No. 783,146. PATENTED FEB. 21, 1905.

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ASPHALT MACHINERY.

APPLICATION FILED SEPT. 6, 1904.

6 SHEETS—SHEET 1.

Fig. 1.

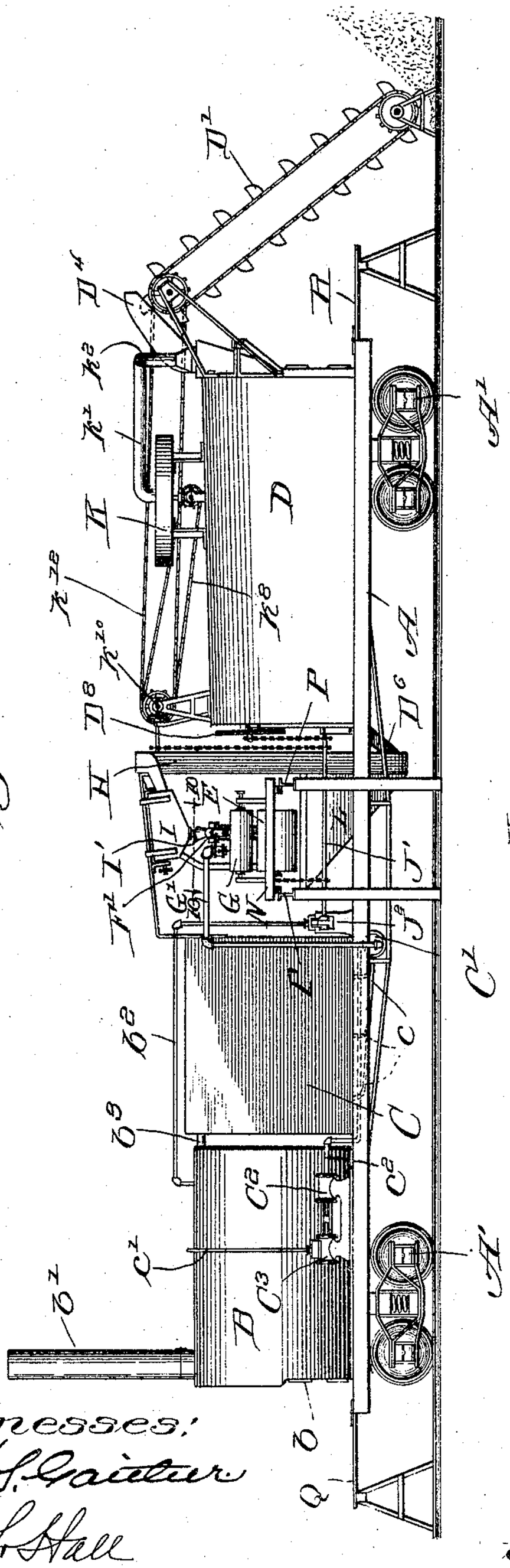
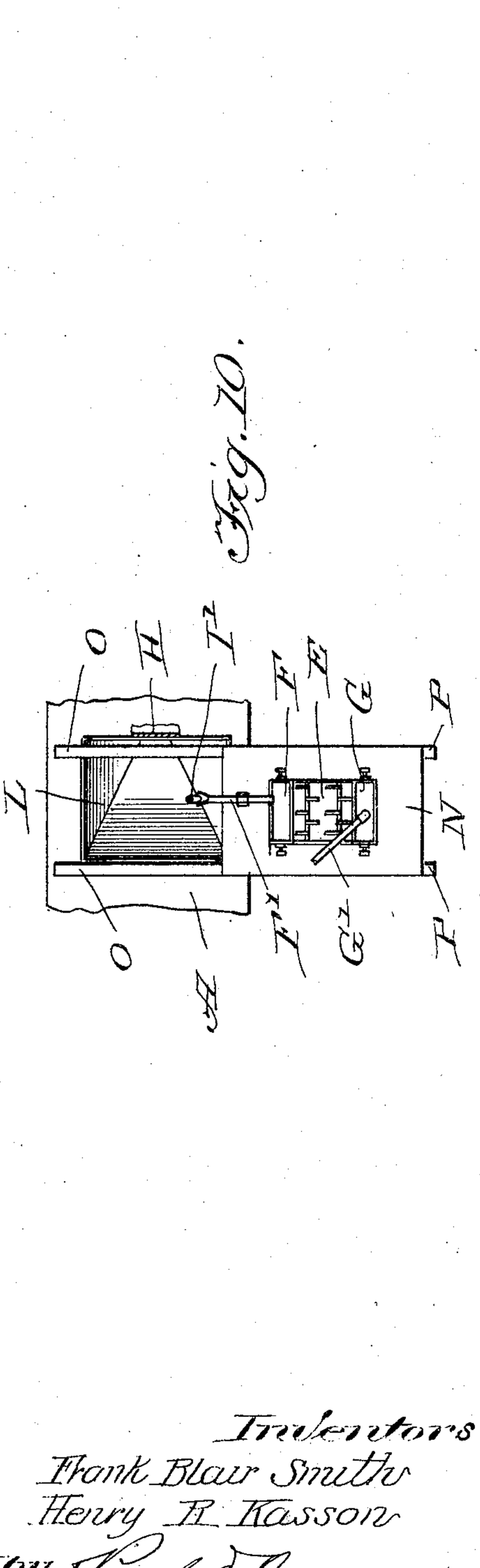


Fig. 10.



