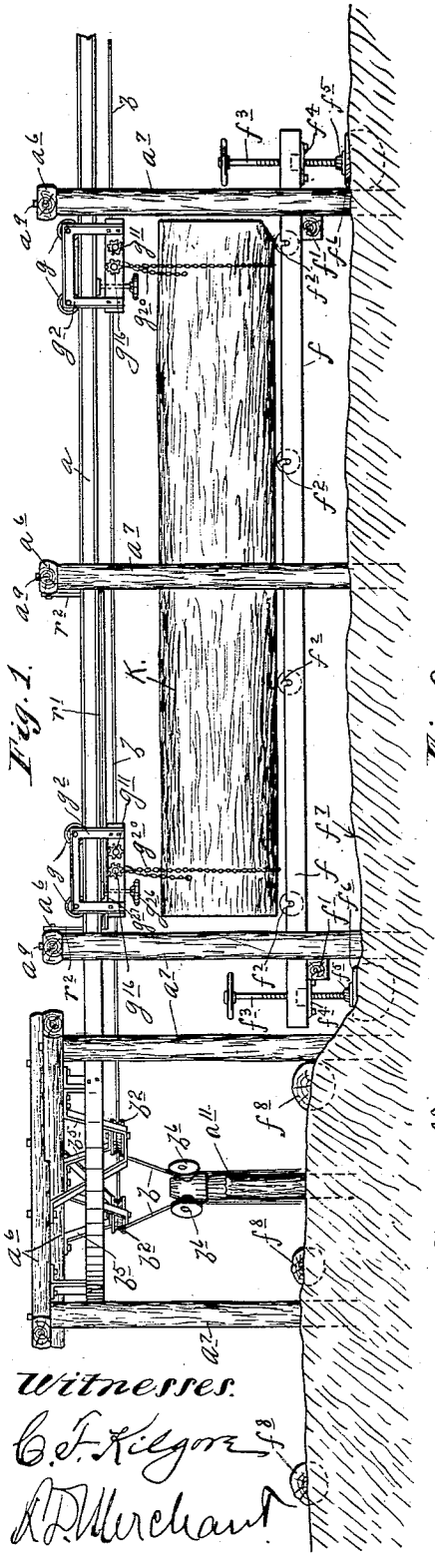
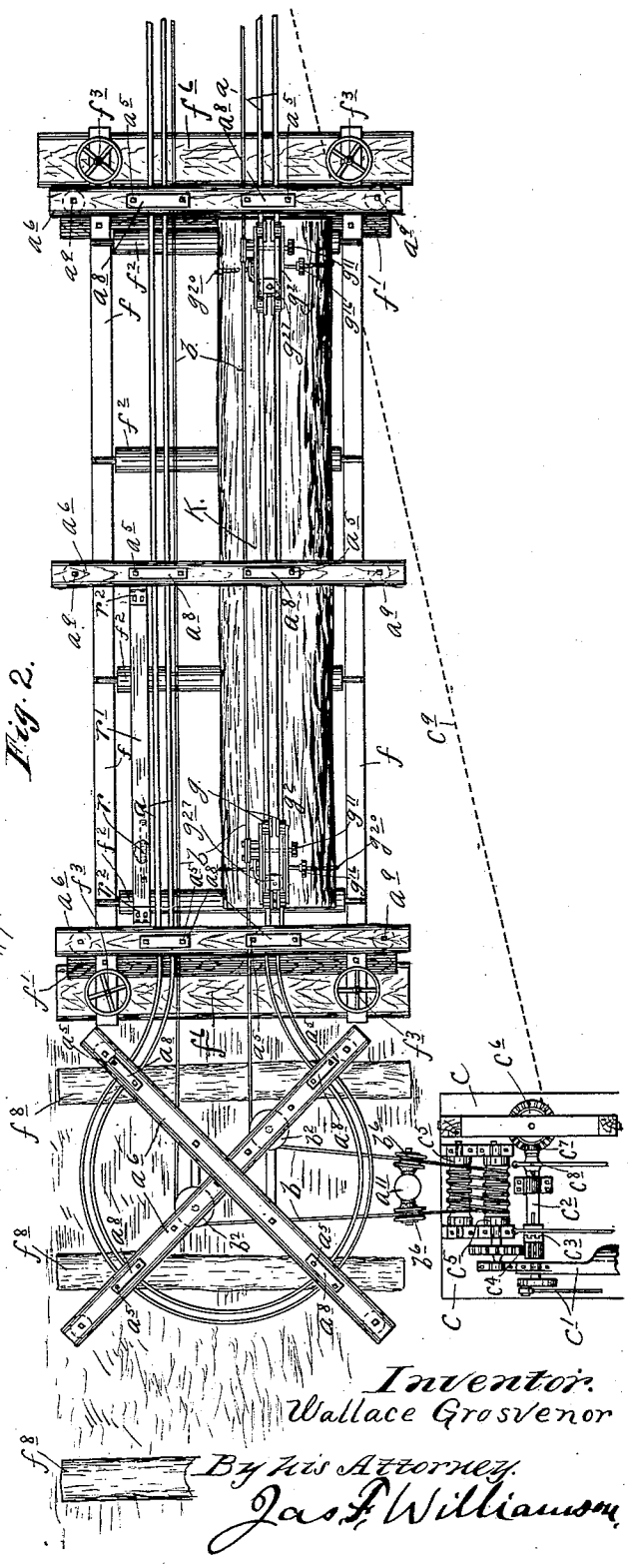


Fig. 2.



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(No Model.) 5 Sheets—Sheet 2.

W. GROSVENOR.

TRANSPORTATION SYSTEM.

