Feb. 27, 1968 M. W. SHANNON 3,370,551

RAILROAD-HIGHWAY TRANSPORT APPARATUS AND METHOD

Filed May 12, 1966 4 Sheets-Sheet 1

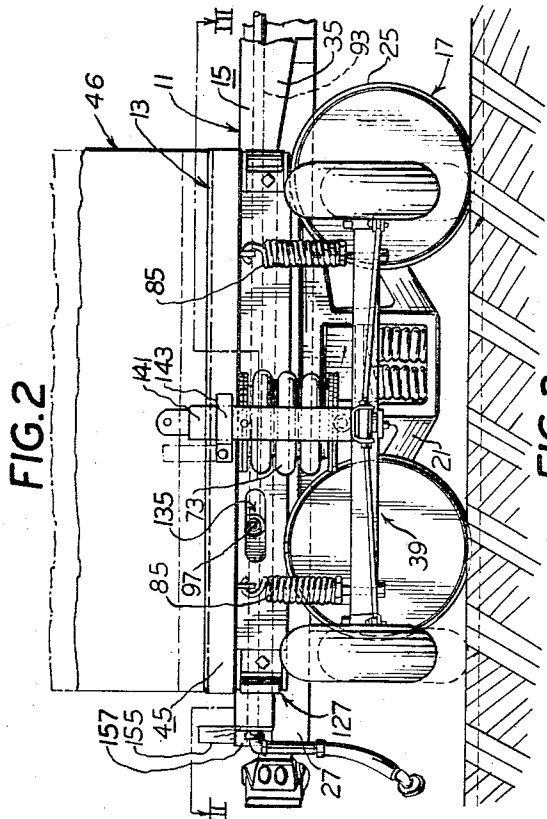


FIG. 2

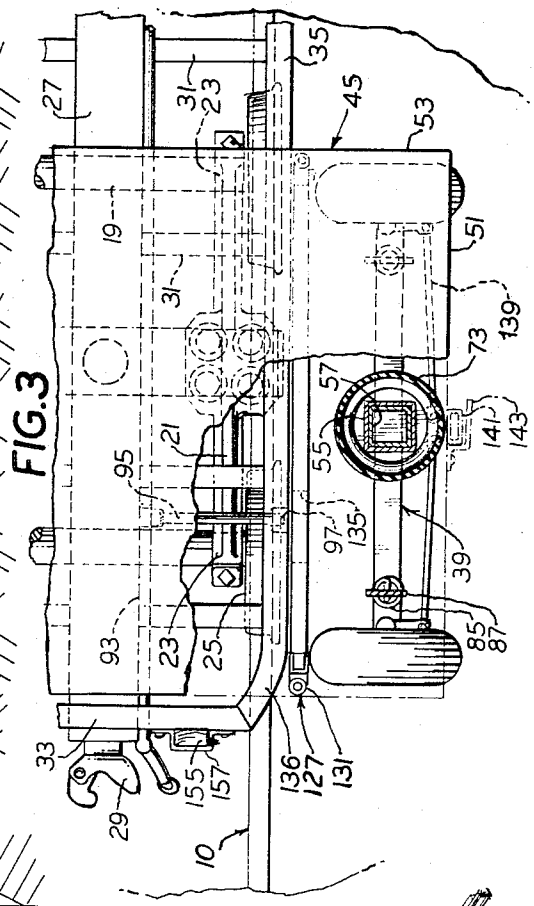


FIG. 3

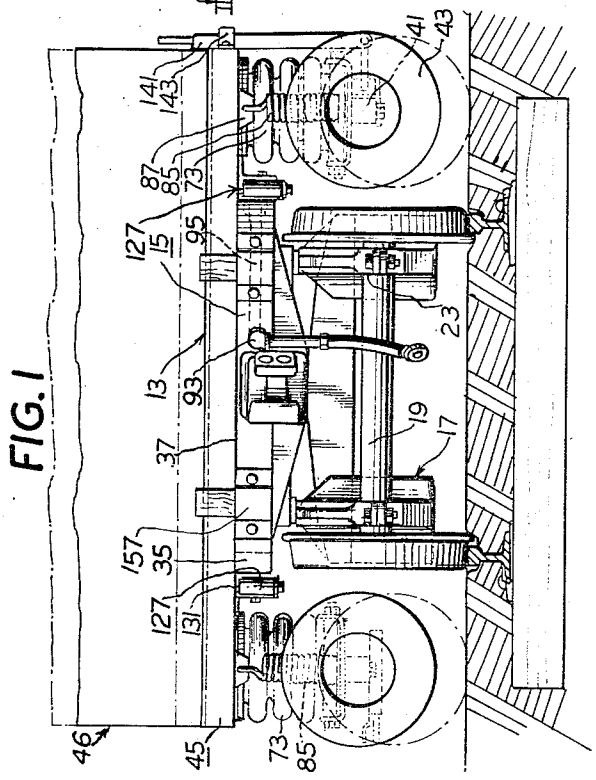


FIG. 1

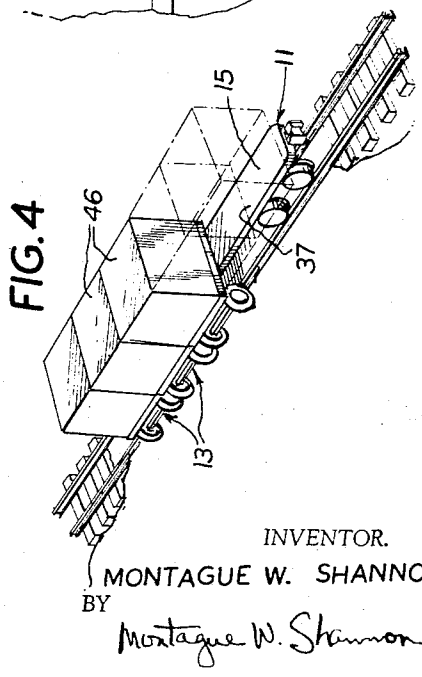


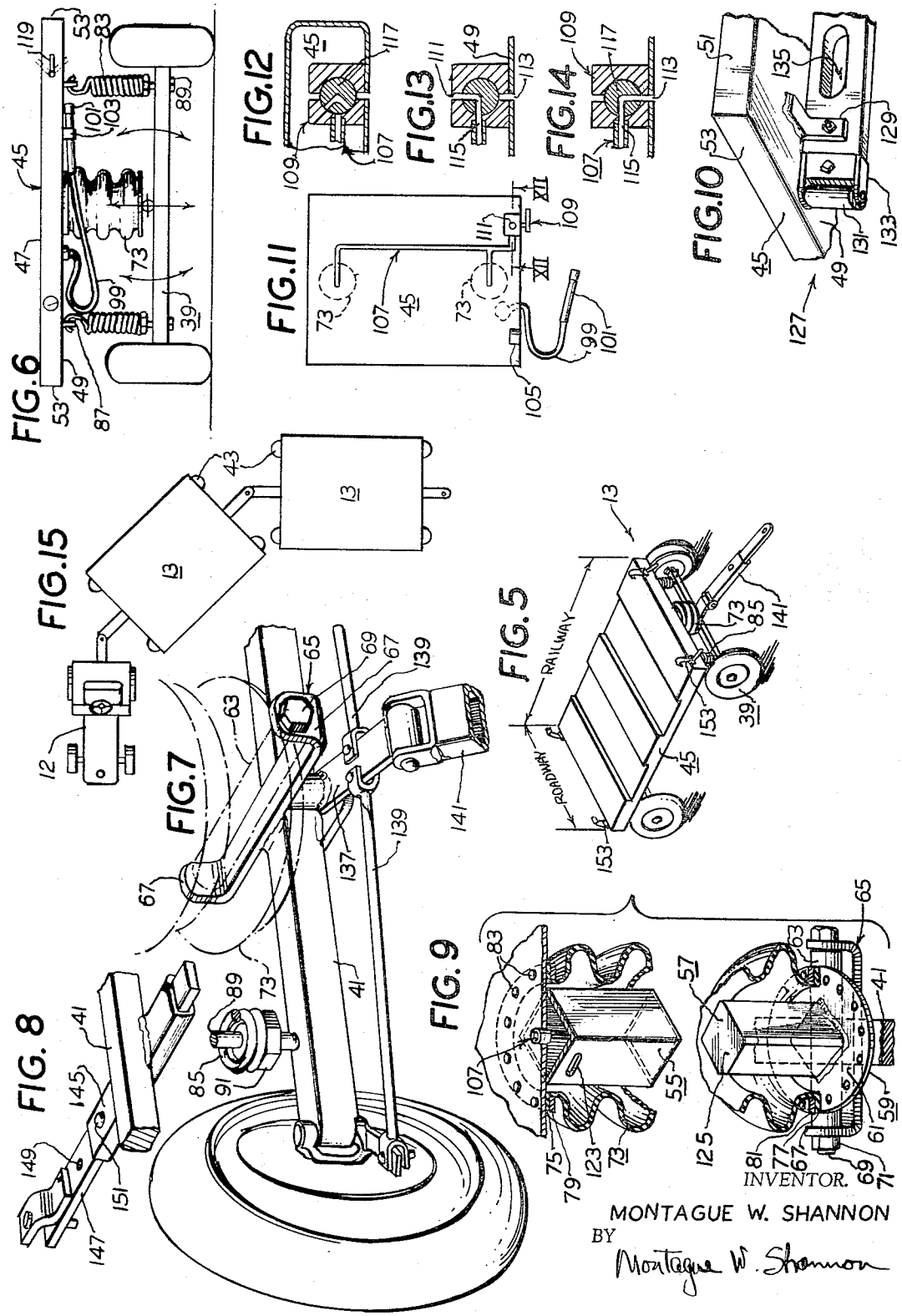
FIG. 4

INVENTOR.
MONTAGUE W. SHANNON
BY
Montague W. Shannon

Feb. 27, 1968 M. W. SHANNON 3,370,551

RAILROAD-HIGHWAY TRANSPORT APPARATUS AND METHOD

Filed May 12, 1966 4 Sheets-Sheet 2



INVENTOR.
MONTAGUE W. SHANNON
BY
Montague W. Shannon

Feb. 27, 1968 M. W. SHANNON 3,370,551