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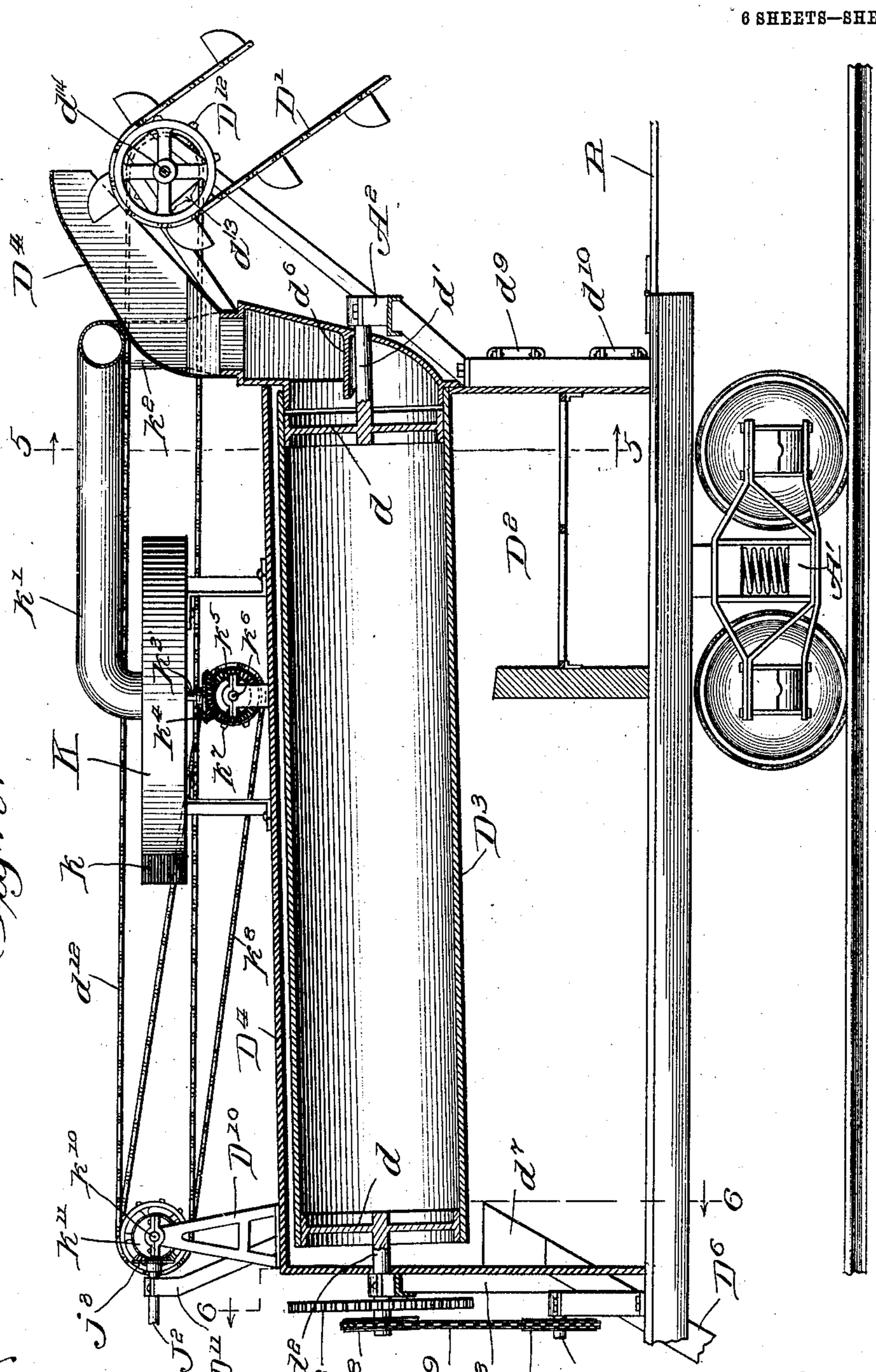

Fig. 2.

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6 SHEETS—SHEET 3.

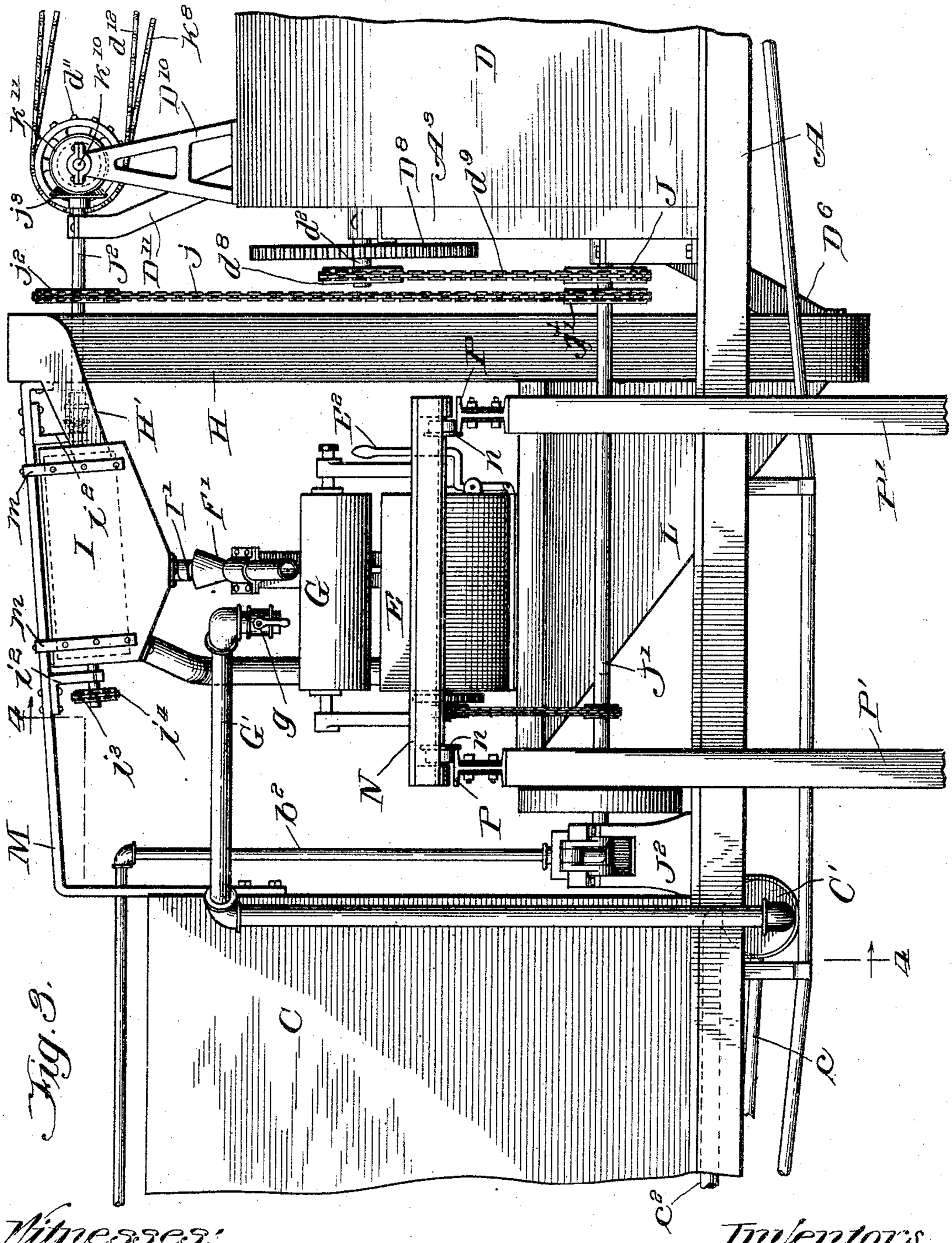

Fig. 3.

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6 SHEETS—SHEET 4.

