A. C. JOHNSTON.

APPARATUS FOR TRANSFERRING MATERIAL FROM A HIGH TO A LOWER LEVEL AND PILING THE MATERIAL.

APPLICATION FILED JAN. 29, 1907.

964,430. Patented July 12, 1910.

3 SHEETS—SHEET 3.

Fig. 10.

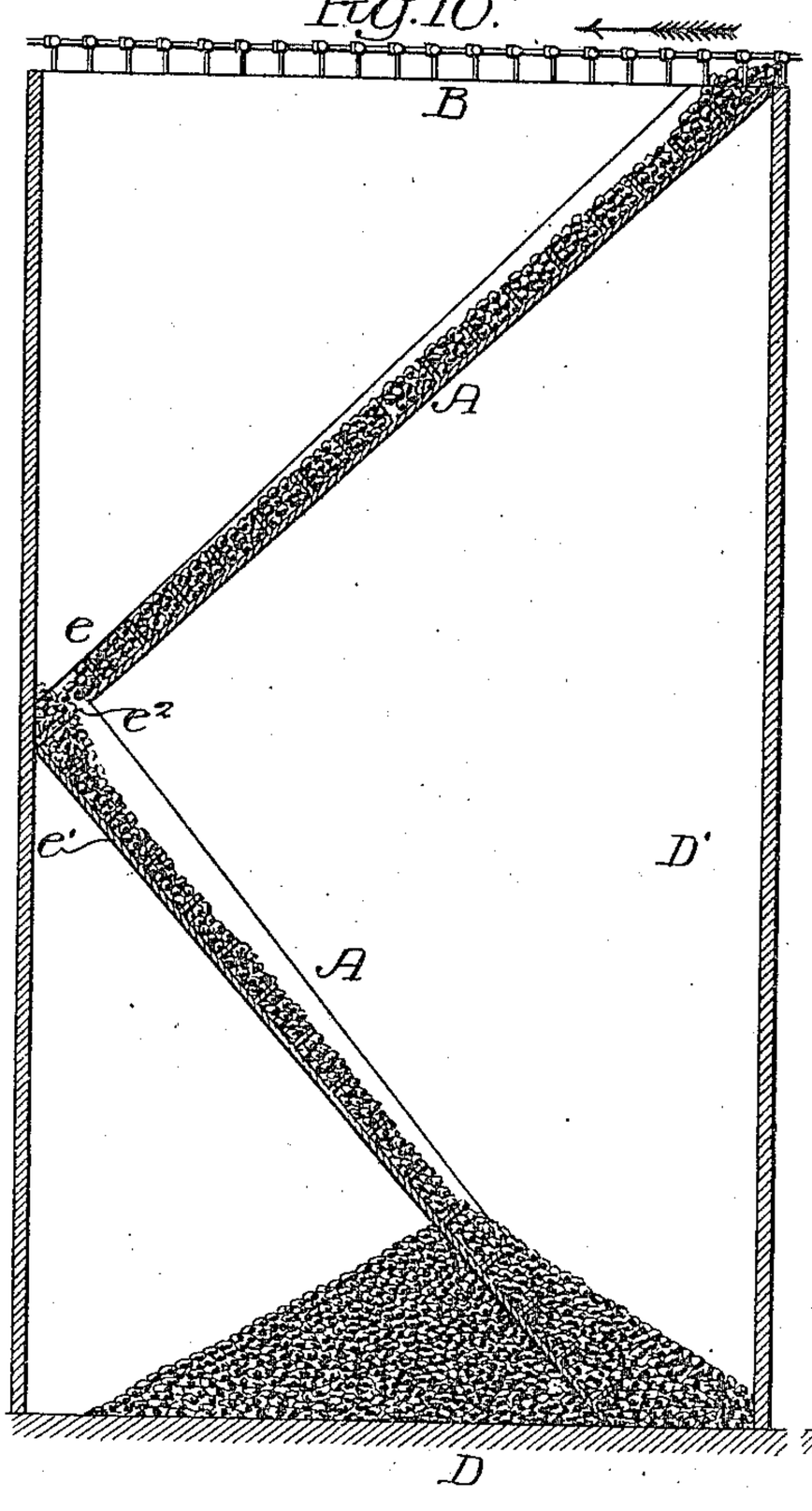


Fig. 12.

