W. SNYDER.

MIXING APPARATUS.

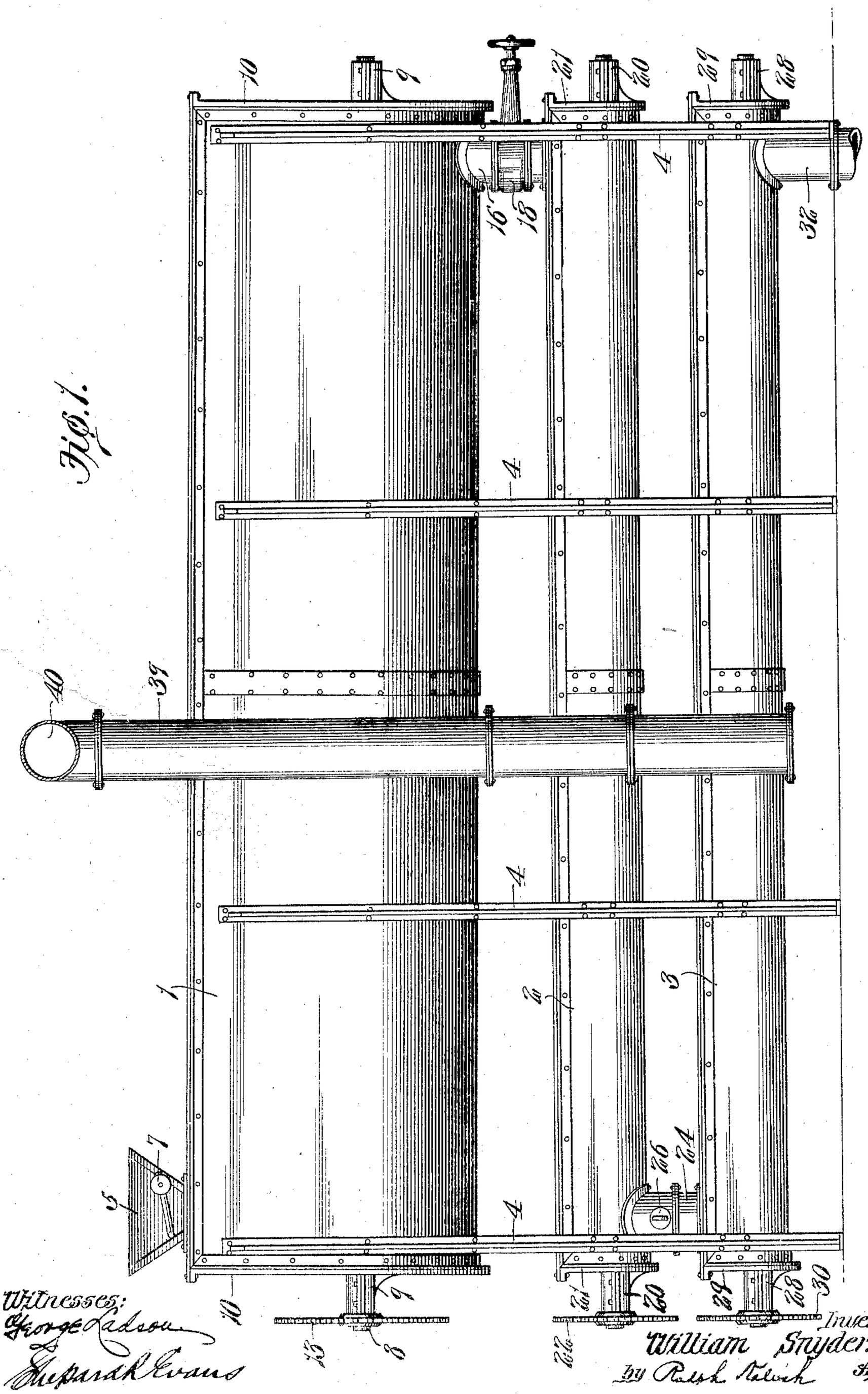
APPLICATION FILED DEC. 18, 1908.

929,719.

