No. 684,696. Patented Oct. 15, 1901.

G. W. LANGE.

CHUTE APPARATUS FOR CONCRETE MIXTURES.

(Application filed Mar. 16, 1901.)

(No Model.) 2 Sheets—Sheet 1.

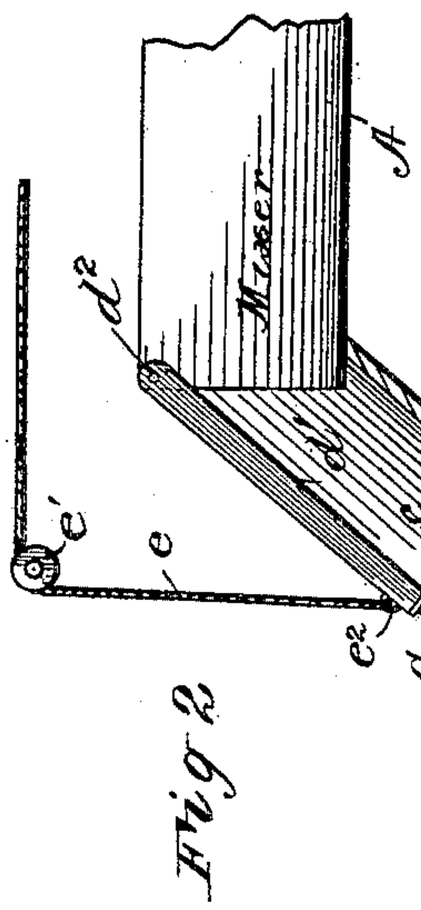

Fig 2

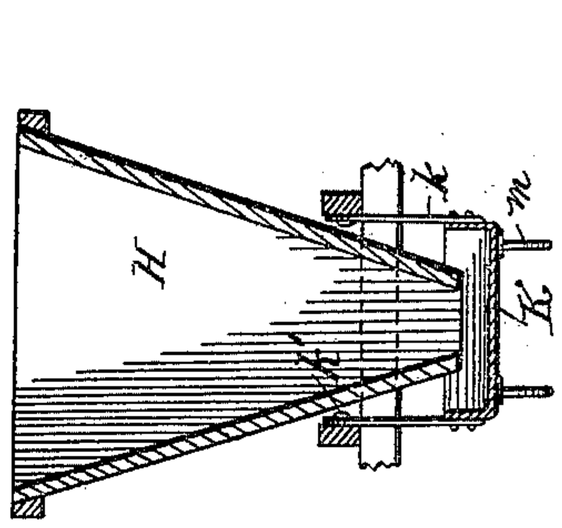

Fig 3

Fig 1.

Witnesses.
W. R. Edelen.
H. B. Tenkam

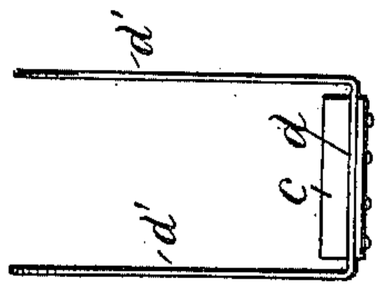

Fig. 4.