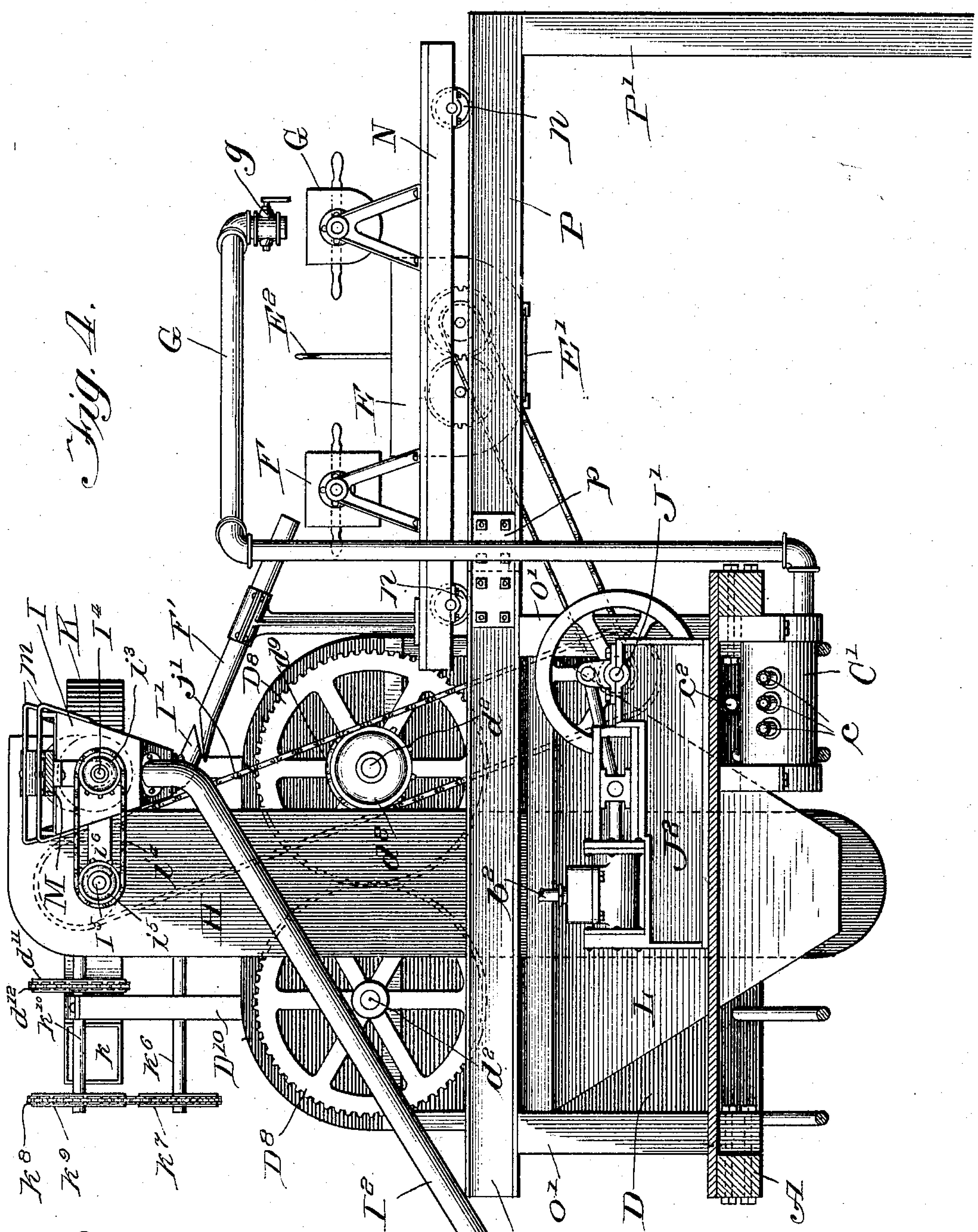

Fig. 4.

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6 SHEETS—SHEET 5.

Fig. 5.

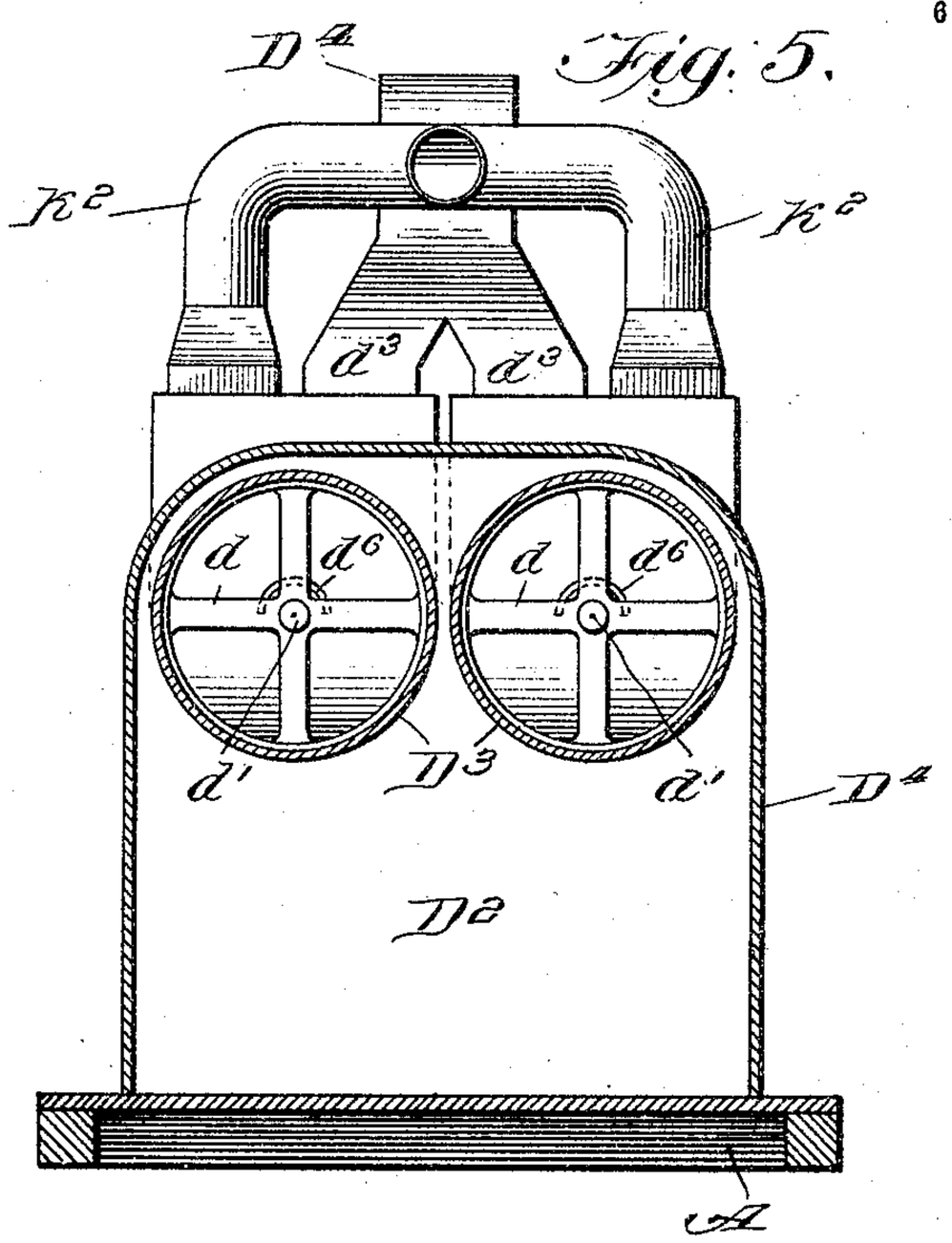
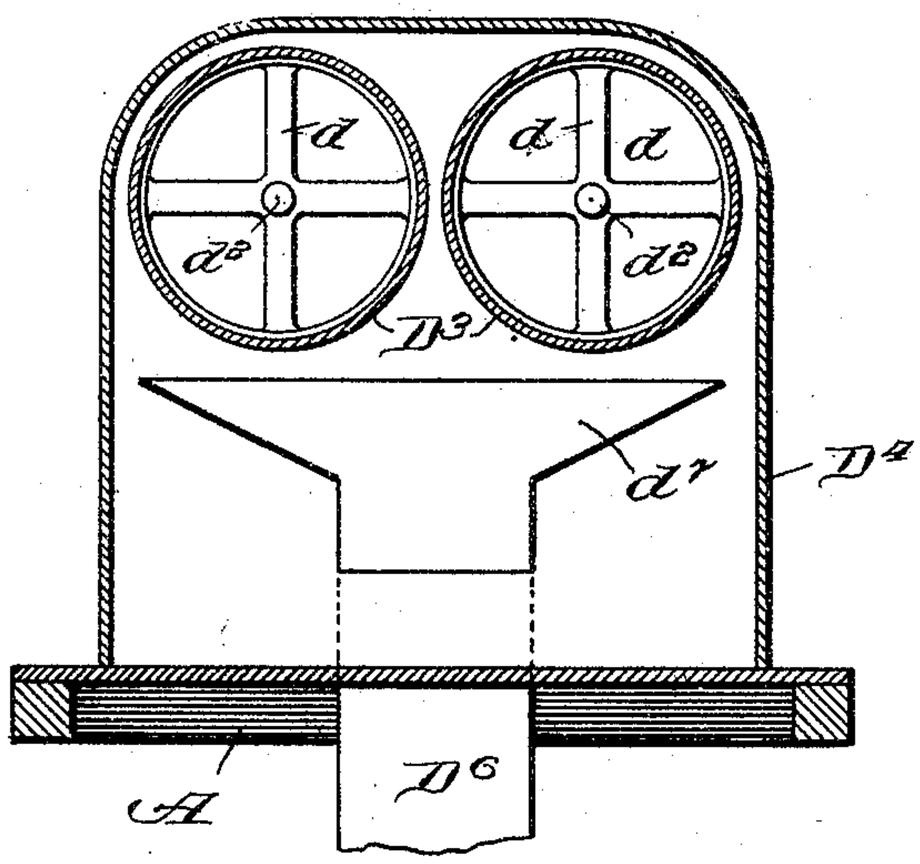