Patented Aug. 3, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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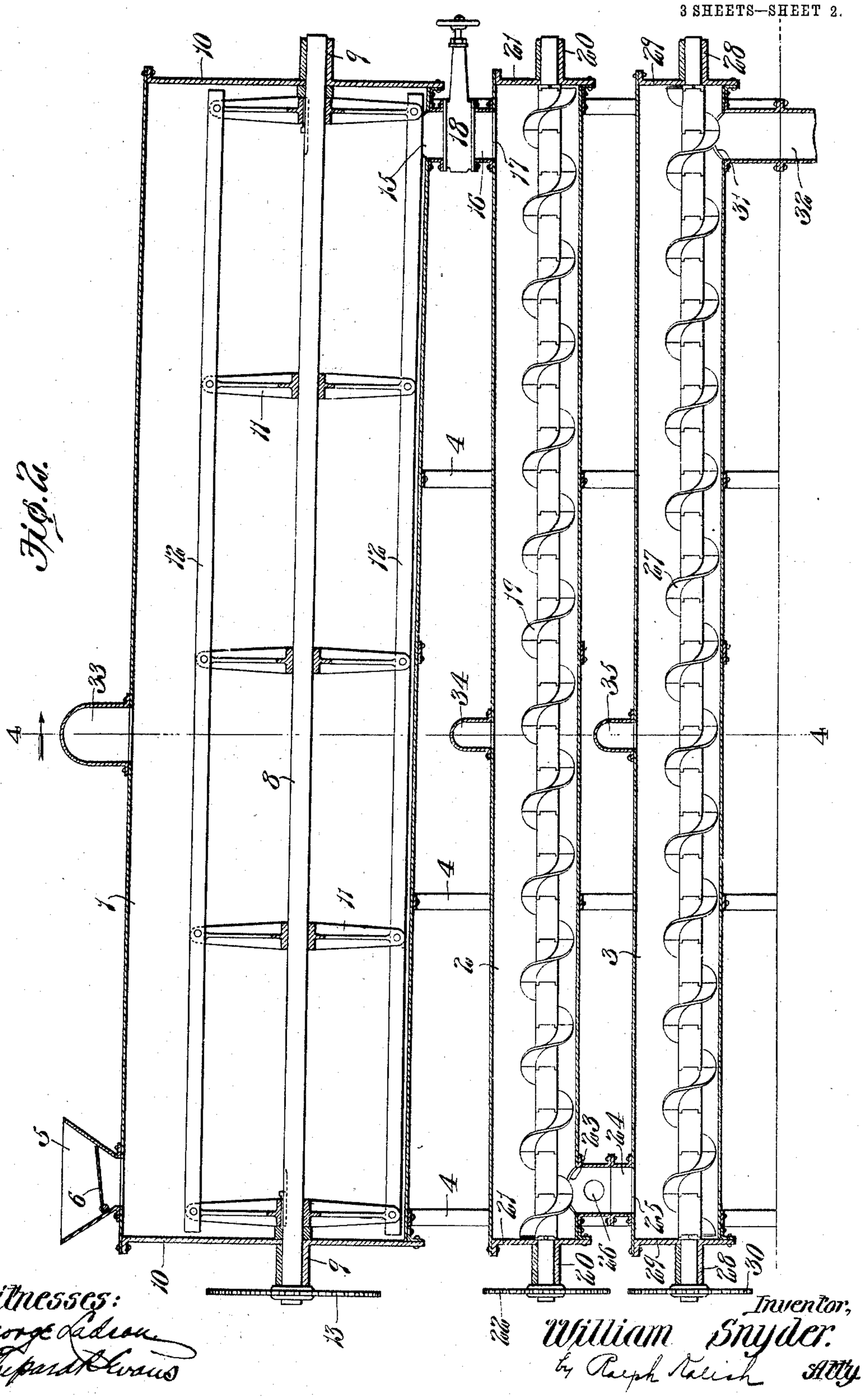
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