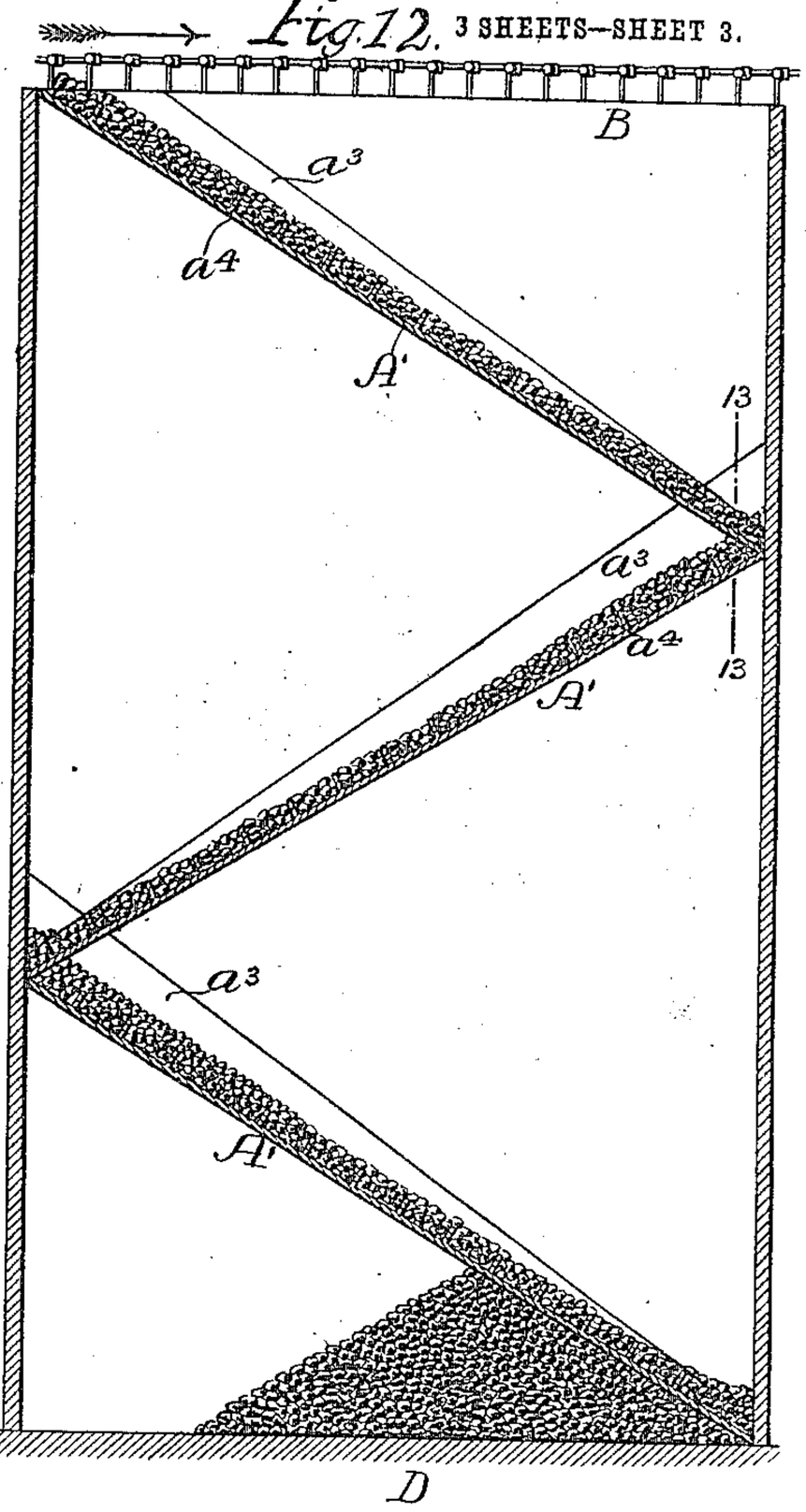


Fig. 13.