Fig. 6



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6 SHEETS—SHEET 6.

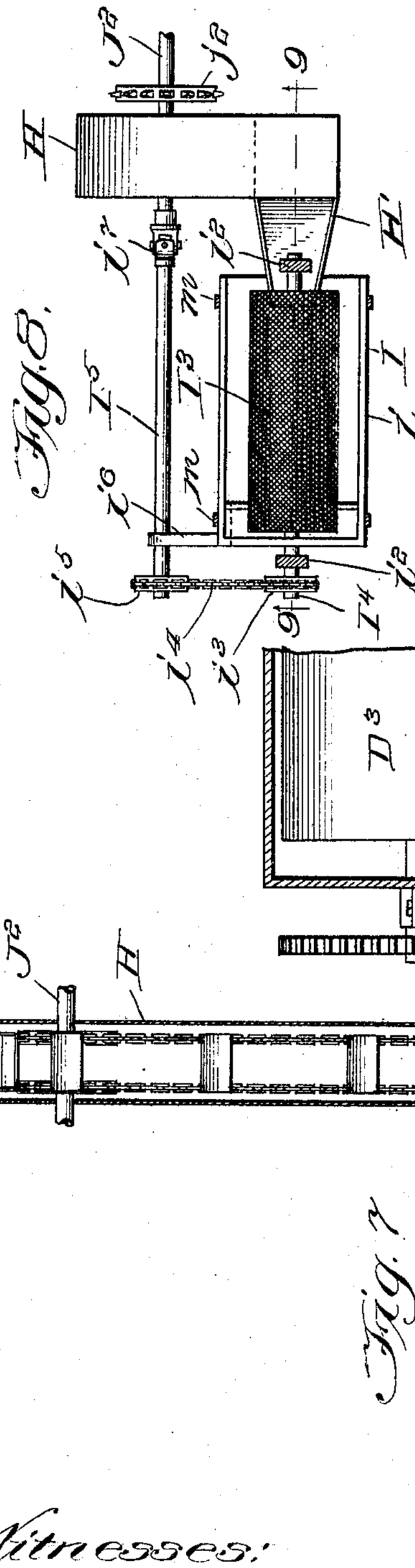

Fig. 8.

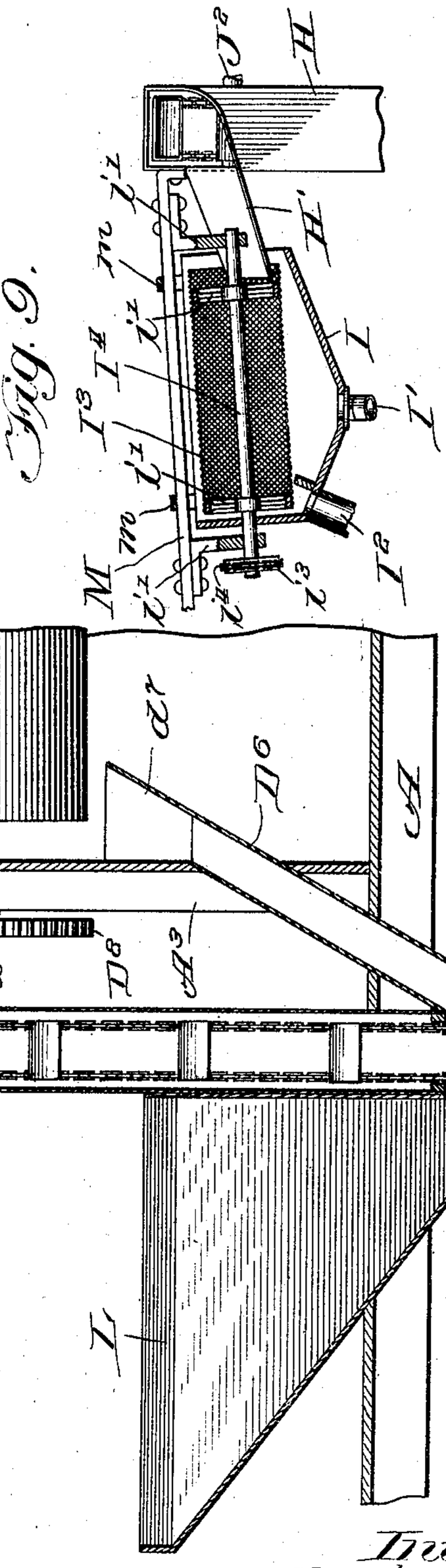

Fig. 9.

Fig. 7.

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No. 783,146. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

FRANK BLAIR SMITH, OF OMAHA, NEBRASKA, AND HENRY R. KASSON, OF CHICAGO, ILLINOIS.

ASPHALT MACHINERY.

SPECIFICATION forming part of Letters Patent No. 783,146, dated February 21, 1905.

Application filed September 6, 1904. Serial No. 223,494.

To all whom it may concern:

Be it known that we, FRANK BLAIR SMITH, residing at Omaha, in the county of Douglas and State of Nebraska, and HENRY R. KASSON, residing at Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented certain new and useful Improvements in Asphalt Machinery; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in apparatus for mixing asphalt and sand preparatory for paving purposes, and refers more specifically to that type of such apparatus generally known as "railroad plants," which have heretofore been built on suitable cars by which they are transferred from place to place and adapted to be switched on a side track when it is to be erected for operation at a place of use.

Among the objects of the invention is to simplify and make more compact an apparatus of this character, the parts of the apparatus being so arranged as to be carried on a single car.

