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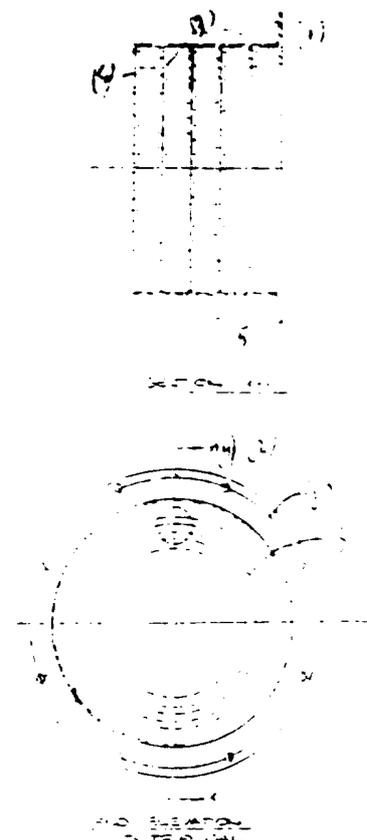
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(54) Title: ROTARY CENTRIFUGAL SEPARATOR (HEAVY MEDIUM)

(57) Abstract: A CENTRIFUGAL SEPARATOR COMPRISING A BOWL FROM WHICH THE PERIPHERAL WALL IS PROVIDED WITH NUMEROUS HOLES, EQUALLY STAGGERED AND TANGENTIALLY ENTERING THE BOWL. THE BOWL IS SURROUNDED BY A WATER JACKET WHICH IS MOUNTED ON A HOLLOW SHAFT. A HOPPER IS INSTALLED ABOVE THE CENTRIFUGAL BOWL WITH A FEEDER LINE AXIALLY LOCATED AND ENDING AT THE BOTTOM. THE BOWL IS PROVIDED WITH AXIAL SPACED RINGS WHICH ARE FIXED TO THE PERIPHERAL WALL. THE INTERIOR DIAMETERS OF THE RINGS INCREASE FROM THE BOTTOM TO THE TOP. A PROCESS FOR SEPARATING MATERIALS FROM A LIQUID IN WHICH THE LIQUID IS ADDED INTO THE HOPPER, FLOWS DOWN THROUGH THE FEEDER LINE INTO THE BOWL AND FLOWS UP AND OUT OF THE TOP. THE MATERIALS ARE SEPARATED THROUGH CENTRIFUGAL FORCE CREATED BY ROTATING THE BOWL WITH THE SURROUNDED WATER JACKET. AIR IS FED INTO THE WATER JACKET AND IS FORCED INTO THE BOWL THROUGH THE HOLES PROVIDED IN ITS WALL AND CREATES A CENTRIFUGATING FLUIDIZED BED. THE BOWL AND WATER JACKET ARE ROTATED BY DRIVING ON THE HOLLOW SHAFT THROUGH WHICH THE END AIR IS FED TO THE WATER JACKET. THE SEPARATED MATERIALS ARE RECOVERED BY FLUSHING THE ROTATING BOWL, STOPPING THE ROTATION AND REPLACING THE AIR INPUT BY CLEAN WATER WHICH IS FORCED INTO THE BOWL THROUGH THE HOLES IN ITS WALL. IT RINSES THE SEPARATED MATERIALS FROM THE RINGS AND FLOWS OUT OF THE BOWL THROUGH A DRAIN LOCATED IN THE BOTTOM. THE APPARATUS IS SUITABLE FOR WINNING A GOLD, SILVER OR PLATINUM FROM A SLURRY.



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ABSTRACT

A centrifugal separator comprising a bowl from which the peripheral wall is provided with numerous holes, equally staggered and tangentially entering the bowl. The bowl is surrounded by a water jacket which is mounted on a hollow shaft. A hopper is installed above the centrifugal bowl with a feeder line axially located and ending at the bottom. The bowl is provided with axial spaced rings which are fixed to the peripheral wall. The interior diameters of the rings increase from the bottom to the top.

A process for separating materials from a liquid in which the liquid is added into the hopper, flows down through the feeder line into the bowl and flows up and out of the top. The materials are separated through centrifugal force created by rotating the bowl with the surrounded water jacket. Air is fed into the water jacket and is forced into the bowl through the holes provided in its wall and creates a centrifugating fluidized bed. The bowl and water jacket are rotated by driving on the hollow shaft through which the end air is fed to the water jacket.

