Aug. 10, 1937. N. W. ELMER 2,089,738

CONVEYER

Filed Aug. 10, 1935 2 Sheets-Sheet 1

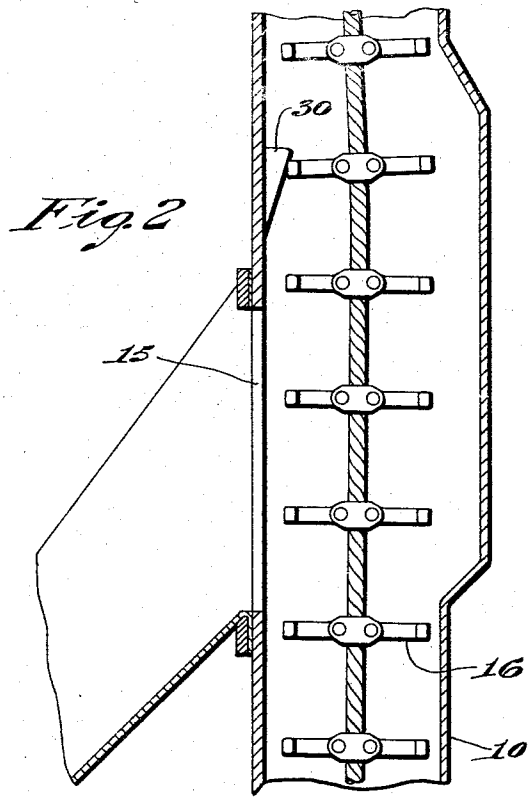


Fig. 2

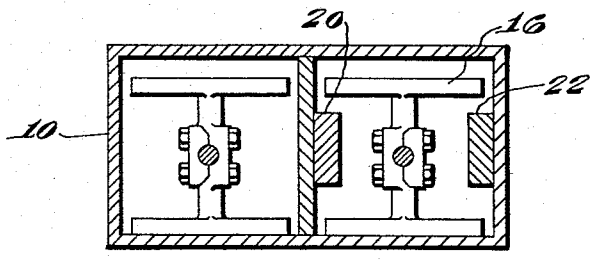


Fig. 3

Fig. 1

INVENTOR
Nixon W. Elmer
BY J. Stanley Churchill.
ATTORNEY

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Filed Aug. 10, 1935 2 Sheets-Sheet 2

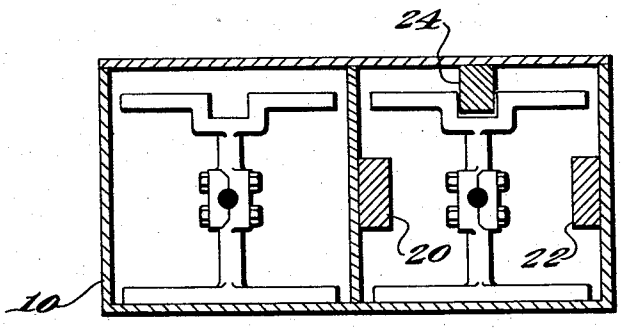


Fig. 5

Fig. 4

INVENTOR
Nixon W. Elmer
BY J. Stanley Churchill
ATTORNEY

UNITED STATES PATENT OFFICE

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CONVEYER

Nixon W. Elmer, Oak Park, Ill., assignor to Redler Conveyor Company, Quincy, Mass., a corporation of Massachusetts

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11 Claims. (Cl. 198—168)

This invention relates to a conveyer for transporting flowable solid material in a continuous stream.

In general, the object of the invention is to provide a novel and improved conveyer of the character specified in which provision is made for reducing to a minimum the production of jams and congestions during the transportation of the material by the conveyer.

A further object of the invention is to provide a novel and improved conveyer of the character specified in which provision is made for facilitating the discharge of the material therefrom.

A still further object of the invention is to provide a novel and improved conveyer of the character specified in which the casing is constructed in a manner such that during conveyance of the material the natural compacting thereof is counteracted and the friction of the material against the casing is prevented from increasing.