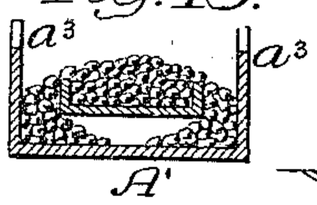


Fig. 14.

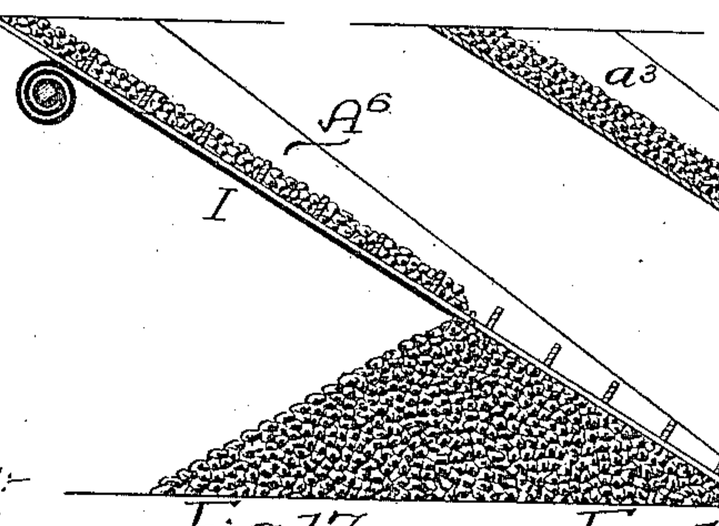
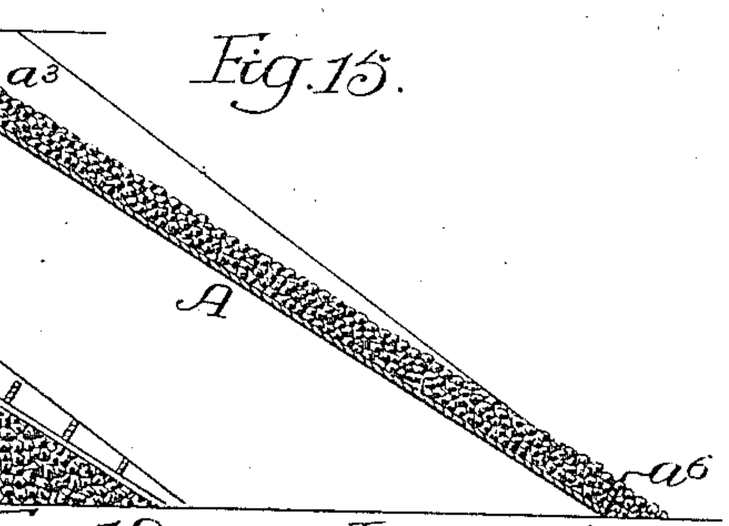


Fig. 15.



Witnesses:-
Titus H. Rowe.
William A. Pavoir.

Fig. 17.

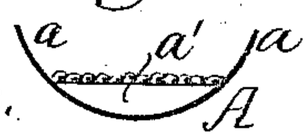
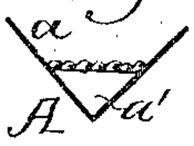


Fig. 18.