The separated materials are recovered by flushing the rotating bowl, stopping the rotation and replacing the air input by clean water which is forced into the bowl through the holes in its wall. It rinses the separated materials from the rings and flows out of the bowl through a drain located in the bottom. The apparatus is suitable for winning of gold, silver or platinum from a slurry.

* * *



CENTRIFUGAL SEPARATOR
and its use

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The invention concerns a centrifugal separator and its use in the separation of heavier materials from a liquid, such as gold, platinum, silver etc. from a slurry.

The separation of heavier materials from a liquid by means of centrifugal force is well known. The present invention improves the efficiency of the separation by creating a fluidized bed in the centrifuge and by a specific construction of the centrifugal separator.

The centrifugal separator subject of this invention comprises a centrifugal bowl, a number of axially spaced rings, fixed to the peripheral wall of the bowl, and a series of equally spaced holes in the peripheral wall, extending into a surrounding water jacket.

The centrifugal bowl and the surrounding water jacket are rotated. Air or another gas is fed to the water jacket and forced into the centrifugal bowl through the numerous holes in the peripheral wall. This creates a rotating fluidized bed in the centrifugal bowl, by which the heavier materials are separated from the slurry. The slurry is introduced axially at the bottom of the bowl and after separation of the heavier materials flows out of the top of the bowl.

Preferably the unit rotates on a hollow shaft with a rotary seat affixed on the bottom, through which air or other fluid is fed to the water jacket. The holes in the peripheral wall are constructed in such a way that the air is forced into the bowl tangentially and contrary to the direction of the rotation of the unit. The Slurry is fed to the unit through a feeding hopper at the top of the unit and enters the separator separator itself at the bottom through a feeder pipe situated axially in the bowl and ending at its bottom. The slurry from which the heavier materials have been separated flows out of the top opening of the rotating unit and leaves through a tangential launder.

To recover the separated heavy materials the slurry input is stopped and the slurry is flushed out of the separator. After all slurry waste has been flushed out the rotation is stopped and the air input to the water jacket is replaced by clean water. The water is forced to enter the centrifugal bowl through the holes in the peripheral wall and rinsed off the separated heavier materials from the axially spaced rings in the bowl. It leaves together with the separated materials, the separator through a drain located in the bottom of the bowl.

The centrifugal separator and its use in the separation of heavier material from a slurry will now be described by means of The drawings nos. 1 to 4.



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Drawing no. 1 shows the centrifugal separator unit.

Drawing no. 2 shows the separator separator itself.

Drawing no. 3 shows the whole assembly with in- and outlets.

Drawing no. 4 shows in figure 1 the end and side elevation of the centrifugal bowl and in figure 2 one of the holes in the peripheral wall.

As illustrated in Drawing no. 1, a hopper (1) is situated on the centrifugal separator. Into the hopper is fed the slurry, containing the heavier materials. The slurry flows downwards through the feeder line (2) into the bottom of the centrifugal bowl (3), upwards through the centrifugal bowl, flows out of the top of the bowl and leaves the centrifugal separator unit through a tangential outlet (4) located in the outer covering of the centrifugal separator unit (5).

The centrifugal separator unit itself consists of the bowl (3), into which peripheral wall are fixed four axial spaced rings. The bowl is surrounded by a water jacket (6) which is mounted on a hollow shaft (7) provided with pillow blocks and bearings. The shaft (7) drives on a gear (8) on the hollow shaft, forming the whole centrifugal separator unit.

The centrifugal separator unit is illustrated more in detail in Drawing no. 2.

One or another fluid is fed through the hollow shaft (7) into the water jacket (6). It is forced into the bowl through a certain number of equally spaced holes (9) situated in the peripheral wall of the bowl (7). In this respect an air pump may be installed at the end of the hollow shaft or wherever convenient.

Axially spaced rings (10) are installed in the bowl (3) and are fixed to the peripheral wall (7). The holes (9) in the peripheral wall (7) are located between the axially spaced rings (10). The interior diameter of the axially spaced rings increases gradually by about 20% from the lower ring to the upper ring by 20%. The shape of the rings (10) is such that the thickness decreases from the outer to the inner, the reduction ratio being about 1:1.5.