Another object of the invention is to provide a novel and improved conveyer of the character specified in which provision is made for gradually and progressively increasing the effective internal sectional area of the conveyer and, in some instances, for suddenly increasing said area so that any tendency of the material being conveyed to become compacted is counteracted and the material is maintained in a loose flowable condition, thus promoting efficient and economical conveyer operation and facilitating the discharge of the material from the conveyer.

With these general objects in view and such others as may hereinafter appear, the invention consists in the conveyer and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a perspective view with portions broken away illustrating a conveyer embodying the present invention; Fig. 2 is an enlarged vertical sectional view of a portion of the conveyer illustrated in Fig. 1 showing the means for facilitating the discharge of the material from the conveyer; Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a perspective view of a modification with portions omitted illustrating a curved portion of a conveyer embodying the present invention; and Fig. 5 is a detail taken on the line 5—5 of Fig. 4.

In the operation of conveyers of the type illustrated in the Redler Reissue Patent No. 18,445, April 26, 1932, experience during practical use has shown that variations in the effective cross-sectional area of the conveyer casing through which flowable and substantially incompressible solid material is being conveyed operate to set up congestions which interfere with and in some cases render impossible the conveyance of the material through the conveyer casing. It has been discovered that relatively small reductions in the effective cross-sectional area of a conveyer casing, and particularly of a vertical run, have rendered the operation of the conveyer through the vertical run impossible. For example, it has been found that a reduction in the effective cross-sectional area of a conveyer casing is an amount as small as that corresponding to a reduction of one-eighth of an inch in diameter of the casing, or, in other words, a very small percentage of the effective cross-sectional area of the casing has rendered the operation of the conveyer through a vertical run impossible when operating upon such substantially incompressible materials as sand, cement and the like. Difficulties have also been encountered in effecting the discharge of the material being conveyed by conveyers of the character above mentioned due to congestion at the discharge opening and particularly in cases where sticky material is being conveyed.

In accordance with the present invention, provision is made for gradually and progressively increasing the effective cross-sectional area of the conveyer casing in the direction of travel of the transporting element in order to counteract the natural tendency of the material to compact, and provision is made for suddenly increasing the effective sectional area of the conveyer casing at those points in the casing where there is more than a normal tendency for the material to compact in order to substantially eliminate jams and congestion and to increase the efficiency and utility of the conveyer; namely, around the discharge opening and at curves of the conveyer casing.

As above stated, the conveyer casing is intentionally made of progressively increasing size in the direction of travel of the transporting member, and in the practical construction of conveyers it is preferred to construct the casing of sheet metal and of sections arranged end to end, each succeeding section being intentionally made of an effective sectional area exceeding that of the preceding section by at least an amount corresponding to the accuracy of the particular shop in which the sections are made. For example, if in any particular shop the construction is carried out to an accuracy of one-thirty-second of an inch then in accordance with the present inven-

tion each succeeding section of the conveyer casing will be designed at least one-thirty-second of an inch larger than that of the preceding section. The construction of conveyer casings in the manner set forth above insures against the possibility of slight restrictions in the sectional area of the conveyer casing and the accompanying disadvantages above mentioned.

Instead of varying the size of the conveyer casing, the invention may be accomplished in varying ways by progressively increasing the effective cross-sectional area within the casing in the direction of travel of the transporting element and preferably by the introduction of tapered space-occupying members positioned within the conveyer casing and extending longitudinally thereof within those portions of the casing where it may be desired to vary the effective load carrying area.

As previously pointed out, it may be desirable to produce a sudden increase in the effective load carrying area of the conveyer casing, particularly at corners, and this may be accomplished in various ways, such as by varying the size of the conveyer casing at the desired section, or by the introduction of space-occupying members within the conveyer casing, as will be described.