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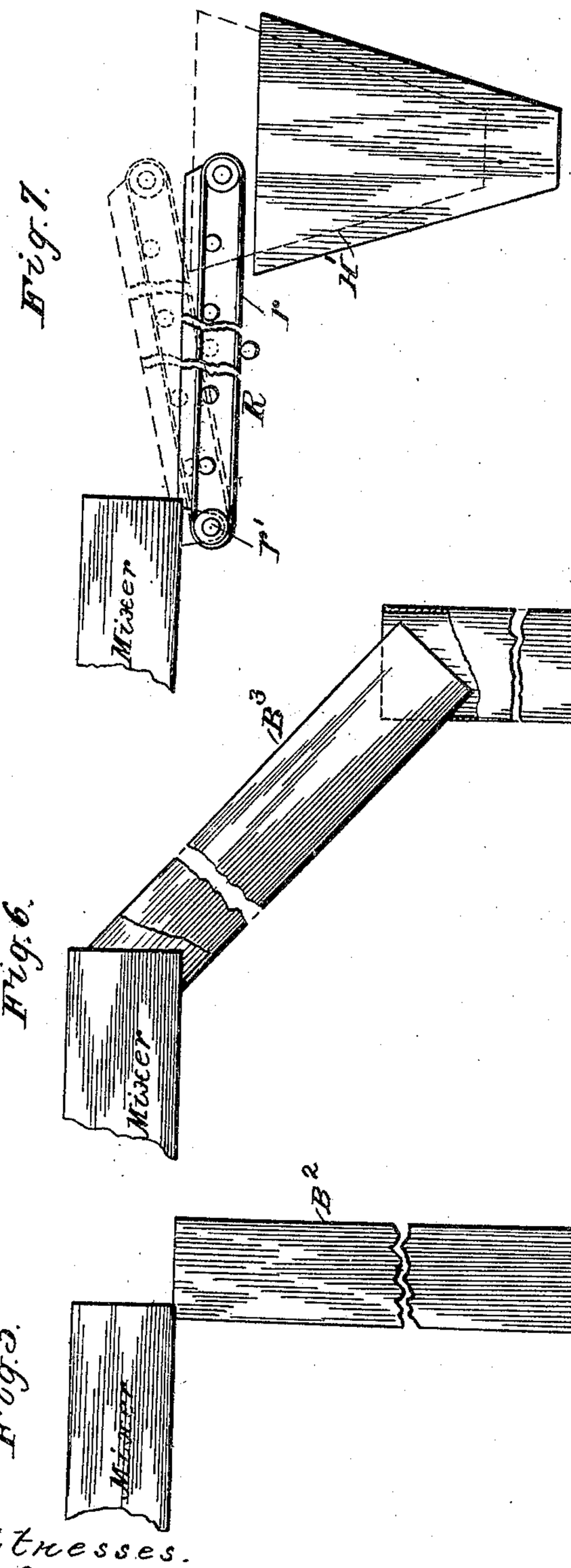

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UNITED STATES PATENT OFFICE.

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CHUTE APPARATUS FOR CONCRETE MIXTURES.

SPECIFICATION forming part of Letters Patent No. 684,696, dated October 15, 1901.

Application filed March 16, 1901. Serial No. 51,445. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LANGE, a resident of Washington, District of Columbia, have invented a new and useful Improvement in Chute Apparatus for Concrete Mixtures, which invention is fully set forth in the following specification.

It has long been the aim of engineers and contractors in the building of foundations, piers, and the like in deep excavations to deliver concrete mixtures—for example, mixtures of broken stone, sand, and cement—from one level to a considerably lower level in a perfectly-mixed condition by means of an inclined chute; but this has heretofore never been successfully and economically accomplished, for the reason that the larger and heavier particles of the mixture—the broken stone—in traveling down the chute outrun the finer and lighter particles—the sand and cement. The sand and cement therefore gradually become separated from the stone and retarded in travel not only because of their lighter weight, but also because of their adherence to a greater or less degree to the surface of the chute, so that when the materials leave the delivery end of the chute they are more or less separated or unmixed (depending largely upon the length of the chute) and unfit for use unless remixed. Remixing in an excavation or at the point of use by hand or by the ordinary mechanical mixers is not only in most cases impracticable, but always involves such additional expense as to render it prohibitive. It follows that where initial mixing at the point of use is not possible or practicable it has heretofore been necessary to lower the concrete mixture in receptacles, involving increased labor, additional apparatus, and hence large expense, avoidable by overcoming in a practicable and economical manner the unmixing incident to the use of an inclined chute.

By my present invention I overcome the difficulties and objections heretofore experienced in attempts to use a chute for the purpose above set forth.