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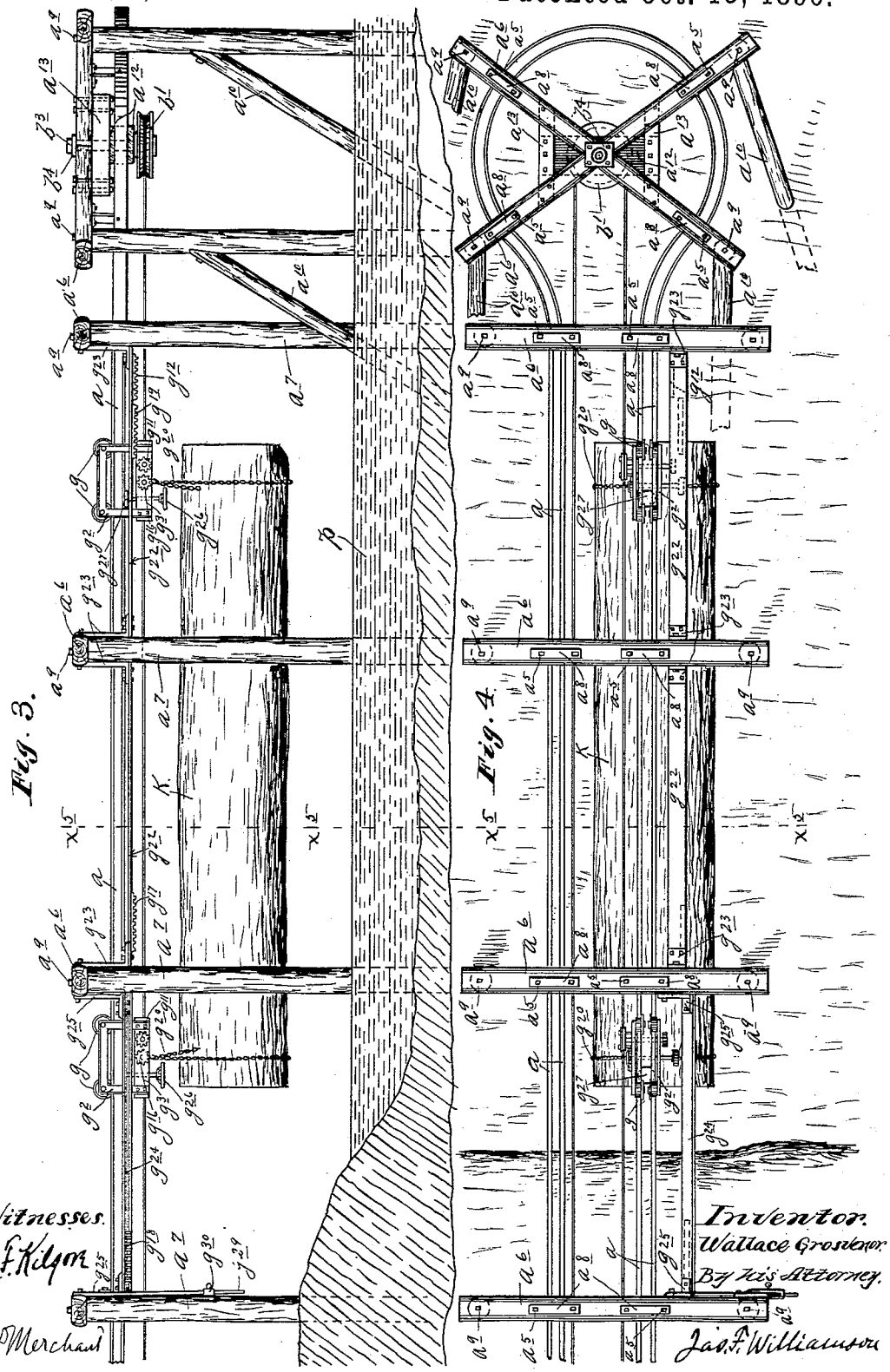

Fig. 3.

Fig. 4.

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5 Sheets—Sheet 3.

W. GROSVENOR.

TRANSPORTATION SYSTEM.

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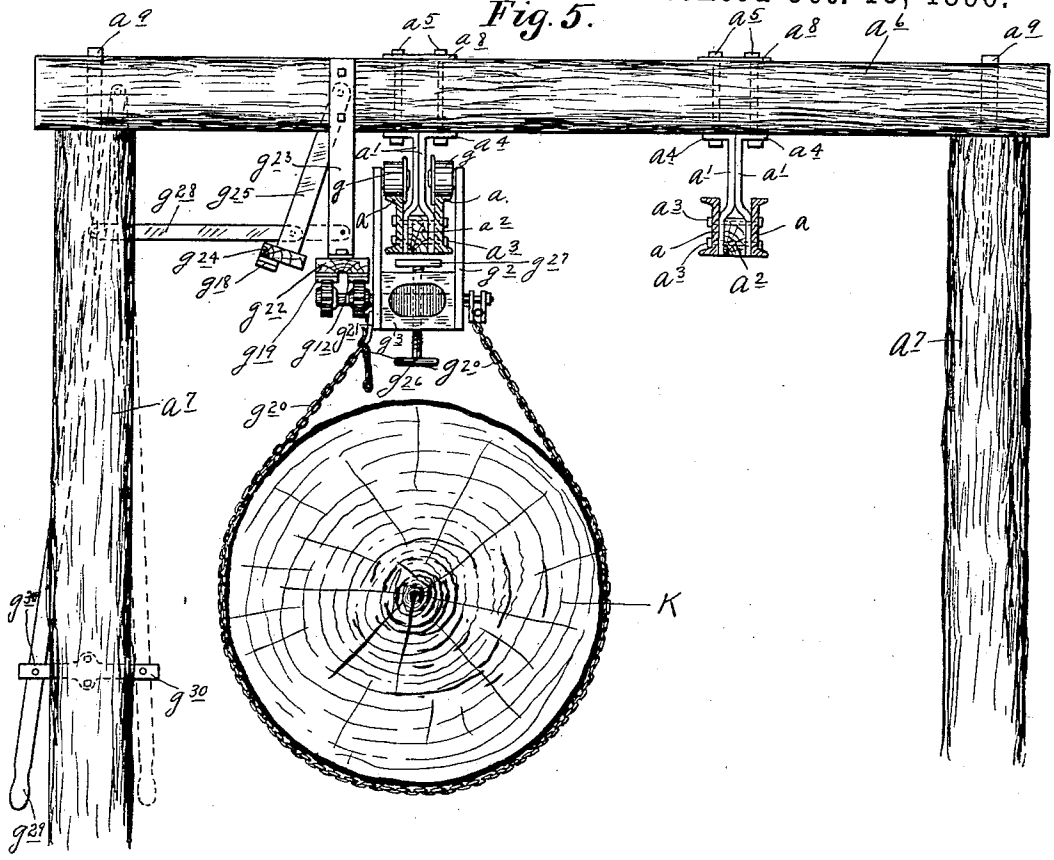
Fig. 5.



