No. 677,677. Patented July 2, 1901.

E. H. MESSITER.

PROCESS OF STORING AND AVERAGING MATERIALS IN BULK.

(Application filed Mar. 22, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

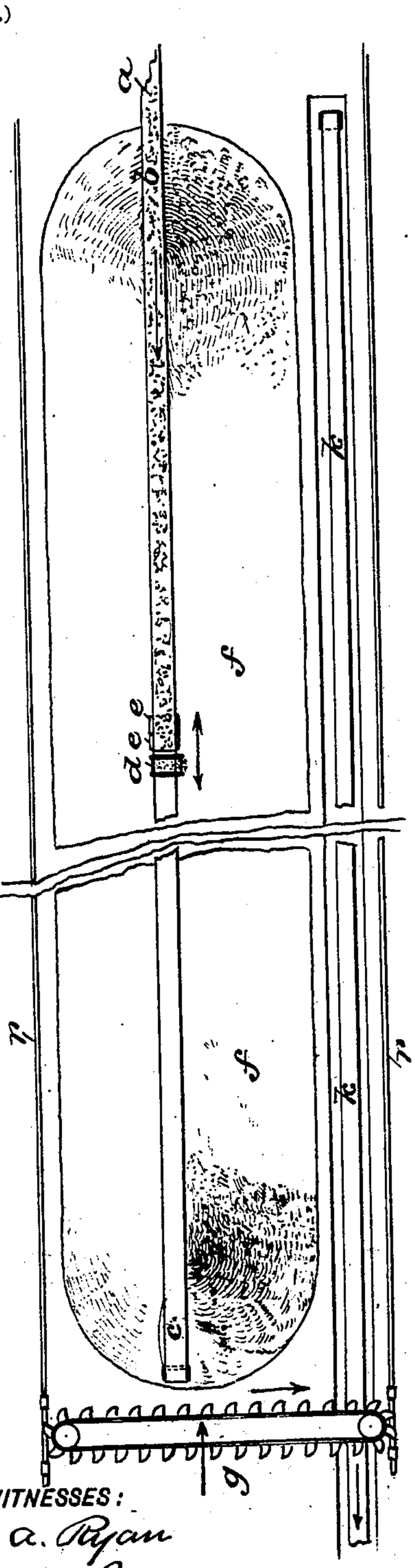
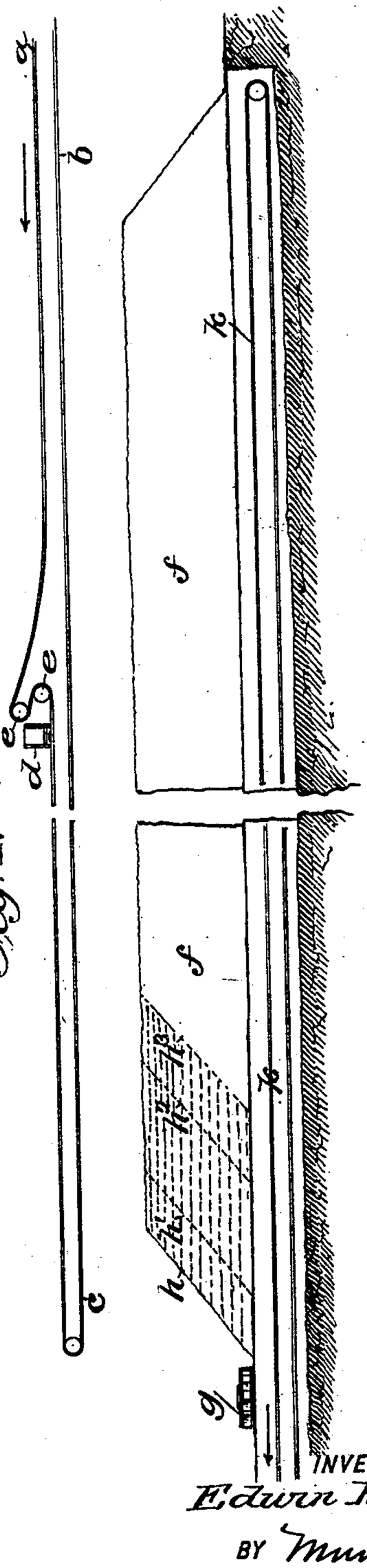


Fig. 1.



