

K. J. BESKOW & M. EKEDAHL.
 DEVICE FOR EMPTYING SUPERPHOSPHATE OUT OF DECOMPOSITION CHAMBERS.
 APPLICATION FILED FEB. 23, 1909.

956,792.

Patented May 3, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

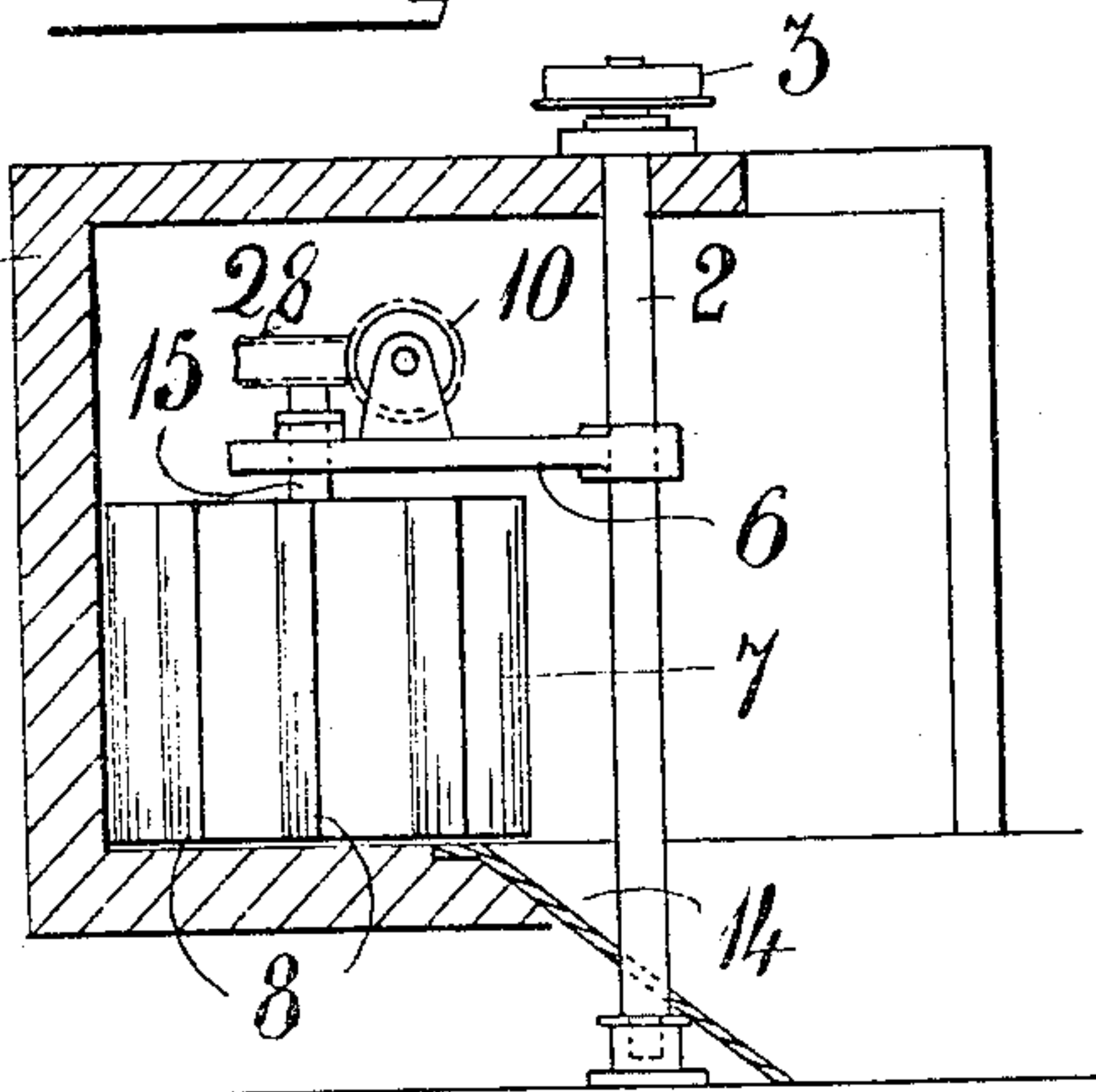


Fig. 3.