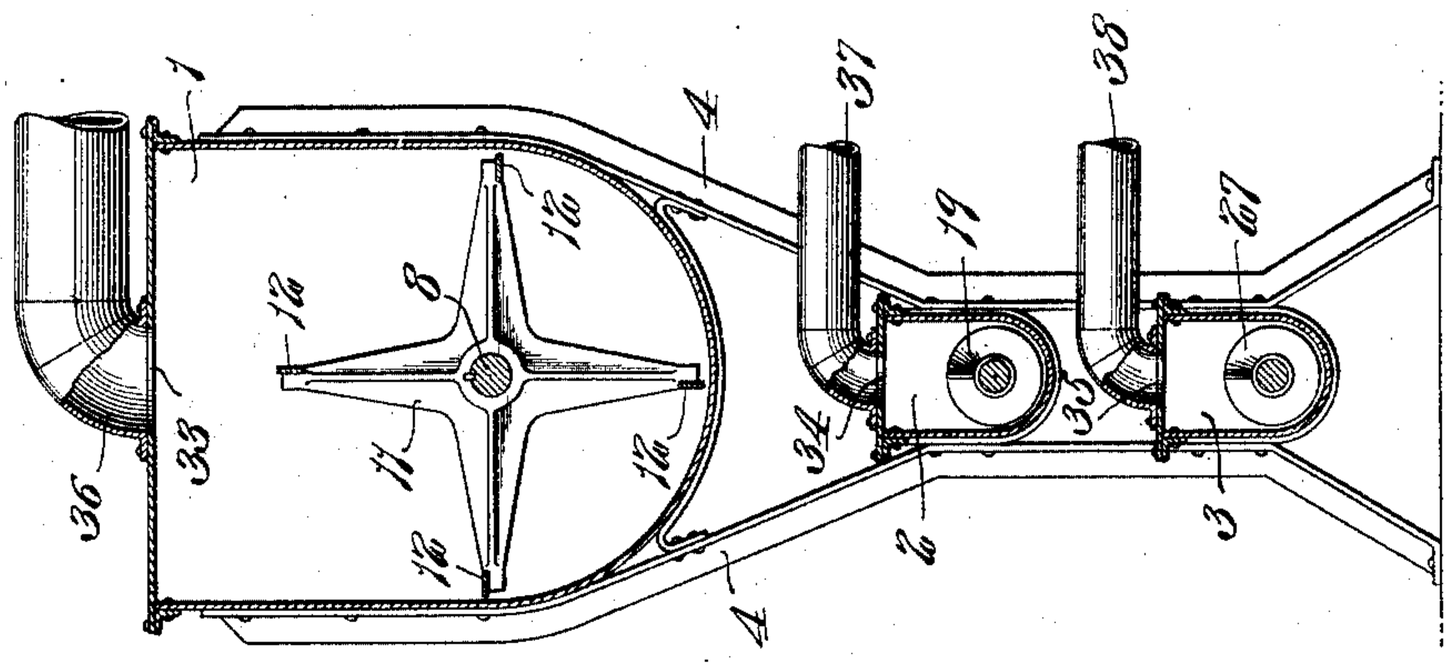
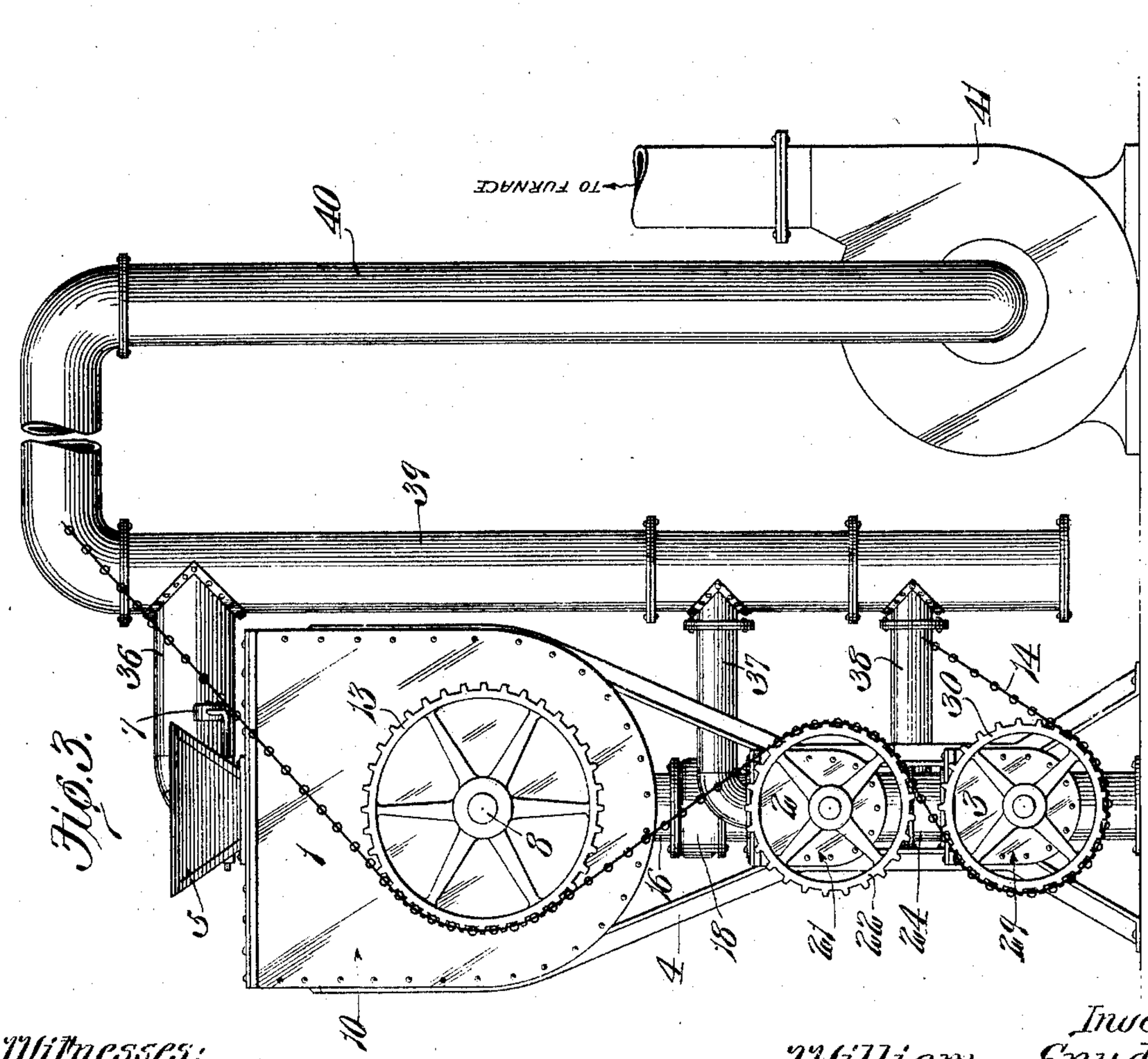