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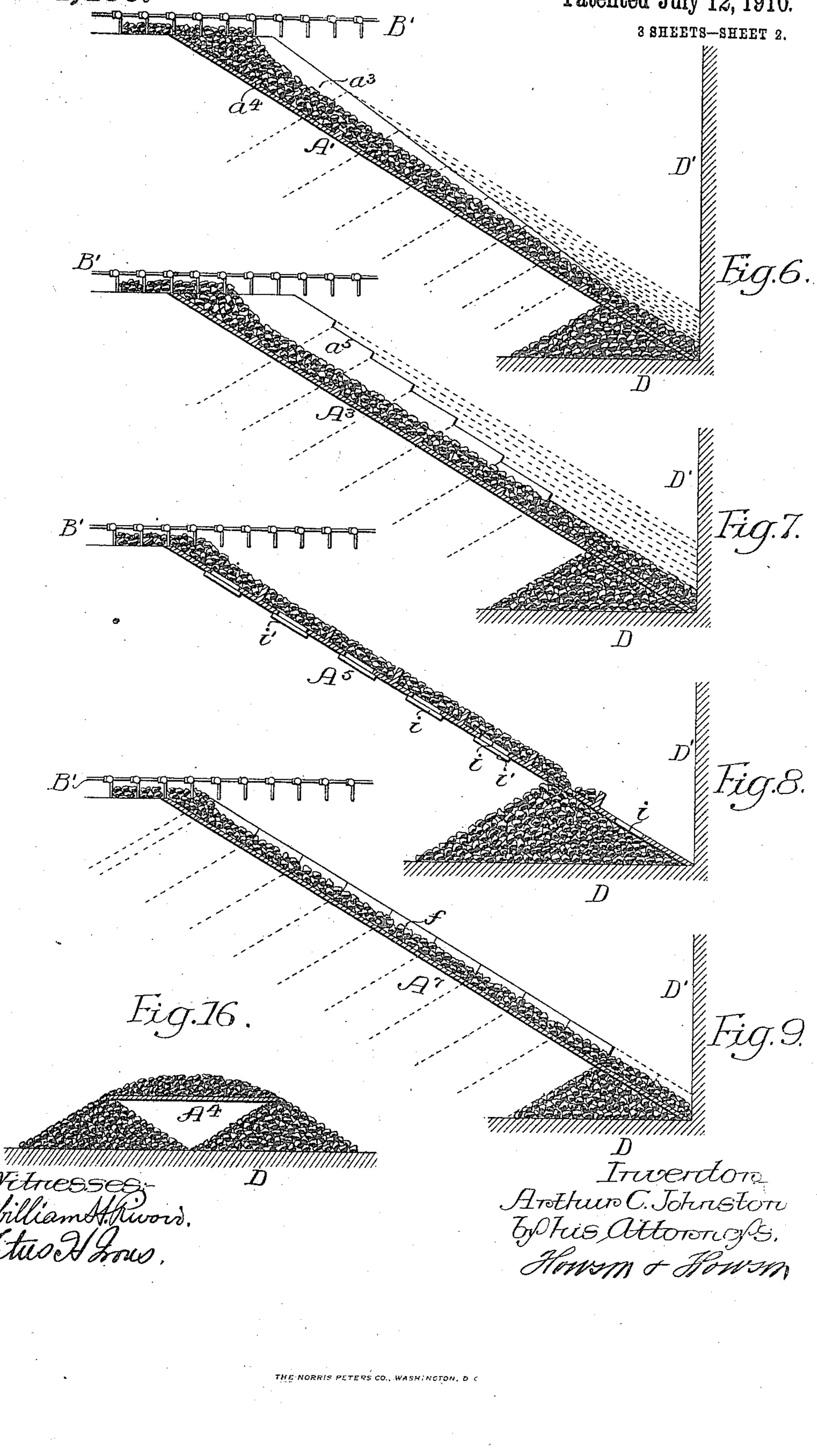

Fig.6.

Fig.7.

Fig.8.

Fig.9.

Fig.16.