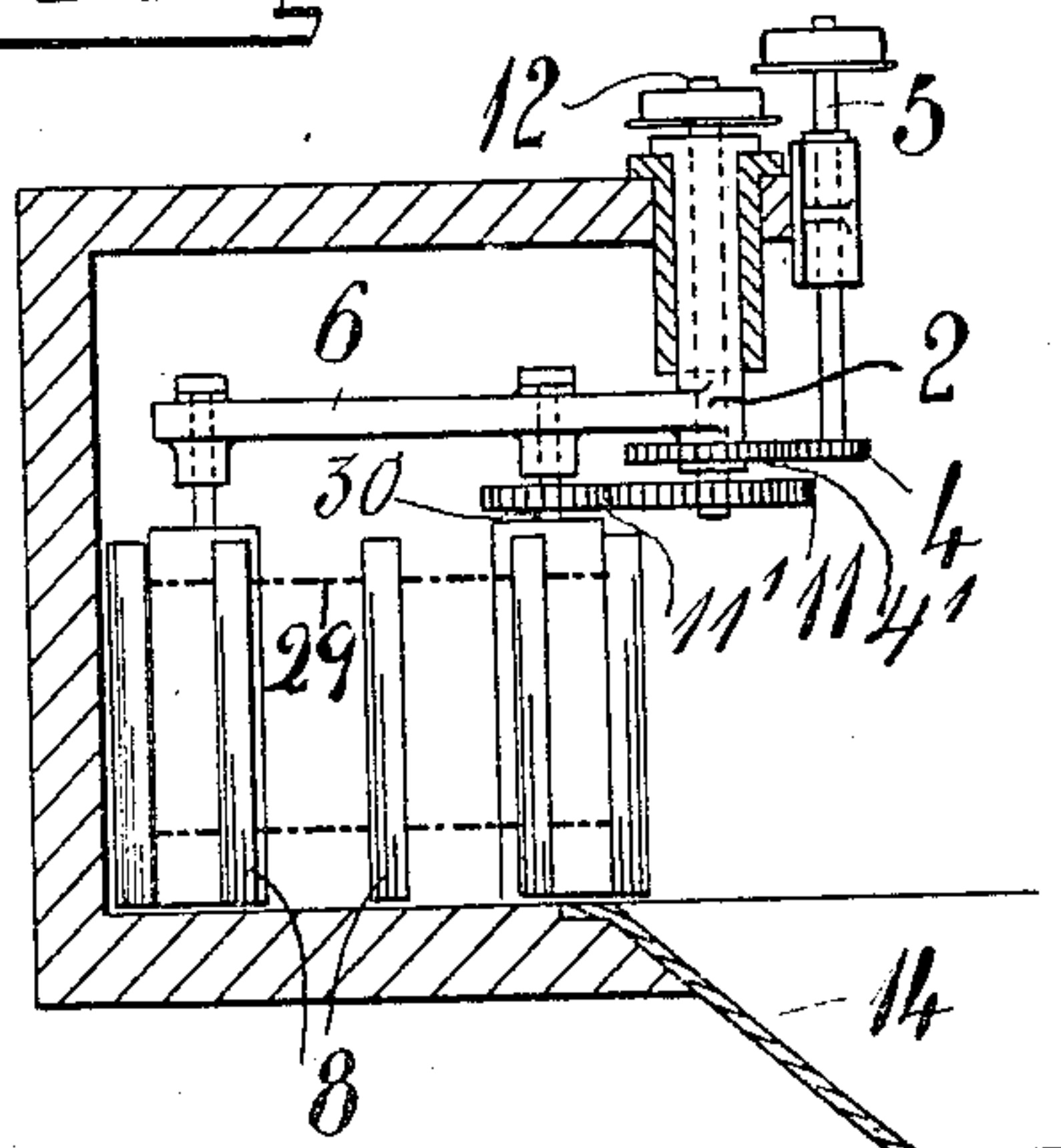


Fig. 2.