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(No Model.) 5 Sheets—Sheet 4.

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TRANSPORTATION SYSTEM.

No. 569,280. Patented Oct. 13, 1896.

Fig. 6.

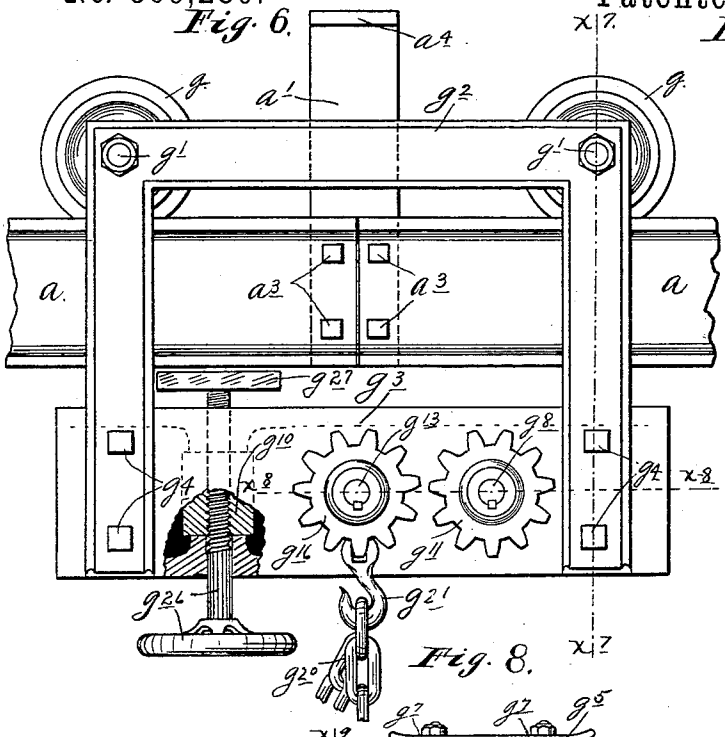


Fig. 7.

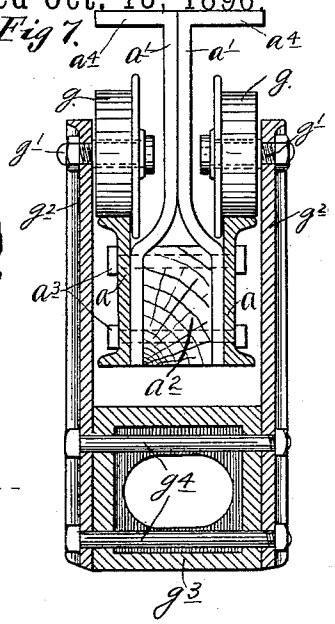


Fig. 8.

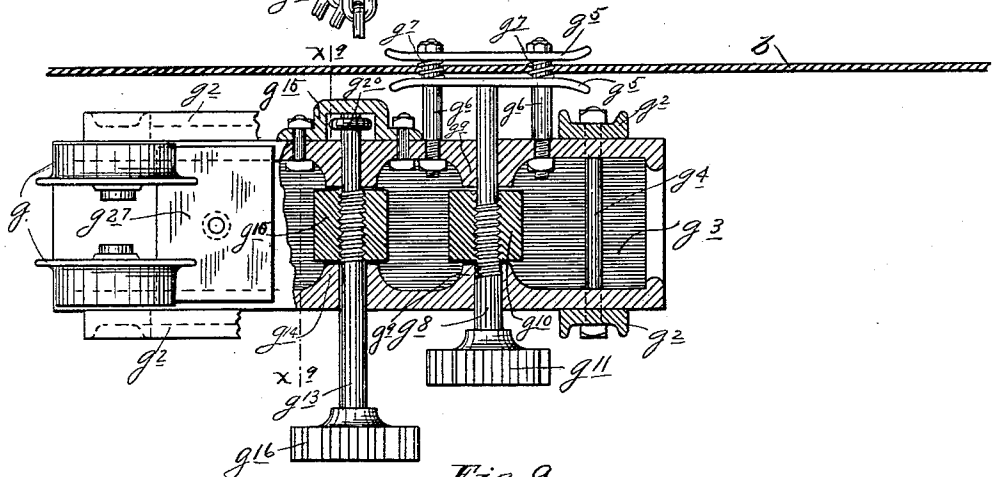
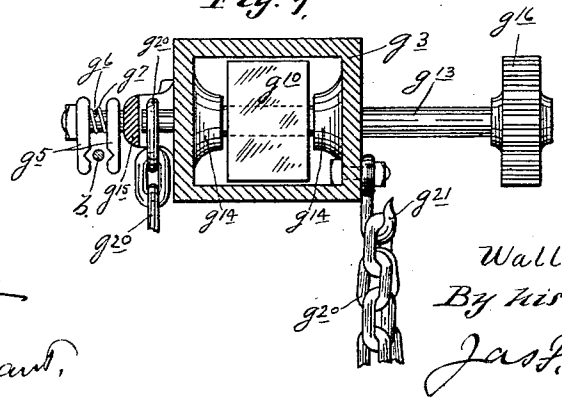


Fig. 9.