RAILROAD-HIGHWAY TRANSPORT APPARATUS AND METHOD

Filed May 12, 1966 4 Sheets-Sheet 3

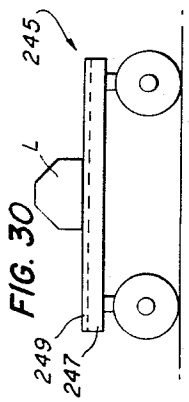


FIG. 30

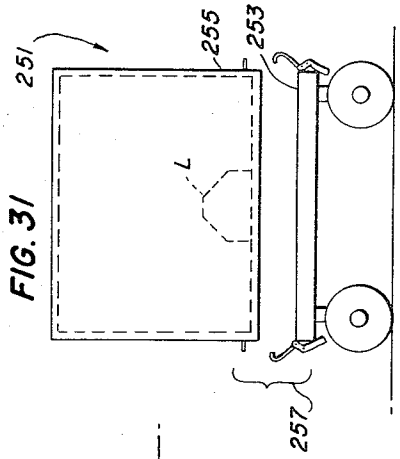


FIG. 31

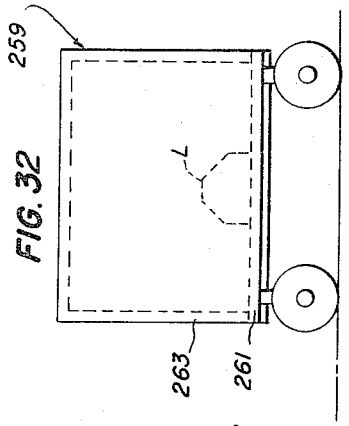


FIG. 32

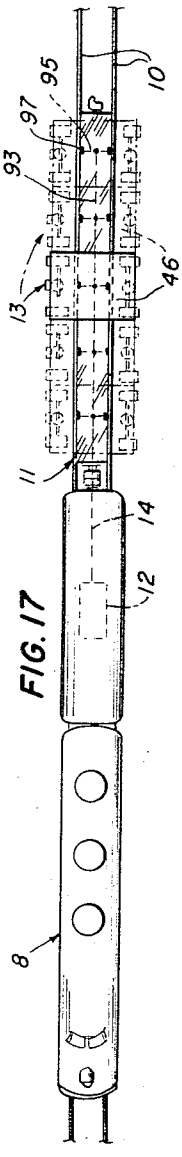


FIG. 17

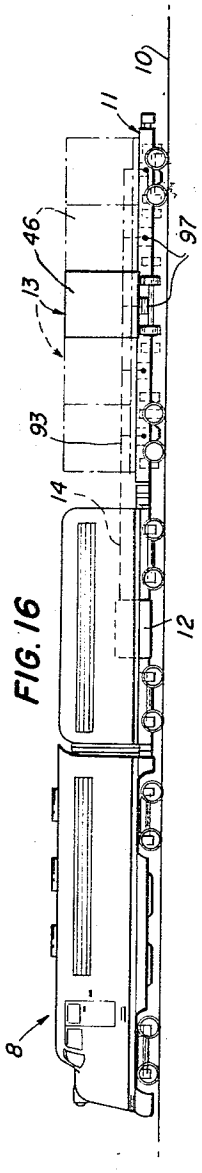


FIG. 16

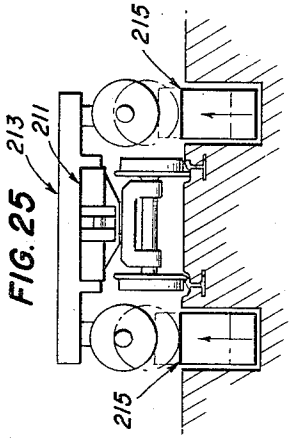


FIG. 25

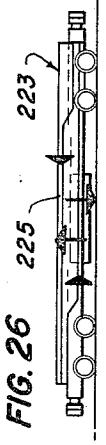


FIG. 26

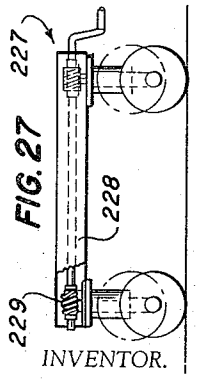


FIG. 27

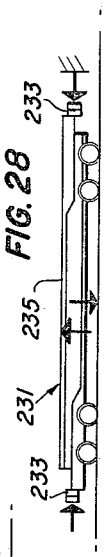


FIG. 28

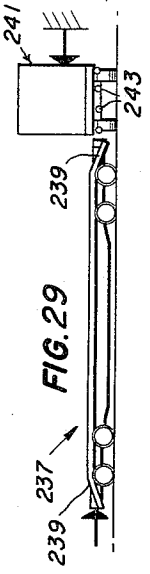


FIG. 29

INVENTOR.