The air enters the bowl between the axial rings and creates a fluidized bed in the slurry which, while flowing upwards, is subjected to a centrifugal force due to the rotation of the bowl. The heavy materials in the slurry are projected outwards by the centrifugal force the latter being inclined slightly upwards. The fluidized bed is maintained throughout the whole length of the bowl. The air enters the bowl through the holes (9) in the peripheral wall (7) and is distributed in the bowl.

In this way a good separation of the heavier materials from the slurry is obtained. The heavy materials stay in the bowl, while the waste slurry flows out of the top of the bowl. The waste water leaves the centrifugal separator through a tangential outlet at the bottom of the outer cover (9), in the direction of the rotation to have a smooth outlet flow.

The heavy materials are recovered by first flushing out the slurry from the bowl by replacing the slurry inlet by clean water. When the slurry is flushed out, the rotation is stopped, and the air inlet is replaced by clean water. The clean water flows through the hollow shaft (4) into the water jacket (6) and through the numerous holes (10) in the peripheral wall into the bowl (12). It leaves the bowl through a drain (13) situated at the lowest part of the bowl. The heavy materials are rinsed off from the axial rings and is carried off with the clean water through the drain (13).

The centrifugal separator assembly shown in drawing no. 3 is composed of the centrifugal separator unit (10), the hopper (11), the feeder line (12), the bowl (13), and the water jacket (14), mounted on the hollow shaft (12), the drain for clean water (13), the air inlet (10) and (11), the tangential outlet for the waste water (9) and (10) and the drain (13) in the bowl. The bowl (13) is provided with a number of the separated materials via the holes (10) in the peripheral wall. The hopper (11) is provided on rubber rollers (15) and is provided with a spring to reduce the vibration when the unit is in operation.

In Figure 1 of Drawing no. 4 is illustrated the end elevation and a diametrical elevation of the centrifugal bowl.

The end elevation shows the ring (16) in the side of the bowl (12) with holes (10) in the ring; the bowl (13) in the water jacket (14) with axially spaced rings with decreasing interior diameter from the peripheral wall of the bowl (13) and the location of the drain (13) in the bottom of the bowl.

The diametrical elevation shows the holes (10) in the peripheral wall, staggered on either side of the axially spaced rings (16) and the drain (13) located in the bottom of the bowl.

Figure 2 of Drawing no. 4 shows the construction of one of the holes in the peripheral wall. Preferably the holes are arranged in staggered rows on either side of the rings (16) and are contrary to the rotation of the centrifuge. In this way it is obtained a more efficient separation of the heavier materials from the slurry in the centrifugal bowl.

The size of the bowl is determined by the throughput, and the diameter of the water jacket is determined by the amount of water required for the separation of the slurry. The diameter of the water jacket is determined by the amount of water required for the separation of the slurry.

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For example, a centrifugal bowl having an interior diameter of 34 cm should be provided with 22 holes having 1.9 mm diameter and uniformly staggered on either side of four axially equally spaced rings. The interior diameters of the rings are respectively by 20 cm, 22.5 cm, 25 cm and 27.5 cm, the drain at the bottom has a diameter of 5 cm.

The centrifugal separator, as described, is especially suitable for separating precious materials such as gold, silver and platinum from slurries. The recovery percentage is much higher than conventional separation means and it recovers fine gold particles which are usually lost and carried away with the waste slurry.

It is understood that centrifuges using the similar principles as described in this specification are covered by the present patent.



1. A centrifugal separator comprising a centrifugal bowl from which the peripheral wall is provided with numerous holes, for introducing air or another fluid into the bowl.
2. A centrifugal separator according to claim 1 in which the centrifugal bowl is surrounded by a water jacket which is mounted on a hollow shaft, for feeding air or another fluid to the water jacket.
3. A centrifugal separator according to claims 1 and 2 in which a hopper is installed above the centrifugal bowl and a feeder line located axially in the centrifugal bowl and ending at its bottom.
4. A centrifugal separator according to claims 1 to 3 in which the centrifugal bowl is provided with axial spaced rings which are fixed to the peripheral wall and which interior diameters are increasing from the bottom to the top.
5. A centrifugal bowl according to claims 1 to 4 in which the numerous holes in the peripheral wall are axially staggered and are tangentially entering the bowl between the axially spaced rings.
6. A process for separating heavier materials from a liquid using the centrifugal separator according to claims 1 to 5 in which the liquid is added into the hopper, flows down through the axial feeder line, into the bowl, flows up out of the top of the bowl and leaves the separator through a tangential outlet; the heavy materials are separated from the liquid through centrifugal force created by rotating the bowl with the surrounded water jacket; air or another fluid is fed into the water jacket and is directed into the bowl through the numerous holes provided in its peripheral wall and creates a centrifugating fluidized bed in the bowl which facilitates and improves the separation of the heavier material from the liquid.
7. A process according to claim 6 in which the bowl and water jacket are rotated by driving on the hollow shaft on which the water jacket and bowl are mounted.
8. A process according to claim 6 and 7 in which the air or other fluid is fed to the water jacket through the hollow shaft.