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5 Sheets—Sheet 5.

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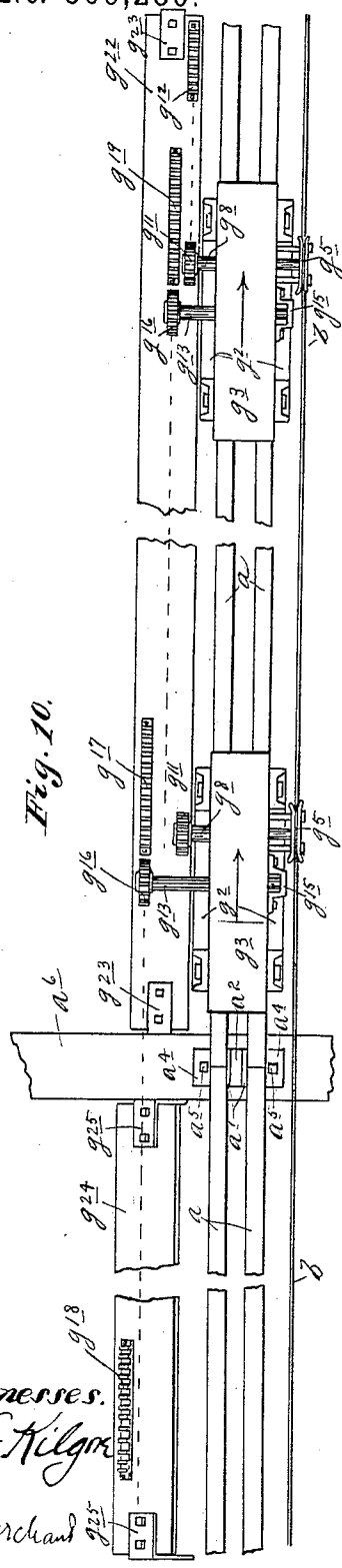

Fig. 10.

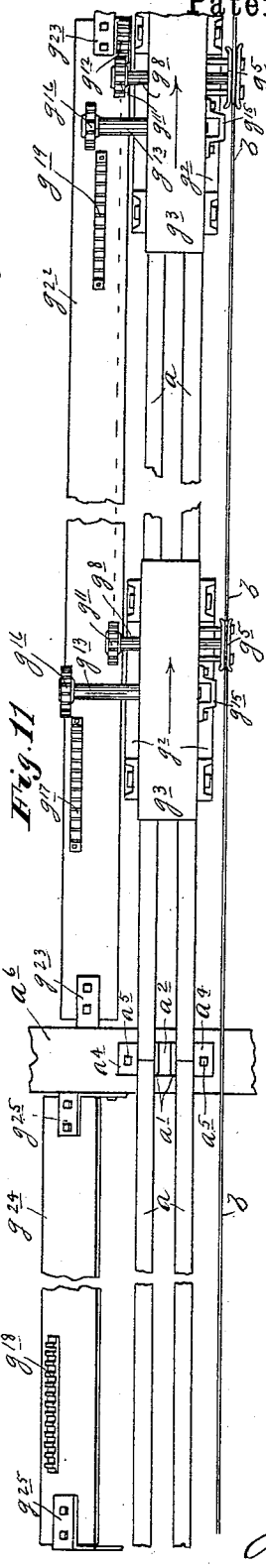

Fig. 11.

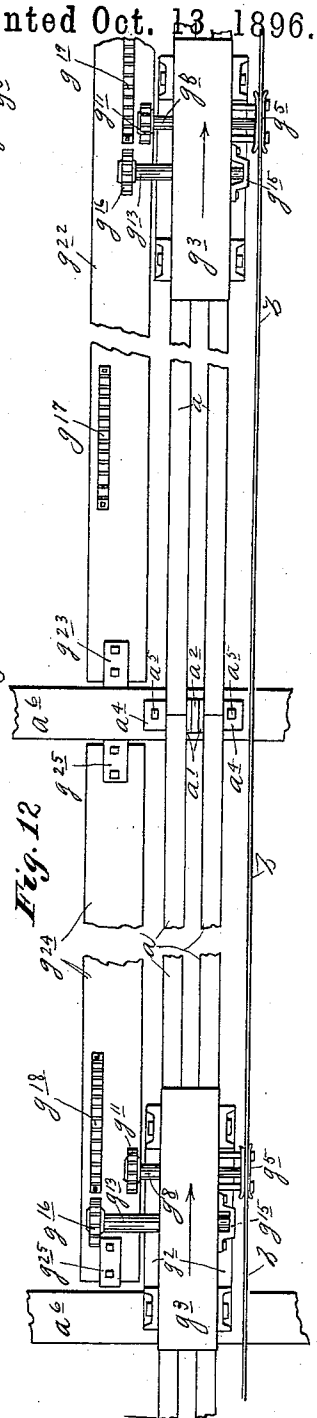

Fig. 12.

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UNITED STATES PATENT OFFICE.

WALLACE GROSVENOR, OF CASSELTON, NORTH DAKOTA.

TRANSPORTATION SYSTEM.

SPECIFICATION forming part of Letters Patent No. 569,280, dated October 13, 1896.

Application filed May 22, 1896. Serial No. 592,583. (No model.)

To all whom it may concern:

Be it known that I, WALLACE GROSVENOR, a citizen of the United States, residing at Casselton, in the county of Cass and State of North Dakota, have invented certain new and useful Improvements in Transportation Systems; and I do hereby 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.

My invention has for its object to provide an improved system of transportation for handling logs and other articles. The system was especially designed to meet the conditions of the heavy-timbered country on the Pacific coast, for the transportation of logs, but is capable of general application not only for the transportation of logs, but for the transportation of many other kinds of articles.