MONTAGUE W. SHANNON

Feb. 27, 1968 M. W. SHANNON 3,370,551

RAILROAD-HIGHWAY TRANSPORT APPARATUS AND METHOD

Filed May 12, 1966 4 Sheets-Sheet 4

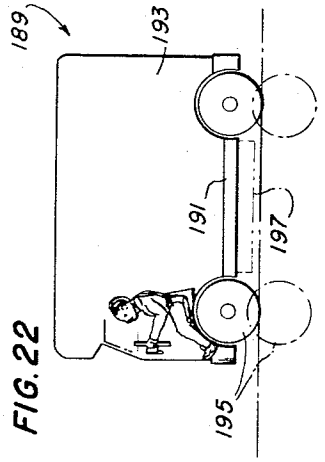


FIG. 22

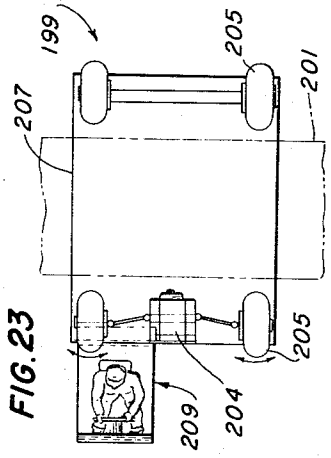


FIG. 23

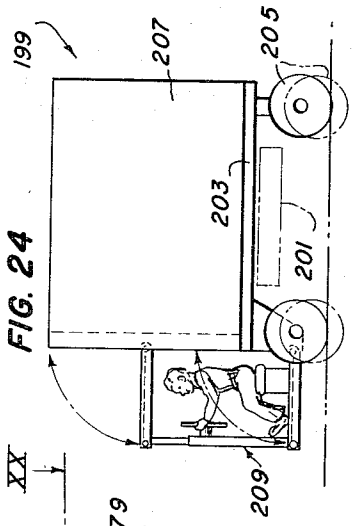


FIG. 24

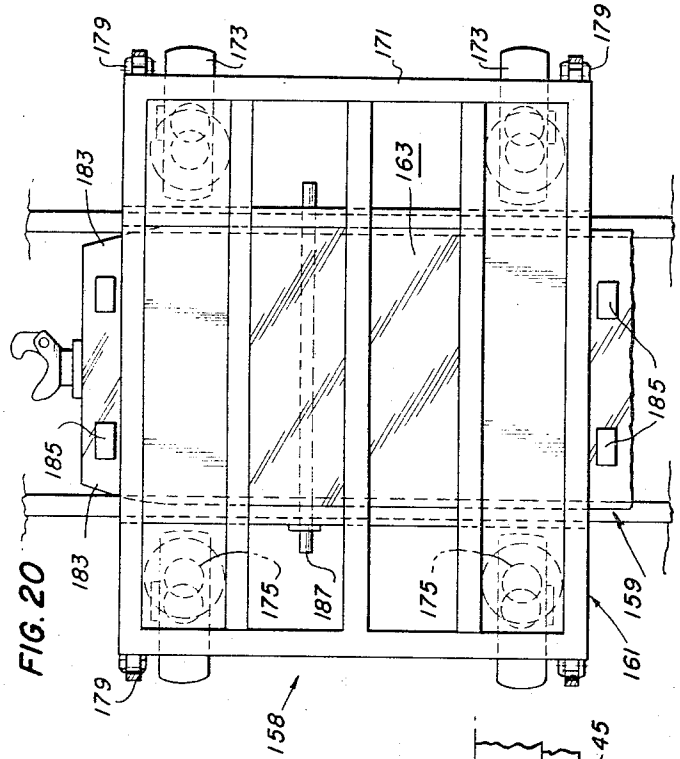


FIG. 20

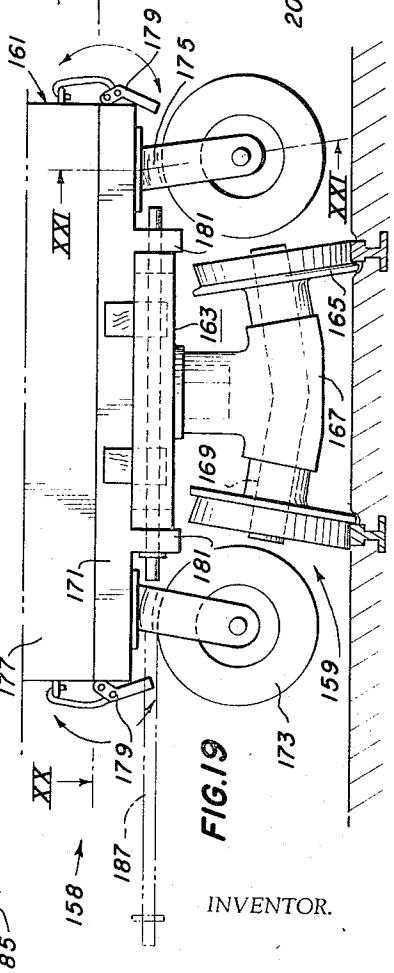


FIG. 19

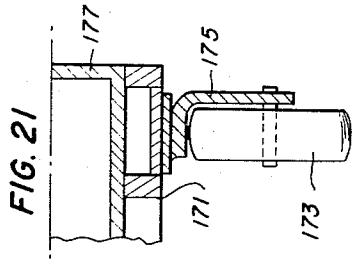


FIG. 21

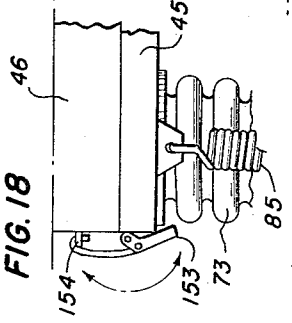


FIG. 18

INVENTOR.

MONTAGUE W. SHANNON

United States Patent Office 3,370,551 Patented Feb. 27, 1968

3,370,551

RAILROAD-HIGHWAY TRANSPORT APPARATUS AND METHOD

Montague W. Shannon, 1461 Tutwiler Ave., Memphis, Tenn. 38107

Continuation-in-part of application Ser. No. 373,342, June 8, 1964. This application May 12, 1966, Ser. No. 554,274

6 Claims. (Cl. 105—368)

ABSTRACT OF THE DISCLOSURE

Materials or freight handling means basically including a narrow low railcar and a load-receivable road-runable carrier unit having front and rear wheels. The carrier unit being adapted to be loaded or transportably position crosswise astraddle the railcar by running the carrier unit on the road surface to a halted position crosswise astraddle the rail track, and then, in coordination with running the railcar between the wheels and underneath the road-supported carrier unit, to lift and transportably position the carrier unit surmountably crosswise astraddle the railcar with the front and rear wheels of the carrier unit being idly suspended on opposite sides of the railcar.

This in a continuation-in-part of application Ser. No. 373,342, filed June 8, 1964. The invention relates to materials or freight handling and to railroad-highway or railway-roadway apparatus adapted for transporting a load of material over rail or road.

The general object of the present invention is to provide means whereby the various transportation agencies, and particularly railway and roadway freight carriers, can standardize and coordinate certain of their services so as to improve service, cut shipping costs and reduce shipment handling.

A further object is to provide a railway car and a plurality of wheeled carrier units, and with each carrier unit being adapted to receive a load of material and selectively, to be moved along on the ground or road surface for road travel or to be crosswise straddle-mounted on the railway car for rail travel.

A further object is to provide a carrier unit having transverse and longitudinal dimensions substantially commensurate respectively with the maximum legal roadway vehicle width and the maximum legal railway vehicle width in a certain locality, and a carrier unit adapted to move longitudinally in roadway travel or to move transversely while supported on the rail car in rail travel.