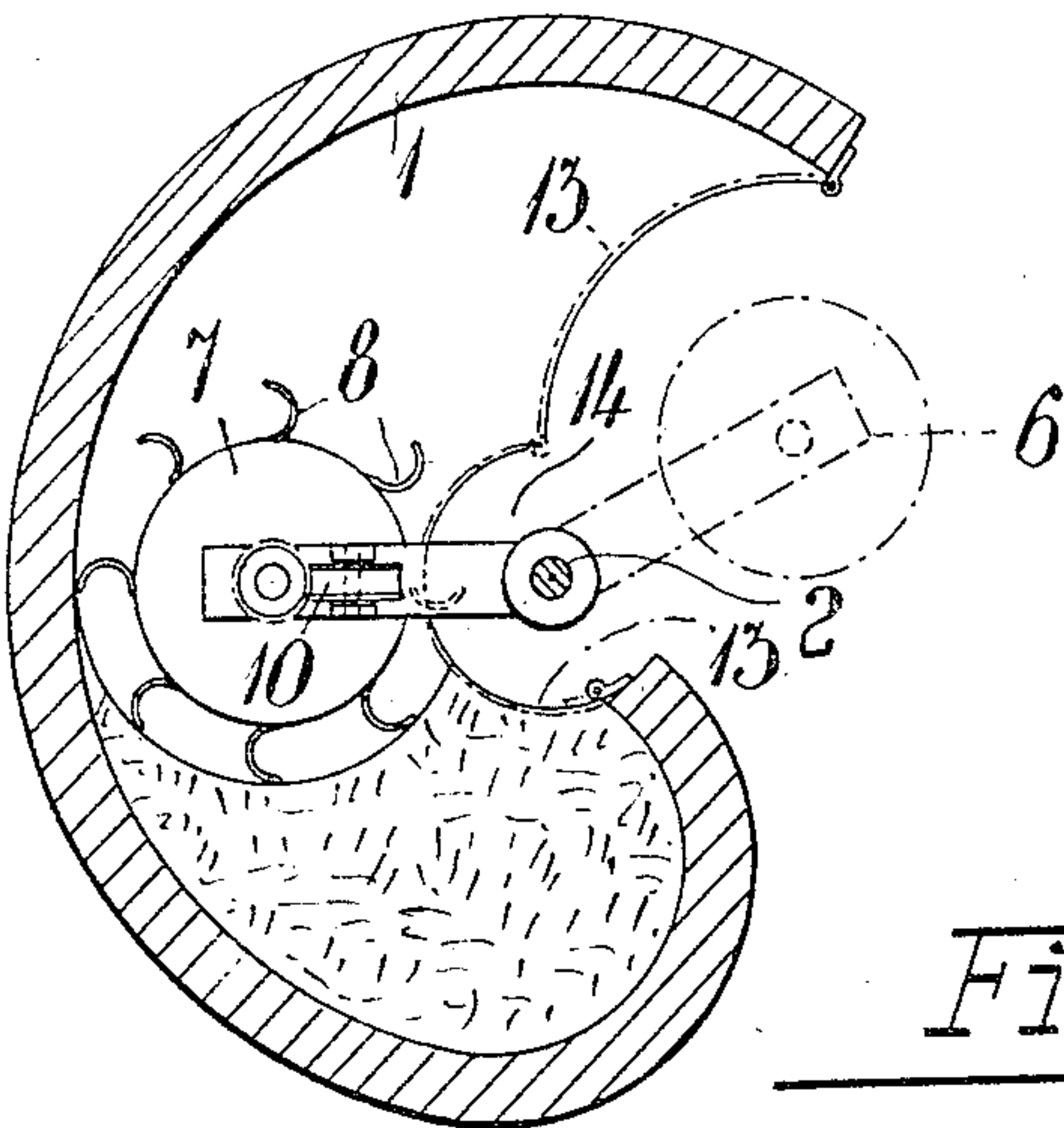


Fig. 4.