The principal feature of said invention consists in combining with the chute, at the delivery end thereof, a hopper which acts in a manner more fully explained hereinafter to automatically remix the materials to correct whatever separation or unmixing has taken place in the travel of the mixture down the chute.

The invention also embraces other features of importance, such as means at the upper and lower ends of the chute which act to retard the travel of the mixture and tend to cause it to intermittently pass down and be delivered from the chute in separate charges, batches, or quantities in contradistinction to a continuous and even flow. It has also been found that the hopper may be used to great advantage for receiving the mixed materials from a vertically-arranged conduit or chute or from a vertical extension of an inclined chute or from a moving conveyer, such as an endless belt.

The invention in its entirety will be more fully understood by reference to the accompanying drawings, illustrating the preferred embodiment of the invention.

In said drawings, Figure 1 is a perspective view, the upper end of the chute being omitted. Fig. 2 is a longitudinal sectional view. Fig. 3 is a section through the hopper at right angles to Fig. 2. Fig. 4 is a detail view of the gate at the upper end of the chute. Fig. 5 is a sectional view illustrating the use of the hopper with a vertical chute. Fig. 6 is a similar view illustrating the use of the hopper with a vertical extension on an inclined chute, and Fig. 7 is a similar view illustrating the use of the hopper with a movable conveyer.

Referring to the drawings, A represents a mechanical mixer of any well-known construction, located, for example, at the top of an excavation. While it is preferable to employ a mechanical mixer, the mixing may be effected by hand.

B is a chute or trough arranged in an inclined position and leading to the bottom of the excavation. The trough may be lengthened and shortened as desired by the addition or removal of sections. The concrete mixture—consisting, for example, of broken stone, sand, and cement—is delivered from mixer A into the upper end of chute B.

C is a gate or retarder adapted to engage across the chute a short distance below the

delivery end of the mixer. Said gate consists of a plate *c*, preferably of sheet metal of approximately the interior shape of the chute, bolted or riveted at its upper or outer edge to the middle part *d* of a U-shaped metallic frame, the arms *d' d'* of said frame being pivoted to the mixer A at d^2. When the gate is lowered into place across the interior of the chute, the plate *c* thereof is inclined to such position as to form an acute angle with reference to the bottom of the chute below the gate, so that the plate *c* will to a certain degree engage under the material which collects in the trough above the gate. As the concrete mixture drops into the upper end of the chute from the mixer the large and heavier particles—the stone—will to a greater or less extent collect against the gate. After the desired quantity or charge of material collects against the gate an attendant pulls on a cord *e*, (which passes over a pulley *e'* and is connected to an eye e^2 on the lower end of the gate,) swinging the gate upwardly on its pivots d^2. In its upward movement the gate, by reason of its inclination, carries up with it some of the mixture, consisting principally of the broken stone which has collected against it, and then drops said material upon the rear of the charge as the same starts down the chute and passes under the elevated gate. It will therefore be seen that the gate not only serves to enable the operator or attendant to intermittently start the mixture down the chute in charges or quantities, but, furthermore, deposits a large portion of the larger and heavier particles—the stone—at the rear of the charge. It follows that with the charge so distributed there is a diminution in the separation or unmixing of the materials in their travel down the chute, the tendency being for the heavier material at the rear to sweep the lighter material down the chute in front of it.

E is a door or retarder at the lower end of chute B, arranged to swing upon a rod *f'*. Springs *f f*, secured at one end to the sides of the chute, are connected at their other ends to the projecting extremities of a rod *g*, secured across the front of the door E. Springs *f f* act to normally hold the door in its closed position, as shown in the drawings. Any loose particles or small body of material which may travel down the chute in advance of the main body of one of the charges released by gate C will be arrested or retarded by door E; but when the main body of the charge strikes the door the tension of the springs *f f* will be overcome and the door opened, the charge falling *en masse* onto the material in the hopper.

