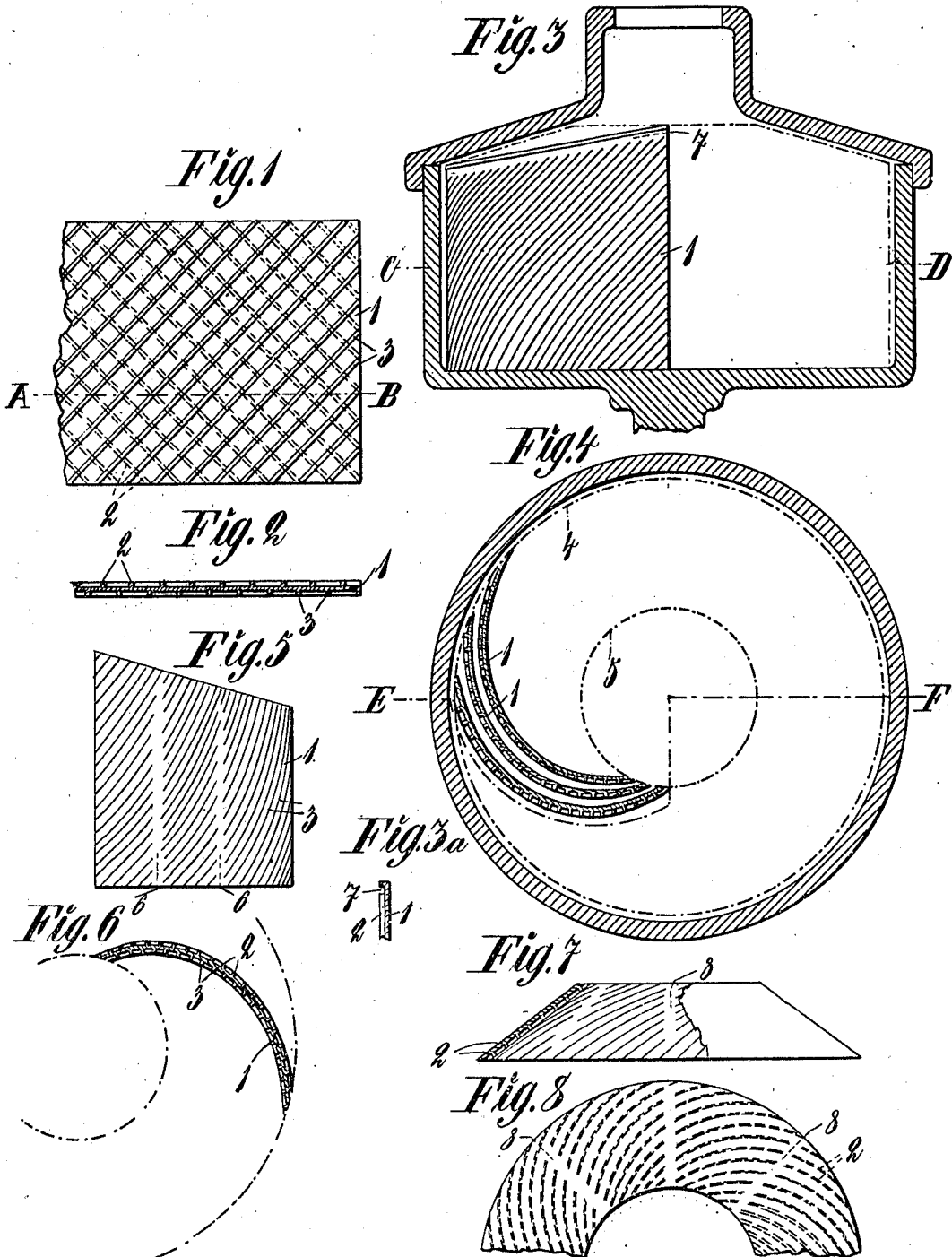


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 LINER FOR CENTRIFUGAL LIQUID SEPARATORS.
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Witnesses:
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UNITED STATES PATENT OFFICE.

CARL ADOLF FREDRIK RAMSTRÖM, OF STOCKHOLM, SWEDEN.

LINER FOR CENTRIFUGAL LIQUID-SEPARATORS.

957,092.

Specification of Letters Patent.

Patented May 3, 1910.