A further object is to provide means whereby the road travel-rail travel transference of a load of material is accomplished by only a few simple direct movements of the rail car and carrier unit.

A further object is to provide road-rail transfer means whereby the rail car and wheeled carrier unit each remain substantially in the same embodiment or configuration during a road-rail transfer of a carrier unit and are not disassembled or fitted with other auxiliary parts or components to effect a transfer.

A further object is to provide road-rail transfer means whereby a wheeled carrier unit can approach or depart from a rail car track equally as readily from either side of the track in effecting a road-rail carrier unit transfer.

A further object is to provide coactingly operative centering means on each carrier unit and on the rail car to facilitate the ready transference of each carrier unit away from the ground and onto the rail car, and for ready transistion of each carrier unit from road travel to rail travel.

A further object is to provide anchoring means for releasably anchoring each carrier unit crosswise on the railway car during rail transporting of each carrier unit.

A further object is to provide means whereby the railway-roadway transference of a carrier unit can be accomplished without the use of a ground-fixed loading ramp or platform, thus providing means whereby the transference of a carrier may be accomplished in outlying localities or at any rail-road crossing or area where the rail track top surfaces and the road surface are substantially level.

A further object is to provide means whereby the transference of each carrier unit onto or away from the railway car of a train can be quickly and easily accomplished, as by trainmen, thereby eliminating substantially the unused or at rest "siding time" for such railway car and carrier unit.

A further object is to provide a carrier unit of such size as to be particularly adapted for use in handling less than carload lots of freight or material, and to lessen considerably the current practice of unloading, sorting and reloading freight at a distribution center or freight transfer house, and to eliminate substantially the practice of picking up and delivering goods to and from these shipping points.

A further object is to provide door-to-door rail service for "off-track" shippers.

A further object is to provide a four-wheel or four-point-contact trailer type carrier unit adapted to be towed by a tractor vehicle on the ground or road surface.