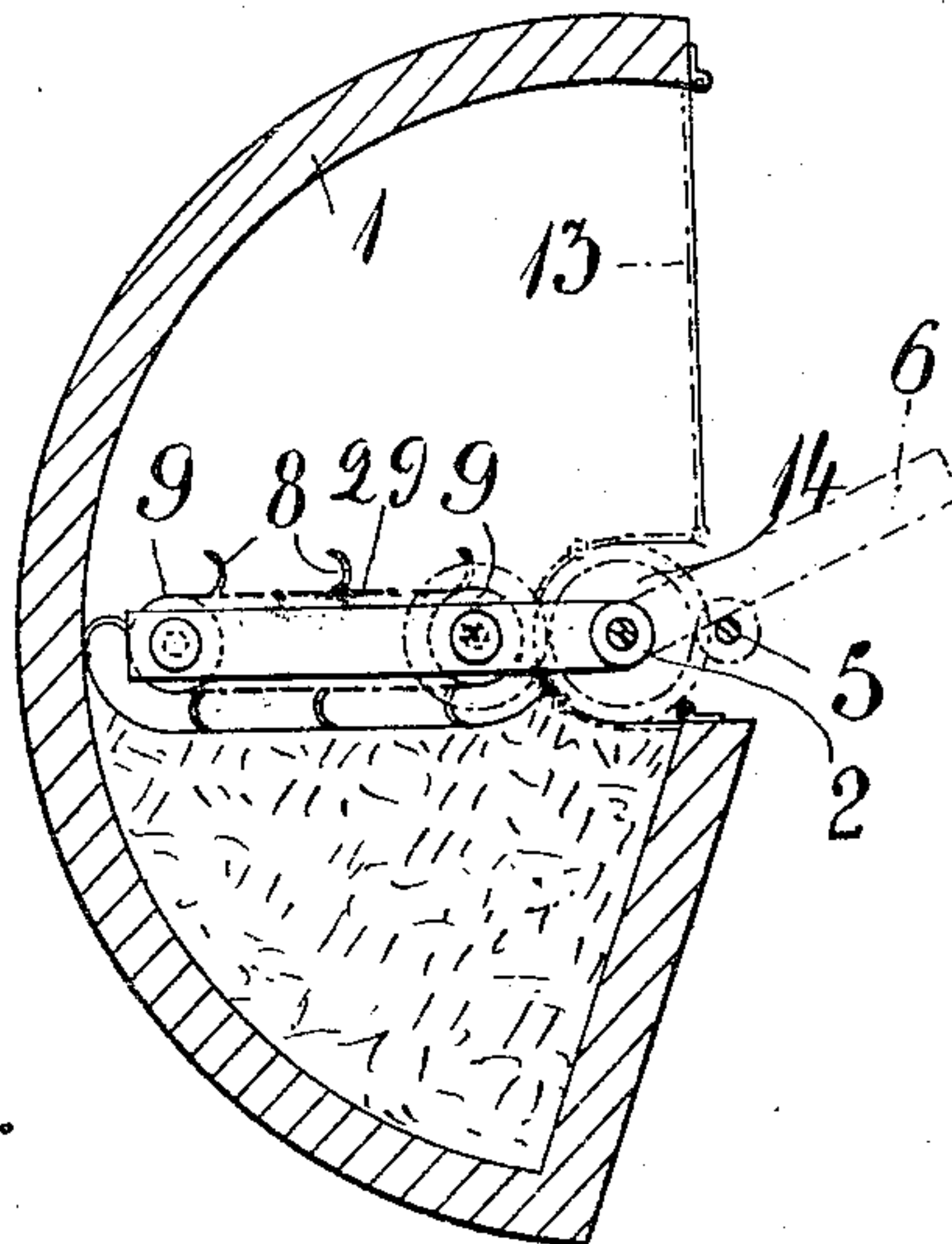
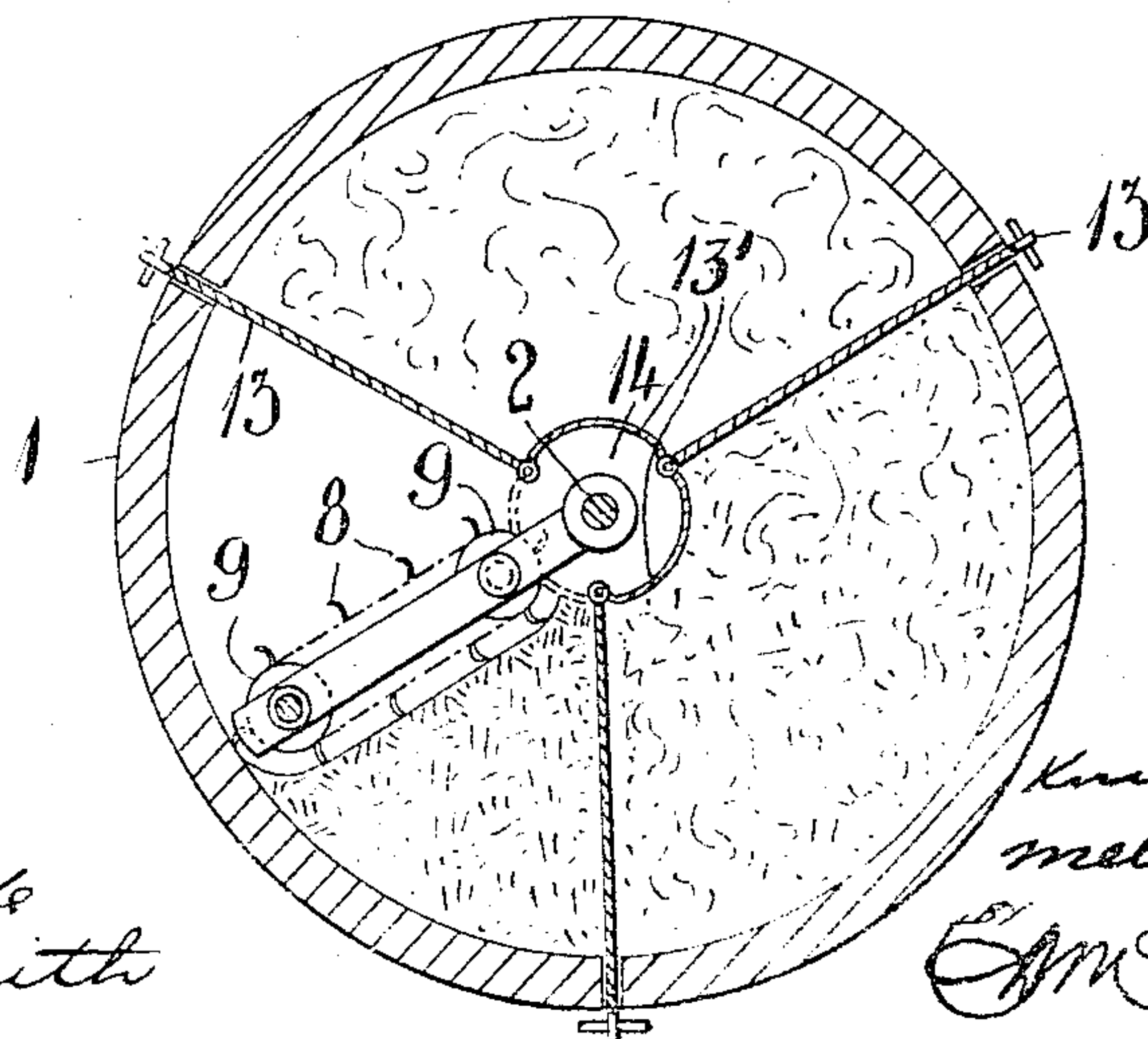


Fig. 5.



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FIG. 6.

