F. L. STUART.

CONVEYER.

APPLICATION FILED JUNE 18, 1920.

1,422,492. Patented July 11, 1922.

7 SHEETS—SHEET 1.

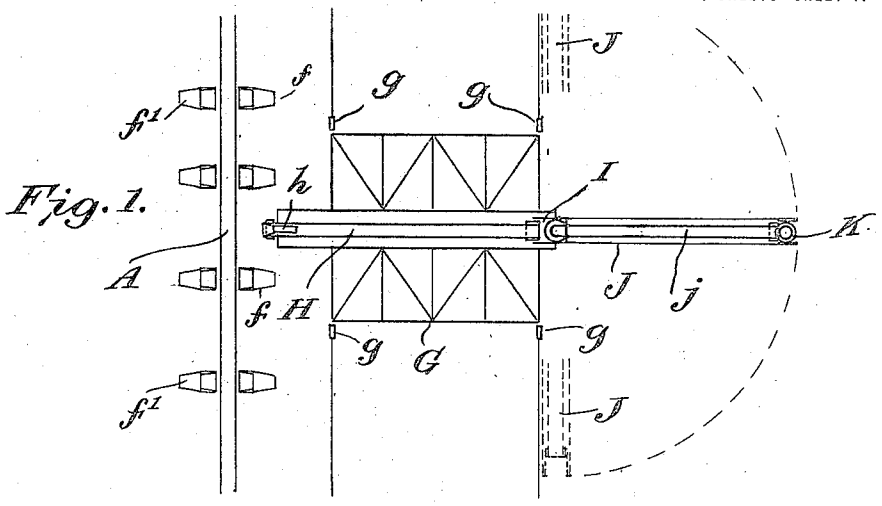


Fig. 1.

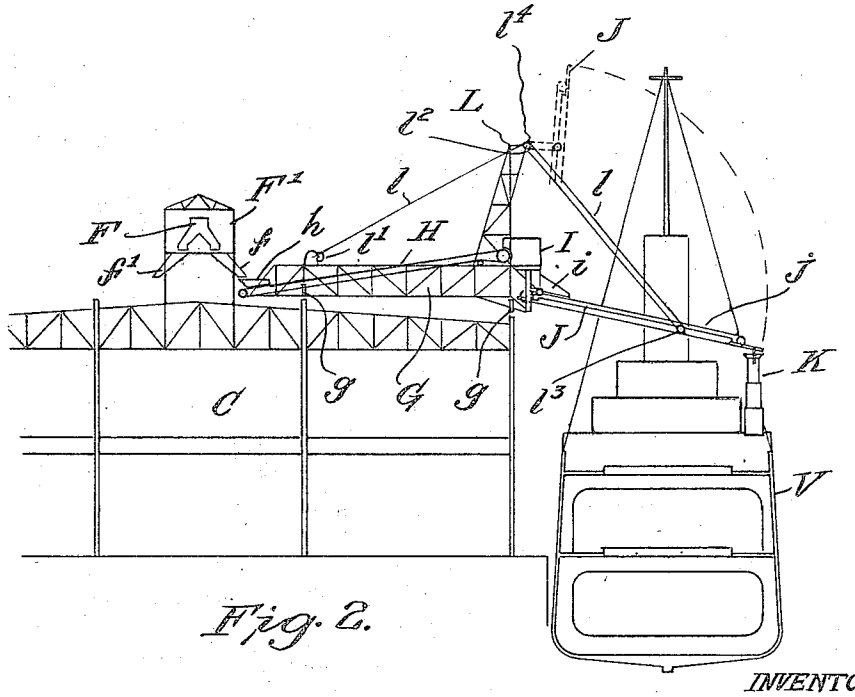


Fig. 2.

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7 SHEETS—SHEET 2.