A further object is to provide a plurality of trailer-type carrier units adapted to be connected together in tandem arrangement and pulled along the road surface for road travel, or to be crosswise straddle mounted side-by-side on the railway car for rail travel.

A further object is to provide a four-wheel or four-point-contact self-propelled type carrier unit having an engine and control means for automotive travel on the ground or road surface.

A further object is to provide means for transferring each carrier unit to and from road travel and rail travel, and including lifting means for bodily raising or lowering each carrier unit away from or onto the road surface and for selectively transportably positioning each carrier unit on or removing each carrier unit from the railway car.

A further object is to provide lifting means including stationary ground based jack means arranged adjacent and on opposite sides of the railway car track for use in transferring a carrier unit to and from road and rail travel.

A further object is to provide lifting means including jack means substantially fully embodied in the railway car structure for use in transferring each carrier unit to and from road and rail travel.

A further object is to provide lifting means including jack means substantially fully embodied in the structure of each carrier unit for use in transferring each unit to and from rail and road travel.

A further object is to provide lifting means including compressed air supply means carried in the railway car and locomotive-train and compressed air actuated jack means carried in each carrier unit for use in transferring each unit to and from rail and road travel.

A further object is to provide inclined plane lifting means including inclined surface jack means arranged respectively on the opposite end portions of the rail car, and utilizing the motive power of the rail locomotive and travel of the rail car along the track for directly engaging and transferring a carrier unit to and from road and rail travel.

A further object is to provide a roadway runable carrier

unit of such size and maneuverability as to be easily loaded or unloaded with material in a close area and to be useful for pick-up and delivery services such as Railway Express Agency work or the like.

A further object is to provide a means for transporting a road runable carrier unit by rail which substantially eliminates wasted cargo space and reduces considerably the dead weight transported.

A further object is to provide a method of transporting a load of material which includes: (1) putting the load of material on a road runable wheeled carrier unit; (2) directing the carrier unit on the road surface and to a halted position crosswise over a rail track; (3) moving a railway car on the rail track and to a halted position underneath the carrier unit; (4) surmountably positioning the carrier unit crosswise over the railway car with the wheels of the carrier unit being clear of the road surface and with the major axes of the car and carrier unit being mutually perpendicular; (5) transporting the carrier unit loaded railway car over rail to a selected spot; and then (6) carrying out the above-described first four steps substantially in a converse manner and finally depositing the load of material at a selected place.

A further object is generally to provide versatile or flexible means for handling materials and such means applicable for coordinating somewhat the various agencies of materials transporting.

In the drawings:

FIGS. 1–18 illustrate a principal embodiment of the invention incorporating a railway car and a plurality of wheeled carrier units, and with each carrier unit being a trailer type unit and further with each unit being of a type including a separable load shell for containing a load of material.

FIG. 1 illustrates a carrier unit crosswise supported on the railway car, and with the lower portion only of the carrier unit load containing shell being shown.

FIG. 2 is a partial side view of the railway car and a front view of the carrier unit, taken as from the right of FIG. 1.

FIG. 3 is a plan view taken as on the line III—III of FIG. 2 showing an end portion of the railway car and a forward portion of the carrier unit.

FIG. 4 is a perspective view of three carrier units arranged for transportation on a five-carrier-capacity railway car.

FIG. 5 is a perspective view of a carrier unit with the load containing shell removed, and illustrating the dimensions of the carrier unit with respect to railway or roadway travel.

FIG. 6 is a schematically illustrated end view of a carrier unit with the load shell removed.

FIG. 7 is a fragmentary perspective view of the steering components of a carrier unit.

FIG. 8 is a fragmentary perspective view of the rear hitch means of a carrier unit.

FIG. 9 is a sectionalized exploded view of the front or rear pneumatic jack means of a carrier unit.

FIG. 10 is a fragmentary perspective view of the underside of a carrier unit with the load containing shell removed.

FIG. 11 is a schematic plan view of the pneumatic jack means of a carrier unit.

FIG. 12 is an enlarged sectional view taken as on the line XII—XII of FIG. 11 and illustrating the air control valve of the carrier unit jack means in the "hold" or "neutral" position.

FIG. 13 illustrates the control valve in the "raise" position.

FIG. 14 illustrates the control valve in the "lower" position.

FIG. 15 is a plan view of two carrier units tandemly attached to a towing vehicle.

FIG. 16 is a side elevational view of the principal embodiment of the invention illustrating the railway car supporting five carrier units (one carrier unit being shown in full lines), and with the railway car being coupled to a locomotive, and further, with the preferred pneumatically operative carrier unit lifting means being shown.

FIG. 17 is a top plan view of FIG. 16.

FIG. 18 is a fragmentary elevational view showing the binding means of a carrier unit.

FIG. 19 illustrates another embodiment of the invention including a railway car having truck wheels journaled on inclined axles, and a non-steerable carrier unit.

FIG. 20 is a horizontal plane sectional view taken as on the line XX—XX of FIG. 19, and illustrating the railway car without the rail wheels, for clarity.

FIG. 21 is a sectional view taken as on the line XXI—XXI of FIG. 19.

FIGS. 22–24 illustrate other embodiments of the invention incorporating respectively a self-propelled type carrier unit.

FIGS. 25–29 schematically illustrate respectively variant forms of lifting means for use in positioning each carrier unit on or for removing each carrier unit away from the railway car.

FIGS. 30–32 schematically illustrate three basic configurations of a carrier unit.

The principal embodiment of the invention (FIGS. 1–18) preferably includes a railway locomotive **8** supported on track rails **10**, a railway car **11**, a road runable tow tractor **12** and a plurality of wheeled carrier units **13**. Railway locomotive **8** includes compressed air generating apparatus **12** and an air supply line **14** connectable to rail car **11** (see FIGS. 16, 17); the means for lifting the plurality of carrier units from the ground and for surmountably positioning each carrier unit on the railway car preferably includes the pneumatic means of the locomotive.