To the ends above noted my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein, like letters referring to like parts throughout the several views—

Figure 1 is a side elevation of a portion of my improved railway at the receiving or loading station, with some parts broken away. Fig. 2 is a plan view of the parts shown in Fig. 1, with some portions broken away. Fig. 3 is a side elevation of the road at the discharging or delivery station, with some parts broken away and others shown in section. Fig. 4 is a plan view of the parts shown in Fig. 3. Fig. 5 is a vertical cross-section on the line x^5 x^5 of Figs. 3 and 4, looking from the right toward the left. Fig. 6 is a side elevation of the rear member of the pair of trucks shown in Figs. 1 to 4 and 10 to 12, inclusive. Fig. 7 is a vertical section on the line x^7 x^7 of Fig. 6, looking from the left. Fig. 8 is a view of the truck shown in Fig. 6, partly in plan and partly in horizontal section on the line x^8 x^8 of said Fig. 6. Fig. 9 is a vertical section on the line x^9 x^9 of Fig. 8, looking from the left. Fig. 10 is a bottom or underneath plan view of the track, the trucks, and the releasing devices at the delivery end of the road shown in Figs. 3 and 4, with the trucks in substantially the same position as shown in said Figs. 3 and 4. Fig. 11 is a view similar to Fig. 10, but with the trucks shown in a different position, or as the parts would appear after the load had been released; and Fig. 12 is a view similar to Fig. 10, but with the parts adjusted as would be required for a very long log, or, otherwise stated, with the pivoted member of the releasing-racks, which is shown in its idle position in Figs. 10 and 11, thrown inward into its active or operative position.

a represents the rails of my track, which are preferably of steel in channel-bar form. The said rails *a* are bolted fast to the lower ends of bracket-irons *a'*. The said rails *a* abut against the outside surfaces of the said bracket-irons *a'*, with their upper or bearing portions extending upward beyond the bends in said irons *a'*, so as to afford clearance for the flanges of the truck-wheels, as will hereinafter more fully appear. The said bracket-irons *a'* face each other and are bent outward a short distance above their lower ends, so as to embrace a spacing-block a^2.

The bolts a^3 extend through the rails *a*, the bracket-irons *a'*, and the spacing-block a^2, thereby serving to rigidly connect all of the said parts together. The said bracket-irons *a'* are provided at their upper ends with outturned flanges a^4, which together constitute the head of the bracket. The said brackets are made fast by nutted bolts a^5 or other suitable means to overhead supports a^6, resting on uprights a^7, rising from the ground. The bolts a^5 work through top plates a^8, resting on the cross-ties a^6. The uprights a^7 are suitably spaced apart crosswise of the roadway, and the cross-ties a^6 are of the proper length to afford sufficient clearance for two tracks. The said parts a^6 and a^7, together with the brackets *a'*, constitute the track-supporting structure. The said parts a^6 and a^7 can conveniently be made from the rough timbers which are usually available along the line of the road. The said uprights a^7 are simply piles driven into the ground, and the cross-ties a^6 may be of the same material, and are made fast to the tops of the piles a^7 by pins a^9 or other suitable means. The said parts a^6 and a^7 must, of course, be prop-

erly proportioned and spaced apart for the required height and width of roadway, so as to afford the necessary clearance between the uprights a^7, crosswise of the track, and below the overhead cross-ties a^6, for the two depending tracks, together with the trucks and the load designed to be suspended therefrom.

The tracks and their supporting structure are built with complete curves or loops at the opposite ends of the roadway, for permitting the trucks to make the complete circuit. The loop at the head or loading end of the road is shown in Figs. 1 and 2, and the loop for the delivery end of the road is shown in Figs. 3 and 4 of the drawings. At these loops the cross-ties a^6 are shown as set in diagonal positions and crossing each other at their centers coincident with the center of the loop-circle. The loop-piling at the delivery end of the road is shown in Figs. 3 and 4 as reinforced by suitable braces a^{10}. At the head or loading end of the road a short pile a^{11} is shown located to one side of the loop, for a purpose which will later appear.

By the means so far described it is obvious that an elevated double-track railway is afforded wherein the two tracks depend from overhead supports, with the necessary clearance below the same for the work required.

A traveling cable b, suitably mounted and driven, makes a complete circuit of the said double-track railway. The said cable b is shown as guided at the opposite ends of the road by horizontal sheaves b' b^2, supported from the track-supporting structure at the loops. The sheave b' at the delivery end of the road is shown as supported by a king-bolt b^3, passing through the cross-ties a^6 at their centers or crossing-point, a bearing-plate b^4, fixed to said cross-ties, and the cross member a^{12} of a set of horizontal braces a^{12} and a^{13}, used to reinforce the cross-ties a^6 and rigidly secure all the said parts together. A long bearing is therefore afforded for the king-bolt b^3, which carries the sheave b'. The sheaves b^2 at the head of the road are shown as supported by suitable hangers b^5, depending from the cross-ties a^6 at the loop.