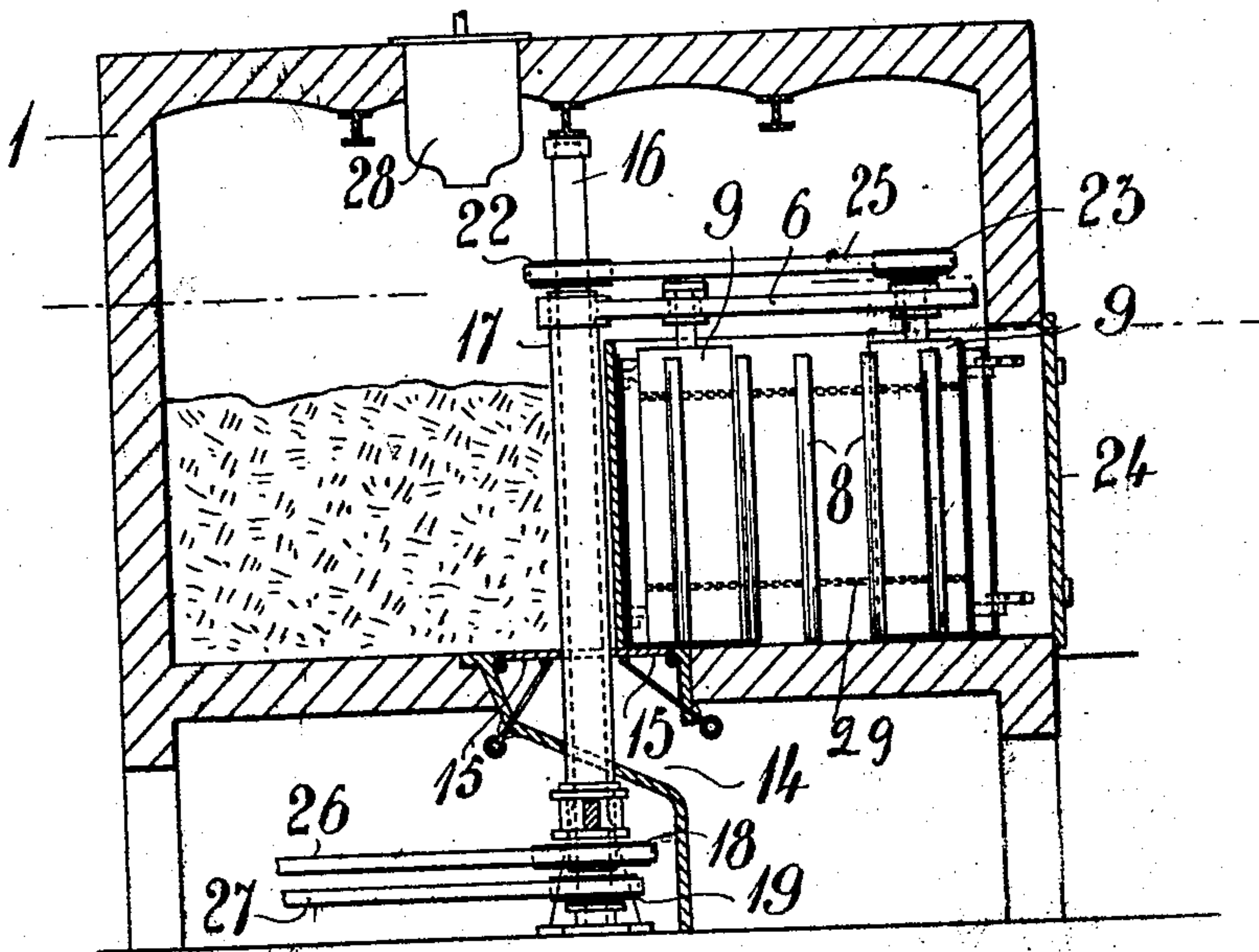
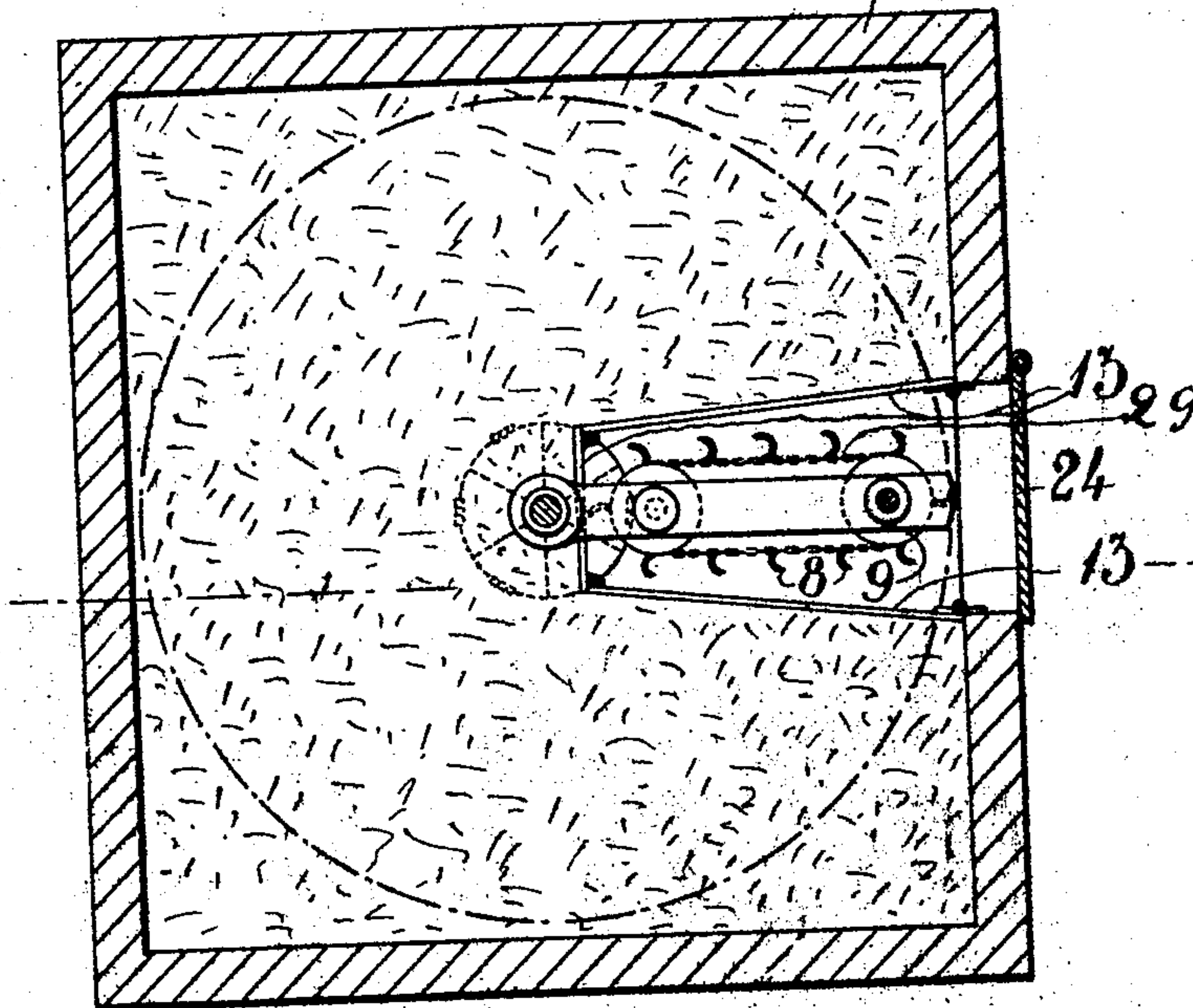