A further object of the invention is to simplify the operation and decrease the cost of erecting and dismantling the plant and to reduce the cost of repairs.

A still further object of the invention is to reduce the freight costs involved in transporting the plant from place to place.

Yet a further object of the invention is to construct the plant within the vertical limits or height imposed by transportation facilities.

Another object of the invention is to provide an improved sand handling, screening, and mixing device which renders it unnecessary to dismantle this part of the plant when moving it from place to place.

Other objects of the invention will appear from the following description.

As shown in the drawings, Figure 1 is a side elevation of a sand and asphalt mixing plant made in accordance with our invention Fig. 2 is a vertical longitudinal section taken through the sand-drier and its associated parts. Fig. 3 is an enlarged side elevation of the central part of the plant. Fig. 4 is a vertical section taken on line 4 4 of Fig. 3 looking toward the sand-drier. Figs. 5 and 6 are transverse vertical sections taken on lines 5 5 and 6 6 of Fig. 2. Fig. 7 is a fragmentary sectional view of the inner end of the drier, the elevator for carrying the sand to the sand-screen and sand-measuring box and the reserve sand-hopper. Fig. 8 is a plan view of the rotary sand-screen located between the elevator and the sand-measuring box and means for supporting and operating the same. Fig. 9 is a horizontal section taken on line 9 9 of Fig. 8. Fig. 10 is a fragmentary plan view of the central part of the car, showing the supporting-frame and car for the mixing device and the mixing device thereon.

As shown in said drawings, A designates a single car provided at its ends with the usual trucks A'.

B designates a steam-generator supported on and located at one end of the car, from which is derived steam to actuate engines located at various parts about the plant and from which steam is also derived for melting the asphalt in the melting-tank C, located adjacent to the boiler. Said boiler is provided with the usual furnace b and a smoke-stack b'.

D designates as a whole a sand-drier located at the other end of the car, to which sand is delivered by means of a suitable elevator D'. Sand and asphalt mixing devices are located between the sand-drier and the melting-tank and receive the sand and asphalt from the said sand-drier and melting-tank, respectively, as will hereinafter more fully appear. Said drier comprises a furnace D^2, Fig. 2, and two rearwardly and downwardly inclined rotating drums D^3 D^3, all inclosed within a suitable casing D^4. Said drums are open throughout their lengths and are provided at their ends with spiders d, having short shafts d' d^2, the former at the front and the latter at the rear of the drying device. Said shafts d' are mounted in the horizontal part of a frame A^2, rising from the floor of the car, while the rear shafts d^2 are mounted in

the horizontal part of a frame A^3, rising from the floor of the car.

The sand and asphalt mixing devices operate, as herein shown, in connection with a sand-screen, whereby the sand is screened before it is mixed with the asphalt. Said devices embrace, in general terms, a mixing device, (indicated at E, Fig. 4,) which may be made of any suitable construction, a sand and an asphalt measuring box F and G, respectively, located one at each side of the mixing-chamber, a pipe F′, designed to direct sand from the drier to the sand-measuring box F, receiving the sand through intermediate devices, and a pipe G′, adapted to receive melted asphalt from the asphalt-melting tank and to direct it to the asphalt-measuring box G. The screening device is located between the drier and said measuring device and will be hereinafter explained.

Referring now more particularly to the sand-drying and sand-handling devices, whereby the sand is delivered to the sand-drier and therefrom to the measuring-box preparatory to being dumped into the mixer, said parts are made as follows: The sand which is carried upwardly by the conveyer D′ is directed into a hopper or conduit D^4 at the front end of the drier, and said hopper is provided with two branches d^3 d^3, leading one to the front end of each of the drums D^3, Fig. 5. The bearings for the front shafts d' of the drums are protected by plates or shields d^6. The sand passes into the drums D^3 through the front spiders d and is carried by gravity slowly through the drums while the latter are rotating and is dried by the heat from the furnace D^2 during its passage through the drums. The sand after gravitating through the drums in this manner passes through the rear spider d, and the sand from both drums empties into a common chute D^6 through the medium of a transversely-widened hopper d^7, Figs. 2, 6, and 7. Said chute D^6 enters the lower end of an inclosed bucket-elevator H, Figs. 1, 3, and 7. Said elevator is provided at its upper end with a spout or chute which discharges into a screening device (designated as a whole by I in Fig. 3) and which will be hereinafter more fully described. Said screening device is designed for the purpose of removing the gravel and larger granules from the sand and is located not higher than the average height of the apparatus as a whole. The screened sand is discharged from the lower end of said screening device through a pipe I′, which latter discharges into the pipe F′, hereinbefore referred to, that conducts the sand to the sand-measuring box. The separated gravel or larger particles of the sand are directed through a pipe I^2 from the screening device.

The means for rotating said drums to carry the sand therethrough are made as follows: One of the rear trunnions or shafts d^2 of the drums is provided with a sprocket-wheel d^8, Fig. 4, over which is trained a chain belt d^9, and said chain belt is also trained over a pulley J, which is fixed to one end of a main driving-shaft J′, that is operated from an engine J^2, supported on the floor of the car, as shown in Figs. 3 and 4. Said engine receives steam from the generator through a pipe b^2. Said rear shafts of the drums are provided also with meshing gear-wheels D^8 D^8, Figs. 2, 3, and 4, which mesh with each other, whereby rotary motion communicated to one of said sprocket-wheels from the engine through the gear connections described transmits opposite rotary motion to the other drum. Said gear-wheels D^8 and the pulley d^8 and belts d^9 are located outside of the rear wall of the casing D^4 of the drier, and the hopper or mouth of the sand-chute D^6 extends into said casing, so that there is no liability of sand finding its way to the meshing and bearing parts of said gearing.

A forced draft mechanism is provided for the furnace D^2 of the drier, which is made as follows: K designates a suction-fan which is supported, as herein shown, upon the casing D^4 of the drier and is arranged horizontal. The purpose of this construction is to provide a fan which shall not be higher than the requirements imposed by the transportation companies and no higher than the average height of the plant when dismantled for transportation. So far as is concerned the broader features of our invention said fan may be otherwise supported and operated. The outlet k to the vacuum-fan discharges into the air, while the inlet-passage k', consisting of a pipe communicating with the fan-chamber at the center thereof, is provided with two branches k^2 k^2, which have communication one with the front end of each drum. Said parts are so arranged that the space communicating with the front ends of the drums have no direct communication with the furnace, while the furnace-space is in direct communication with the interior of the drums through the rear ends thereof. Therefore upon the operation of the fan K air is drawn through the ventilation and air-check doors d^9 d^{10} at the front end of the furnace into the combustion-chamber beneath the drums and from there to the rear ends of the drums, thence through the drums from the rear to the front ends thereof and through the fan out into the open air. In this manner the heated products of combustion are brought directly into contact with the sand as it gravitates in thin layers through the rotating drums.