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9. A process for recovery heavier materials separated from a liquid according to claims 6 and 7 in which the rotating bowl is flushed with clean liquid, the rotation is stopped and the air input is repaired by feeding clean water to the water jacket and is forced into the bowl through the numerous holes in its peripheral wall, rinses the separated heavier materials from the axial spaced rings in the bowl and flows out of the bowl through drain located in the bottom of the bowl.

10. A process for the winning of precious materials, such as gold, silver or platinum, from a slurry by using a centrifugal separator or a process according to claims 1 to 9.

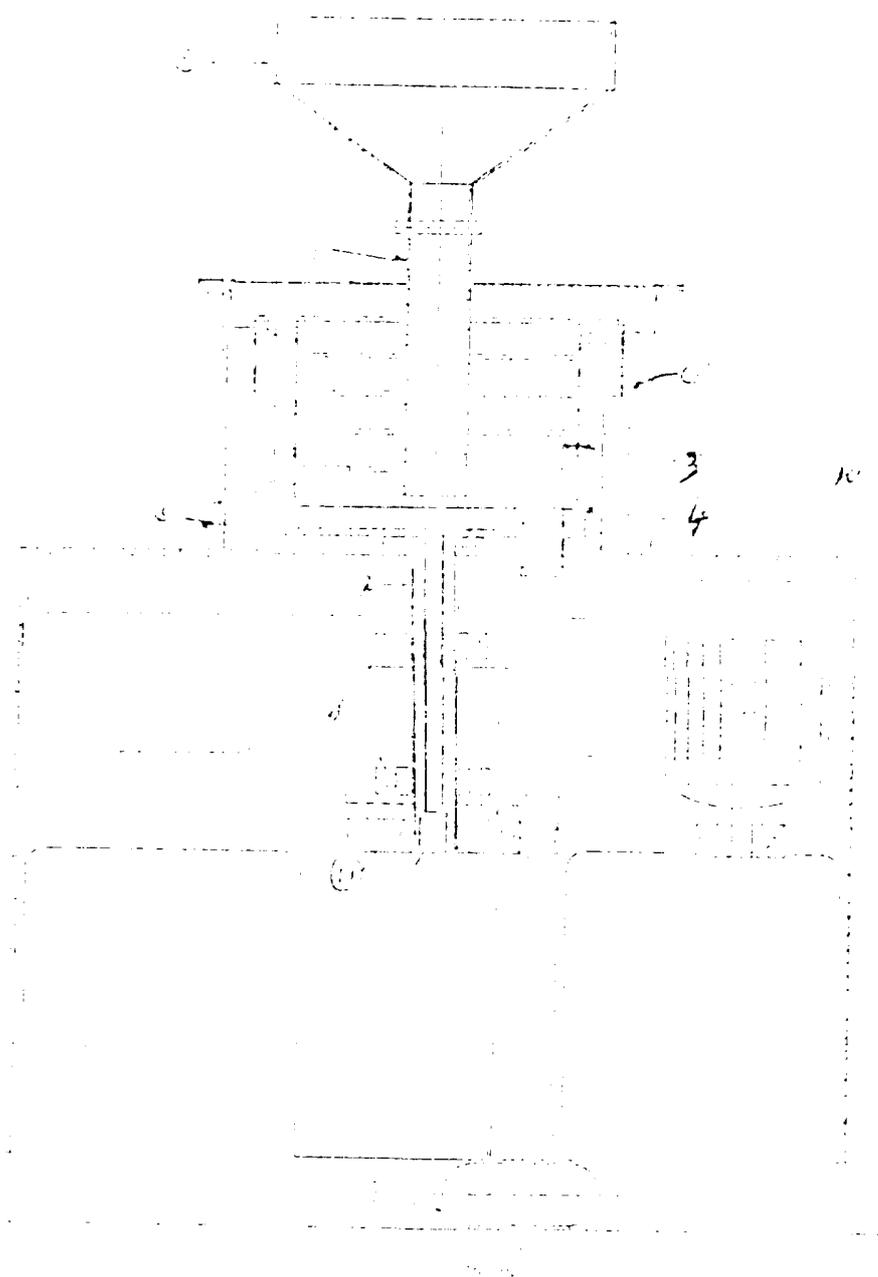
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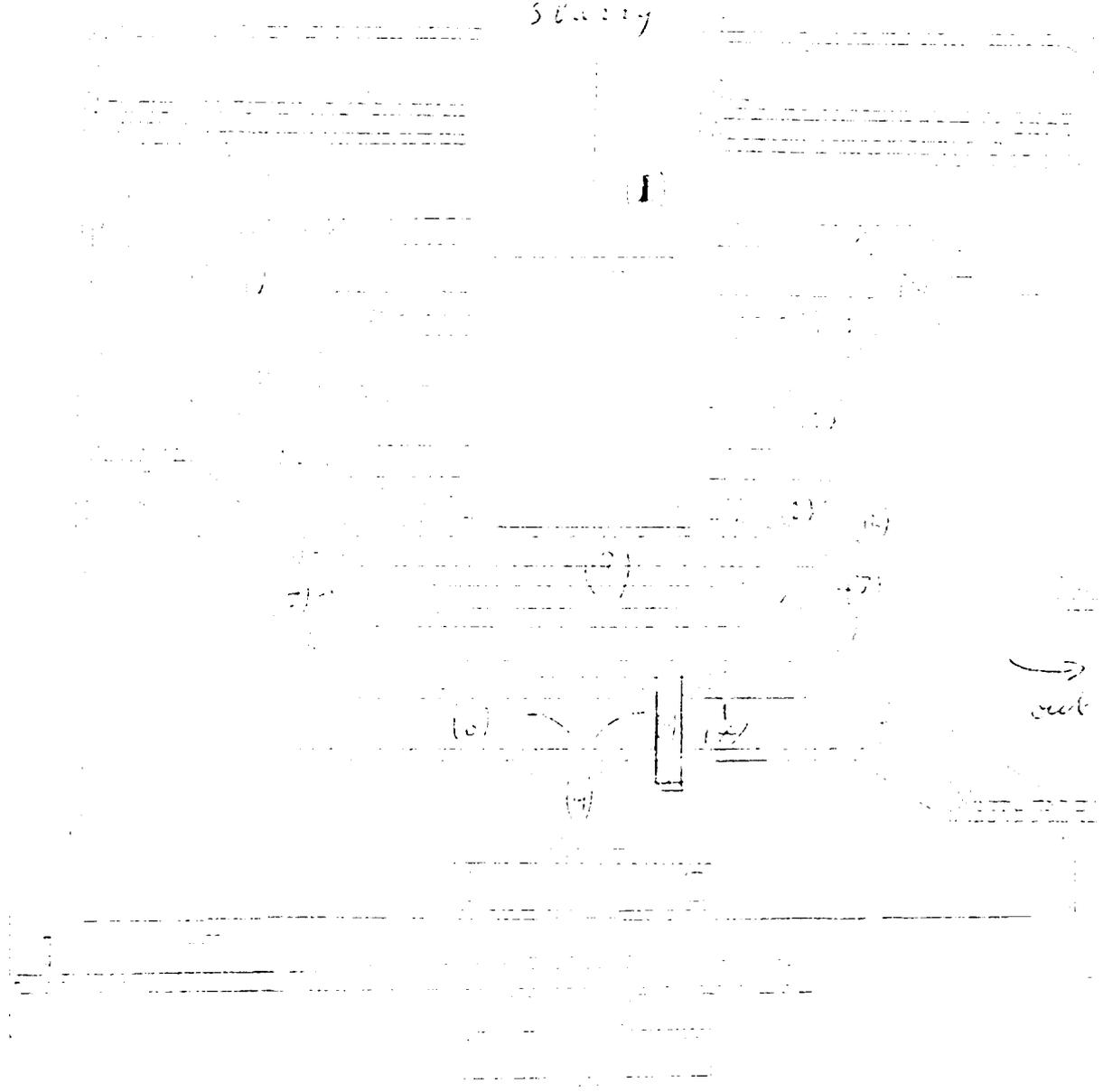