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM SNYDER, OF ST. LOUIS, MISSOURI.

MIXING APPARATUS.

No. 929,719. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed December 18, 1908. Serial No. 468,165.

To all whom it may concern:

Be it known that I, WILLIAM SNYDER, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Mixing Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a side elevational view of my improved mixing apparatus; Fig. 2 is a vertical longitudinal sectional view through the same; Fig. 3 is an end elevational view thereof; and Fig. 4 is a vertical cross-sectional view thereof on the line 4—4, Fig. 2.

This invention relates to a new and useful improvement in mixing apparatus, and particularly in apparatus for mixing materials, such as garbage, tankage, offal, and the like, with proper or suitable acids or chemicals for the purpose of making thereof either fuel or commercial fertilizers.

The object of my invention is to provide an apparatus of the kind described which is strong, durable, readily constructed, and positively operated, and wherein the said materials and acids or chemicals are thoroughly mixed and the vapors or gases removed therefrom during the passage thereof through the apparatus.

With this object in view, my invention consists in the novel construction of the several parts of my apparatus and in the novel arrangement and combination of the same, all as will hereinafter be described and pointed out in the claims.

As shown in the drawings, my apparatus comprises preferably a receiving mixing-chamber 1, an intermediate mixing-chamber 2, and a finishing chamber 3, the same being preferably arranged one above the other and supported by suitable frames or standards 4.

Receiving-chamber or tank 1 is preferably an elongated closed receptacle having a semi-cylindrical body portion, as shown, and is preferably arranged on the standards 4 at an incline downwardly from the front end toward the rear end thereof. In its top and at the front or higher end thereof, tank 1 is provided with an inlet-opening or hopper 5, through which the materials to be mixed or treated are adapted to be fed into said tank, the hopper 5 being provided with a suitable flap or leaf valve 6, which is held in open or closed position by a weighted arm or lever 7.