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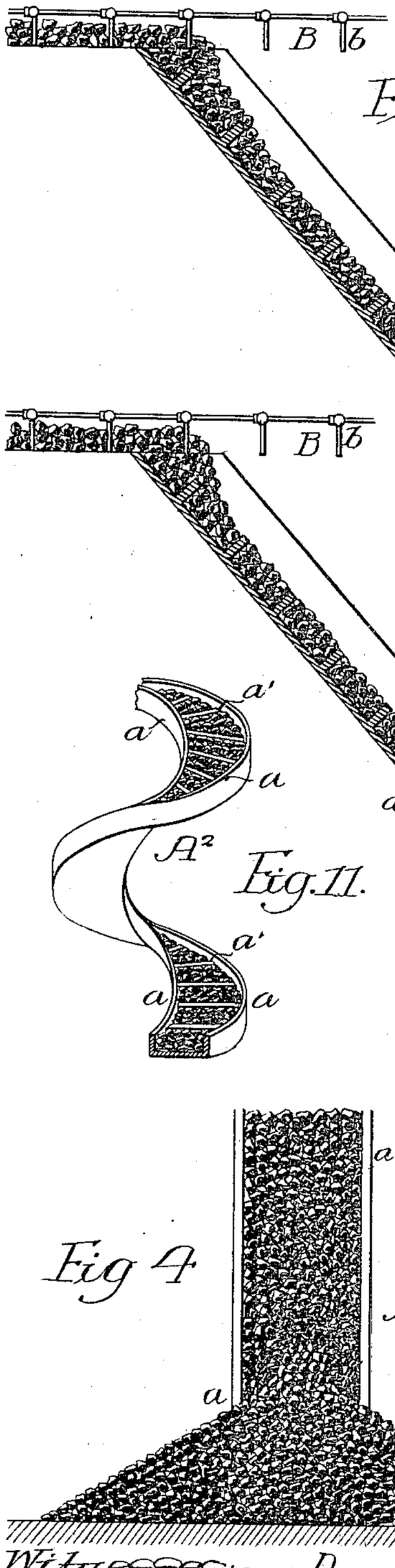

Fig. 1.

Fig. 5.

Fig. 2.

Fig. 11.

Fig. 3.

Fig 4

Witnesses:-
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UNITED STATES PATENT OFFICE.

ARTHUR C. JOHNSTON, OF WYNCOTE, PENNSYLVANIA, ASSIGNOR TO DODGE COAL STORAGE COMPANY, OF NAUGATUCK, CONNECTICUT, A CORPORATION OF CONNECTICUT.

APPARATUS FOR TRANSFERRING MATERIAL FROM A HIGH TO A LOWER LEVEL AND PILING THE MATERIAL.

964,430. Specification of Letters Patent. Patented July 12, 1910.

Application filed January 29, 1907. Serial No. 354,638.

To all whom it may concern:

Be it known that I, ARTHUR C. JOHNSTON, a citizen of the United States, residing at Wyncote, Pennsylvania, have invented certain Improvements in Apparatus for Transferring Material from a High to a Lower Level and Piling the Material, of which the following is a specification.

My invention relates to certain improvements in the construction of a chute for transferring material from a high to a lower level and is particularly adapted to the transfer, without material breakage, of frangible materials, such as coal, from a high to a lower level, either in immediate distribution or to form a pile upon a piling floor, or in a bin or other receptacle.

In the accompanying drawings:—Figure 1, is a vertical sectional view of a chute illustrating my invention; Fig. 2, is a section on the line 2—2, Fig. 1; Fig. 3, is a sectional view of a chute arranged to form a pile of material; Fig. 4, is a view looking in the direction of the arrow, Fig. 3; Fig. 5, is a view of a modification of the chute; Figs. 6, 7, 8 and 9, are other modifications of the chute; Fig. 10, is a view showing the chute mounted in a storage bin; Fig. 11, is a view of a spiral chute; Fig. 12, is a sectional view showing a series of chutes arranged at an incline the same as Fig. 6; with a storage bin; Fig. 13, is a sectional view on the line 13—13, Fig. 12; Figs. 14 and 15, are views of other modifications of my invention; Fig. 16, is a view showing a flat chute arranged to carry out my invention; and Figs. 17 and 18, are cross sectional views of other forms of chutes.

Referring in the first instance to Figs. 1 and 2, A is an inclined chute arranged at an angle greater than the angle of repose of the material to be transferred. This chute has side members *a*—*a* and a series of transverse ribs *a'* extending across the chute from one side to the other, as illustrated in Figs. 1 and 2. At the upper end of the chute A, which may be of any desired length, is shown a flight conveyer B, in the present instance having flights *b*, which deliver the coal or other material to the chute and at the base of the chute, as shown in Fig. 1, is a conveyer C, having flights *c*, which travel over the trough or bed *c'* on to which the coal rolls from the chute.

It will be understood that other means may be employed to feed the material into the chute or to carry the material away from the base of the chute, or the material may be allowed to accumulate at the base of the chute, as shown in Figs. 3 and 4.