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To all whom it may concern:

Be it known that I, CARL ADOLF FREDRIK RAMSTRÖM, a subject of the King of Sweden, residing at 21 Observatoriegatan, Stockholm, in the Kingdom of Sweden, have invented new and useful Improvements in Liners for Centrifugal Liquid-Separators, of which the following is a specification.

This invention relates to liners for centrifugal liquid separators.

The liner consists of plates, walls or leaves, mounted side by side in parallel vertical or horizontal planes or arranged in any similar manner to form together a body, filling the drum to a greater or less extent, and provided with a plurality of narrow spaces or cavities, occupied by the liquid. The said plates, walls or leaves may be straight, curved, or bent, and so mounted that they divide the radius of the drum, or a line parallel to the axis of the drum. The acting surface of said plates, walls or leaves with which the liquid comes in contact is finely rifled and the rifled surfaces are mounted so close to each other that the walls are separated from each other by a thin rib, which may be sharp edged. If the rifles are formed by pressing by means of a stamp, or between rollers, the plates or leaves will be strengthened and are preferably very thin and light; either one or both sides of the plates or leaves may be rifled while the opposite side is left smooth, but it is preferred to rifle both sides, and arrange the rifles in one side so that they cross the rifles in the other side. It is preferred to provide a wider channel in each surface so rifled into which said rifling leads.

In the accompanying drawing some forms of execution of the plates are shown.

Figure 1 is a side view of a part of a plate and Fig. 2 is a section on the line A—B of Fig. 1. Both the said figures are drawn on a very enlarged scale. Fig. 3 is a side view of a plate, Fig. 3^a shows in section the top edge of a plate, and Fig. 4 is a plan view of a plurality of plates. According to these figures in which the drum is shown, the plate has a curve shape, and one side is rifled while its other side is smooth. Fig. 3 is, as for the liner, a section on the line E—F of Fig. 4, while the drum is cut diametrically; Fig. 4 is a section on the line C—D of Fig. 3. Fig. 5 is a side view and Fig. 6 a section of a plate, having the same shape as those

shown in Figs. 3 and 4 but having both sides rifled. Fig. 7 is a side view partly in section of a plate, conical in shape, and Fig. 8 is a plan view of a part of said plate.

The plate 1, Figs. 1 and 2, is rifled diagonally and to such a depth, that the depth of the rifles is substantially as great as the thickness of the plate at the bottom of the rifles or greater than the same. The rifles are situated very close to each other so that the surface of the plate suggests the surface of a coarse file with the exception that the rifles need not be very sharp at their bottom in order that the whole surface may be easily cleaned. Consequently, one may also say, that the surface of the plate is rifled, which word indicates that it is now the question of the profile or the character of the surface itself and not the shape of the plate as a whole. The said rifles are preferably so disposed that their longitudinal direction forms an angle with the horizontal plane or with the perpendicular, when the liner is mounted in the drum, or the direction of the rifles may, if desired, coincide with said plane or said perpendicular line. The ribs or ridges 2 and 3 resulting from the rifling and extending along the surface of the plate are very thin, in order that the bearing surfaces between the plates may be small, or the surfaces between the ribs on the other hand, as large as desired. Owing to the fact that there is a greater number of ribs on the superficial area and the ribs, so to say, are mounted on edge, the surface of the plate is divided into many narrow rifles while the ribs will greatly strengthen the plate or leaf so that it may be very thin. Owing to the fact that the ribs on one side of the plate form an angle with the ribs on its other side, the stiffness of the plate is increased, although the material at the bottom of the rifles is very thin. The rifles may be formed by working the surface of the plate mechanically; for instance, by cutting narrow grooves in the material, by scratching, by means of a pointed or toothed instrument of steel, or by cutting as in cutting files, or by pressing by means of a stamp or between rollers, the said stamp or the said rollers being provided with narrow grooves in which the ribs are formed by great pressure causing a displacement of the particles of the material. The said rifles may be formed also by casting, by galvanic precipitation, or

in any other suitable known manner. When the rifles are formed by a cutting operation a part of the plate material is removed without being cut through. Owing to this fact the thickness of the plate is reduced on a great part of its area, the space effective in the separation of the liquid being correspondingly increased and the weight of the liner decreased, which is of the greatest importance in centrifugal separators. The case is analogous to that now stated in rifled plates manufactured by pressing or casting; the rifles may have a straight, curved or broken shape and there may be a break in the same in one or more places. The rifles may change in depth and width and the ribs also may change in width and height. The rifles may diverge in one direction or the other longitudinally. Adjacent plates bear upon each other by means of the ribs.