Drawing n° 1

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Security



Drawing n° 2

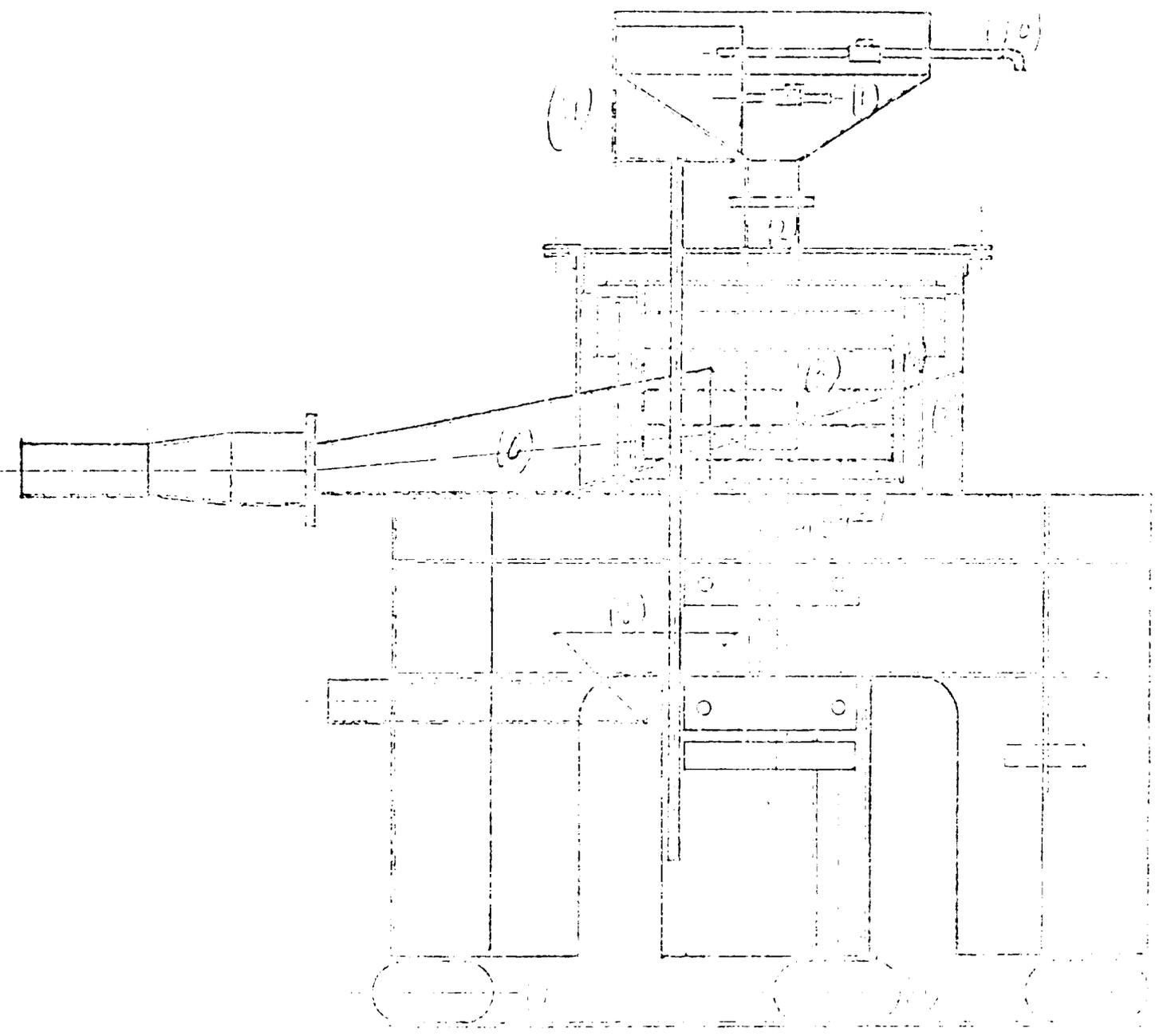
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Drawing n° 3