The cable is driven from a suitable plant, which may be located at any convenient point along the line of the road, but is preferably located at the head or loading end of the road, in order to permit the power therefrom to be also used for dragging the logs into the loading-station. Such a plant for driving the cable, &c., is indicated at the extreme left in Fig. 2 of the drawings. For the purposes of this case it is not deemed necessary to go minutely into the details of this cable-driving plant. It is sufficient to note that c represents the framework; c', some of the parts of the engine; c^2, the main shaft driven from said engine; c^3 c^4, the driving connections from said shaft c^2 to the drums c^5 around which the cable travels. The cable is guided to and from the said drums c^5 by sheaves b^6, supported from the low pile a^{11} at one side of the road-bed, as shown in Figs. 1 and 2. On the same framework c is mounted a vertical windlass or drum c^6, which is adapted to receive motion from the main shaft c^2 through driving connections c^7 c^8. On the said vertical drum or windlass c^6 is mounted a suitable cable, chain, or other flexible connection for dragging the logs into the loading-station. The position of this cable for dragging in the logs is partly shown in dotted lines at c^9. The said cable c^9 would pass from the windlass c^6 to a suitable snatch-block (not shown) located in advance of the loading-platform f', and thence the cable would pass outward over the top of the platform f', through the head end of the receiving-station, and thence into the woods to the point from which it was desired to snatch in the log. It will be convenient to distinguish this cable c^9 as the "snatch-cable," inasmuch as it is used to snatch the logs into the loading-station and onto the platform ff'. A log k is shown as having been thus drawn onto the said platform in Fig. 1 of the drawings. The said platform f f' is of skeleton form, composed, as shown, of the side pieces f and the cross-pieces f', which cross-pieces are so arranged as to bear against the uprights or piles a^7, so as to afford a suitable base of resistance against the endwise movement of the platform when the log is being drawn onto the same. The said platform ff' is provided with suitable transverse rollers f^2 for receiving and holding the log. The platform ff' is carried by hand-screws f^3, which work through nuts f^4, fixed to the side bars f of the platform at the corners thereof, and work with their lower ends resting in stepped bearing-plates f^5, fixed to mudsills f^6. In virtue of this construction the platform ff' may be raised or lowered at will by manipulating the hand-screws f^3. The platform ff' should be at the proper level for conveniently receiving the logs when drawn in by the snatch-cable c^9. To this end the ground f^7 should be somewhat lower directly under the platform ff' than it is at the head of the receiving-station. Skid-logs f^8 are also located on the higher ground at the head of the platform for coöperation with the raised ground to afford a suitable approach to the platform in snatching in the logs. The further actions of the platform f f' may be most conveniently noted after describing the trucks and the load-suspending devices which are used in transporting the logs.

In respect to the railway-cable b it should be further noted that for the portion of its travel intermediate the loops at the opposite ends of the railway the said cable may either be assumed to travel on the ground or to be guided by suitable sheaves (not shown) supported in any suitable way from the track-supporting structure.

On the elevated tracks hitherto described are mounted suitable trucks, which are movable by the traveling cable. For the trans-

portation of logs I employ two trucks, which are substantially of the same construction, but differ in a minor particular, which will be hereinafter noted. The said trucks are each provided with four flanged wheels g, with the two members on the same side traversing one of the rails a of the track. The said truck-wheels g are mounted on stub-axles g', fixed to and projecting inward from the four upper corners of the side frames g^2 of the truck. The said side frames g^2 are of inverted-U shape, and the lower ends of their legs embrace a hollow body portion g^3 of the truck-frame and are rigidly connected thereto by nutted bolts g^4, as best shown in Figs. 7 and 8. With this construction and mounting of the truck the wheels g traverse the rails a with central clearance for passing the brackets a'. The side frames g^2 embrace the track, and the body portion g^3 of the truck-frame is supported by said side frames g^2 directly below the track. The said parts g^2 and g^3 and the stub-axles g' are so proportioned as to afford the requisite clearance between the track and the truck-frame. The said trucks are provided with suitable grips for coöperation with the cable b. The grip-jaws g^5 are loosely threaded on shouldered and nutted stud-bolts g^6, fixed to the inner wall of the truck-body g^3. Springs g^7 encircle the said stud-bolts between the said jaws g^5 and tend to spread the said jaws apart from each other. The inner member of said jaws g^5 is carried on the end of a screw-shaft g^8, which is seated in suitable bearings g^9 in the walls of the truck-body g^3 and has screw-threaded engagement with a nut-block g^{10}, which is loosely seated within the truck-body g^3 and is prevented from endwise movement lengthwise of the screw-shaft by the bearing-bosses g^9. At its outer end the said screw-shaft g^8 is provided with a pinion g^{11}. This pinion g^{11} serves as a means for operating the screw-shaft g^8 either by hand or by a suitable releasing-rack g^{12}, fixed in the line of travel for coöperation with said pinion, as will hereinafter more fully appear.

It is obvious that by the coöperation of the springs g^7 and the screw-shaft g^8 the movable member of the jaws g^5 may be moved toward or from the outer or relatively-fixed member thereof for causing the said jaws g^5 to grasp or release the cable b by the clamping action. The said jaws g^5 are notched on their inner or opposing faces at the proper point for grasping the cable, so as to afford a better bite thereon. By the grip thus described each truck may be connected with or disconnected from the cable at the will of the operator, and the release from the cable is also effected automatically at the proper point, after dropping the logs, under the coöperation of the pinion g^{11} and the fixed rack g^{12}, in the line of travel, as will hereinafter more fully appear. Another screw-shaft g^{13} is also mounted in suitable bearings g^{14} of the truck-body g^3, with its screw-threaded portion working in a nut-block g^{10}, loosely seated in said truck-body g^3 and prevented from endwise displacement lengthwise of the screw-shaft by the bearing-bosses g^{14}. The inner end of said screw-shaft g^{13} works outward against a wrought-iron keeper g^{15}, which is bolted fast to the wall of the truck-body g^3, as best shown in Fig. 8. The outer end of said screw-shaft g^{13} is provided with a pinion g^{16} for operating the said screw-shaft g^{13}, either by hand or by the coöperation with said pinion of releasing-racks g^{17} or g^{18} for the said screw-shaft of the rear truck and g^{19} for the corresponding shaft of the forward truck, as will hereinafter more fully appear. The projecting end of said screw-shaft g^{13} is adapted to engage with the end ring or link of a chain g^{20} or other flexible connection, which is adapted to embrace the log and be secured to the truck-body g^3 at its opposite end portion by means of a hook g^{21}, engaging with one of the links of the chain, as best shown in Figs. 5 and 9. These chains or other flexible connections g^{20} are used for suspending the log or other load from the truck, one of said chains being used on each of the said trucks, with the two trucks properly spaced apart to bring the chains in proper position for supporting the opposite ends of the log, as best shown in Fig. 1. When the projecting end of the screw-shaft g^{13} has been passed through the end ring of the chain g^{20} and jammed up against the keeper g^{15}, as shown in Figs. 8 and 9, it is obvious that the ring end of the chain cannot escape from the said shaft or holder, and it is equally obvious that by operating said screw-shaft so as to retract the same away from the keeper g^{15} the end ring of the chain will be released from said screw-shaft or holder g^{13} with a positive action.

