

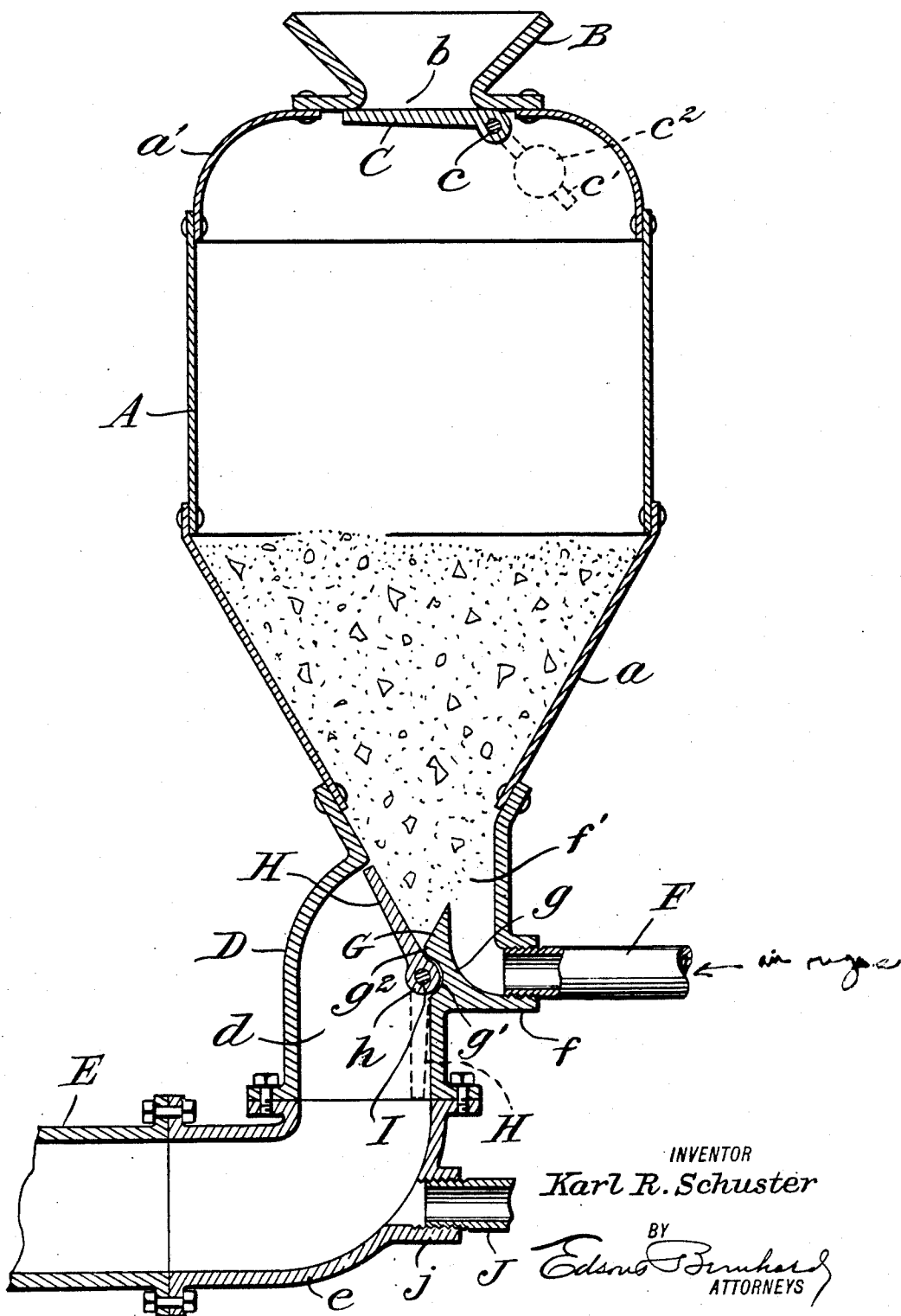
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ART OF MIXING CONCRETE AND TRANSPORTING THE SAME

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# UNITED STATES PATENT OFFICE.

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ART OF MIXING CONCRETE AND TRANSPORTING THE SAME

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*To all whom it may concern:*

Be it known that I, KARL R. SCHUSTER, a citizen of the United States, residing at the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Art of Mixing Concrete and Transporting the Same, of which the following is a specification.

10 This invention pertains to the art of mixing concrete and transporting the same to the place where said material is to be utilized in the installation of concrete structures of one form or another.