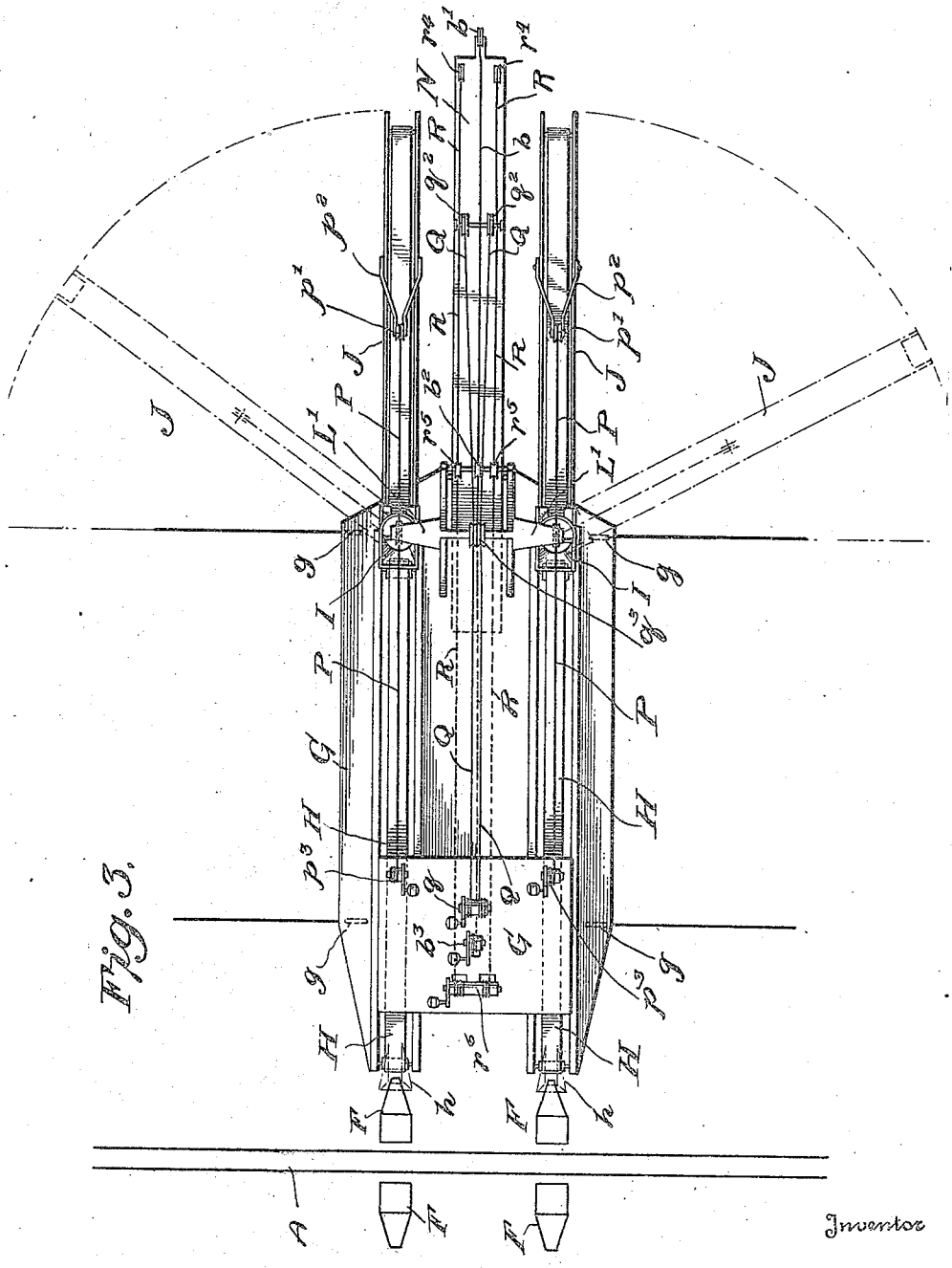


Fig. 3.

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7 SHEETS—SHEET 3.

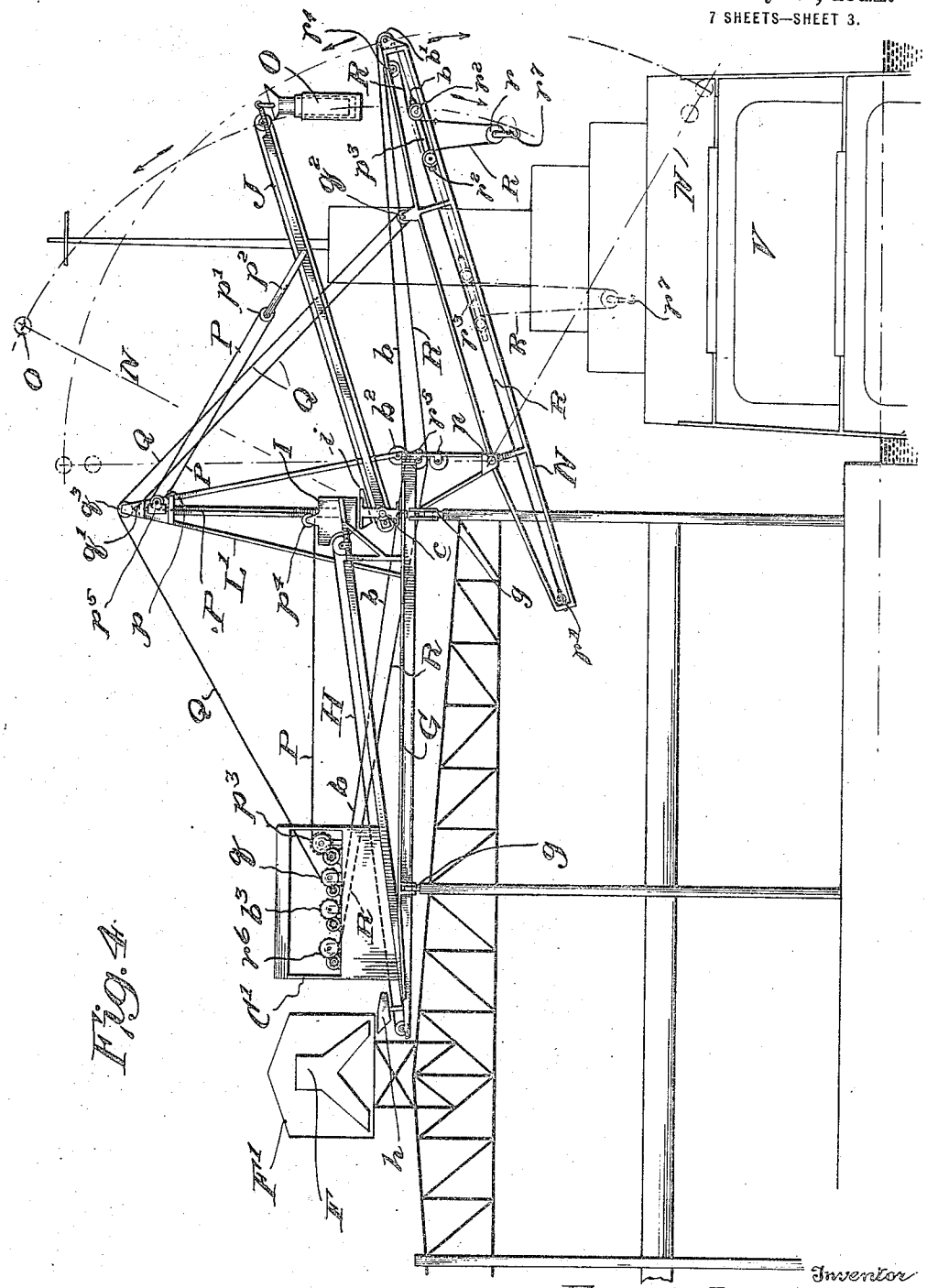


Fig. 4.

