Feb. 7, 1939. F. J. STRAUB 2,146,409

STORAGE APPARATUS

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Fig. 1.

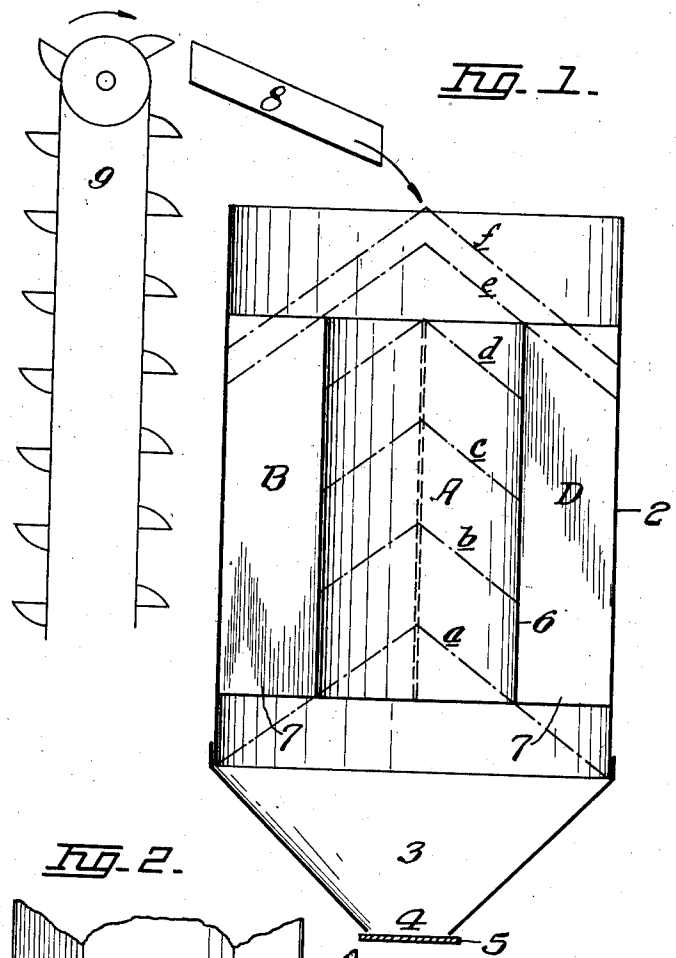
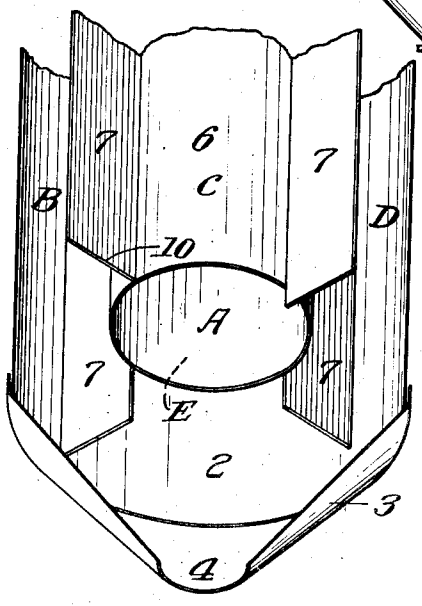


Fig. 2.



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Fig. 3.

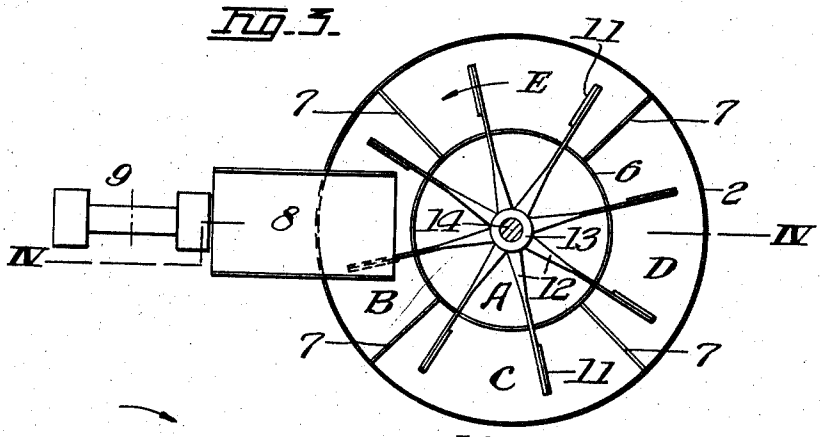


Fig. 4.