In addition to the enlargement of the conveyer casing, it has been found of advantage to construct the casing so that it is suddenly enlarged in the immediate vicinity of the discharge opening in order to cause the material to assume a loosened condition and to facilitate the discharge thereof, and it has also been found that provision of discharge openings upon a plurality of sides of the transporting element both with and without the enlargement of the conveyer casing at the point of discharge contributes to the ease and efficiency with which various materials may be discharged. In some instances, particularly where the conveyer is used to transport sticky materials, it has been discovered that the discharge of the material is decidedly facilitated by positioning an abutment or lug in the conveyer casing which is adapted to engage and displace the transporting member laterally of the conduit in order to set up vibrations in the transporting member to dislodge the material from the flights thereof, and this is most effective if the lug or abutment is placed in the immediate vicinity of the discharge opening, particularly in the vertical run of the conveyer, and where the tension in the transporting element is relatively great.

Referring now to the drawings, and particularly to Figs. 1 and 3 wherein I have illustrated a conveyer of the type forming the subject of the Redler reissue patent above referred to, and which comprises a conveyer casing **10** having a horizontal leg **12** and a vertical leg **13**. An inlet **14** is provided in the horizontal leg **12** through which the solid flowable material to be conveyed is introduced into the casing to be conveyed through the casing by a plurality of conveyer flights **16** and discharged therefrom from a discharge opening **15** in the vertical leg **13** of the casing.

In accordance with the present invention, the succeeding sections of the conveyer casing illustrated in Fig. 1 are constructed so that each succeeding section has a larger effective cross-sectional area than the preceding section in the direction of travel of the transporting element. In order to provide a sudden increase in the effective internal area of the conveyer casing at the corner in the casing, in Figs. 1 and 3 I have illustrated the horizontal leg **12** of the conveyer casing **10** as being provided with a plurality of space-occupying members **20, 22** which are affixed to the inside of the casing and which extend to the point where it is desirable to suddenly increase the effective internal area. In some instances, and particularly where the conveyer flights are relatively large, for example, fourteen inches and larger, it has been found desirable in addition to suddenly increasing the effective cross-sectional area at the corner in the conveyer casing, and to increase the effective cross-sectional area after the corner, and particularly when changing from a horizontal to a vertical or inclined run, and, accordingly, as illustrated in Figs. 4 and 5, this may be accomplished by the provision of an additional space-occupying member **24** affixed to the inside of the casing **10** and extending around the corner to the point where it is desired to suddenly increase the effective cross-sectional area. As illustrated in Figs. 4 and 5, it is preferred to position the additional space-occupying member **24** at the top of the conveyer casing **10** and to notch or recess the conveyer flights **16** so that they may be freely moved by the additional space-occupying member **24** and function in the usual manner. Referring now to Figs. 1 and 2, as previously stated, the discharge of the conveyer may be facilitated by the provision of a plurality of discharge openings **15** and by suddenly enlarging the conveyer casing in the immediate vicinity of the discharge opening **15** and, accordingly, in Fig. 1, I have illustrated a conveyer as being provided with a plurality of discharge openings **15** and, as shown in Fig. 2, the conveyer casing is constructed so that a sudden increase in the effective cross-sectional area takes place in the immediate vicinity of the discharge openings **15**, thus causing the conveyed material to assume a more loose and freely flowing condition.

In some instances, and particularly where sticky flowable materials are being conveyed, the discharge of the material from the conveyer may be facilitated by the provision of an abutment or lug **30** positioned in the conveyer casing **10** and adapted to engage and displace the transporting member laterally of the conduit in order to set up vibration in said transporting member and cause the material to be dislodged from the flights **16** thereof and, as illustrated in Fig. 2, it is preferred to place the abutment or lug **30** in the immediate vicinity of the discharge opening **15**, particularly of a vertical run of the conveyer, where the tension in the transporting element is relatively great.