H is a hopper open at its lower end and having a vertical front wall and inclined rear and side walls. Any suitable form of hopper having downwardly-converging opposite walls either straight or curved may, however, be used—such, for example, as a conical hopper. As clearly shown in the drawings, hopper H is supported by suitable framework, which need not be described in detail. Beneath the open end of hopper H is a spout K, wider and longer than the opening from the hopper, suspended by uprights *k k* at opposite sides thereof, said uprights being pivoted at their upper ends at *k' k'* to cross-braces of the framework. Spout K may be tilted (see dotted lines, Fig. 2) by means of rearwardly-extending handles *m m*, a clearance being left between the lower extremity of the hopper and the flat bottom of the spout to permit said tilting. The delivery end of spout K overhangs the upper end of a short inclined trough L, which is adapted to deliver the material into a wheelbarrow or the like. Trough L is supported by a bar *l*, pivotally engaging the framework at its opposite ends. The inclination of trough L may be varied by means of chains *n n*, one extending from each edge of the lower end of the trough to a hook *n'* at the top of hopper H.

In order that the hopper may most efficiently perform its function of remixing the materials to correct any separation of the fine from the large particles that may have taken place in the travel of the materials down the chute B, it is desirable that the hopper shall at all times during its use remain partially full of material. Hence when work is started with the hopper empty a quantity of the material equal, say, to one or more charges which is first drawn out of the hopper is not used, or at least is preferably remixed by hand before using. Assuming the hopper to be partially filled, it will be seen that the impact and driving force exerted by each charge delivered *en masse* from the chute upon the top of the materials in the hopper acts to force said materials into a compact mass down into the tapering lower end of the hopper, the converging side walls acting to crowd both coarse and fine material together into a uniform mixture. Furthermore, the impact of the charge falling from the chute upon the contents of the hopper causes the fine particles of sand and cement to penetrate and lodge in the interstices between the larger particles of stone. It follows that a homogeneous mixture equal to if not more perfect than that delivered by the mixer to the chute issues from the lower end of the hopper. Said mixture is drawn from the hopper by an attendant, who tilts the spout K by means of handles *m*. From the spout the mixture passes by short trough L into a wheelbarrow or other means for conveying it to the particular point in the excavation at which it is to be used. Although there is not so much separation of the fine from the coarse particles when a concrete mixture falls through a vertical chute or conduit as when said mixture travels down an inclined chute, the hopper may, nevertheless, perform its functions to great advantage in connection with a vertical chute. Such an arrangement is shown in Fig. 5, H' being the hopper, having inclined

converging walls, and B^2 the vertical chute or conduit. The hopper not only prevents spreading or scattering of the material, such as would take place if the mixture were delivered upon a flat surface, but, on the contrary, acts in a manner already described to crowd and compact the materials together into a uniform mixture.

Fig. 6 shows the hopper H′ used in connection with an inclined chute B^3, having a vertical extension Q leading to the hopper, which acts to form a compact mixture, as before.

Fig. 7 shows a conveyer R having an endless traveling belt r, to which the mixture is delivered from the mixer. The conveyer may be moved on pivot r' to accommodate it to the location of hopper H′, which may be either above, below, or on a level with the mixer. In this arrangement the hopper acts substantially as above described, although there is in this case little, if any, unmixing to correct.

It is to be understood that I do not limit myself to the specific construction illustrated in the drawings, as modifications and departures therefrom may be made within wide limits without departing from the principle of the invention. Furthermore, the term "chute" as employed in the specification and claims is intended to embrace any suitable form of passage or conduit for conducting the materials and is not restricted to a passage or conduit open along one side.

I am aware that prior to my invention concrete-mixers have been devised wherein a small chamber having a tapering bottom is located below and forms an integral part or extension of the mixing-chamber proper. Such construction is in no sense the equivalent of the mixer, chute, or conveyer and hopper combined and arranged as herein set forth and cannot be employed for the purposes of my invention. The small chamber of said old construction is not a "chute" or "conveyer" nor is the tapered bottom of said small chamber a "hopper" within the meaning of such terms as ordinarily employed and as employed herein.