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7 SHEETS—SHEET 4.

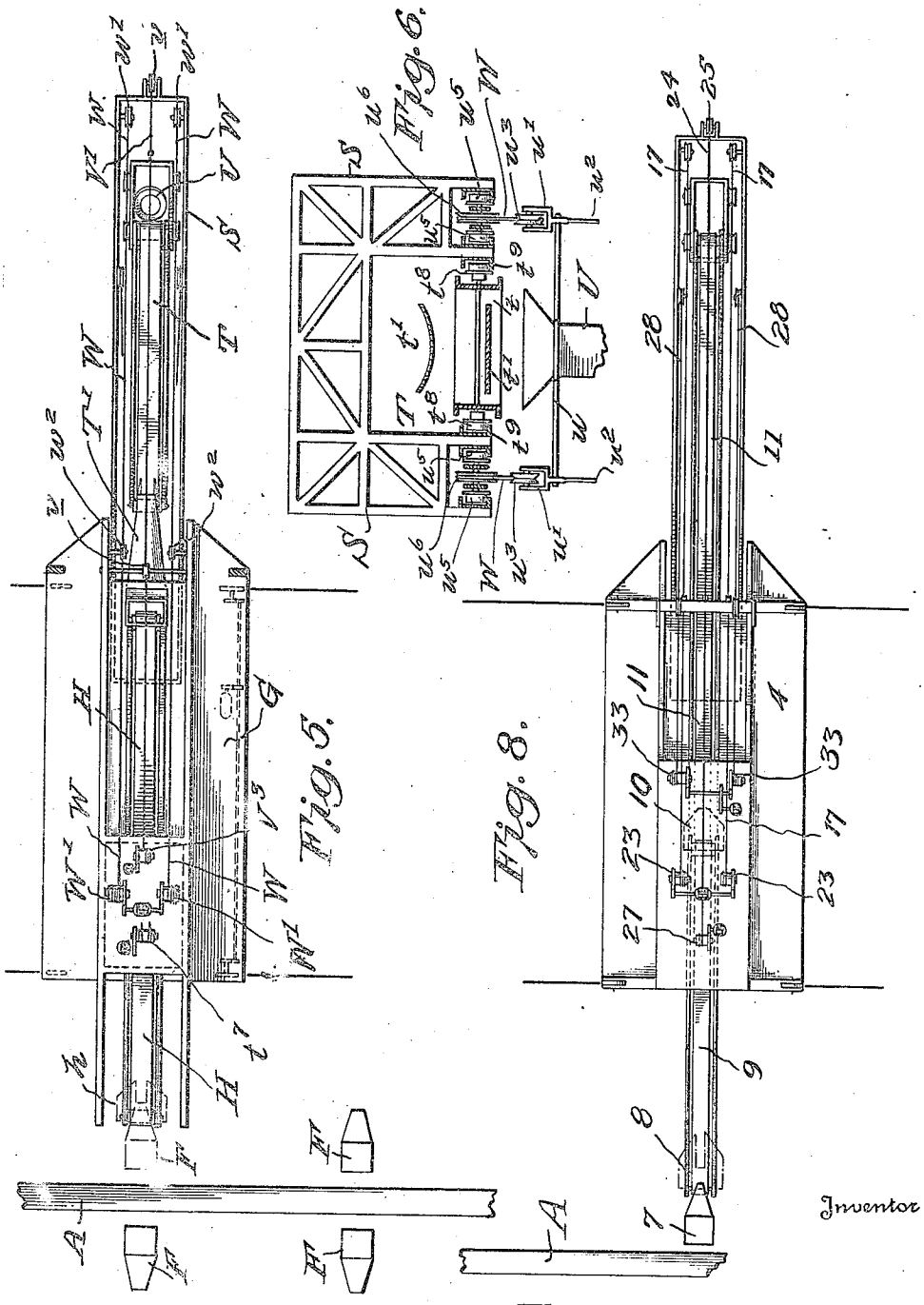


Fig. 5.

Fig. 6.

Fig. 8.

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7 SHEETS—SHEET 5.

Fig. 7.