FIG. 7.



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KNUT JAKOB BESKOW, OF HELSINGBORG, AND MELCHER EKEDAH, OF LIMHAMN, SWEDEN.

DEVICE FOR EMPTYING SUPERPHOSPHATE OUT OF DECOMPOSITION-CHAMBERS.

956,792.

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To all whom it may concern:

Be it known that we, KNUT JAKOB BESKOW, engineer, subject of the King of Sweden, residing at Södra Storgatan 19, in Helsingborg, in the Kingdom of Sweden, and MELCHER EKEDAH, accountant, subject of the King of Sweden, and residing at Limhamn, in the Kingdom of Sweden, have invented new and useful Improvements in Devices for Emptying Superphosphate Out of Decomposition-Chambers, of which the following is a specification.

Of late years a number of different devices for the emptying of superphosphate out of the decomposition chambers have come into use. Most of these devices, however, are either pretty complicated and expensive or else are constructed upon false principles. To the former category belong, in our opinion such devices in which a special reaction vessel is used and, among the latter category all such emptying devices ought to be counted in which the mass of superphosphate from the upper surface of the heap of the same is acted upon by dredging or plowing implements. For on a working of the upper surface of the superphosphate mass, the superphosphate cut loose is dragged on the remaining superphosphate mass, and, of course, in this process a kneading-together in some degree of the superphosphate which in fresh condition is very sensitive against pressure can hardly be avoided. Therefore it must be more proper to work the heap of superphosphate from the side. In so doing, this advantage is gained that the superphosphate which is newly cut loose, falls down immediately, giving off some moisture in falling where-by it can later on more easily allow itself to be transported without becoming doughy. Thus the superphosphate cut loose need not, in this latter case be transported on superphosphate.

In accordance with the present invention the emptying of the decomposition-chamber takes place in such a way that the heap of superphosphate is on one side exposed to the action of cutting or shoveling devices, which are of such a character that they at the same time cut loose the superphosphate from the side of the heap of superphosphate and transport the mass cut loose to a certain place inside or outside the chamber. It has, however, been a matter of great difficulty,

to invent a cutting or shoveling device which is capable in practice of being advantageously used for this purpose, which device for said purpose must be of such a character that it can be brought to pass through the whole chamber so that it passes over the whole bottom of the same. In accordance with the present invention this problem is solved in such a way, that the said device is pivotally carried on a vertical shaft or axle in such a way that it may be swung through the whole chamber along the bottom of the same. With this device the great advantage is at the same time gained, that all the superphosphate may be emptied out of the chamber at one and the same place, where it can fall directly down for example into a disintegrating machine for superphosphate without requiring the use of a transport-band or other special transport implements.

In order to illustrate the invention there are shown, by way of example, in the accompanying drawing several embodiments of the invention.