The fan is rotated through the following driving mechanism, (shown more clearly in Figs. 2, 3, and 4:) Attached centrally to the movable part of the fan is a shaft k^3, Fig. 2, carrying at its lower end a beveled gear-pinion k^4. Said gear-pinion k^4 meshes with a gear-pinion k^5, affixed to the inner end of a

horizontal shaft k^6, Figs. 2 and 4, having suitable bearing on the casing D^4 of the drier. Rotating with said shaft k^6 is a sprocket-wheel k^7, over which is trained a chain belt k^8, which is trained over and transmits power from a drive-wheel k^9, that is affixed to a shaft k^{10}, which is rotatively mounted in brackets D^{10}, rising from the casing of the drier. The said shaft k^{10} is rotated from the drive-shaft J′ through the medium of a chain or driving belt j, Figs. 3 and 4, which is trained over pulleys j' j^2, fixed, respectively, on the driving-shaft J′ and a generally horizontal shaft J^2, that is located adjacent to the upper end of the elevator H and to the shaft k^{10}. Said shaft J^2 has bearing in the frame of the elevator H and in a bracket D^{11}, rising from the shell of the drier. The shaft is provided at one end with a beveled gear-wheel j^3, Figs. 2 and 3, that meshes with a similar bevel gear-wheel k^{11}, affixed to the shaft k^{10}. The source of driving power for the fan, therefore, may be traced from the drive-shaft J′ through the pulley j', chain belt j, pulley j^2, shaft J^2, the bevel gear-pinions j^3 and k^{11}, shaft k^{10}, the sprocket-wheel k^9, belt k^8, sprocket-wheel k^7, shaft k^6, and bevel-pinions k^4 k^5. The upper or driving pulley D^{12} for the elevator D′, that delivers the sand from a sand pile at one end of the plant to the drier, is operated, through the pulley d^{11} on the shaft k^{10}, laterally inside of the pulley k^9, Fig. 4, and a chain belt d^{12} trained thereover and over a pulley d^{13}, Fig. 2, which is affixed to a shaft d^{14}, that carries the upper driving-pulley D^{12} of said conveyer D′ before referred to.

As hereinbefore stated, the heat furnished to the melting-tank for melting the asphalt is derived from the steam of the generator B, the steam being conducted to the melting-tank from said generator through a short pipe b^3. Any suitable form of heating device within the melting-tank may be used and which receives steam from said pipe b^3. Moreover, the heat for melting the asphalt may be derived from other sources. The melted asphalt is directed from the melting-tank to the measuring-box G, before referred to, through mechanism constructed as follows: C′, Figs. 1, 3, and 4, designates a small tank or chamber, which is located beneath the platform or floor of the car and attached thereto in any suitable manner. Said tank or chamber communicates with the melting-tank through the medium of a plurality of pipes c, said pipes leading from the bottom of the melting-tank to the supplemental tank near the upper part thereof. The pipe G′, through which the melted asphalt is delivered to the asphalt-measuring box G, enters one end of said supplemental tank C′ near the bottom thereof. C^2, Fig. 1, designates an air-pump, the engine C^3 of which receives steam from the generator B through the medium of a pipe c'. Said air-pump communicates, through the medium of a pipe c^2, Figs. 1 and 4, with the supplemental chamber or tank C′, said pipe entering the tank C′ at the upper part thereof. In the operation of the air-pump the melted asphalt is directed by its gravity to the tank C′ when the air-pump is in its exhausting stroke, and on the return or pressure stroke of the pump the melted asphalt contained in the supplemental tank is forced through the pipe G′ to the asphalt-measuring box G. Said pipe G′ is furnished at its outlet end with a valve g, by which the flow of the melted asphalt therethrough may be cut off.

In the operation of the apparatus the sand is delivered to the measuring-box F and the asphalt to the measuring-box G until they are filled and the flow of sand through the pipe F′ and the asphalt through the pipe G′ is temporarily suspended while the proper proportions of the sand and asphalt are dumped into the mixing device E. The cutting off of the flow of the asphalt through the pipe G′ is effected by means of the valve g before referred to. In the case of the sand no valve is herein shown in the passages for the sand from the screening device to the measuring-box F; but the pipe I′, leading from the lower part of the screening device and registering with the pipe F′, is connected with the screening-device casing by means of a swivel-joint, whereby said curved pipe I′ may be turned out of register with the pipe F′ and the flow of sand thus cut off from the pipe F′ and the measuring-box F. The screening device with which said pipe I′ is connected is located directly over a reserve chamber L, made of hopper form and communicating at its lower end with the lower end of the elevator H through an opening l. The sand thus diverted from the measuring-box F falls into the reserve chamber or hopper L and is carried from thence upwardly by the elevator H to the screening device. We are thus enabled to constantly deliver the sand to and discharge it from the drier and from thence to the screening device, and whatever sand is temporarily diverted from the measuring-box falls into said chamber L and is returned to the screening device and to the measuring-box. It will be understood that said hopper or storage-space L is made of such size relatively to the body of sand delivered to the elevator from the drier that it will never become filled during the usual operation of the plant—that is to say, some little time is required for dumping the contents of the measuring-boxes into the mixing device, and it is only at this time under usual circumstances that the sand is required to be diverted into said reserve chamber; but the presence of the reserve chamber or compartment avoids the necessity of entirely stopping the delivery of sand to the plant, avoids sand-valves, and insures a constant supply of sand to the elevator and screening device.

The location and construction of the screening device is shown more clearly in Figs. 1, 3, 4, 8, and 9, the latter two figures indicating more particularly the interior construction of said screening device. Said screening device, which is designated as a whole by the reference-letter I, embraces an outer wall or shell *i*, which is open at both its ends and is supported from an overhead frame M, extending between and attached at one end to the melting-tank and at its other end to the elevator H, said casing *i* being attached to said frame by means of straps *m m*, as shown in Fig. 3. Located within said casing *i* is a rotary hollow screen I^3, having at its ends spiders *i'*, which are located within and to which the screen is attached. Affixed to said spiders *i' i'* is a shaft I^4, which extends at its ends past the ends of the screen and has rotative bearings in brackets i^2 i^2, depending from the supporting-frame M. The shaft I^4 and screen I^3 are rotated as follows: The said shaft I^4 is provided at its end remote from the elevator H with a pulley i^3, about which is trained a belt i^4, that is also trained about a pulley i^5, fixed to one end of a shaft I^5, that is generally parallel with the shaft I^4. Said shaft I^5 has bearing at one end in an arm or bracket i^6, extending laterally from the casing of the screening device, and is connected at its other end by a knuckle-joint i^7 with the shaft J^2 before referred to. One of the pulleys of the bucket-elevator H is fixed to said shaft J^2, Fig. 7.

The rotary screen I^3 and shaft I^4 are inclined downwardly and rearwardly, and the sand is delivered from the spout H' of the elevator H into the higher end of the screen by having said spout extend inwardly through the adjacent end of the casing and into the screen just outside of one of the adjacent spiders *i'*. The sand delivered to the screen in this manner passes through the screen in much the same manner as does the sand through the rotary drums, and during its passage therethrough, the finer sand falls into the lower part of the casing *i* and from thence through the spout I' and spout F' to the sand-measuring box F and the coarser parts of the sand or gravel being discharged from the lower end of the rotary screen into and through the discharge pipe or chute I^2, leading away from the plant or apparatus.