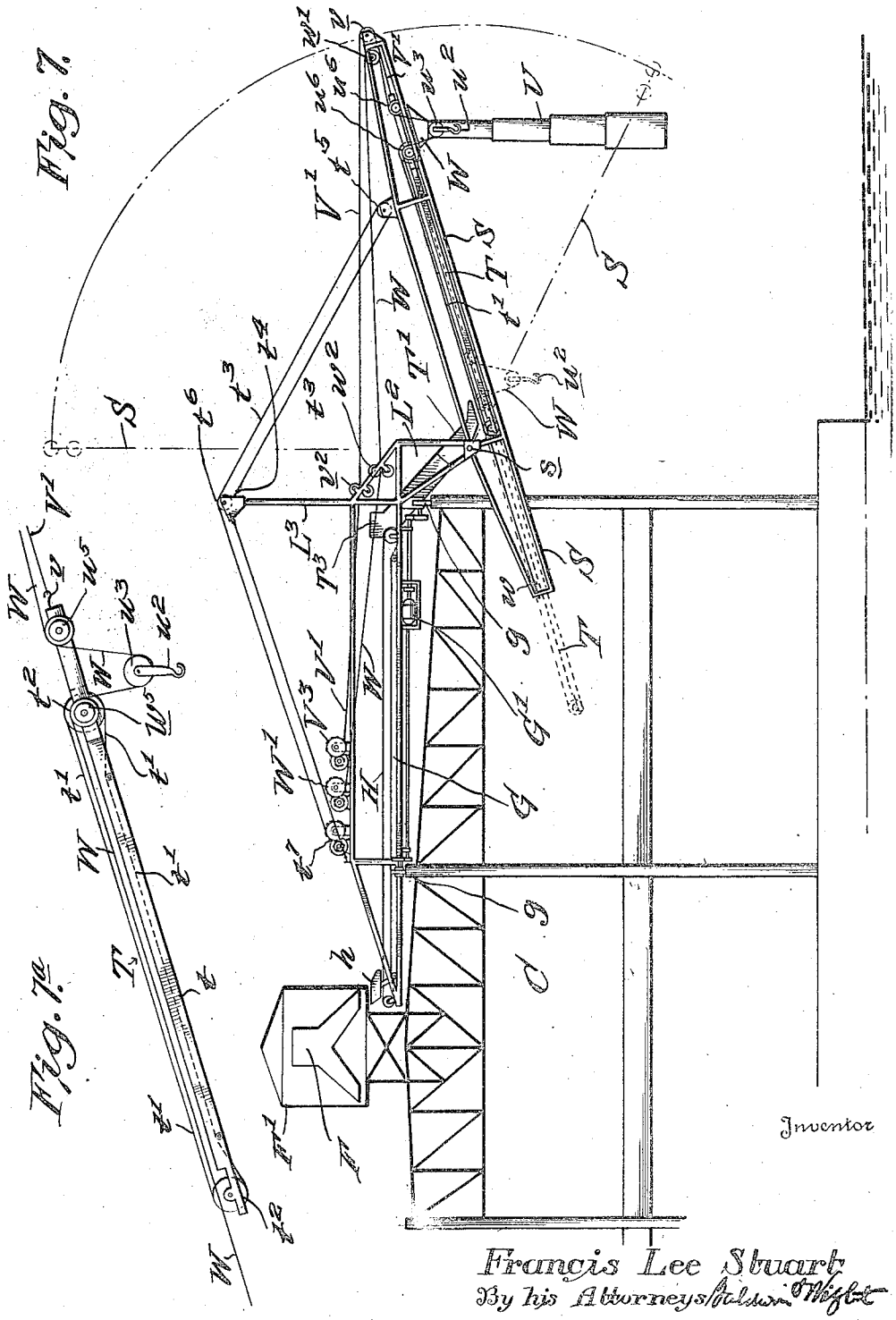


Fig. 7a.

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7 SHEETS—SHEET 6.

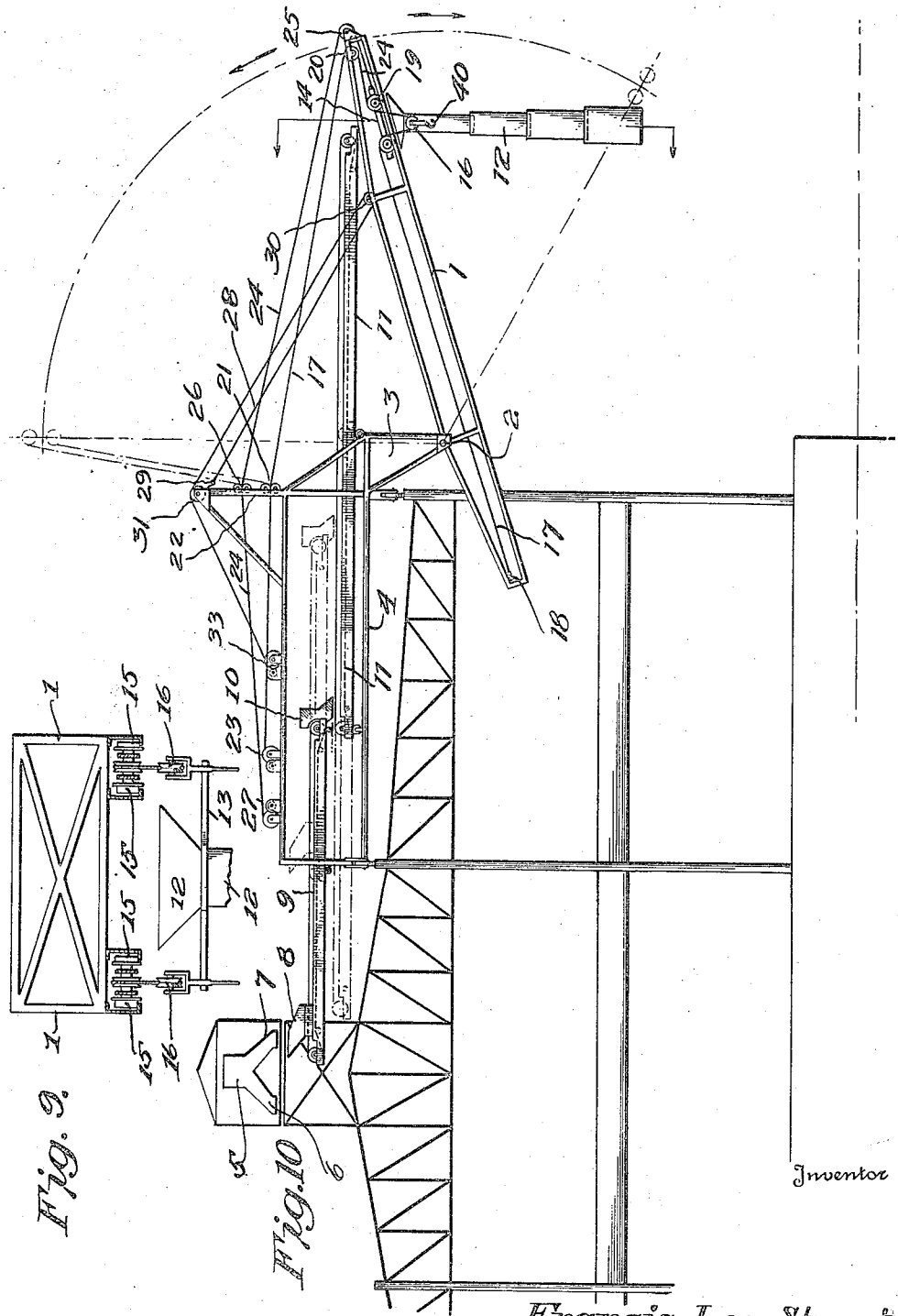


Fig. 9.