The grip-operating screw-shafts g^8 on the two trucks are of the same length, and when in their gripping positions the pinions g^{11} thereon stand closer to the truck-body g^3 than the pinions g^{16} of the chain-holding screw-shafts g^{13}. The said chain-holding screw-shafts g^{13} on the two trucks differ from each other in length, the member on the forward truck being shorter than the member on the rear truck, so as to bring the pinions g^{16} of the two trucks into staggered relation in respect to each other. This is the minor and only difference between the two trucks. The rack g^{17} normally coöperates with the pinion g^{16} on the chain-holder of the rear truck, and the rack g^{19} coöperates with the pinion g^{16} on the shorter chain-holder of the forward truck. The said racks g^{17} and g^{19} and the rack g^{12} for releasing the grip are all mounted on the under side of suitable planks or timbers g^{22}, which are fixed by angle-iron brackets g^{23} or otherwise to the cross-ties a^6 of the track-supporting structure, parallel with and adjacent to the track, at the delivery end of the road, as best shown in Figs. 3, 4, 10, 11, and 12.

The rack g^{18} is fixed to the under surface of a plank or timber g^{24}, which is supported

by angle-iron brackets g^{25}, pivoted to the cross-ties a^6 adjacent to but up the track in respect to the timber or plank g^{22}. The said pivoted plank g^{24}, together with its rack g^{18}, is normally turned and held outward in an idle position, as shown in Figs. 4, 10, and 11, but may be swung into line with the plank g^{22}, as shown in Fig. 12, for bringing the rack g^{18} into operative position for action on the pinion g^{16} of the chain-holder on the rear truck whenever it is desired to effect the release of the rear chain at an earlier time than could be done by the rack g^{17}. Otherwise stated, the racks g^{17} and g^{19} coöperate with the chain-holders of the two trucks for effecting the release of comparatively short logs, and the racks g^{18} and g^{19} coöperate with said chain-holders of the two trucks to effect the release of long logs. The said trucks are equipped with brakes consisting of hand-screws g^{26}, with brake-shoes g^{27}. The screws g^{26} are vertically disposed in suitable bearings of the truck-body g^3, with the screw-threaded portions thereof working through a suitable nut-block g^{10}, similar to the other nut-blocks hitherto described, which is prevented from endwise movement lengthwise of the screw-shaft by the bearing-bosses between which it is located. The brake-shoes g^{27} are adapted to be brought into contact with the under surface of the track-rails a under the action of the hand-screw g^{26}. By the use of these brakes the trucks may be positively stopped and locked to the track in any desired position after the release from the cable. The body-casting g^3 of the truck-frame is open at one or both ends for the insertion of the several nut-blocks g^{10} and affording access to the other parts located within the interior of the same.

The pivoted parts g^{24} g^{25}, which carry the rack g^{18}, are shown in Fig. 5 as provided with controlling connections for holding the same either in the idle or the operative position of said rack. These connections, as shown, comprise a link g^{28}, connecting one of the pivoted brackets g^{25} with a hand-lever g^{29}, shown as pivoted to one of the cross-ties a^6 and securable in either of two positions to a locking-plate g^{30}, fixed to the adjacent upright a^7.

All the parts of my mechanism have now been specified, and more or less of the action has been stated. The general operation may, however, be briefly summarized.

Directing attention first to Figs. 1 and 2, or the loading-station at the head of the road, let it be assumed that a log k is on the loading-platform f f'. The trucks are then brought to loading position and are accurately spaced apart to the exact distance required for the proper action of the releasing-racks g^{17} and g^{19} or g^{18} and g^{19} at the delivery end of the road by the use of a suitable gage-plank or other device, and the trucks are then locked to the track by the brakes. The platform ff' is then raised, so as to bring the log to the desired level with respect to the trucks, by manipulating the hand-screws f^3. The ring end of the chain g^{20} is then secured to the truck by bringing the chain-holder screw-shaft g^{13} into the position shown in Figs. 8 and 9. The loose end of the chain is then passed around the log and one of the links thereof is engaged over the hook g^{21}. When both chains have been thus applied, the platform ff' is lowered, thereby leaving the log suspended from the two trucks by the two chains g^{20}. The brakes are then released. The cable-grips are then operated simultaneously on the two trucks, so as to connect both of the trucks to the traveling cable b at the proper distances apart. The said trucks and the log or other load will be then moved with the cable to the delivery or discharging station. (Shown in Figs. 3, 4, 10, 11, and 12.) On reaching the proper point to drop the log or other load the pinions g^{16} of the chain-holders will engage simultaneously with the releasing-racks g^{17} and g^{19} or g^{18} and g^{19}, as the case may be, and under the action of said racks the chain-holder shaft g^{13} will be screwed outward, so as to drop or release the ring ends of the two chains, thereby dropping the log or other load simultaneously at both ends. As shown, the logs are assumed to be delivered or dropped into the water p of the bay or other body of water assumed to be at the delivery end of the road. Figs. 10 and 11, which are bottom or underneath plan views, illustrate the actions, just above noted, for releasing the chains and dropping the log. In Fig. 10 the trucks are shown as just approaching the releasing-racks which act on the chain-holders. In Fig. 11 the said trucks are shown as just leaving or passing beyond the said releasing-racks for the chain-holders. On comparing these two views it will be seen that the chain-holder screw-shafts g^{13} are in line with their proper respective releasing-racks g^{17} and g^{19} in Fig. 10, but that in Fig. 11 the said shafts appear as screwed outward beyond the said releasing-racks sufficiently far to have withdrawn the chain-holding ends of said screw-shafts from the ring ends of the chains, as hitherto noted. Under the continued movement of the trucks the pinions g^{11} of the grip-operating screws will come in succession into engagement with the grip-releasing rack g^{12}, thereby setting the two trucks free from the cable in succession. The operator at the unloading-station will then push the trucks around the loop and reëngage the grips with the cable for permitting the same to be returned by the cable to the loading or starting station at the head of the roadway.