Railway car **11** is preferably constructed as low and as narrow as is feasible with respect to the existing standard track width and railway car coupler height. Railway car **11** includes a long narrow frame **15** arranged substantially within the space above and between track rails **10**. A rail truck **17** supports each end of frame structure **15**. Trucks **17** each include wheel and axle assemblies **19** and a truck frame **21**. Truck frame bearings **23** are disposed respectively on the inward side of each truck wheel **25**. Frame **15** includes a center sill **27** of substantially square cross section extending longitudinally and along the major axis of railway car **11**. Railway coupler members **29** are provided on the opposite ends of frame center sill **27**. Frame **15** includes cross members **31**, end members **33**, and oppositely disposed side rail members **35**. A floor **37**, as seen in FIG. 4, preferably covers the enclosed area of frame **15**; however, a floor may not be desired in certain rail car embodiments utilizing a skeleton type frame (see FIGS. 1, 2 and 3).

The wheel means of each carrier unit preferably include front and rear wheel and axle assemblies **39**, with each assembly including an axle **41** and a pair of pneumatic-tired wheels **43**. Rear wheel and axle assembly **39** includes rear wheels **43** fixedly journaled on the opposite end portions of rear axle **41**. Front wheel and axle assembly **39** includes automotive type knuckle means at the opposite end portions of front axle **41** for providing dirigible mounting means for the front wheels.

The preferred form of each wheeled carrier unit basically includes frame means or base structure **45**, a load container or load containing shell **46**, and binding means releasably binding the load containing shell and base structure together. Base structure **45** provides the basic support structure in each carrier unit and includes an upper horizontal wall **47**, a lower horizontal wall **49**, front and rear end walls **51**, and oppositely arranged side walls **53**. Base structure **45** of each carrier unit **13** is hollow for the storage of compressed air; the preferred base structure of each wheeled carrier unit also functions as tank

means for the storage of compressed air which is utilized in lifting each carrier unit and in transferring each unit from road travel to rail travel.

Front and rear suspension means suspend front and rear wheel and axle assemblies **39** from base structure **45**. The suspension means preferably includes a vertically extending tubular member **55** fixedly attached to the underside of structure **45** and a movable member **57** telescopically received in member **55**. A circular plate **59** is concentrically fixed to the lower end portion of movable member **57** and defines an annular flange **61**. A sleeve **63** is fixedly attached diametrically to the undersurface of plate **59**. A yoke member **65** is attached transversely to the center portion of axle **41**. A pivot pin **69** extends through apertured end portions **67** of yoke member **65**, through sleeve **63**, and is secured by a nut **71**. Front and rear pneumatic jacks or bellows member **73** are concentrically arranged respectively around telescopically arranged tubular members **55**, **57**. Bellows members **73** are cylindrical air suspension type and include upper and lower flange portions **75**, **77**. A pair of apertured rings **79**, **81** seat respectively against the inward side surfaces of upper and lower flange portions **75**, **77** of bellows **73**. Threaded fasteners **83** extending respectively through apertures in base structure lower wall **49**, flange portion **61** of plate **59**, the respective upper and lower flange portions **75**, **77** of bellows **73**, and through rings **79**, **81** sealingly secure the respective bellows members to base structure **45** and to the respective wheel and axle assemblies **39**. Front and rear pairs of helical tension springs **85** provide means for retracting wheels **43** from the ground surface when the carrier is supported on railway car **11** and also provide means for laterally stabilizing the carrier unit during road travel. Each spring **85** is fixedly secured at the upper end portion to a bracket **87** attached to base structure lower wall **49**, and is adjustably secured at the lower end portion to a respective axle **41**; a bolt **89** extends through an aperture in axle **41** and is threaded in a spring plug **91** which is turnably secured in the lower coils of each spring **85**.

A main air supply line **93** extends along frame center sill **27** to railway car **11** (see FIGS. 1–3 and 16, 17). A plurality of branch lines **95** intermittently spaced along and extending transversely of rail car frame **15** are connected to air line **93**. Each branch line **95** extends laterally from main line **93** and terminates in a check valve **97** recess-mounted in respective side members **35** of the railway car. A hose assembly is provided for filling the base structure air tank means of each carrier unit. A hose **99** is connected at one end to structure **45**; the other end is provided with a coupling **101** which is adapted to removably connect with a respective one of valves **97** of the railway car. A bracket **103** is fixed to the underside of structure **45** for holding the hose assembly when it is not being used. An air gauge **105** is fitted in structure **45** for determining the amount of compressed air in the base structure tank means of each carrier unit. Conduit means **107** connect bellows members **73** to the compressed air in base structure **45**. A valve **109** regulates the passage of air to and from bellows members **73** and is adapted to be turned to a "hold," "raise," or "lower" position, as seen respectively in FIGS. 12, 13 and 14. Valve **109** includes an inlet port **111**, and outlet port **113**, a bi-directional port **115** and a ported barrel **117**. A handle **119** provides means for turning the valve to a selected position. When valve **109** is in the "raise" position, compressed air enters inlet port **111**, passes through conduit means **107**, inflates bellows members **73** and raises the base structure of the carrier unit; compressed air from conduit **107** enters the interior of front and rear support members **55**, passes through slotted apertures **123** in the support members, inflates front and rear bellows members **73** and raises the base structure of the carrier unit. A top closure member **125** sealingly closes the upper end of each tubular support member **57**. When valve **109** is in the "hold" position there is no passage of air through the valve, and the air trapped in bellows members **73** supports and cushions the base structure and load as the carrier unit is supported on the ground surface. When valve **109** is moved to the "lower" position air in bellows members **73** is released into the atmosphere and the base structure is lowered if the carrier unit is supported on the ground; or if the carrier unit is supported on rail car **11**, springs **85** move wheel and axle assemblies **39** upwardly and lift wheels **43** from the ground.