Figure 1 shows in vertical section a decomposition chamber for superphosphate arranged in accordance with the present invention, together with the device belonging thereto for the emptying of the chamber. Fig. 2 shows the same in horizontal section. Figs. 3 and 4 show in the same way another form of construction of the device in question. Fig. 5 shows diagrammatically, in horizontal cross section another form of the decomposition chamber comprising the present invention. Fig. 6 shows in vertical section and Fig. 7 in horizontal cross section still another form of the invention.

In Figs. 1 and 2, 1 indicates the decomposition chamber itself which in horizontal section can suitably have the form somewhat like a segment of a circle, shown in Fig. 2. Into this chamber which is provided with a removable wall or walls 13, is introduced the superphosphate mixture or composition which is intended to be decomposed, which mixture during the reaction there taking place stiffens to a dough-like mass of such a consistency, that it will not run out when the wall or walls 13 are removed for the purpose of emptying the superphosphate out of the chamber. For the emptying of the superphosphate mass out of the decomposition chamber, the following device is provided.

2 is a vertical shaft rotatably arranged in about the center of the circle after which the inner side of one part of the wall of the chamber is formed, which shaft is adapted to be turned by arrangements suitable for the purpose, for example, by means of a pulley 3, fixed on the same. To the shaft 2 there is firmly attached an arm 6 which carries the cutting or shoveling tools proper. These tools can suitably consist of bent, vertically arranged scoops or blades 8 which are fastened on the circumference of a drum 7 firmly attached on a shaft 15 rotatably journaled in the arm 6, so that the drum 7 thus comes to be carried by the said arm. The drum 7 is put into rotation by means of devices suitable for the purpose for example, an electric motor 10 arranged on the arm 6, which motor stands in gearing connection with a gear 28 fixed on the shaft 15. By turning the shaft 2 the arm 6 can be swung out of the chamber as is indicated by the dotted lines in Fig. 2, or swung into the chamber—as is shown by full lines in the same figure—in such a way that the drum 7 will pass over the whole bottom of the chamber. With this device the emptying of the superphosphate mass out of the decomposition chamber is carried out in the following way. After the removable walls 13 have been taken away so that one side of the heap of superphosphate within the chamber is exposed, the drum, which is carried rotatably by the arm 6, is swung in toward the exposed side-surface of the heap of the superphosphate by means of a slow rotation of the shaft 2. Simultaneously therewith the drum 7 is put in rotation by the motor 10, in doing which the cutting or shoveling tools 8 by degrees cut off the superphosphate mass from the side of the heap of superphosphate and at the same time transport it to an open channel or passage 14 issuing from the center of the chamber, into which channel the superphosphate falls. After all the superphosphate mass has been thus removed from the decomposition chamber, the drum 7 is swung out of the chamber and the walls 13 are replaced so that the chamber is again put in order for the reception of a new charge.

In Figs. 3 and 4 the corresponding parts are indicated with the same numerals of reference as in Figs. 1 and 2. The form of construction shown in Figs. 3 and 4 of the device in question differs from that shown in Figs. 1 and 2 with respect to the devices intended for the carrying and driving of the cutting or shoveling tools and with respect to the form of the decomposition chamber thereby rendered necessary. According to this form of construction the shovels 8 are attached to endless chains or belts 29, arranged on rolls 9 which rolls are rotatably supported by the arm 6. This arm is rigidly attached to the rotatably arranged

shaft 2 which is driven by the shaft 5 by means of a gear 4 which meshes with a gear 4' fixed on the shaft 2. The one roll 9 is driven by the shaft 12 by means of a gear 11, fixed on the lower end of the said shaft 12, which shaft goes right through the shaft 2 which in this case is hollow—and a gear 11' which is fixed on the shaft 30 of the said roll 9. By rotating the shaft 2 the arm 6 can thus, together with the cutting or shoveling tools supported by the same, be swung out of the chamber as is indicated by the dotted lines, in Fig. 4 or into the chamber and over the whole of its bottom surface. When the shovels or blades 8 are put in motion as has been described above, by rotating the shafts 5, 2 and 12 they cut off superphosphate from the side of the heap of superphosphate and transport the same to the passage 14 where it falls down and is carried away for further treatment. The length of the scoops 8 corresponds, of course, to the depth of the heap of superphosphate. These scoops can be placed vertically, as shown in the drawing or more or less obliquely.

By removing the superphosphate mass out of the decomposition chamber, in the way described above, there is gained that the caking together of the same is avoided, at the same time that the work can be carried out by relatively simple means, and without the workmen needing to expose themselves to the effects of the unwholesome gases present in the decomposition chamber.

It ought to be understood that the decomposition chamber also may be given such a form that its horizontal section occupies a whole circle or nearly a whole circle and that the said chamber, as it is diagrammatically shown in Fig. 5, may by means of removable vertical partition walls 13 be divided into two or more divisions, in order that the charging process may take place in one division at the same time as the decomposition or reaction and emptying process is going on in the other division or divisions, which emptying process then may be carried out by means of one and the same emptying machinery common to all divisions. Said machinery may for said purpose be of the construction above described, and preferably pivotally supported by a vertical shaft 2 placed in the center of the chamber coinciding with the middle of the passage 14. The opening of this passage is surrounded by removable walls 13'. When a division is to be emptied, the said walls 13' belonging to that division are removed (see dotted lines in Fig. 5) so that the superphosphate shoveled loose from the side of the heap by the tools 18 may by the shoveling tools be transported into said passage and thus carried off from the chamber.