When long logs are being hauled, the pivoted rack-support g^{24} will be swung from its idle position, as shown in Figs. 10 and 11, into its operative position, as shown in Fig. 12. The rack g^{18} will then act as the substitute for the rack g^{17}, so as to coöperate with the rack g^{19} at the proper time for releasing the two chains simultaneously, and thereby dropping the load. The two trucks are shown

as thus spaced apart for long logs and as approaching the releasing-racks g^{18} and g^{19} for releasing the chains and dropping the log in Fig. 12 of the drawings. On reaching the loop at the head of the roadway or loading-station the said trucks are again released from the cable and pushed around the loop by the operator at that point. The trucks are thus pushed around the loops at the end of the roadway because the cable is not extended around the said loops in proper position to pull the trucks when moving thereon.

The loading-station at the head of the roadway has been shown and described as if located for loading from the ground; but wherever a lake or a pond is available at the head of the road it would be preferable to extend the railway into the water, with the track at the proper level for loading directly from the water. In that event it would be possible to dispense with the loading-platform. The logs could be readily floated into loading position and the operators could pass the chains around the same while still floating in the water. Such a lake or pond would be a convenient place for the accumulation and storage of the logs which were to be subsequently transported over the roadway. On the Pacific coast, for example, such a lake or pond would be sought far up into the interior of the woods, and the delivery-station would be at some point in tide-water convenient for shipment or rafting.

It must be obvious that a road constructed as above described is of comparatively small cost, as compared with the ordinary surface railways, and that the logs can be handled thereby with great rapidity, convenience, and economy.

It is also obvious that the railway or transportation system above described can be utilized for the transportation of any other kind of articles besides logs and with the addition of a suitable car could be utilized for the transportation of persons. The system would be well adapted, for example, as a cheap means for the transportation of ores from the mines to the docks or cars.

It will be understood, of course, that many of the minor features of the construction might be changed without departing from the spirit of my invention. The chain shown for suspending the log might, for example, be substituted by any other flexible connection adapted to do the same work.

It should have been noted that a releasing-rack r for the cable-grip is also employed at the loading-station. This rack r is fixed to the under side of a plank r', connected by angle-iron brackets r^2 to the cross-ties a^6 at the loading-station, as shown in Fig. 2. The said rack is in proper position for coöperation with the pinion g^{11} on the grip-operating shaft g^8 when the trucks reach a point at the loading-station where they should be released from the cable. The operation in this respect is the same as by the rack g^{12} at the unloading-station.

It will of course be understood that instead of a single log, as shown, several logs might be bound together by the chains g^{20} or other flexible connections and be suspended thereby from the trucks. Otherwise stated, the mechanism is adapted to carry a load made up of several pieces as well as a load composed of a single piece. When handling small logs, several thereof would be carried at a time.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a truck and chain, of a chain holding and releasing device comprising a keeper or abutment, a hook, and a removable detent, all mounted on said support and so arranged that said detent may be moved through an end link of the chain, and that any desired link of the opposite end of said chain may be engaged over said hook, substantially as described.

2. The combination with a truck of a holding and releasing device comprising a keeper, a screw-shaft and a hook, on said truck, with said parts so arranged that the end of said shaft may be moved through an end link of the chain and that any desired link of the opposite end of said chain may be engaged over said hook, substantially as and for the purposes set forth.

3. The combination with the trucks and the chain-holder screw-shafts having pinions thereon, of the releasing-racks in the line of travel engageable with said pinions, for automatically releasing the load, substantially as described.

4. The combination with the pair of trucks having the chain-holder screw-shafts provided with pinions, staggered in respect to each other, of the pair of releasing-racks in the line of travel, staggered in respect to each other, for coöperation with said pinions, substantially as described.

5. The combination with the trucks, of the chain-holding screw-shafts thereon, provided with pinions, and the pair of releasing-racks for coöperation with the holder of the rear truck, one of which racks is laterally movable in respect to the other for adaptation to logs of different lengths, substantially as described.

6. The combination with the track, the trucks and the traveling cable, of the grip mechanism comprising the jaws g^5 loosely threaded on the studs g^6, the springs g^7, tending to throw said jaws apart, and a power device for positively forcing said jaws together, substantially as described.

7. The combination with the track, the trucks and the traveling cable, of the grip mechanism comprising the jaws g^5 loosely threaded on the studs g^6, the springs g^7, the screw-shaft g^8 carrying the inner member of said jaws, the pinions g^{11} on said shafts g^8,

and the releasing-rack g^{12}, in the line of travel, engageable with said pinions to release the grips from the cable, substantially as described.

8. The combination with the elevated track, the trucks and the traveling cable, of the loading-platform and the hand-screws for raising and lowering said platform, substantially as and for the purposes set forth.

9. The track structure, comprising the upright a^7, the cross-ties a^6 made fast to said uprights, the brackets a', secured to said cross-ties at their upper ends and spread at their lower ends, the rails a made fast to the outer sides of the lower ends of said brackets, and the filling rail or pieces a^2 secured between the spread lower ends of said brackets, substantially as described.

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

WALLACE GROSVENOR.

Witnesses:
H. G. SCOTT,
S. A. MOORE.