Assuming coal to be the material to be transferred in the operation, the first coal which is discharged from the conveyer B flows from the conveyer B into the several pockets formed by the ribs *a'* until these pockets have been successively filled, as indicated in Fig. 1, and it will be noticed that in filling these pockets the coal forms a bed having a greater angle than the ordinary angle of repose of the material, as the ribs are preferably arranged close together. As the pockets are filled with coal, as shown in Fig. 1, the coal forms a rough bed over which the coal fed to the chute must flow and as the feed of the coal is continued each particle of additional coal will travel down this roughened surface rolling upon the coal held in the pockets of the chute until it either reaches an unoccupied pocket and is there retained or until all the pockets have been filled, and it rolls off the chute into the conveyer C at the bottom. Thus material breakage of the coal is prevented, since it is subjected to no appreciable vertical drop, but to a simple rolling or sliding action throughout the length of the chute over a surface sufficiently rough to act as a retarding bed preventing any such acceleration in the speed of the flow of material as would be calculated to cause breakage.

In the case of the apparatus shown in Fig. 1, the coal itself forms the roughened bed over which the material to be transferred must flow, but it will be understood that this bed may be formed by any other means which will prevent the too rapid rush of coal down the inclined chute or any vertical drop of the coal.

In Fig. 5, I have shown a modification of the chute in which the bed a^2 is made of stones or other suitable material set in cement, thus forming a permanent roughened bed without the use of transverse ribs, such as shown in Fig. 1.

In Figs. 3 and 4, I have illustrated my invention arranged to form a pile of coal or other material, the apex of the pile, as the latter increases in height, being shifted toward the point of supply at the upper end of the chute. It will be noticed that in this case the coal as it travels down the inclined chute comes in contact with the accumulation of coal at the base of the chute. In this case the piling floor D′ forms a stop for the flow of coal and as the coal travels down the inclined chute it comes in contact with the floor or the accumulation of coal upon the floor at the base of the chute and is thereby caused to escape over the sides of the latter at a point which is constantly shifting toward the top of the chute. The coal thus escaping from the chute continues to flow down the mass of coal previously accumulated until the angle of repose is attained. This form of apparatus is particularly adapted for filling bins with coal or similar material and in the case where the depth of the bin or other receptacle may make it desirable to use two or more lengths of chute to deliver the coal from the top of the bin to the bottom the chutes may be arranged as in Fig. 10. In this figure the chutes are of the construction illustrated in Fig. 1, but are so proportioned that the lower end *e* of each section is directly above the upper end *e′* of the chute section next below, and in the lower end *e* of each chute is an opening e^2 to allow coal to flow from the upper chute onto the roughened surface of the chute directly under it, thus securing a continuous flow of material from the upper end of the bin D′ to the bottom thereof or to the apex of the pile formed within the bin.

It will be understood that the chute A may be of any shape, for instance, it may be made as shown in either Figs. 17 or 18 without departing from the invention.

In Fig. 6, I have shown a modification of my invention, in which the chute is arranged at such an angle that the roughened surface will be at the angle of repose of the material to be piled and the side walls a^3 of the chute A′ are tapered, being level with the body of the chute at the lower end thereof and increasing in height toward the upper end of the chute, as illustrated in said figure. I prefer to use cross ribs a^4 in this form of apparatus similar to those illustrated in Fig. 1, but these ribs are not absolutely necessary.

The coal as it is discharged from the conveyer B′ at the upper end of the chute travels down the latter, accumulating back of the several transverse ribs until there is a body of coal throughout the entire length of the chute. This body is shallowest at the base of the chute, increasing in depth as it nears the upper or feed end, as illustrated in Fig. 6. As the coal continues to flow down the chute it travels over the coal retained on the chute, as in the forms of apparatus heretofore described, but in this case the coal will tend to accumlate at the upper end of the chute and then will move gradually in a body, traveling down to the base of the chute, or if a pile is being formed at the base of the chute, as shown in Fig. 6, until it reaches the apex of the pile when it will flow laterally over the sides of the chute and add to the pile.