Fig. 10

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7 SHEETS—SHEET 7.

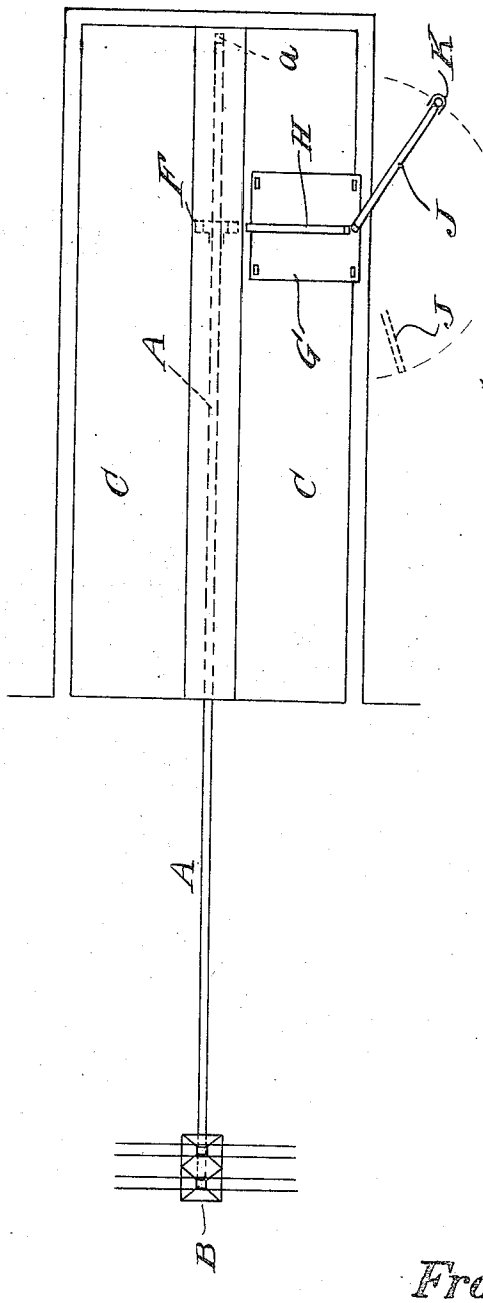


Fig. 11.

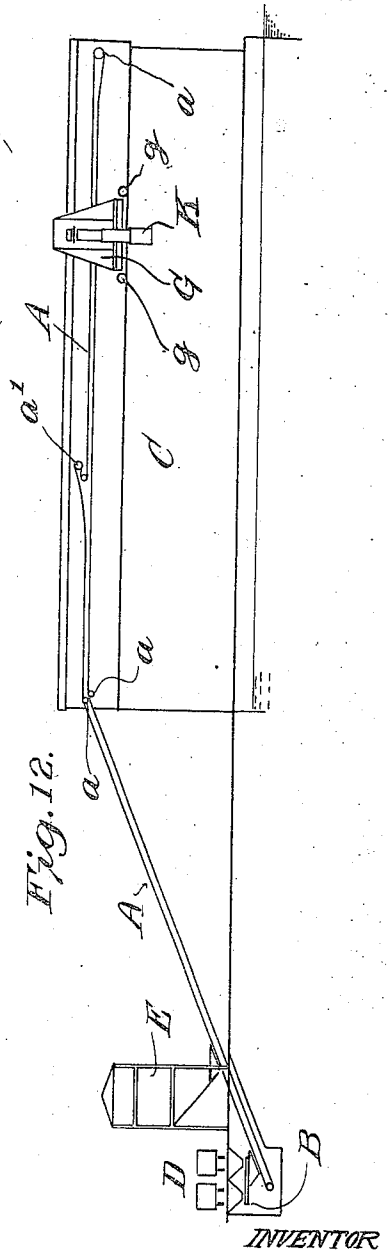


Fig. 12.

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UNITED STATES PATENT OFFICE.

FRANCIS LEE STUART, OF NEW YORK, N. Y.

CONVEYER.

1,422,492. Specification of Letters Patent. Patented July 11, 1922.

Application filed June 18, 1920. Serial No. 389,878.

To all whom it may concern:

Be it known that I, FRANCIS LEE STUART, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Conveyers, of which the following is a specification.

This invention relates to conveying apparatus of the kind in which material is conveyed from a source of supply to a pier and transferred therefrom to vessels lying alongside the pier, and in which provision is also made for unloading vessels at the pier and for transferring material thus unloaded to suitable places for storage, use or transfer.

The object of my present invention is to so organize the conveying, loading and unloading apparatus that space may be economized and material may be transferred to vessels at the pier with a minimum of labor and in such manner as to load all parts of the vessels when desired.

A further object of the invention is to provide apparatus by which material may be conveniently unloaded from vessels and conveyed to the desired place or places and which may be associated with the apparatus for loading the vessels without interference therewith.

In carrying out my invention in the preferred way, I provide a supply conveyer which is supported on the top or roof of a pier shed and which receives material from cars, bins or other places of supply, and which delivers through suitable hoppers to chutes, which in turn deliver to a transfer conveyer which carries the material to a boom conveyer, in turn delivering directly to a vessel or through a vertical chute to the vessel. The boom conveyer may be mounted to move about both vertical and horizontal axes and in some cases to swing about a vertical axis through an arc of 180° and to swing about a horizontal axis to the desired extent so as to clear the upper part of a vessel as it approaches a pier.