According to Figs. 1-5 means are provided

for protecting the emptying machinery against the mass of superphosphate when this is charged into the chamber. For carrying out the emptying process according to the present invention it is however not necessary that the said machinery be arranged outside the decomposition chamber and swung into the chamber when this latter is to be emptied but instead it may also be wholly or partly arranged within the decomposition chamber itself. In this latter case the small portion of the superphosphate which perhaps should hinder the starting of the mechanical emptying process must be shoveled away by hand. By way of example there is shown in Figs. 6 and 7 of the accompanying drawings a form of the decomposition chamber with the shaft on which the emptying machinery is turned arranged inside the decomposition chamber 1. This chamber which at its top is provided with a mixer 28 for the materials to be charged into the chamber, is at one side provided with a movable door 24 through which entrance into the chamber is secured. The upper opening of the passage or channel 14 serving for carrying off the superphosphate from the chamber as above stated is located in the middle of the chamber surrounding the shaft 17 by which the emptying machinery is rotatably carried. Said opening of the passage 14 is during the charge of the chamber closed by loose members or lids 15 hinged to the walls of the opening. The excavating tools 8 are in the same manner as above described and shown in Figs. 3 and 4 attached to endless chains 29 laid on vertical rolls 9, rotatably journaled in the support or arm 6, which is rigidly attached to the hollow shaft 17. On the lower end of the shaft 17 is a pulley 18 fixed which may be driven by a belt 26 so that the arm 6 with the excavating tools carried by it, may be turned or swung through the chamber 1. For moving the excavating tools 8 relatively to the support or arm 6 in the direction from the periphery against the center of the decomposition chamber there is a pulley 23 fixed on the upper end of the shaft of the one roll 9, located nearest the periphery. The said pulley 23 is driven by means of an endless belt 25 from a pulley 22 fixed on a rotatable shaft 16 which goes through the hollow shaft 17 and which at its upper and lower end is journaled in suitable bearings. Said shaft 16 carries at its lower end a pulley 19, fixed thereto which pulley is driven by means of an endless belt 27. By this means the shovels or excavating tools 8 may be given a movement relatively to the arm 6 in the direction from the periphery to the center of the chamber and thereby they shovel away superphosphate from the one side of the heap of superphosphate resting within the

decomposition chamber, and at the same time transport the mass thus shoveled across the bottom of the chamber to the channel 14 through which it is carried off, and simultaneously therewith the arm 6, supporting said tools, is turned through the chamber against the heap of superphosphate at the same rate as this is shoveled away.

In order to prevent the shoveling machinery from being embedded into the mass of superphosphate when the chamber is charged removable, vertical, partial walls 13 inclosing a free space or room within the chamber may be provided, the machinery then being during the charging placed in the free space or room thus formed. When the emptying process is to be started the said walls 13 are removed and the machinery operated in the way above described.

If the chamber as shown in Fig. 7 is of rectangular cross section, the mass remaining in the corners may be left there or it may be shoveled away by hand. Obviously the chamber may also in this case be formed with circular crosssection of such a diameter that the tools 8 will reach its inner periphery.

Having thus described our invention, we declare that what we claim is:—

1. Means for emptying a decomposition chamber of superphosphate comprising a decomposition chamber the inner walls of which or parts thereof are in horizontal section curved upon a circle, a vertical shaft arranged in the center of said circle, a support for excavating tools pivotally carried by said shaft, and adapted to be swung through the chamber along the bottom of the same, means for turning said support on its shaft through the chamber, excavating tools movably mounted in said support and means for moving said tools relatively to their support in a direction from the periphery toward the center of the decomposition chamber.

2. Means for emptying a decomposition chamber of superphosphate comprising a decomposition chamber the inner walls of which or parts thereof are in horizontal section curved upon a circle, radially arranged, removable vertical walls by which the chamber is subdivided into sections, a vertical shaft arranged in the center of said circle, a support for excavating tools pivotally carried by said shaft and adapted to be swung through the chamber along the bottom of the same, means for turning said support on its shaft through the chamber, excavating tools movably mounted in said support and means for moving said tools relatively to their support in a direction from the periphery against the center of the decomposition chamber.

3. Means for emptying a decomposition chamber of superphosphate, comprising a

vertical shaft, a support pivoted on said shaft, movable excavating tools on said support, means for turning said support through the chamber along the bottom of the same, and means for moving the tools relatively to their support in a direction from the outer walls of the chamber toward said shaft, and a discharge outlet adjacent said shaft.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

KNUT JAKOB BESKOW.
MELCHER EKEDAHL.

Witnesses:

SIGFRIED JACOBSSON,
NILS ENGSTRÖM.