The mixing device E and the measuring-boxes F and G are supported on a carriage N, that is provided with rollers or casters *n*, that rest when the plant is dismantled and not in operation on horizontal transverse **I**-beam girders or rails O O, that are supported from the floor of the car by means of vertical standards O' O', Fig. 4, between the melting-tank and drier. Extending laterally and horizontally from the car and in horizontal alinement with the rails or beams O are like beams P of a lateral frame, said lateral beams or rails being attached at their inner ends to the beams O and supported at their outer ends upon the upper ends of vertical standards P', thereby providing a space beneath the beams or rails P, beneath which a wagon may be driven, into which is dumped the contents of the mixer through an opening in the lower end thereof, normally closed by a gate-valve E', actuated by a suitable lever E^2, Figs. 3 and 4. The inner ends of said beams P are connected with the **I**-beams or rails O by means of connecting-plates *p*, that are attached to the horizontal beams or girders P and O by means of suitable bolts. Thus the lateral supporting-frame for the carriage N may be readily and quickly erected and dismantled. When dismantling the plant, the pipe G may be removed, or the joint between a horizontal and a vertical part thereof may be a swivel-joint, whereby the upper horizontal end of said pipe may be swung into a position parallel with the direction of movement of the car. Platforms Q R are placed at the front and rear ends of the car, respectively, thereby affording convenient means for introducing fuel into the furnaces of the steam-generator and the sand-drier.

From the foregoing description it will be seen that we have provided an exceedingly simple and compact apparatus for mixing sand and asphalt, of that class commonly known as "railroad plants," having placed within the limits of not an extraordinary length of car all of the various apparatus which have heretofore been located on two or more cars. Moreover, the permanent and operative positions of all the parts of the apparatus are not higher than that imposed by the exigencies of transportation, but may pass under bridges and the like without being dismantled. For this reason the dismantling of the device is much simplified when the plant is to be moved from place to place. Moreover, by reason of the various parts of the apparatus being contained on one car it is not necessary that the various pipe connections be disturbed when the plant is to be removed. The construction also involves a very simple and economical means of handling the sand from the time it is introduced into the drier until it is discharged into the sand-measuring box, such construction being characterized by compactness, simplicity, and an improved method of handling the sand. An apparatus or plant made in accordance with our invention is much more economical in its construction and simple in its operation than an apparatus of like capacity built and operating under the present practice. By reason of the reduced weight of the apparatus and its compactness the freight charges in its transportation from place to place are greatly lessened.

While we have shown what we regard at this time to be an approved construction, it is to be understood that such showing is merely illustrative and is not intended to impose

limitations upon the scope of the invention except when described in specific claims.

In case the power applied to operate the several parts of the machine (which power, as now shown, is steam) be that generated from a dynamo or an explosive-engine the melting of the asphalt may be accomplished by the direct application of heat thereto instead of heat transmitted thereto from steam. Other changes may be made without departing from the spirit of our invention—such, for instance, as the mode of operating the several parts of the apparatus either singly or in unison.

We claim as our invention—

1. An apparatus for the purpose set forth comprising a single railway-car, an asphalt-melting tank at one end of the car, a horizontally-arranged sand-drier at the other end of the car, a mixing device supported centrally of the car intermediate said tank and drier, and mechanisms for directing melted asphalt and sand from said tank and drier, respectively, to the mixing device, said asphalt and sand directing mechanisms, when in their operative positions being located with their highest parts not substantially higher than said tank and drier.

2. An apparatus for the purpose described comprising a single railway-car, an asphalt-melting tank at one end of the car, a horizontally-arranged sand-drier at the other end of the car, a mixing device located intermediate the tank and drier, means whereby said mixing device may be projected laterally beyond the side of the car, means for delivering melted asphalt and sand in measured quantities to said mixing device when so projected laterally from the car, said sand-delivering means embodying a permanently-mounted elevator located with its lower end beneath the inner or discharge end of the sand-drier and extending upwardly with its upper end not substantially above the general level of the tank and drier.

3. An apparatus for the purpose described comprising a single railway-car, an asphalt-melting tank at one end thereof, a sand-drier at the other end of the car, said drier and tank being separated by a space, located centrally of the car, a mixing device located in said space, a supporting-frame for said mixing device extending above the platform of the car, a detachable extension-frame adapted to be extended laterally therefrom and made of sufficient height to permit a wagon to pass beneath the same, means for moving said mixing device from said supporting to the extension frame, and vice versa, and means for delivering asphalt and sand from the tank and drier, respectively, to the mixing device.

4. An apparatus for the purpose described comprising a single railway-car, an asphalt-melting tank at one end thereof, a sand-drier at the other end of the car, a mixing device, a supporting-frame for the mixing device rising from said car in the space between said tank and drier, a detachable frame extending laterally from said supporting-frame and constructed to provide beneath the same a passage-way for a wagon, a wheeled carriage for supporting said mixing device, rails on the supporting and extension frame arranged to permit the carriage and mixing device to be run from the supporting-frame to the extension-frame and vice versa, and means for delivering sand from the drier and asphalt from the tank to said mixing device while said mixing device is supported on said extension-frame.

5. An apparatus for the purpose described comprising a single railway-car, an asphalt-melting tank at one end thereof, a sand-drier at the other end thereof, means for delivering sand to one end of the drier, an asphalt and sand mixing device located between said sand-drier and asphalt-melting box, a temporary frame extending laterally from the car and upon which the said mixing device is located when the plant is erected for operation, means for delivering the melted asphalt and sand to the mixing device, a valve for controlling the flow of the melted asphalt to the mixing device and means for diverting the flow of sand from the mixing device, constructed to automatically redirect the sand thereto.

6. An apparatus for the purpose described comprising a single railway-car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device, a sand-measuring and an asphalt-measuring box located adjacent thereto, said mixing device and measuring-boxes being supported on a carriage, tracks or ways located between the melting-tank and sand-drier upon which said carriage rests and rolls when the apparatus is dismantled, an extension-frame comprising horizontal tracks or beams extending laterally from said tracks or ways on the car and upon which said carriage is supported when the plant is erected for operation, and means for delivering melted asphalt and sand to their respective measuring-boxes.

7. An apparatus for the purpose set forth comprising a single car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, horizontal parallel beams or rails located between said melting-tank and sand-drier, a car resting and traveling on said rails, an extension-frame comprising horizontal beams or rails extending in horizontal alinement from said beams or rails on the car, and vertical standards supporting the outer ends thereof, and affording a space beneath the extension horizontal beams for a wagon or the like, a mixing device carried by said car, and means for delivering the melted asphalt and sand in measured quantities to said mixing device.

8. An apparatus for the purpose described comprising a single car, a horizontal sand-drier

at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device located between said tank and drier, a permanently-mounted sand-elevator extending at its lower end beneath the level of the drier and located with its upper end but little above the sand-drier, means for directing the sand from said drier to the lower end of said elevator, means for directing the sand from the upper end of the elevator to the mixing device, and means for directing the melted asphalt to the mixing device.

9. An apparatus for the purpose described, comprising a single bar, a horizontal sand-drier at one end thereof, an asphalt-melting chamber at the other end thereof, a mixing device located between said tank and drier, sand and asphalt measuring boxes located adjacent to said mixing device, a permanently-mounted sand-elevator extending at its lower end below the level of the sand-drier and at its upper end not substantially higher than the sand-drier, means for directing the sand from said drier to the lower end of said elevator, means for directing the sand from the upper end of said elevator to the sand-measuring box, and means for directing the melted asphalt to the asphalt-measuring box.