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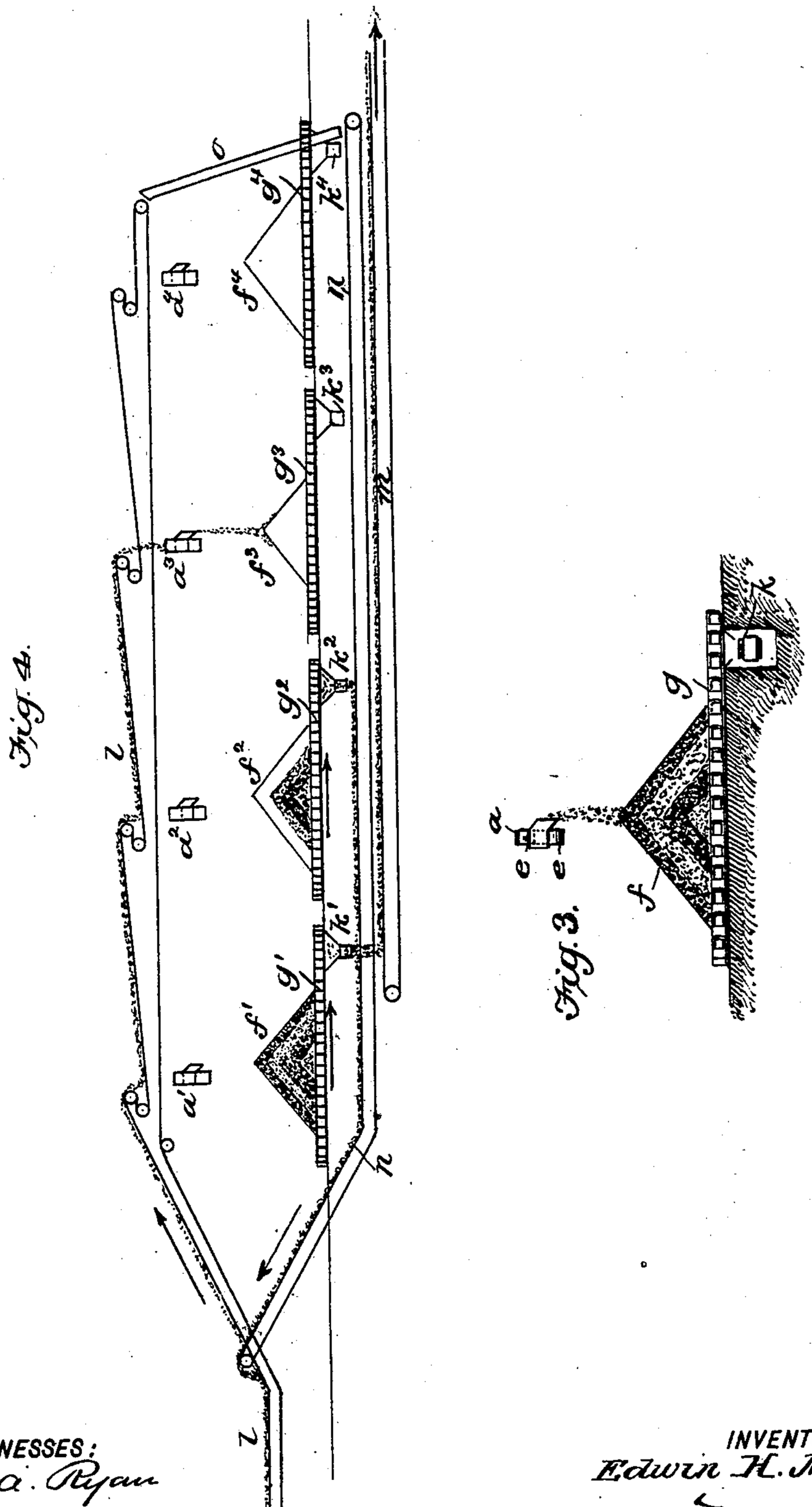

Fig. 4.

Fig. 3.

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EDWIN HENRY MESSITER, OF SAN LUIS POTOSI, MEXICO.

PROCESS OF STORING AND AVERAGING MATERIALS IN BULK.

SPECIFICATION forming part of Letters Patent No. 677,677, dated July 2, 1901.