What I claim is—

1. An apparatus for mixing fine and coarse materials and delivering the same in a thoroughly-mixed condition at a point remote from the place of mixing, comprising a mixer at the point of mixing, a hopper at the remote point of delivery, and a chute or conveyer extending from the mixer to the hopper.

2. An apparatus for mixing fine and coarse materials and delivering the same in a thoroughly-mixed condition at a point remote from the place of mixing comprising a mixer at the point of mixing, a hopper at the remote point of delivery all of the walls of which converge downwardly, and a chute or conveyer extending from the mixer to the hopper.

3. Apparatus for mixing fine and coarse materials and delivering the same from one point to another in a thoroughly-mixed condition, said apparatus comprising a mixer, a chute or conveyer to which the materials are delivered from the mixer, a hopper into which the chute or conveyer discharges, and means at the lower end of the hopper for withdrawing the contents thereof.

4. An apparatus for mixing fine and coarse materials and delivering the same in a thoroughly-mixed condition at a point remote from the place of mixing, comprising a mixer at the point of mixing, a hopper at the remote point of delivery, and an inclined chute extending from the mixer to the hopper.

5. An apparatus for mixing fine and coarse materials and delivering the same in a thoroughly-mixed condition at a point remote from the place of mixing, comprising a mixer at the point of mixing, a hopper at the remote point of delivery all of the walls of which converge downwardly, and an inclined chute extending from the mixer to the hopper.

6. Apparatus of the kind described comprising a mixer, an inclined chute into which the mixer discharges, a hopper into which the lower end of the chute discharges, and means at the lower end of the hopper for drawing out the contents thereof.

7. Apparatus of the kind described comprising a mixer, an inclined chute into which the mixer discharges, a hopper into which the lower end of the chute discharges, and a spout located beneath the open lower end of the hopper and adapted to be tilted for drawing out the contents of the hopper.

8. In combination, a hopper open at its lower end, a spout located beneath the open lower end of the hopper adapted to be tilted for drawing out the contents of the hopper, and an inclined trough into which the spout discharges.

9. In combination, a chute or conveyer, a hopper open at its lower end and into which the materials are discharged from the chute or conveyer, a spout located beneath the open lower end of the hopper adapted to be tilted for drawing out the contents of the hopper, and an adjustable inclined trough into which the spout discharges.

10. An apparatus for mixing fine and coarse materials and delivering the same in a thoroughly-mixed condition at a point remote from the place of mixing comprising a mixer at the point of mixing, a hopper at the remote point of delivery, an inclined chute extending from the mixer to the hopper, and means associated with the chute for retarding the passage of the materials down the same.

11. Apparatus of the kind described comprising a mixer, an inclined chute into which the materials are discharged from the mixer, a hopper at the lower end of the chute, and a gate at the upper end of the chute adapted to start the materials down the chute in charges or quantities.

12. In apparatus for delivering mixtures of fine and coarse materials from one level to a lower level in a thoroughly-mixed condition, said apparatus comprising an inclined chute,

a hopper into which the materials are discharged from the lower end of the chute, and an upwardly-movable gate extending across the chute near its upper end and so inclined as to partly engage under materials which may collect in the chute above the same.

13. Apparatus for delivering mixtures of fine and coarse materials from one level to a lower level in a thoroughly-mixed condition, said apparatus comprising an inclined chute, a hopper into which the materials are discharged from the lower end of the chute, and a door for closing the lower end of the chute normally held shut by yielding pressure.

14. Apparatus for delivering mixtures of fine and coarse materials from one level to a lower level in a thoroughly-mixed condition, said apparatus comprising an inclined chute, a hopper into which the materials are discharged from the lower end of the chute, a gate at the upper end of the chute for starting the materials down the chute in charges or quantities, and a door for closing the lower end of the chute normally held shut by yielding pressure.

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

GEORGE W. LANGE.

Witnesses:

REEVE LEWIS,

H. B. KERKAM.