Coactingly operative centering means is provided on each carrier unit **13** and on the opposite end portions of rail car **11** for longitudinally centering each carrier unit crosswise over the rail car fame in response to movement of the rail car along the rail track. A parallel spaced pair of runner assemblies **127** are adapted to engage respectively side rail members **35** of the railway car. Runner assemblies **127** extend transversely of carrier unit **13** and are dependently attached along the bottom surface of lower wall **49** by brackets **129**. Each assembly **127** includes a pair of upstanding rollers **131** attached respectively to the opposite end portions of each runner assembly by mounting brackets **133**. Elongated horizontally extending through apertures **135** are provided respectively in runner assemblies **127** and provide access means to the railway car air supply line valves **97**; when carrier unit **13** is supported on railway car **11** a respective opening **135** aligns with a valve **97** and permits coupling **101** of the hose assembly to be engaged with the valve and to charge the base structure tank means of the carrier with compressed air. End portions **136** respectively of side rail members **35** of railway car **11** are turned inwardly (see FIGS. 3 and 4). The inwardly converging rail portions **136** are adapted to engage paired rollers **131** of each carrier unit **13** and to longitudinally center the carrier unit crosswise over the railway car.

Steering mechanism is provided at the front of each wheeled carrier unit **13** (see FIG. 7). A center link **137** is pivoted at the rearward end thereof about a vertical axis disposed forwardly of front axle **41**. A pair of tie-rod members **139** connect center link **137** to each front wheel **43** and the front wheels together. The steering mechanism includes front hitch means and such means for trailingly attaching the carrier to a towing vehicle or to another carrier unit. The hitch means includes a tongue **141** pivoted at the rearward end thereof to center link **137** and turnable about a horizontal axis. A pivotable bracket **143** is mounted on the front of each carrier unit base structure to hold tongue **141** in a vertical position when the carrier unit is being transported by rail. Rear hitch means is provided for connecting two or more carriers together: a tubular member **145** is transversely attached to rear axle **41**. A hitch bar **147** having a plurality of apertures **149** is slideably received in tubular member **145**. A pin **151** insertable in a selected one of apertures **149** adjusts the extension of hitch bar **147**.

Load containing shell **46** of each carrier unit **13** is in the form of a rectangular prism having six walls defining the load receiving interior. The horizontal dimensions of load shell **46** correspond substantially with the maximum legal roadway and railway vehicle widths, as for example a load shell having eight feet (roadway) by ten feet (railway) horizontal dimensions. Doors or closure members (not shown) provide access means into the interior of load shell **46**.

Each carrier unit **13** includes binding means removably binding shell **46** on base structure **45**; a manually operative overcenter lever type binder half **153** is mounted on each corner of base structure **45** and coacts with a fixed binder half or binder bar **154** mounted respectively on each lower corner portion of shell **46** (see FIGS. 5 and 18).

Anchoring means removably anchor the carrier units on the railway car. The anchoring means includes stakes **155** secured on rail car **11** and runner assemblies **127**

secured on each carrier unit 13. Stakes 155 removably secured in sockets 157 in rail car frame 15 secure the transversely juxtaposedly arranged plurality of carrier units against lateral displacement on the rail car frame; parallel runner assemblies 127 engage the opposite side rails 35 of the railway car and secure each carrier unit against longitudinal displacement on the rail car frame. The centering and the anchoring means of the railway car and each carrier unit are relatively operative in that, parallel spaced assemblies 127 engage rail car side rails 35 and provide a dual function in longitudinally centering each carrier unit crosswise over the rail car frame, and in anchoring each centered carrier unit against longitudinal displacement on the rail car frame.

In use, when it is desired to transfer a carrier unit 13 from roadway to railway travel, the carrier unit is pulled to a halted position crosswise over the rail track by such means as tow tractor 12, and base structure 45 is raised by the pneumatic jack means of the carrier unit. Railway car 11 is moved under carrier unit 13; as the railway car is moved under the carrier unit the converging end portions 136 of the railway car frame engage rollers 131 of runner assemblies 127 and longitudinally center the carrier unit crosswise over the frame of the railway car. When railway car 11 is correctly positioned underneath carrier unit 13 the base structure of the carrier unit is then lowered on to the frame structure of the railway car by turning control valve 109 to the "lower" position. With the carrier unit base structure resting on the frame of the rail car, springs 85 retract carrier unit wheels 43 from the ground and the carrier unit is then ready for rail transporting. When it is desired to transfer a carrier unit from railway travel to roadway travel, the above-described procedure is substantially carried out in a converse manner.

FIGS. 19–21 illustrate another embodiment 158 of the invention including a railway car 159 and a plurality of wheeled carrier units 161 (one carrier unit being illustrated). Railway car 159 includes a long, narrow frame 163 which may optionally be a platform type and include a floor covering (as shown in FIG. 20) or may be of open or skeleton type construction. Rail wheel means including paired flanged wheels 165 and wheel suspension means 167 support frame 163. Rail wheels 165 are convergingly canted upwardly and journaled respectively on upwardly inclined axles 169.

Each wheeled carrier unit 161 includes a generally horizontal base structure 171 and wheel means including four wheels 173 and wheel suspension members 175 fixedly secured on base structure 171. Carrier unit 161 includes a generally rectangular load containing shell structure 177. A binder mechanism 179 disposed at each corner of carrier unit base structure 171 removably secures the load shell on the base structure. Parallel spaced runners 181 pendently fixed from base structure 171 are adapted to engage respectively converging end portions 183 of railway car frame 163. Removable stakes 185 secured in railway car frame 163 prevent movement of each carrier unit 161 along the railway car frame. Clamp or lock type anchoring means and such means having removable or releasable parts interengaging the railway car and each carrier unit is provided for securing each carrier unit and the rail car together; a removable bar 187 extending through carrier unit runners 181 and through railway car frame 163 is one form of lock type anchoring means which may be employed in releasably securing each carrier unit on the railway car frame.

FIG. 22 illustrates a self-propelled panel truck type carrier unit 189 including base structure 191 and load bearing structure 193 permanently secured to the base structure. Carrier unit 189 preferably includes movable wheel suspension means for extending and retracting wheels 195 relative to base structure 191. Railway car frame 197 and the wheels of the carrier unit are shown in broken lines for illustrating the relative arrangement of the road and rail vehicles.

FIGS. 23 and 24 illustrate respectively top and side views of a self-propelled carrier unit 199 and the arrangement of the carrier unit relative to a railway car frame 201 (illustrated in broken lines). Carrier unit 199 includes base structure 203, an engine 204, and movable wheel suspension means for extending and retracting wheels 205. Carrier unit 199 may be optionally fitted with a load holding paneled body 207 permanently secured on base structure 203 (as shown), or may be fitted with a removable load containing shell (not shown). Carrier unit 199 preferably includes collapsable or stow-away driver compartment and vehicle control means 209 for shortening the length of the vehicle for rail travel.