15 The objects of the invention are to expedite the mixture of the materials, to attain a superior admixture within a few minutes time, and to feed or transport the material from the mixing contrivance, all of which results in substantial economy of the operations.

To these ends, the first part of my invention involves the use of air or other gas under pressure and controlled in such a way as to effect both the admixture of the materials and the feeding or transportation of the resulting concrete. Accordingly, the operations include the depositing of the material (sand, a mineral aggregate and cement with sufficient water) within a closed chamber; admitting air, steam or other gas to the lower part of such chamber, whereby the air or gas blown into the chamber exerts pressure upon the materials so as to blow the same upwardly within the chamber and thereby agitate said materials to secure the desired admixture thereof; then accumulating the air or gas within said chamber until the air or gas pressure upon the mixed materials is equal substantially to the pressure of the current blown into the bottom part of said chamber; then shutting off the pressure of the inflowing air or gas while retaining the pressure within the chamber; then opening the outlet from the bottom of the chamber so as to supplement the gravity or weight of the mass by the pressure of air or gas within the chamber, thereby displacing the mass of materials from said chamber and expelling or feeding said mass through a conduit leading to the point at which the concrete is to be utilized, and, if required, admitting additional air or gas under pressure into the

conduit and in the rear of the mass moving through said conduit.

The apparatus invented by me for carrying out the process hereinbefore stated embodies a drum-like chamber provided at its upper portion with a charging opening, and at its lower portion with an outlet; means for closing said charging opening tightly; a pressure pipe attached to the lower part of said chamber for feeding air or gas thereinto and under a pressure sufficient to effect the admixture of the materials and the displacement of the resulting mixed mass of concrete; and a valve for closing the outlet at the time the air or gas is blown into the chamber. From the bottom of the chamber a conduit extends to the point at which the concrete is to be utilized, and if necessary a second pressure pipe is connected with said conduit for blowing air or gas into the same to supplement the pressure of the gas or air admitted initially and thereby effect the movement of the mass of concrete should it be found necessary to transport the latter for a long distance.

Other features and advantages of the invention will appear from the following description taken in connection with the drawing, wherein the figure shown is a vertical section through an apparatus for mixing and transporting concrete in accordance with this invention.

A designates a tank or hopper, the lower part *a* of which is of inverted conical form, whereas the upper part *a'* is dome-shaped. The tank is provided with a mouth member B of flaring form having a charging opening *b*, the latter being normally closed by a gate-valve C. The mouth and the valve are mutually constructed to secure a tight joint around the charging opening in order to preclude the escape of air or gas and to effect the accumulation of the air or gas blown into the chamber of the tank. Any suitable means may be employed for the operation of the gate-valve and to retain the latter in a tightly closed relation to the charging mouth, but, as shown herein, said gate-valve is hung on a rockshaft *c*, to one end of which is attached an externally positioned lever *c'* having a weight *c''*. The lever provides convenient means for opening the valve in order to introduce the materials into the tank, but when the lever is

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released, the weight  $c^2$  presses the valve tightly against the mouthpiece B.

Attached to the lower part of the tapering member  $a$  is a fitting D, the same providing an outlet  $d$  leading from the lower part of the tank or receptacle to an elbow  $e$  of a conduit E, the latter extending from the tank or receptacle to the place where the mass of concrete is to be used in the construction of buildings, etc. The fitting D is provided at one side thereof with a nipple  $f$  forming a passage  $f'$  leading upwardly into the chamber of the tank or receptacle A. The pressure pipe F is coupled in a suitable way to the nipple  $f$ , said pipe being adapted to feed air or gas under pressure through the passage  $f'$  in a manner to at all times direct the inflowing pressure of air or gas upwardly into the material present within the tank, said inflowing air or gas being directly upwardly into contact with the material and above the mixture outlet  $d$ . The area of the air inlet is considerably less than the area of the outlet  $d$  for the mixture; in practice, the mixture outlet is sufficiently large to provide for the free egress of the concrete material, including the coarse mineral aggregate which is incorporated with the sand and cement. The mixture outlet thus affords an unobstructed opening for the mixed material, and the gas or air is supplied under pressure and at the required velocity upwardly into the chamber, and above the mixture outlet, for agitating the materials to properly effect the mixture thereof. The pressure pipe F should, obviously, be connected with a pressure reservoir into which air or gas is forced by any suitable compressor so as to maintain a pressure of 80 lbs., more or less, as may be found necessary in the operation of the apparatus. The fitting D is provided, also, with a baffle G, positioned opposite the outlet of pressure pipe F. The baffle extends upwardly into the space or chamber of fitting D, one surface  $g$  of the baffle being curved as shown for the purpose of directing the inflowing air or gas in an upward path into the tank. The baffle G is formed with a recess  $g'$  adapted to produce a shoulder  $g^2$ , and within this recess is fitted a heel  $h$  of a valve H, the latter being normally positioned across the outlet from the bottom of the hopper. Said heel of the valve is attached to a rockshaft I, the end portions of which are supported in suitable bearings provided in the fitting D, and, as will be readily understood, this rockshaft is provided with suitable means whereby the shaft may be rocked either by hand or power so as to impart a swinging movement to the valve H. In the operation of mixing the material and of accumulating air or gas pressure within the tank, valve H occupies the raised position shown in full lines in the