The boom conveyer may be associated with a gantry crane which may be so organized as to unload a vessel, or the gantry may be so equipped as to receive material from the transfer conveyer and deliver it to the vessel and to also unload the vessel.

In some cases where the gantry is associated with loading apparatus the boom conveyer is arranged to swing through an arc of 90° only and preferably two boom conveyers are in this case employed, one on each side of the gantry. In other cases the boom conveyer is dispensed with and the transfer conveyer delivers to a gantry which may be provided with a shuttle conveyer receiving material from the transfer conveyer and delivering through a vertical chute to the vessel. In other cases, the transfer conveyer may be associated with a shuttle conveyer receiving material from the transfer conveyer and delivering to a gantry provided with a vertical chute through which material is delivered to a vessel.

My improvements are illustrated in the accompanying drawings, and will be hereinafter more fully described. The drawings are largely diagrammatic, but are sufficient to illustrate my improvements.

Figure 1 is a diagrammatic view, showing how the supply conveyer, the transfer conveyer and the boom conveyer are associated.

Figure 2 is an end view, showing how the supply conveyer is mounted on the roof of a pier shed and how it is associated with the transfer conveyer and the boom conveyer, and this figure also illustrates how the boom conveyer delivers to a vessel.

Figure 3 is a diagrammatic plan view, showing an organization in which two boom conveyers and two transfer conveyers are employed with a gantry crane arranged between them.

Figure 4 is an end view, further illustrating the organization shown in Fig. 3.

Figure 5 is a diagrammatic plan view of an organization in which the transfer conveyer is associated with a gantry provided with a shuttle conveyer which receives material directly from the transfer conveyer and delivers through a vertical chute to a vessel.

Figure 6 is an end view of the gantry forming part of the mechanism shown in Figures 5 and 7 and having a shuttle conveyer within it, and it also shows the means for supporting a telescopic chute.

Figure 7 is an end view, showing more clearly the organization shown in Fig. 5.

Figure 7ª is a detail view of the shuttle conveyer.

Figure 8 is a plan view, showing a further modification in which the transfer conveyer

is longitudinally adjustable and delivers to an intermediate conveyer in turn delivering to the vertical chute on a gantry.

Figure 9 is an end view of the gantry forming part of the mechanism shown in Figs. 8 and 10 and it also shows a hoisting trolley thereon which supports a telescopic chute.

Figure 10 is an end view, showing more fully the organization shown in Fig. 8.

Figure 11 is a diagrammatic plan view, showing how material is conveyed from a track hopper or a bin to the top of the shed and how the supply conveyer delivers through the transfer conveyer to a boom conveyer which in this instance is mounted to move about a vertical axis through an arc of 180°.

Figure 12 is a side elevation of the organization shown in Fig. 11.

The supply conveyer A may extend from a track hopper B (Figs. 11 and 12) to the top of a pier shed C and it is supported, at suitable intervals, by rollers a, as shown. The supply conveyer may receive material from cars D delivering to the hopper or from a bin or bins E. The conveyer A is formed with a tripper a' of well known construction which may deliver to any one of a series of hoppers F located in a housing F′ in turn delivering to either of the chutes f or f'. It will be understood that the chutes f' are employed when there is a vessel on the opposite side of the pier and when the loading apparatus is arranged to receive material from said chutes f'.

As indicated in Fig. 1, a series of chutes f, f' is provided and the tripper may be shifted to deliver to any of these chutes.

G indicates a frame having wheels or rollers g traversing tracks on the top of the shed. This frame constitutes a traveling carriage for the transfer conveyer and parts connected therewith and said carriage may be moved longitudinally along the shed opposite any one or more of the chutes f. The carriage G is equipped with a belt conveyer H which I call the transfer conveyer and which receives material from a hopper h into which any one of the chutes f may discharge. Said conveyer H delivers through a hopper I to a chute i which discharges onto the boom conveyer J, which is equipped with a conveyer belt j that delivers at its outer end to a telescopic, vertically arranged chute K. The boom conveyer is mounted at its inner end to move about both vertical and horizontal axes. It can be swung about a vertical axis through an arc of 180°, as indicated in Fig. 1, and it may be raised and lowered to the desired extent, as indicated in Fig. 2. The carriage G supports a frame L over the top of which passes a rope l connected to a winch l'. The rope l is secured at l^2 to the frame and passes around a pulley l^3 on the boom. The rope then passes over a pulley l^4 on the top of the frame and thence passes to the winch.

By the apparatus thus organized material can be conveyed from sources of supply to the top of a shed and transferred to a boom conveyer which can deliver the material through the vertical chute K to any part of a vessel in proximity to or within range of the outer end of the boom conveyer. When one portion of a vessel is loaded the boom can be raised, as indicated in Fig. 2, and the transferring mechanism may be shifted from one chute f to another, then the boom can be lowered and another part of the vessel loaded.

It is sometimes desirable to associate the boom conveyer with a gantry which affords means for unloading a vessel. In Figs. 3 and 4, I have shown apparatus suitable for this purpose. A gantry is indicated at N, in Fig. 3, and also by the same letter in Fig. 4. In this case the carriage G supports two transfer conveyers H which supply two boom conveyers J similar to the conveyer J shown in Figs. 1 and 2, but in this instance mounted to move about an arc of 90° only so as not to interfere with the gantry or the tackle for raising and lowering it. Each boom conveyer carries at its outer end a vertically arranged telescopic chute O through which material may be conveyed to a vessel V. Each conveyer is mounted at c to move about both vertical and horizontal axes and may be raised and lowered by a rope P, attached at p to a vertical frame L′ on the carriage G and passing around a pulley p' at the outer end of a bail p^2, connected with the boom. From the pulley p' the rope passes over a pulley p^5 on the frame L′, thence downwards and under a pulley p^4 and thence to the winch p^3 on the carriage G. It will be observed by reference to Fig. 3 that there is a winch p^3 for each of the ropes P and that each boom conveyer may be separately operated.