Application filed March 22, 1901. Serial No. 52,388. (No model.)

To all whom it may concern:

Be it known that I, EDWIN HENRY MESSITER, of San Luis Potosi, Mexico, have invented a new and useful Improvement in Processes of Storing and Averaging Materials in Bulk, of which the following is a specification.

The invention is designed to provide for the storage of material of a variable character in such a way that when withdrawn from storage the material withdrawn will be for all practical purposes a substantially homogeneous mixture of that which was stored, and to do this with as little labor as possible and at as small an initial outlay as possible for bins, buildings, &c. It is designed more especially for the storage of ores and the preparation of charges for blast-furnaces. The usual procedure in lead-smelting, at least, is to "bed" the ores by forming each kind of ore into a horizontal layer in a rectangular bin by means of wheelbarrows, &c. The ores are removed from the beds by entering through doors in the sides of the bins and attempting to cut the beds down vertically. The caving of the ore causes irregularity in the resulting mixture and the expense for labor is great.

The leading feature of my process consists in bringing in the ore by means of an elevated conveyer which is capable of discharging the material not from a fixed and definite point, but from a traveling point uniformly along a certain portion of its length by a sort of sowing action caused by the travel of the discharge devices, as hereinafter fully described with reference to the drawings, in which—

Figure 1 is a side view, partly in section, of the appliances employed and the horizontally-extended bank of materials. Fig. 2 is a plan view; Fig. 3, a cross-section; and Fig. 4 is a view looking endwise at the elongated banks of material, showing a multiplicity of the latter and an extension of my process.

In Fig. 1 I show a conveyer *a* and the points *b* and *c*, between which the discharging devices *d* and *e* travel and discharge uniformly. Of several usual types of conveyer available for this purpose I prefer a belt discharging into a chute *d* by means of the pulleys *e e*, as shown, the chute and pulleys being moved back and forth between the points *b* and *c* in any convenient way. The chute *d* discharges laterally to the conveyer and as it travels it spills or sows the material, and the material will thus be deposited in an elongated bank *f*, each class of material brought in by the conveyer *a* being distributed in a substantially uniform manner with respect to the length of the travel, forming an elongated layer, a succession of which in parallel courses form the elongated bank *f*. (Seen in cross-section in Fig. 3.) In removing the material from storage in this bank I provide, preferably, an excavator or conveyer *g* of ordinary construction, such as a chain of buckets, whose longitudinal axis is arranged transversely to the bank and which excavator or conveyer is capable of motion laterally to itself and lengthwise of the bank on guides *r r*. This excavator is adapted to remove the material in a direction at right angles to the bank, taking the material constantly from the foot of the slopes $h\ h'\ h^2\ h^3$ successively as it advances, these slopes being inclined at the angle of repose of the material. Said excavator or conveyer discharges the material into a conveyer *k*, of ordinary design, which conveyer *k* is arranged parallel with the bank and delivers the material at any desired place. The conveyer is, as shown, of the endless-belt type, but may be any other form. The material being removed uniformly from the parallel slopes $h^2\ h^3$ will be a practically homogeneous mixture of the several classes of material deposited in the layers of the bank. That which is removed from the extreme ends, being a relatively very small portion, will be an approximately true mixture. Obviously the removal of the material from the slopes $h\ h'$, &c., may be accomplished by means of shovels and wheelbarrows or in any other convenient manner.

When it is desired to use several storage-banks in conjunction with each other, my process can be used to even greater advantage. For this purpose an arrangement of apparatus similar to that shown in Fig. 4 might conveniently be used. This figure presents an end view of four banks in different stages. In Fig. 4 the material is represented as being brought in by a conveyer *l*, adapted to discharge at will into either of the con-