From the description thus far, it will be apparent that by constructing conveyers of the type described so that the effective cross-sectional area of the conveyer casing is increased, the tendency for the material being conveyed to compact and form jams or congestions is counteracted. It will also be apparent that by constructing conveyer casings of the character described so that sudden enlargement in the effective cross-sectional area of the casing takes place at points where more than an ordinary tendency to compact and become congested exists, and particularly at corners and at the discharge opening of the conveyer casing, congestions and jams of the material being conveyed are substantially eliminated and the efficiency

and utility of the conveyer is greatly increased. It will also be observed that in addition to facilitating the discharge of the conveyer, as above described, provision is made for further facilitating the discharge by provision of a plurality of discharge openings in the conveyer casing and by providing means for displacing and setting up vibration in the conveyer flights in order to dislodge the material from the flights.

While the preferred embodiment of the present invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:—

1. A conveyer for transporting flowable solid material in a continuous stream comprising a casing, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect transportation of the material in a mass, said casing comprising a plurality of sections adapted to be secured end to end with each succeeding section of slightly greater effective internal area than the preceding.

2. A conveyer for transporting flowable solid material in a continuous stream having, as a combination, a moving element of the open type and a casing the conveying area thereof being progressively enlarged in the direction of travel of said moving element.

3. A conveyer for transporting flowable solid material in a continuous stream comprising a casing, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect transportation of the material in a mass, said casing having the interior thereof increasing in area in the direction of travel of the transporting element.

4. A conveyer for transporting flowable solid material in a continuous stream comprising a casing, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect transportation of the material in a mass, said casing comprising a sheet metal structure made up of sections, the effective internal sectional area of a succeeding section being greater than that of the preceding section.

5. A conveyer for transporting flowable solid material in a mass, comprising a casing provided with an inlet and an outlet, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect transportation of the material in a mass, said casing having the interior progressively increasing in area in the direction of travel of the transporting element and said interior being suddenly enlarged in the immediate vicinity of said outlet.

6. A conveyer for transporting flowable solid material in a mass, comprising a casing, a transporting member adapted to be drawn through the casing provided with a plurality of open flights to effect transportation of the material in a mass, said casing being provided with an inlet and an outlet, said outlet being open on a plurality of sides of the conveyor casing to permit the discharge of the material and said casing having its walls suddenly enlarged in the immediate vicinity of said outlet.

7. A conveyer for transporting flowable solid material in a mass, comprising a casing a transporting member adapted to be drawn through the casing provided with a plurality of open flights to effect transportation of the material in a mass, said casing having the conveying area thereof progressively increasing in area in the direction of travel of the transporting element and being provided with an outlet, said outlet being open on a plurality of sides of the conveyer casing and the internal area of said casing being suddenly enlarged in the immediate vicinity of said outlet.

8. A conveyer for transporting flowable solid material in a mass, comprising a casing provided with an inlet and an outlet, a transporting member adapted to be drawn through the casing provided with a plurality of open flights to effect transportation of the material, said casing having the conveying area thereof progressively increasing in the direction of travel of the transporting element, said outlet being open on a plurality of sides of the conveyer casing whereby the discharge of the material is facilitated.

9. A conveyer for transporting flowable solid material in a mass, comprising a casing provided with an inlet and an outlet, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect the transportation of the material in a mass, said casing having the interior thereof progressively increasing in area in the direction of travel of the transporting element, and means adjacent said outlet for displacing and setting up vibration in said transporting element.

10. A conveyer for transporting flowable solid material in a mass, comprising a casing, a transporting member adapted to be drawn through the casing and provided with a plurality of open flights to effect the transportation of the material in a mass, said casing having the internal sectional area thereof progressively increasing in the direction of travel of the transporting element and suddenly increased at points where the normal tendency of the material to jam or congest occurs.

11. A conveyer for transporting flowable solid material in a mass, comprising a casing provided with an inlet and an outlet, a transporting member adapted to be drawn through the casing provided with a plurality of open flights to effect the transportation of the material in a mass, said casing having the interior thereof progressively increasing in area, said outlet being open on a plurality of sides of the conveyer casing, and means adjacent said outlet for displacing and setting up vibration in said transporting member.

NIXON W. ELMER.