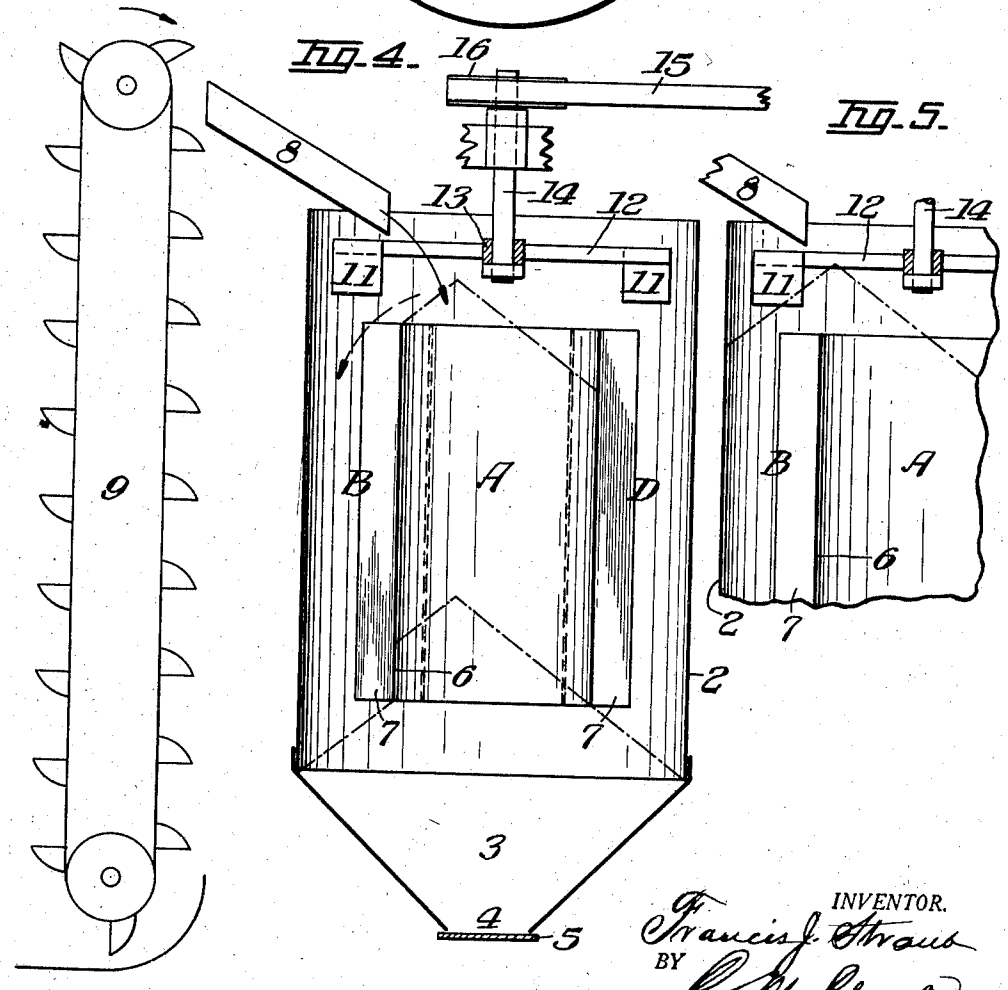


Fig. 5.

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UNITED STATES PATENT OFFICE

2,146,409

STORAGE APPARATUS

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Application June 2, 1937, Serial No. 145,955

6 Claims. (Cl. 214—17)

This invention is an improvement in the art of storing and delivering aggregate for use in making concrete, and consists in the method and apparatus therefor.

Ordinarily, raw aggregate of different kinds, as cinders, gravel, etc., is charged into an overhead bin or container, as by an elevator or other suitable means for use by withdrawal from the bottom as required.

As the material is delivered into the upper portion of the bin and accumulates therein from the bottom upwards, it assumes an upper cone formation, sloping downwardly around the central point or zone of the supply flow. With material consisting of a constant non-uniform character as to size, i. e., coarse, intermediate, and fine, the larger pieces tend to run off towards the outer wall of the bin and the smaller pieces and fines tend to pile up in its vertical middle section.

Such tendency results in an undesirable segregation which is ordinarily maintained throughout the mass. As a consequence withdrawal of uniform average charges is impossible, and the variation in consistency results in corresponding lack of uniformity in the successive mixes and the resulting product.