The gantry N is pivoted to turn about a horizontal axis n at the lower end of the frame L′ and may be moved within the limits indicated by dotted lines in Fig. 4. It may be thus raised and lowered by ropes Q, operated by a winch q. One end of each rope Q is attached at q' to the frame L′ and passes around a pulley q^2 on the gantry, thence it passes over a pulley q^3 on the top of the frame L′ and thence to the winch q. The ropes Q, it will be observed, extend between the boom conveyers J and do not interfere with their operation.

A truck r^3 is adapted to move back and forth longitudinally on the gantry and it carries pulleys r^2 over which extend ropes R, attached at r' to the lower or inner end of the gantry. The ropes R are looped, as indicated, and these loops suspend pulleys

r, having hooks r^7 adapted to engage bales or other articles of cargo in the vessel. Each rope R, after passing over the pulleys r^2, passes around a pulley r^4, mounted in the outer portion of the gantry. Thence the rope passes between pulleys r^5 and thence to a winch r^6 which operates both ropes. By operating the winch r^6, the hooks r^7 may be raised and lowered; they may be made to engage cargo within the vessel and then raise it to the desired extent. Inasmuch as the gantry is mounted on the carriage G the articles of cargo raised may be carried to any desired position. Furthermore, the truck r^3, from which the hooks r^7 are suspended, is movable longitudinally in the gantry under the control of the winch b^3 so that the hooks r^7 may not only be raised and lowered but may be shifted from one end of the gantry to the other, as indicated by dotted lines in Fig. 4 so as to deposit the cargo wherever desired. By thus shifting the hooks they may be lowered on opposite sides or in different parts of the vessel. The rope b may be attached to the outer end of the truck r^3 and this rope passes around a pulley b' on the outer end of the gantry and thence passes under a pulley b^2 on the frame L', from which point it passes to the winch b^3. The several winches p^3, b^3, r^6 and q are preferably contained within a housing C' mounted on the carriage G. It will be observed that the ropes R extend over pulleys r^2 on the truck r^3. The details of the truck are not shown in Figs. 3 and 4, but the truck may be of the construction shown in other figures of the drawings.

By the organization of apparatus shown in Figs. 3 and 4, material may be conveyed from a source of supply along the top of the shed to the transfer conveyer which may deliver through a boom conveyer and a chute to a vessel, and such mechanism is associated with a gantry by means of which the cargo of the vessel may be unloaded in the manner hereinbefore described. By operating the winch q the gantry may be raised and lowered, to the desired extent, while by operating the winch r^6 the hooks r^7 may be raised and lowered and by operating the winch b^3 the truck r^3 may be caused to traverse the gantry so as to operate in the gantry in any desired vertical plane, it being understood that the truck will move by gravity in one direction when the rope b is slack while the rope pulls the truck to the opposite end of the gantry when operated for that purpose.

In Figs. 5, 6, 7 and 7^a an organization is shown in which the boom conveyer is dispensed with and its place taken by a conveyer on the gantry S. The gantry is pivoted at s to the frame L^2 and it supports a shuttle conveyer T, comprising a frame t and an endless belt t', traversing pulleys t^2 on the frame t. This conveyer receives material delivered through a chute T' to which material is supplied from the transfer conveyer H. The gantry may be raised and lowered or turned about its pivot s by means of a rope t^3, attached at t^4 to a standard L^3 rising from the carriage G, and extending under a pulley t^5 on the gantry. Thence the rope t^3 extends over a pulley t^6 at the top of the standard L^3 and then passes to a winch t^7 on the carriage G. Preferably two ropes t^3 are employed, as most clearly indicated in Fig. 5, the winch t^7 being employed to operate both ropes.

The gantry supports a vertical, collapsible chute U which may be raised and lowered and shifted from one end of the gantry frame to the other, as indicated. This chute is supported in the manner most clearly indicated in Fig. 6. As shown, a cross piece u, to which the chute is directly connected, is connected at each end with a frame u', carrying a hook u^2, and each carrying a pulley u^3. It will be observed by reference to Fig. 6 that the shuttle conveyer frame carries trolley wheels t^8 which traverse guides or rails t^9 in the gantry frame. It will also be observed that the truck is provided with trolley wheels u^5 which traverse guides in the gantry frame. Viewing Figs. 5 and 7 together, it will be seen that the truck comprises wheels which traverse guides in the gantry frame and is provided with four pulleys u^6 over which extend ropes W. The ropes or hoist-lines W are dead-ended at w and after passing over the pulleys u^6 and under the pulleys u^3, these ropes extend under pulleys w' on the outer portion of the gantry. Thence they extend between pulleys w^2 on the frame L^2 and thence to the winches W' on the carriage G. By these means the chute U may be raised and lowered as desired.

The shuttle conveyer from which the chute is suspended is operated by a rope V' attached to the outer end of the shuttle conveyer frame and passing under a pulley v on the outer end of the gantry. Thence the rope passes between pulleys v^2 on the frame L^2 and thence to a winch V^3 on the carriage. By these means the chute may be moved longitudinally on the gantry, the shuttle conveyer moving downwardly on the gantry by gravity to the extent indicated by dotted lines in Figure 7 and being moved in the opposite direction or outwardly by the rope V'.

By this apparatus material may be conveyed from the supply conveyer A to the transfer conveyer H and thence to the chute T'; thence the material passes onto the shuttle conveyer T which delivers it to the chute U, which latter may be made to deposit the material in different vertical planes by properly operating the shuttle conveyer in the

manner indicated by dotted lines in Figure 7.