Journaled or rotatably mounted in suitable bearings 9 in heads 10 of tank 1 and extending longitudinally through said tank is a shaft 8. Fixedly secured on said shaft is a series of spiders or arms 11, to the ends of which are adapted to be connected blades or strips 12, said shaft 8, arms 11, and blades 12 constituting or forming an agitator or stirrer adapted to mix or stir the materials fed into said tank, the said blades 12 being adapted to rotate or revolve close to the lower cylindrical portion of said tank 1. On one end of shaft 8 is mounted a suitable pulley or sprocket-wheel 13, which is adapted to receive motion from or to be rotated by a suitable sprocket-chain or belt 14. In the bottom and at the rear end of tank 1 is an outlet or discharge opening 15, which communicates preferably with an inlet-opening 17 in the top and at the rear end of chamber 2 through a pipe or tube 16, this pipe or tube 16 being provided with preferably a suitable gate-valve 18, for purposes hereinafter appearing. Intermediate chamber 2 is also preferably an elongated closed tank having a semi-cylindrical body portion and is preferably of smaller size than tank 1.

Journaled or rotatably mounted in bearings 20 in heads 21 of chamber 2 is a preferably sectional screw-conveyer 19, which extends the entire length of said tank and is adapted to deliver or transfer the materials entering tank 2 at the rear thereof through inlet-opening 17 to the front end thereof. On the front end of conveyer 19 is a suitable pulley or sprocket-wheel 22 preferably in substantial alinement with sprocket-wheel 13, so as to be rotated by the same sprocket-chain or belt 14. At the front end and in the bottom of chamber 2 is an outlet or discharge opening 23, which communicates through a pipe or tube 24 to an inlet-opening 25 in the top and at the front end of the finishing-chamber 3, the said pipe or tube 24 being provided with a removably-covered opening 26, for purposes hereinafter appearing. Finishing-chamber 3 is also preferably an elongated closed tank having a semi-cylindrical body portion and is preferably of the same size as tank 2.

Journaled or rotatably mounted in bearings 28 in heads 29 of said tank 3 is a preferably sectional screw-conveyer 27 similar to conveyer 19 and which is adapted to deliver or transfer the materials entering said tank through inlet-opening 25 to the rear of said tank, where it is discharged through a suit-

able outlet-opening 31 communicating through a pipe or tube 32 to any suitable drying or pressing apparatus (not shown), where the said materials may be further treated or made into fuel-briquets. On the front end of conveyer 27 is a suitable pulley or sprocket-wheel 30 preferably in substantial alinement with sprocket-wheels 13 and 22, so as to be rotated also by the same belt or sprocket-chain 14.

In the top of each of said respective tanks or chambers 1, 2, and 3 is a vapor or gas outlet-opening 33, 34, and 35, respectively, which openings are connected by pipes 36, 37, and 38, respectively, to an upstanding pipe 39 leading through a pipe 40 to an exhaust or suction fan 41 leading to the furnace or other suitable place, whereby the vapors or gases given off by said materials during the passage thereof through said tanks may be exhausted from said tanks and carried to said furnace or other suitable place where they are burned or otherwise disposed of.

While it is to be understood that my mixing apparatus may be used for mixing materials or substances of various kinds and for various purposes, I have heretofore used it for mixing such materials as garbage, tankage, nightsoil, and other refuse with proper or suitable acids or chemicals for the purpose of making thereof either fuel or fertilizer. For such purposes, my process of treatment or mixture of said materials by my mixer is, briefly, as follows: After the garbage, tankage, or other refuse has been ground or rolled, it is delivered in a wet or green state to hopper 5 and into tank 1, said tank being usually constructed to contain about two and a half tons of such materials. During this filling operation of tank 1, the gate-valve 18 is slightly opened, in order that the water in said materials may be to a great extent drained off. Afterward this valve 18 is closed, and I now add to the particular materials in tank 1 the proper quantity of any suitable chemicals or acids, such as preferably sulfuric acid or vitriol, which tend to disintegrate or decompose said materials, to kill the grease therein, to evaporate or absorb the moisture or water remaining therein, and to separate therefrom odorous gases or vapors. The said materials and acids or chemicals are now thoroughly mixed in tank 1, the gases or vapors therefrom being drawn off through opening 33 and pipe 36. After the mixture has been treated in tank 1 for a sufficient length of time, the gate-valve 18 is opened, and said mixture may be delivered to the exterior, but preferably passes down into the rear end of tank 2, where it is transferred by conveyer 19 through tank 2 to pipe 24, whence it passes into tank 3, where it is transferred by conveyer 27 to discharge-pipe 32, the conveyers 19 and 27 being adapted to rotate or revolve close to the cylindrical bottoms of tanks 2 and 3, respectively, and said mixture being further treated or mixed during its passage through said tanks and any vapors or gases thrown off therefrom during said passage being exhausted through openings 35 and 36 and pipes 37 and 38. When such mixture is delivered through pipe 32, it is comparatively odorless and is in a damp, powdered state, such mixture being now transferred to any suitable drying or pressing apparatus, where it may be further treated, depending upon the use to which the same is to be put. Should it be desired to make fertilizer of such mixture, the necessary or desired plant-food elements, such as phosphates, for instance, might be added to the said materials and mixed therewith during the passage thereof through my mixer; but I preferably add such fertilizer or plant-food elements to said mixture after the same has passed from my apparatus and been thoroughly dried. Should it be desired to make fuel briquets from said materials, I preferably add to the same while passing through my mixer and preferably through opening 26, pulverized coal or other suitable substance, which is thoroughly mixed with said materials during the passage thereof through tank 3. Such mixture may now be delivered to a pressing apparatus and pressed into the form of briquets, which have been found to make exceedingly good fuel. I might add that in the treatment of nightsoil by my mixer for the purpose of making fuel thereof, crude oil in the proper amount or quantity might also be added, which increases the burning qualities thereof.