drawings so as to cut off the outflow of the mass of material and to retain the air or gas within the tank, but after the mixture of the materials shall have been effected within the tank, the rockshaft I is turned so as to move the valve H into the position shown in dotted lines in the drawing. The outlet from the hopper is thus opened for the material to pass through the fitting D and elbow  $e$  into the conduit E, the valve H being positioned below the shoulder  $g^2$  of the baffle and said valve lying close against a wall of the fitting D so that said valve is substantially out of the path or line of direction of flow of the material as it is forced out of the tank and into the conduit.

It is apparent that the fitting D should be attached firmly to the member  $a$  of the tank and to a flange of the elbow  $e$ , the latter being in turn secured rigidly to the conduit E, but as the details of construction are well within the scope of the skilled constructor, I have not considered it important to more particularly illustrate or describe the special form of connection between the several parts of the apparatus.

The conduit E is of a length to extend from the mixing tank to the place at which the concrete material is to be utilized in construction work, and in some instances this conduit may be so long that the pressure of air or gas accumulated within the tank A is not sufficient to effect the transportation of said concrete material for the full length of said conduit. Under such circumstances, it is preferred to employ an additional pressure pipe J which is coupled to a nipple  $j$  of the elbow  $e$ , whereby said pipe J is adapted to supply additional air or gas to the conduit E and rearwardly of the mass of material moving therein.

The operation is as follows:—

The pressure pipes F, J are closed by the operation of suitable stop cocks (not shown) and lever  $c'$  is operated to open valve C, the valve H occupying the closed position shown in full lines. The materials, usually sand, cement, a mineral aggregate, and water in the required volumes, are poured through the opening  $b$  of the charging mouth so as to accumulate within the tank A a batch of the materials to be mixed. The valve C is now closed and pressed tightly against the charging opening of the mouth B, and air or gas under a pressure of about 80 lbs. to the square inch is admitted to the lower part of the tank through the pipe F. The baffle G directs the inflowing air or gas upwardly and into and through the material comprising the batch, whereby said air or gas when initially admitted blows the material upwardly within the chamber of the tank for the purpose of effecting the admixture of said materials. The air or gas accumulates within the upper part of the tank

A and above the mass of materials therein. The air or gas continues to flow into the tank until the pressure in the upper chamber thereof becomes equal to the pressure of the inflowing air or gas, and at this time the mass of material is in a quiescent or non-agitated condition. By accumulating the air or gas within the tank until it has attained a pressure in the upper part of the tank equal to the pressure of the inflowing air or gas, instead of permitting the air or gas to escape out of the tank as in systems which have preceded my invention, I am enabled to utilize the air or gas pressure in the expulsion of the mixed mass of materials from the tank and to transport said mixed materials through the conduit to the point where the concrete mixture is to be utilized, as a result of which economy of operation is obtained. The materials having been mixed within the tank, and air or gas having accumulated to about 80 lbs. within said tank and above the mass of materials, the operator should turn rock shaft I in order to move the valve H to the depending position close to a wall of the fitting D, as shown in dotted lines, thus opening the outlet from the tank to the conduit. The weight or gravity of the mass of material and the pressure of the air or gas upon the mass effects a quick expulsion of the material from the tank, said material being forced through the conduit E by the pressure of the air or gas. Should the movement of the material be relatively slow, or should the material require transportation for a comparatively long distance, then additional air is supplied directly into the conduit E by the pressure pipe J.