FIGS. 25–29 schematically illustrate various jack means which may be used individually or in combination in transportably positioning a carrier unit on a railway car. FIG. 25 illustrates a railway car 211, a carrier unit 213, and ground based jack means 215 for lifting and positioning the carrier unit. FIG. 26 illustrates a railway car 223 having jack means for raising superstructure 225 of the rail car in lifting a carrier unit. FIG. 27 illustrates a carrier unit 227 having manually operative means for raising and lowering base structure 228 of the carrier unit; crank operative worm gear jack means 229 is adapted to raise and lower the base structure of the carrier unit. FIG. 28 illustrates a rail car 231 having oppositely displaceable coupler members 233 for raising and lowering rail car superstructure 235; rail car 231 is adapted to utilize the tractive power and travel of a rail locomotive in lifting and positioning each carrier unit. FIG. 29 illustrates a railway car 237 having inclined surface jack means 239 arranged at the opposite end portions of the rail car; a carrier unit 241 including rollers 243 is adapted to be lifted directly onto railway car 237 by utilizing the tractive power of a rail locomotive.

FIGS. 30–32 schematically illustrate three basic configurations of a carrier unit and particularly the three basic load bearing means of a carrier unit. Each carrier unit, wherether it is a trailer type (FIGS. 1–18), a non-steerable type (FIGS. 19–21), or a self-propelled type (FIGS. 22–24), is adapted to be fitted with load bearing superstructure suitable for the particular materials handling problem. FIG. 30 illustrates a carrier unit 245 having base structure 247 and load sustaining structure 249 integrally secured to the base structure; the upper surface of load sustaining structure 249 is adapted to directly engage a load L of material in surface-to-surface contacting relation. FIG. 31 illustrates a carrier unit 251 including base structure 253, load containing shell structure 255 and binding means 257 releasably binding the shell structure on the base structure. FIG. 32 illustrates a carrier unit 259 including base structure 261 and load holding structure 263 permanently secured to base structure 261.

What I claim is:

1. Apparatus for transporting material comprising a railway car arranged over and adapted for running shifting movement on a rail track, said railway car including a long narrow frame extending longitudinally of said railway car, a carrier unit adapted for rail-transported rail travel or road-running road travel, said carrier unit including front wheel means including front road wheel members, rear wheel means including rear road wheel members, load bearing means adapted for immediately engaging and positively supporting a load of material, and base structure integrally supporting said front and rear wheel means and said load bearing means, means for transferring said carrier unit from road travel to rail travel including means for lifting said carrier unit from a road-supported position crosswise astraddle said rail track and surmountably positioning said carrier unit crosswise astraddle said railway car frame with said front road wheel members being idly suspended laterally outwardly from one side of said railway car frame with said rear road wheel members being idly suspended laterally outwardly from the other side of said railway car frame including

means for running said railway car on said rail track and shiftably moving said railway car frame underneath said carrier unit base structure and between said front and rear road wheel members and including jack means for vertically raising said carrier unit.

2. Apparatus for transporting material comprising a rail track including two horizontally parallel rails; generally level road surface means arranged between the rails and on opposite sides of the rail track at least at a short section of the rail track; a railcar arranged over and adapted for running shifting movement on the rail track, said railcar including a long narrow horizontal frame extending fore and aft of said railcar; at least one wheeled carrier unit adapted for running shifting movement on said road surface means in road travel or adapted to be transportably positioned on said railcar in rail travel; said carrier unit including front road wheel means including road wheel members, rear road wheel means including road wheel members, load bearing means adapted for immediately engaging and positively supporting a load of material, and generally horizontal base structure integrally supporting said front and rear road wheel means and said load bearing means; means for transferring said carrier unit from road travel to rail travel including carrier propelling means for runningly shifting said wheeled carrier on said road surface means and including means for lifting and positioning said carrier unit surmountably astraddle said railcar frame with the wheel members of said front road wheel means being idly suspended laterally outwardly from and arranged on one side of said railcar frame and with the wheel members of said rear road wheel means being idly suspended laterally outwardly from and arranged on the other side of said railcar frame and including railcar propelling means for runningly horizontally shifting said railcar on said rail track and jack means for perpendicularly vertically raising said carrier unit; said carrier unit being adapted to be transferred from road travel to rail travel by actuating said carrier unit propelling means and horizontally shifting said carrier unit on said road surface means to a halted position with the carrier unit crosswise astraddle the rail track, and then lifting and surmountably positioning the carrier unit crosswise

surmountably astraddle said railcar frame by coordinately actuating said jack means and vertically raising said carrier unit and actuating said railcar propelling means and horizontally shifting said railcar on said rail track.

3. The apparatus of claim 2 wherein said means for lifting and positioning said carrier unit surmountably astraddle said railcar frame includes inclined plane lifting means and wherein said railcar propelling means and said jack means include common and simultaneously operative structure.

4. The apparatus of claim 2 wherein said carrier unit includes dirigible road wheel means and hitch means operatively connected to said dirigible wheel means for tandem attachment of said carrier unit to a towing vehicle in road travel.

5. The apparatus of claim 2 wherein said carrier unit includes self-propelling power means and manually operative control means for controlled automotive movement of each carrier unit on a roadway surface in road travel.

6. The apparatus of claim 2 wherein the rail wheels of said railway car each are journaled about an axis inclined upwardly and outwardly from a vertical plane coincident with the major axis of said railway car.

References Cited

UNITED STATES PATENTS

1,303,854	5/1919	Clark	105—366 X
1,883,538	10/1932	Bywater.	
2,114,707	4/1938	Fitch et al.	105—366
2,228,800	1/1941	Wiesinger	105—157
2,974,972	3/1961	Hassell	280—43.23
2,996,021	8/1961	Clejan	105—368
3,112,836	12/1963	Back	214—515
3,159,111	12/1964	Gutridge et al.	105—366

FOREIGN PATENTS

679,656	9/1952	Great Britain.

ARTHUR L. LA POINT, *Primary Examiner.*

DRAYTON E. HOFFMAN, *Examiner.*