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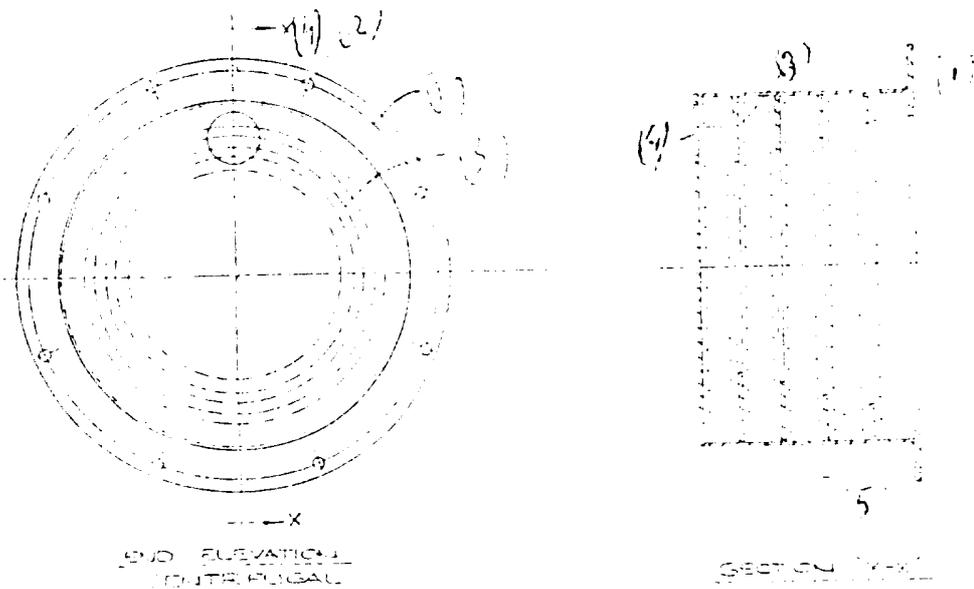


Figure 1

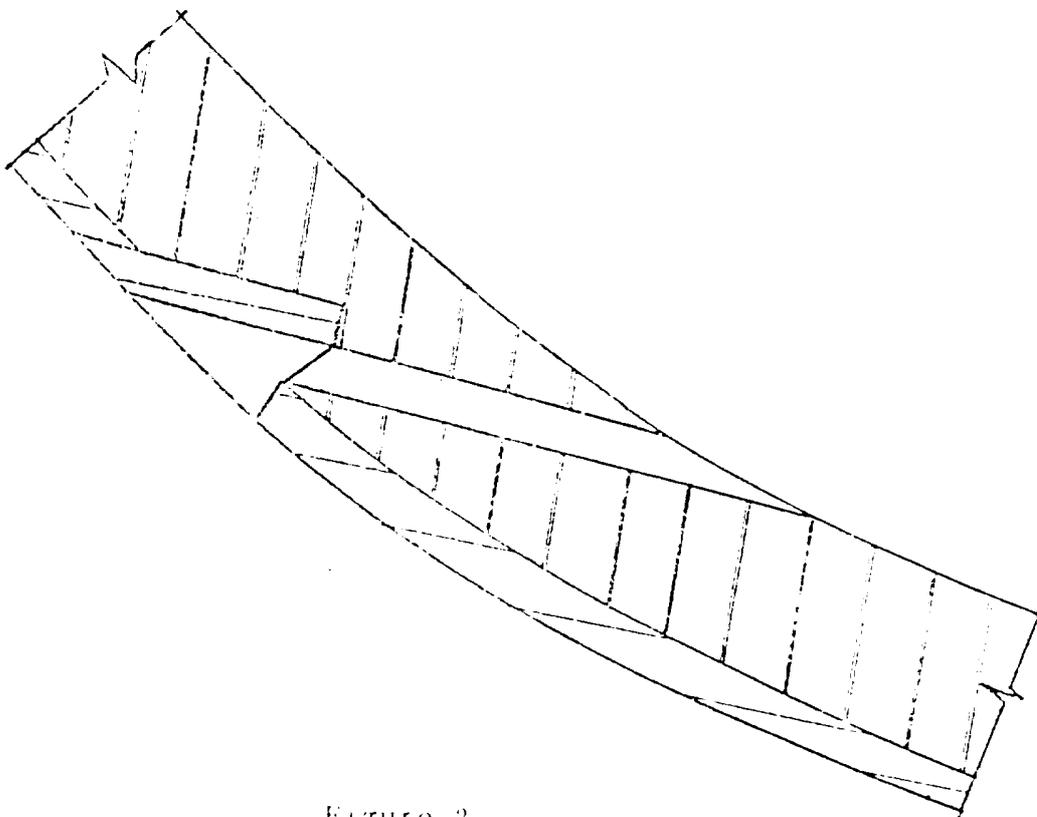


Figure 2

Drawing no. 4

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