By my mixer and the process of treatment of said materials as described, the expensive process of boiling or rendering said materials is done away with, the obnoxious gases or vapors from said materials being drawn off and carried away by my mixer during the passage of said materials therethrough, and my mixer may be readily constructed and at a comparatively low cost. The top portions of the tanks may be of comparatively light material, while the body portions and heads are preferably of cast iron, so as to provide a rigid construction and one not readily affected by acids or chemicals. The shaft 8 and conveyers 19 and 27 are positively driven by the belt or sprocket-chain 14, and, as is obvious, conveyer 19 rotates in an opposite direction from shaft 8 and conveyer 27, so as to properly propel the materials being mixed through the apparatus. I have shown but one vapor or gas exhaust opening in each tank, but it is to be understood that two or more such openings might be made in each said tank and that other changes in the construction, arrangement, and combination of the several parts of my mixer may be made and substituted for those herein shown

and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The mixing apparatus herein described, the same comprising standards, a series of elongated tanks comprising a receiving-tank and a finishing-tank mounted substantially in vertical alinement on said standards, said receiving-tank being adapted to receive the materials to be mixed and being inclined downwardly toward the rear thereof, and each of said tanks being provided with an inlet-opening in its top, an outlet-opening in its bottom, and a vapor-exhaust opening, a stirrer adapted to mix said materials rotatably mounted in said receiving-tank, a pipe connecting the outlet-opening of said receiving-tank with the inlet-opening of said finishing-tank, a valve in said pipe adapted to regulate the passage of said materials therethrough, a screw conveyer rotatably mounted in said finishing-tank and adapted to convey said materials from end to end thereof, means adapted to rotate said stirrer and conveyer, a main exhaust-pipe, a separate exhaust-pipe connecting the exhaust-opening of each of said tanks with said main exhaust-pipe, and means adapted to exhaust the vapors and gases from each of said tanks through said exhaust-pipes; substantially as described.

2. The mixing apparatus herein described, the same comprising standards, a series of elongated tanks comprising a receiving-tank, a middle-tank, and a finishing-tank mounted substantially in vertical alinement on said standards, said receiving-tank being adapted to receive the materials to be mixed and being inclined downwardly toward the rear thereof, and each of said tanks being provided with an inlet-opening in its top, an outlet-opening in its bottom, and a vapor-exhaust-opening, a stirrer adapted to mix said materials rotatably mounted in said receiving-tank, a pipe connecting the outlet-opening of said receiving-tank with the inlet-opening of said middle-tank, a valve in said pipe adapted to regulate the passage of said materials therethrough, a screw-conveyer rotatably mounted in each said middle and finishing-tanks and adapted to convey said materials from end to end thereof, a pipe connecting the outlet-opening of said middle-tank with the inlet-opening of said finishing-tank, means adapted to rotate said stirrer and conveyers, a main-exhaust-pipe, a separate exhaust-pipe connecting the exhaust-opening in each of said tanks with said main exhaust-pipe, and means adapted to exhaust the vapors and gases from each of said tanks through said exhaust-pipes; substantially as described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM SNYDER.

Witnesses:
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SHEPARD R. EVANS.