10. An apparatus for the purpose described, comprising a single car, a sand-drier at one end thereof, an asphalt-melting chamber at the other end thereof, a mixing device located between said tank and drier, sand and asphalt measuring boxes located adjacent to said mixing device, an elevator the lower end of which is below the level of the sand-drier and the upper end of which is not higher than the average height of the apparatus, means for directing sand from said drier to the lower end of said elevator, means for directing sand from the upper end of said elevator to the sand-measuring box, means for directing melted asphalt to the asphalt-measuring box, and a storage-space or hopper into which sand may be temporarily diverted at a point between said elevator and the sand-measuring box, said chamber or hopper discharging its contents in the lower end of said elevator.

11. An apparatus for the purpose set forth comprising a single car, a sand-drier on one end thereof, an asphalt-melting tank at the other end thereof, a mixing device located between said tank and drier, an elevator extending at its lower end below the level of said drier, means for delivering sand from said drier to the lower end of the elevator, means for delivering sand from the upper end of the elevator to said mixing device, means for delivering melted asphalt from the asphalt-tank to the mixing device, and a chamber or hopper located at the lower end of and communicating with the elevator for receiving sand diverted from the conduit through which the sand is directed from the elevator to the mixing device, the sand so diverted into said hopper or chamber being again carried upwardly by the elevator and a portion or all of it directed to the mixing device.

12. An apparatus for the purpose set forth comprising a single railway-car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device located between said tank and drier, sand and asphalt measuring boxes located adjacent to said mixing device, means for delivering melted asphalt to its measuring-box, means for delivering sand to the sand-measuring box, comprising an elevator located with its lower end below the level of the sand-drier, means for delivering sand from said drier to the lower end of the elevator, a sand-screen located at a level above that of the measuring-boxes, but not substantially higher than the average height of the apparatus, means for directing the sand from the upper end of said elevator into the sand-screen and a spout for discharging the sand from said screen to the sand-measuring box.

13. An apparatus for the purpose set forth comprising a single railway-car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device located between said tank and drier, sand and asphalt measuring boxes located adjacent to said mixing device, means for delivering melted asphalt to its measuring-box, means for delivering sand to the sand-measuring box, comprising an elevator located with its lower end below the level of the sand-drier, means for delivering sand from said drier to the lower end of the elevator, a sand-screen located at a level above that of the measuring-boxes, means for directing the sand from the upper end of said elevator to the sand-screen, a spout for discharging the sand from said screen to the sand-measuring box, said spout being rotative or movable for diverting the sand from said sand-measuring box and a chamber or hopper communicating with the lower end of said elevator for receiving the sand so diverted.

14. An apparatus for the purpose set forth comprising a single car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device located between said tank and drier, sand and asphalt measuring boxes located adjacent to said mixing device, means for delivering sand to the sand-measuring box, comprising an elevator located with its lower end below the level of the sand-drier, means for delivering sand from said drier to the lower end of the elevator, a sand-screen located at a level above that of the measuring-boxes, but not substantially higher than the general average height of the apparatus, means for directing the sand from the upper end of said elevator into the sand-screen, a spout for discharging the sand from said screen to the sand-measuring box, said spout being rotative or movable for diverting the sand from said measuring-box, a chamber or hopper communicating with the lower end

of said elevator for receiving the sand so diverted, and a spout leading from the sand-screen for directing the coarser sand or gravel therefrom.

15. In an apparatus for the purpose described, the combination with an asphalt-melting tank, a mixing device, means for delivering melted asphalt to said mixing device, a sand-measuring box adjacent to the mixing device, means for delivering dried sand to the measuring-box comprising means located between the drier and the mixing device for diverting a portion of the sand from said measuring-box, and means whereby the sand so diverted is automatically redirected to the measuring-box.

16. In an apparatus for the purpose set forth, the combination with an asphalt-tank, a mixing device, means for delivering melted asphalt to said mixing device, a sand-drier, an elevator receiving at its lower end dried sand from said drier, means for directing the sand from the upper end of said elevator to said mixing device, means located between the elevator and mixing device for temporarily diverting a portion of the sand to a chamber or hopper located near and communicating with the lower end of the elevator, whereby the sand so diverted is again elevated to be redirected to said mixing device.

17. In an apparatus for the purpose set forth, the combination with an asphalt-tank, a mixing device, means for delivering melted asphalt to said mixing device, a sand-drier, a sand-measuring box located adjacent to the mixing device, an elevator receiving the sand at its lower end from said drier, a sand-screen located above the level of said sand-measuring box but not substantially higher than the general height of the apparatus, a spout leading from the sand-screen for directing the sand to the sand-measuring box, means for diverting a portion of the sand from the said measuring-box, and a hopper or chamber communicating with the lower end of said elevator and adapted to receive the sand so diverted and carry it upwardly to said screen.

18. An apparatus for the purpose set forth comprising a single car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device between said tank and drier, measuring-boxes located adjacent to said mixing device, means for delivering melted asphalt to the asphalt-measuring box, means for delivering the sand to the sand-measuring box, comprising an elevator receiving at its lower end sand from the sand-drier, a screen located above the level of said sand-box but not substantially higher than the average height of the apparatus, means for discharging sand from the upper end of the elevator to the screen, a spout for discharging the sand from said screen to the sand-measuring box.

19. An apparatus for the purpose set forth comprising a single car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device between said tank and drier, measuring-boxes located adjacent to said mixing device, means for delivering melted asphalt to the asphalt-measuring box, means for delivering the sand to the sand-measuring box, comprising an elevator receiving at its lower end sand from the sand-drier, a screen located above the level of said sand-box, but not substantially higher than the average height of the apparatus, means for discharging sand from the upper end of the elevator to the screen, a spout for discharging the sand from said screen to the sand-measuring box, means for diverting a portion of the sand from the sand-measuring box, and a chamber communicating with the lower end of the elevator for receiving the sand so diverted from the sand-measuring box.

20. An apparatus for the purpose set forth comprising a single car, a sand-drier at one end thereof, an asphalt-melting tank at the other end thereof, a mixing device between said tank and drier, measuring-boxes located adjacent to said mixing device, means for delivering melted asphalt to the asphalt-measuring box, means for delivering the sand to the sand-measuring box, comprising an elevator receiving at its lower end sand from the sand-drier, a screen located above the level of said sand-box, but not substantially higher than the average height of the apparatus, means for discharging sand from the upper end of the elevator to the screen, a spout for discharging the sand from said screen to the sand-measuring box, a carriage on which said mixing device and sand and asphalt measuring boxes are supported, tracks or ways located above the level of the car between said tank and drier, and upon which the carriage is adapted to be supported, and an extension-frame extending laterally and horizontally from said tracks or ways and provided beneath the same with a space to receive a wagon, said frame being constructed to receive the carriage supporting the mixing device and measuring-boxes when the apparatus is erected for operation.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 29th day of August, A.D. 1904.

FRANK BLAIR SMITH.

Witnesses:
ARTHUR J. LEAHY,
ALBERT JOHNS.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of September, A. D. 1904.

HENRY R. KASSON.

Witnesses:
CHAS. G. ROMANS,
R. P. TILLOTSON.