The apparatus as a whole is mounted on the carriage G, which may be moved along the pier by suitable motor mechanism G'. The apparatus thus described is suitable for delivering material to a vessel. The chute U may be detached and the apparatus employed to raise cargo from the vessels by means of the hooks u^2. A further modification is shown in Figs. 8, 9 and 10. In this case the gantry carries a vertical delivery chute which may be shifted transversely across the vessel. The transfer conveyer is longitudinally adjustable and delivers through a hopper to an intermediate conveyer which is preferably of the shuttle type, or may be adjusted longitudinally as indicated by dotted lines in Figure 10.

The gantry 1 is pivotally connected at 2 to a frame 3 depending from the carriage 4. Material is delivered in the manner before described to a hopper 5 delivering to chutes 6 and 7 which in turn may deliver to a hopper 8 discharging onto the transfer conveyer 9, which, as shown, is longitudinally adjustable. This conveyer is provided with a hopper 10 which delivers to an intermediate conveyer 11 adjustable longitudinally as indicated. The transfer conveyer 9 is adjustable in the manner shown in order that it may be made to clear the shed frame when the carrier is moved along the pier. The intermediate conveyer 11 is made longitudinally adjustable in order that it may discharge material in different vertical planes. The chute 12 is collapsible or of the telescopic kind and is adapted to receive material from the outer end of the intermediate conveyer 11. It is supported by a frame 13. Fig. 9, suspended from a trolley 14, the wheels 15 of which traverse guides on the gantry frame as indicated in Fig. 9. The frame 13 carries pulleys 16 over which extend ropes 17 dead-ended at 18 passing over pulleys 19 on the trolley, under the pulleys 16, across pulleys 20 on the outer portion of the gantry frame, thence between pulleys 21 on the frame 22 and thence to a winch 23 on the carriage. By these means the chute may be raised and lowered. The trolley 14 is movable longitudinally in the gantry frame. It may be moved by gravity inwardly and it may be moved in the opposite direction by a rope 24 attached to the outer end of the trolley extending under a pulley 25 on the outer end of the gantry frame, thence between pulleys 26 on the frame 22 and thence to a winch 27 on the carriage. In order to raise and lower the gantry to turn it about its pivot 2, I employ ropes 28 dead-ended at 29, passing under pulleys 30 on the gantry, over pulleys 31 on the frame 22, and thence to winches 33 on the carriage. By operating the winches, the chute 12 may be made to deliver in any desired vertical plane. It may be raised and lower to the desired extent with the gantry in a fixed posititon or it may be raised bodily with the gantry in the way indicated.

As before stated, the transfer conveyer 9 may be shifted longitudinally so as to clear the frame of the shed while the intermediate conveyer 11 which receives material from the transfer conveyer may have its discharge end properly placed to deliver to the chute 12 whether the chute be arranged near the outer or inner ends of the gantry or intermediate its ends. The gantry is provided with hooks 40 by means of which cargo may be raised from the hold of a vessel and when so used the chute 12 may be detached.

I claim as my invention:—

1. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, and means associated with said transfer conveyer for delivering material to a vessel adjacent the shed.

2. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, chutes to which said supply conveyer delivers, a transfer conveyer adapted to receive material from the chutes, a carriage movable along the roof and on which said transfer conveyer is supported, and means associated with said transfer conveyer to deliver material to a vessel adjacent the pier.

3. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, and a boom conveyer movable about both vertical and horizontal axes to which the transfer conveyer delivers.

4. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, a boom conveyer mounted to turn about both vertical and horizontal axes and receiving material from the transfer conveyer, and a vertically arranged chute to which the boom conveyer delivers.

5. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, a boom conveyer mounted to turn about both vertical and horizontal axes and which re-

ceives material from the transfer conveyer, and a gantry crane associated with said boom conveyer.

6. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a carriage movable along the roof, transfer conveyers mounted on said carriage which receive material from the supply conveyer, a plurality of boom conveyers carried by the carriage and receiving material from the transfer conveyers, and a gantry crane supported by the carriage and disposed intermediate the boom conveyers.

7. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, a gantry crane supported by the carriage, a conveyer belt mounted on the frame of the gantry crane which receives material from the transfer conveyer, and a chute to which said gantry conveyer delivers.

8. Apparatus for delivering material comprising a supply conveyer, a gantry crane, a vertically arranged chute supported thereby, and conveyer mechanism receiving material from the supply conveyer and delivering it to the chute.

9. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof of the shed and on which said transfer conveyer is supported, a gantry crane supported by the carriage, an endwise adjustable belt conveyer mounted in the frame of the gantry crane, and a vertically adjustable chute supported on the gantry crane and to which said endwise adjustable conveyer belt delivers.

10. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof of the shed and on which said transfer conveyer is supported, a gantry crane supported by the carriage, a trolley hoist supported by the gantry crane for loading and unloading cargo, an endwise adjustable belt conveyer mounted in the gantry crane, a chute adjustable vertically and longitudinally supported on the gantry crane by said trolley hoist and to which said endwise adjustable belt conveyer delivers.

11. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, an endwise adjustable transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, and another conveyer to which said transfer conveyer delivers.

12. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, an endwise adjustable intermediate conveyer to which the transfer conveyer delivers, and another conveyer onto which the intermediate conveyer delivers.

13. The combination with a pier shed having a roof, of a supply conveyer mounted on the roof of the shed, a transfer conveyer receiving material from the supply conveyer, a carriage movable along the roof and on which said transfer conveyer is supported, an endwise adjustable intermediate conveyer receiving material from the transfer conveyer, a gantry crane, and a vertically adjustable chute carried by the gantry crane and adjustable longitudinally thereof.

In testimony whereof, I have hereunto subscribed my name.

FRANCIS LEE STUART.