Heretofore it has been common practice to use two bins holding coarse sizes in one and fine sizes in the other, as graded by previous screening. In such case selected portions withdrawn from each are mixed in an effort to secure approximately average distribution, but is still defective because in freely flowing full area bins, a considerable degree of segregation necessarily results.

Such variation is particularly objectionable in connection with the storage and use of cinders in making building blocks or other separate units, where continuous similarity and regularity is highly desirable and necessary. My invention has in view to correct segregation tendency by sub-dividing the main transverse area of the bin or container into one primary and several secondary chambers, with restricted slope movement and minimized segregation. Also by means for moving the material from one supplemental or secondary compartment to the other as each is filled, to effect a mixing of partially segregated material, as more fully hereinafter described.

The invention also includes a modified construction providing varying depths of partitions dividing the several secondary chambers whereby as the central mass gravitates towards the outlet opening of the bin the flow thereinto from the secondary chambers is successively controlled or regulated.

Certain preferred constructions are illustrated in the accompanying drawings, in which:

Fig. 1 is a central vertical section of a bin showing one form utilizing my invention;

Fig. 2 is a similar section in perspective illustrating the use of variable depth partitions;

Fig. 3 is a plan view showing the same construction of bin as in Fig. 1 but provided with means for distributing the material annularly from one supplemental bin to another;

Fig. 4 is a vertical section on the line IV—IV of Fig. 3;

Fig. 5 is a partial similar section illustrating overflow from the middle or primary chamber to one of the supplemental chambers.

Referring to the simplest embodiment of the invention, as in Fig. 1 the main bin **2** is of usual conventional construction, either cylindrical or rectangular in cross section, having an open top and a tapered or hopper bottom portion **3** terminating in an outlet discharge opening **4** having a closing gate **5** of suitable construction. While a hopper bottom is usually preferable, it will be understood that a flat bottom with one or more discharge openings may be used, the material in the corners itself supporting the upper gravitating mass towards the outlet.

A middle initially receiving chamber A is provided by means of an inner vertical shell **6**, spaced inwardly from the main wall of bin **2**, providing ample surrounding space for a series of supplemental overflow chambers B, C, D and E as shown in Fig. 3. These chambers are formed by radial separating partitions **7** which in Fig. 1 are of the same depth as shell **6** and with it and the outer main wall, provide the several open top and bottom cavities or overflow chambers above noted.

It will also be understood that instead of the partitions may be substituted bracing rods or the like connecting and holding the middle shell in position, with a continuous open annular chamber. In such case material may overflow thereinto all around or at one side only, with resulting average regularity throughout.

In such form aggregate is delivered by gravity at the upper central portion of the bin and of the inner chamber A by any suitable means, as a conventional chute **8** and elevator **9**.

The material first enters the middle chamber A, filling the tapered bottom **3** up to the lowermost dotted line capacity *a*. Thereafter continued feeding successively fills the chamber A as in-

dicated by the successive higher coniform zones *b*, *c*, *d*, *e*, and overflow zone *f*, conforming to usual gravity distribution of such material. The middle chamber having been filled to zone *e*, further supply will overflow the upper edges of shell **6**.

All such additional material, including coarse, intermediate, and fine, will flow radially off of the middle cone into the several outer compartments B, C, D and E, until the entire receiving capacity of the whole bin is filled.

Assuming the main bin is of conventional size, say ten feet in diameter, and the inner shell **6** to be say one third to one half of such dimension, the coniform flow in filling chamber A is thus so limited, as through but one half of its diameter, as to avoid any substantial outer segregation of coarse grades throughout its length. Ordinarily, after the first filling and in usual day-after-day use, with continued supply at the top, the tapered bottom cavity will be always full and more or less in all of the chambers, well above the coniform zone *a*.

Assuming the bin to be empty, the first filling will of course provide for a limited additional cone flow reaching its maximum as at zone *a* outwardly towards the inwardly tapering bottom wall **3**, with some slight outer accumulation of coarse sizes.

Downward flow against the tapered wall surfaces toward the outlet will tend to effect a degree of reaction and admixture of any such coarse sizes with middle body intermediates and fines, with material approach towards average consistency.

Such approach is greatly assisted and practically perfect and regular normal re-arrangement of the particles is effected by the addition of the whole mass of all sizes flowing over the middle uppermost cone *e* and downwardly through the several flanking chambers B, C, D and E. Such supply naturally combines with the initial cone *a*, flowing inwardly and downwardly therewith towards the outlet, and the desirable general average consistency at the outlet is maintained.