Fig. 4 shows the arrangement of a set of curved plates arranged in a circle around the axis of the drum; only a few plates are shown in Fig. 4, the rest being indicated by two circles 4 and 5, the outer one nearly coinciding with the inner surface of the drum or having a somewhat shorter diameter. In Fig. 4, the plates are for the sake of clearness, mounted at some distance from each other. The spaces between the plates are divided by the rifles into a great number of narrow channels in which the liquid, as milk, let into the same, is subjected to the centrifugal force, the separated lighter part of the liquid moving upward and inward toward the center of the drum and the heavier part downward and outward toward the periphery of the drum following the rifles, which preferably have such a direction. In order that the liquid may easily be let into the said spaces the rifles are preferably interrupted at one or more places in such a manner that one or more special channels 6, Fig. 5, are formed, leading upward from the bottom of the drum. A narrow channel 7, Figs. 3 and 3^a, may be provided in the top of the plate, extending along its upper edge, in which the liquid, leaving the rifles opening into the said channel, can run. The plates in Fig. 6 are arranged in the same manner as shown in Fig. 4 but are provided with ribs on both sides of the same kind as shown in Figs. 1 and 2. The plates bear upon each other at a great number of places *i. e.* at such places where the ribs of one of the plates cross the ribs of the neighboring plate. In this form of the invention one of the sides facing each other has a great number of rifles for the liquid, extending in one direction, while the other side is provided with a greater number of rifles, extending in another direction. The separated, heavier part of the liquid will find its way outward from the center of the drum through the rifles of the plate-surface facing the said center and the

lighter part of the liquid will find its way inward toward the said center through the rifles of the plate surface facing the wall of the drum. The channels 6 are preferably provided in the side first mentioned. As the separated, heavier part of the liquid generally has a much greater volume than the lighter one, the rifles for the same are preferably made deeper than the rifles for the lighter part. For that purpose the ribs of one plate surface are made higher than the ribs of the other surface in accordance with the proportion of the differently heavy parts of the liquid. Consequently, the said contact points of the plates may coincide with a layer or a plane between the plates in which the specific weight of the liquid may be considered equal to the specific weight of the liquid led into the drum, owing to which fact the said contact points may be considered representing a neutral layer in substantially radial direction. In this manner the liquid will pass between the plates without disturbing the separation effected in said neutral layer. In Figs. 7 and 8, the ribs provided on the inner side of the cone are curved shape, longitudinally turning inward toward the center. If a plurality of plates of said construction are placed one upon another, spaces are formed, in each of which the liquid, getting heavier and heavier, is caused to pass a long way toward the periphery, in consequence thereof the lighter parts of the liquid have a long time for separating. Also in these plates one or more breaks in the ribs crossing the rifles may be provided for facilitating the passage of the full milk through the spaces. The said channels are preferably provided in the lower side of the plate. Such channels 8 are shown in Figs. 7 and 8.

The word "rifle" and its inflections as herein used refers to the cut or groove between ribs, like that due to the chisel cuts in the surface of a file.

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

1. A liner for centrifugal liquid separators consisting of partition walls mounted near to each other in the drum, having both surfaces finely rifled, the rifles in one surface crossing the rifles of the other side.

2. A liner for centrifugal liquid separators consisting of partition walls mounted near to each other in the drum, which walls have a finely rifled surface the rifles in facing adjacent walls crossing each other at an angle.

3. In a centrifugal separator, the combination with the drum, of liner plates provided with rifles on both sides, those on one side being substantially continuous and at an angle with those on the other side.

4. A liner for centrifugal separators con-

sisting of partition walls mounted in the drum with their surfaces near each other across the radius of the drum, said surfaces being finely rifled, the rifling of the side toward the center of the drum being deeper than the rifling of the side toward the wall of the drum.

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

CARL ADOLF FREDRIK RAMSTRÖM.

Witnesses:

CARL FRIBERG,
AUG. SÖRENSEN.