As indicated by diagrammatic lines in this figure, as the pile increases in height the height of the coal in the chute also increases proportionately.

Fig. 11, shows my invention as applied to a spiral chute. The chute A^2 is provided with a series of transverse ribs, which form pockets to retain the material so that there is an unbroken roughened surface from the top to the bottom of the spiral chute and the flow of material down this chute will be retarded to such an extent as to prevent material breakage.

In Figs. 12 and 13, I have illustrated the chute shown in Fig. 6, as applied to a bin D^2, in which two or more chutes are used. In this instance the chutes A′ are wider at the upper end than at the lower end as shown in Fig. 13 so that the material will flow over the sides of the upper chute into the wide portion of the chute directly below it.

In Fig. 7, I have shown a chute A^2 in which the side members a^5 are stepped, so that as the pile increases in height the point of lateral discharge of the material from the chute will rise from one step to another throughout the length of the chute. In some instances the sides of the chute may be dispensed with and the body A^4 of the chute may be made wide enough to allow the body of the coal to be retained in the center of the chute and as the pile increases the coal will be discharged laterally from the chute over this retained body, as illustrated in Fig. 16.

Fig. 8, illustrates a modification of my apparatus; in which the material is discharged through openings *i* in the bottom of the chute A^5 and these discharge openings are closed by means of suitable slides or doors *i′* which may be withdrawn to allow the coal to pass through the openings, or a sliding apron I may be used, as illustrated in Fig. 14. In this instance, the inclined chute A^6 has a bottom open from one end to the other and the apron is arranged to slide in grooves to close this opening. The coal is discharged from the chute over the lower end of the apron I, as indicated in said figure.

In Fig. 9, I have shown a chute A^7 with the sides *f* made in sections and these sections can be dropped or removed one after the

other as the height of the pile increases, so that the coal will be discharged over the edges of the chute at the apex of the pile.

Thus it will be seen that the essential feature of the invention is the retarding of the material in its downward flow to prevent such accelerations of speed of flow as would lead to breakage when the flowing material comes in contact with the bed of a conveyer or other receptacle at the base of the chute, or with an accumulation of the material in a formed pile, either on a piling floor or in a bin.

When the apex of the pile reaches the upper end of the chute the pile is continued, the discharge point of the conveyer B moving forward, the material flowing over the pile until the entire bin or floor has been filled.

It will be understood that while I have shown in the modifications in Figs. 6, 7, 8, 9, 12 and 14, transverse ribs to retain the coal or similar material to form the roughened retarding surface, in some cases these ribs may be dispensed with as the floor or side of the bin will form a stop for the material to allow it to accumulate in the chute, or a single cross rib a^6 may be used at the base of the chute A, as shown in Fig. 15. When the material reaches the height of the stop, it will flow over the same, having enough material to produce an inclined roughened bed.

I claim:—

1. The combination of a fixed chute, arranged at an incline greater than the angle of repose of the granular material to be transferred, and having a series of transverse ribs forming a series of pockets, so that the initial body of material will accumulate in the pockets and form a roughened retarding surface, with means for continuing the feeding of material to the chute, said material flowing over the material in the pockets, the latter material retarding the downward movement of the main body of the material.

2. The combination in a chute having sides and arranged at an angle greater than the angle of repose of the granular material to be piled and a piling floor upon which the material collects, means for holding the initial flow of the material so as to provide a roughened surface over which the main body of the material will travel, the roughened surface retarding the travel of said material, and as the pile on the piling floor increases in height, the material will flow over the sides of the chute onto the pile without dropping and without material breakage.

3. A chute for transferring material from a high to a lower level, said chute being arranged at an angle greater than the angle of repose of the material to be transferred and having side members and transverse ribs, said transverse ribs being arranged close together and of such a height that the granular material flowing over the chute will accumulate in the pockets formed by the ribs and form a practically continuous roughened surface, with means for feeding the material over said roughened surface, causing it to flow by gravity alone without material breakage.

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

ARTHUR C. JOHNSTON.

Witnesses:
E. R. Loughery,
Wm. A. Barr.