I show in Fig. 2 a modified construction in which the several radial partitions **7** between the several chambers B, C, D and E extend successively beyond the lower edge of the next adjacent partition providing a series of progressively deeper partition terminals. Thus one partition may terminate at the bottom edge of the shell, as at **10**, each next succeeding partition being deeper, more or less as desired, depending on the material and working conditions. Such arrangement is of material advantage in automatically regulating the flow to and also in partially filling the uppermost portion of the tapered bottom **3**, especially in connection with the overflow sweep operation of Figs. 3 to 5, now to be described.

As therein shown the bin is like the one above described but is provided with a series of annularly moving slow speed sweeps or scoops **11** revolving around its top inner portion, above the shell **6**. These extend downwardly from radial arms or spokes **12** extending from a central hub **13** secured to a drive shaft **14** which is driven by any suitable gearing, as a belt and pulley **15**, **16**.

In such construction the delivery from chute **8** enters the shell slightly off center for clearance of the hub and shaft, with resulting lateral formation of the cone towards one side. The contents of shell **6**, upon being filled between the slow rotating arms **12** to the top, at one side, will therefore overflow to the closest adjacent compartment, as B.

Such compartment will thus be filled to the top as in Fig. 5, the others receiving little or no aggregate directly.

Thereupon surplus material having risen within range of sweeps **11**, will be carried around over the next adjacent partition **7** into chamber C. It being thus filled, surplus will be carried over into chamber D, and in the same manner finally to chamber E. Assuming that material is being withdrawn, the operation of filling the several compartments will vary considerably and the height of each such charge will thus depend on working conditions.

In this connection the variation in length of the several partitions as in Fig. 2 becomes a useful feature in relieving the frictional wear on the sweeps, the abrasion of the aggregate on them being apt to be severe. It will be seen that, the contents of chamber B being discharged into the bottom cavity more freely by reason of the shorter partition, and somewhat checked by the next successively longer ones, contents of certain of the compartments will sink below the sweeps as the operation proceeds, thus relieving them from wear.

The construction, advantages, and manner of use of my invention will be readily understood and appreciated from the foregoing description, and it will be found to contribute materially to the making of regular and consistently uniform aggregate for the manufacture of concrete, especially in unit forms.

It will be understood that the bin and its parts may be made of suitable material, as sheet metal, planking, concrete, etc., properly supported as to foundation, and with suitable lower clearance for trackway, batch receptacles, etc. Also that the apparatus may be changed or varied by the builder or designer according to local requirements or otherwise, within the scope of the following claims.

What I claim is:

1. A storage bin for aggregate-forming material consisting of a main casing provided with a hopper bottom, a middle casing having an open top and bottom the lower end of which terminates at a substantial distance above the upper end of the hopper bottom, and an overflow cavity between the main and middle casing walls.

2. A storage bin for aggregate-forming material consisting of a main casing provided with a full cross area open top and a hopper bottom having a discharge opening, a middle casing having an open top and bottom the lower end of which terminates at a substantial distance above the upper end of the hopper bottom, said middle casing being spaced inwardly from the main casing to provide overflow chamber space between the main and middle casing.

3. A storage bin for aggregate-forming material consisting of a main casing provided with a full cross area open top and an inwardly sloping hopper bottom having a discharge opening, a middle casing having an open top and bottom the lower end of which terminates at a substantial distance above the upper end of the hopper bottom, and radial partitions between the main and middle casing providing overflow chambers.

4. A storage bin for aggregate-forming material consisting of a main casing provided with a full cross area open top and an inwardly sloping hopper bottom having a discharge opening, a middle casing having an open top and bottom the

lower end of which terminates at a substantial distance above the upper end of the hopper bottom, and radial partitions between the main and middle casing having lower edges terminating at varying distances with relation to the bottom of the middle casing providing overflow chambers.

5. A storage bin for aggregate-forming material consisting of a main casing provided with a full cross area open top and a hopper bottom having a discharge opening, a middle casing having an open top and bottom the lower end of which terminates at a substantial distance above the upper end of the hopper bottom, said middle casing being spaced inwardly from the main casing, and radial partitions of varying length between the main and middle casing providing overflow chambers opening into the bottom of the main casing.

6. A storage bin for aggregate-forming material consisting of a main casing provided with a full cross area open top and an inwardly sloping hopper bottom having a discharge opening, a middle casing having an open top and bottom the lower end of which terminates at a substantial distance above the upper end of the hopper bottom, and radial partitions between the main and middle casing providing overflow chambers whereby excess accumulation at the upper receiving portions of both casings may be caused to pass laterally from above one chamber to another.

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