veyers a' a^2 a^3 a^4 by ordinary means, each of which conveyers a' a^2 a^3 a^4 may, as described heretofore in connection with Fig. 1, form storage-banks f' f^2 f^3 f^4, whose cross-section or ends only appear in Fig. 4. Each of the banks f' f^2 f^3 f^4 has its corresponding excavator g' g^2 g^3 g^4 and receiving-conveyer k' k^2 k^3 k^4 at right angles to the excavators and parallel to the banks. The conveyers k' k^2 k^3 k^4 may all discharge into a conveyer m, running at right angles with them, which conveyer m will deliver the material to any desired place. A return-conveyer n may be provided adjacent to and parallel with the conveyer m, which conveyer n may be used to return, by means of the chute o, any material which may inadvertently have been allowed to pass by all of the conveyers a' a^2 a^3 a^4, as well as to return the extreme end portions of any storage-bank to the conveyer l, by means of which such material will be incorporated in the bank which may be in process of formation at the time. In Fig. 4 the conveyer l is represented as delivering into the conveyer a^3, which is distributing the material in the storage-bank f^3. At the same time the excavator g' is supposed to be removing material from the bank f' through conveyers k' and m. Simultaneously excavator g^2 is represented as removing an end portion of the bank f^2, the material from which end portion is being conveyed, by means of conveyers k^2, n, l, and a^3, to the bank f^3. The object in redistributing the ends of the banks is that the end of a bank, being cone-shaped, will not give a homogeneous mixture by a straight cross-cut of the excavator. Bank f^4 is in reserve.

The conveyer a, Fig. 1, may by the travel of its discharge-chute d be made to discharge over the entire length of a bank containing, say, ten thousand tons of ordinary material every two minutes without difficulty. It will thus be seen that the mixing of the material is accomplished by my process with the utmost accuracy, for the material removed from any slope, as h^3, Fig. 1, will be composed of layers of the material deposited during, say, every two minutes of the time during which the bank was being formed.

The irregularity of the mixing occurring at the extreme ends of the storage-bank will be so slight and the proportion of the material affected by it will be so small that it will be inappreciable in the practice of preparing furnace charges or in any ordinary operations. Where several banks are used, however, the redistribution of the material from the extreme ends is so readily accomplished, as heretofore described, that I have illustrated it as an extension or modification of my process which may be used in special cases. My improved process, considered with reference to a single storage-bank or with several storage-banks independent of each other, is complete for practical purposes. Obviously when several banks are used the material may be delivered to the conveyers a' a^2 a^3, &c., in any convenient way whatever other than by the conveyer l; also, obviously, the material may be removed from the slopes h' h^2 h^3, &c., in any convenient way whatever.

My process may be used for the simple storage and removal from storage of material not necessarily requiring to be mixed, and also for the purpose of adding to a storage-bank partially formed other material to bring the whole to any desired average composition.

I am aware of the Patent No. 662,063, in which the averaging, mixing, and storing of materials are effected in a series of stratified conical piles, each pile being formed as it grows in height by bringing into action a higher discharge-orifice, and in which the storage of the material is in bins. In my invention no bins are required and the storage in bulk is not in conical piles, but in prolonged horizontal prismatic banks of material, which are formed by imparting to the discharge spout or chute a longitudinal travel that sows or distributes the material along a definite path, forming a horizontally-extended bank of unlimited length, which avoids the necessity of bins, the mixing being effected by a transverse cutting action of a laterally-traveling excavator, as described.

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

1. The process of storing and averaging materials in bulk, which consists in distributing the materials in horizontal layers longitudinally in an elongated bank, said layers being of different quality and then removing the material uniformly from a cross-section of said elongated bank, substantially as set forth.

2. The process of storing and averaging materials in bulk, which consists in distributing the materials in horizontal layers longitudinally in an elongated bank, said layers being of different quality and then removing the materials uniformly from a cross-section along planes inclined at the angle of repose substantially as described.

3. The process of storing and averaging materials in the preparation of furnace charges, which consists in distributing the materials in horizontal layers with respect to the length of an elongated prismatic bank, said layers being of different quality and in removing the materials uniformly with respect to a transverse section of said bank substantially as set forth.

4. The process of storing and averaging materials, which consists in distributing the materials in horizontal layers longitudinally in an elongated bank, said layers being of different quality, and in removing the end portions of said bank to a second bank, and then removing the materials from the remain-

der of the elongated bank uniformly with respect to a transverse section thereof, substantially as set forth.

5. The process of storing and averaging materials, which consists in distributing the materials in horizontal layers longitudinally in an elongated bank, said layers being different quality, and in removing the end portions of said bank, and redistributing the materials from said end portions in a second elongated bank, and in removing the materials from both banks uniformly with respect to the transverse sections of said banks, substantially as set forth.

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