I attach importance to the use of the tank closed against the exit of air or gas and the outlet of the materials during the operation of blowing air or gas under pressure into the tank, for the reason that I am thereby enabled to effect substantial economy in the mixing operation and in the subsequent transporting operation. By closing the tank against the egress of air or gas while mixing the ingredients, it is apparent that the cement, introduced in a dry condition, is not blown out of said tank when the air or gas blast is turned on, thus effecting a material saving in the cement; and, further, the air or gas is retained under pressure so that after the blast is first turned on the materials are mixed, and then become quiescent under the accumulated pressure, whereupon valve H is opened and the mixed mass is expelled by the accumulated pressure, thus effecting a substantial saving in the blast required to effect the mixing and in the pressure utilized for transporting the mass.

In the operation of the apparatus so as to carry out the process of this invention, the inflow of air or gas, at the initial stage of

mixing, operates to displace the ingredients of the mixture; but after a short time the mixture attains a state of quiescence, due to the continued inflow of the air or gas and to the accumulation thereof within the upper part of the closed chamber. The air or gas, after the mixing is completed, continues to flow into the chamber until the pressure therein above the mixture is equal to the pressure at the feed pipe or substantially so, this condition being indicated to the user of the apparatus by the cessation of flow from the feed pipe into the chamber or tank, or such indication may obviously be attained by any means known to those skilled in the art, such, for example, as are afforded by a pressure gage or gages.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In the art of mixing and transporting concrete, the process which consists in accumulating the materials to be mixed within a closed chamber; blowing air or gas upwardly into contact with said materials for agitating and mixing the same and simultaneously with said inflow of air or gas restraining the materials to preclude their exit from the chamber and restraining, also, the exit from said chamber of the inflowing air or gas; continuing the inflow of air or gas upwardly through the material until it attains a desired pressure upon the mixed mass; releasing the mixed mass from restraint and expelling the same from said chamber solely by the pressure of air or gas accumulated therein; and by a continuance of said inflow of gas and moving the mixed mass to a place of use by air or gas pressure applied to said mass.
2. In the art of mixing and transporting concrete, the process which consists in accumulating the materials to be mixed within a closed chamber; blowing air or gas under pressure upwardly within said chamber into contact with said materials for agitating and mixing the same and simultaneously therewith restraining the exit from said chamber of the agitated materials and of the inflowing air or gas; continuing to feed air or gas under pressure upwardly into the mass and the chamber until such air or gas attains a desired pressure within said chamber; releasing the mixed mass from restraint and expelling said mass from the chamber solely by the pressure of air or gas accumulated therein; and subjecting the mixed mass to the pressure of the air or gas released from the chamber augmented by the pressure of additional air or gas supplied rearwardly of the moving mixed mass.

3. In an apparatus of the class described, the combination of a chamber provided with a charging opening and at its bottom por-

tion with an outlet, means for closing the charging opening against the escape of air or gas, means connected with said chamber for blowing air or gas therein, a valve operable to close the outlet during the operation of blowing air or gas into the chamber, a baffle positioned intermediate the valve and the outlet from said blowing means, for directing the inflowing air or gas upwardly within the chamber, and a conduit connected to the bottom part of the chamber for the flow of the concrete mass therethrough upon opening the valve.

4. In an apparatus of the class described, the combination of a closed chamber provided with a charging opening, an off-bearing conduit connected to the bottom portion of said chamber and affording an outlet for the mass therein, means for closing said charging opening whereby air or gas is precluded from escaping out of the chamber, a valve positioned for cutting off communication between the chamber and the off-bearing conduit, means connected with said chamber for feeding air or gas upwardly into said chamber when said valve is closed, said valve being operable to open a path from the chamber to the conduit and thereby utilize the pressure of the accumulated air or gas in displacing the mixture,

and means for feeding additional air or gas into said conduit and rearwardly of the material moving through it.

5. An apparatus for mixing concrete and the like embodying a vessel provided at its upper part with a charging opening, said vessel having at the lower part an outlet for the mixture, means for insuring at all times the inflow of air in an upward direction into the mixture at a point above the mixture outlet, the area of said mixture outlet exceeding the area of the air inlet and affording an unobstructed path for the free egress of the mixed materials, and a valve for closing the mixture outlet at the mixing stage of the operation.

6. An apparatus for mixing concrete and the like, comprising a vessel provided with an upper feed opening, a compressed air nozzle at the lower part thereof having a fluid discharge opening of smaller area than the said upper opening, a movably-mounted valve at the lower part of the vessel, and an upwardly directed baffle interposed in the path of the air from said nozzle, said baffle being independent of the said valve.

In testimony whereof I have hereunto signed my name.

KARL R. SCHUSTER.