Aug. 11, 1959 J. T. MURPHY 2,899,070

SAND AND GRAVEL DRYING MACHINE

Filed Oct. 4, 1955 2 Sheets-Sheet 1

Fig. 1.

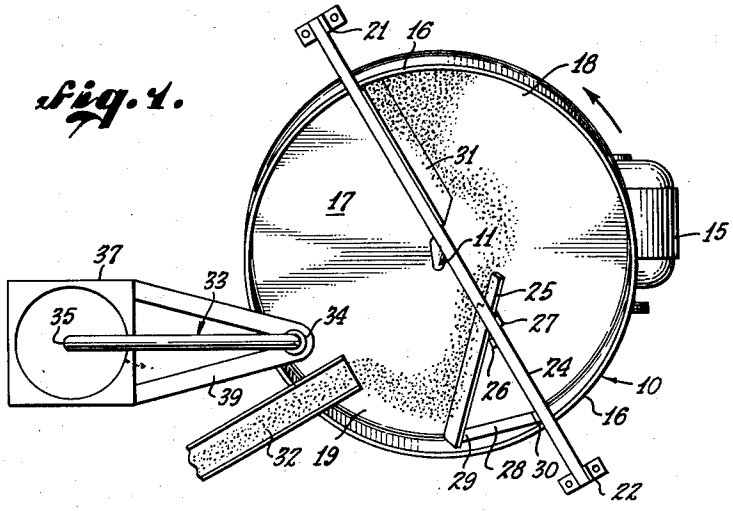



Fig. 2.

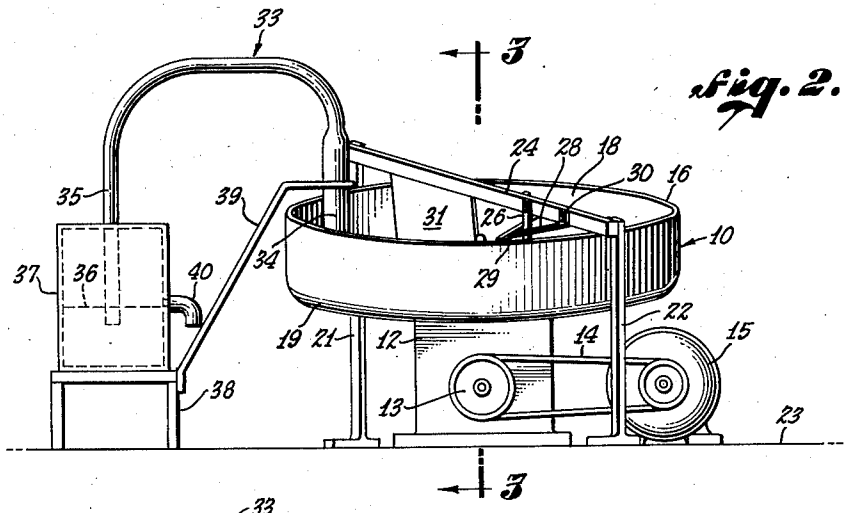
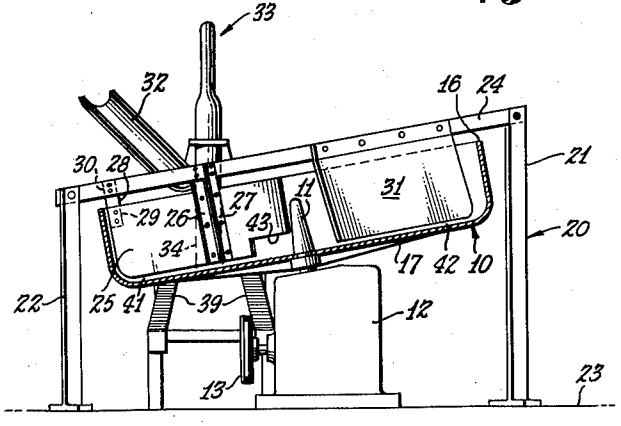



Fig. 3.




JEREMIAH T. MURPHY,
INVENTOR.

BY R. E. Beaugue

ATTORNEY.

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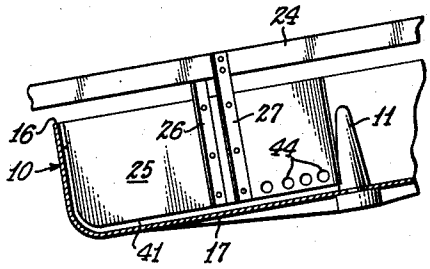



fig. 4.

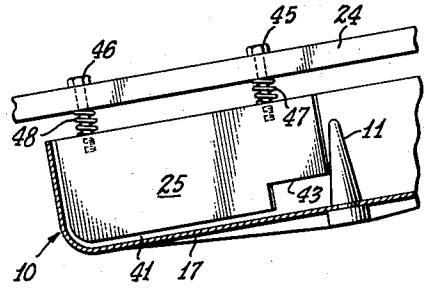
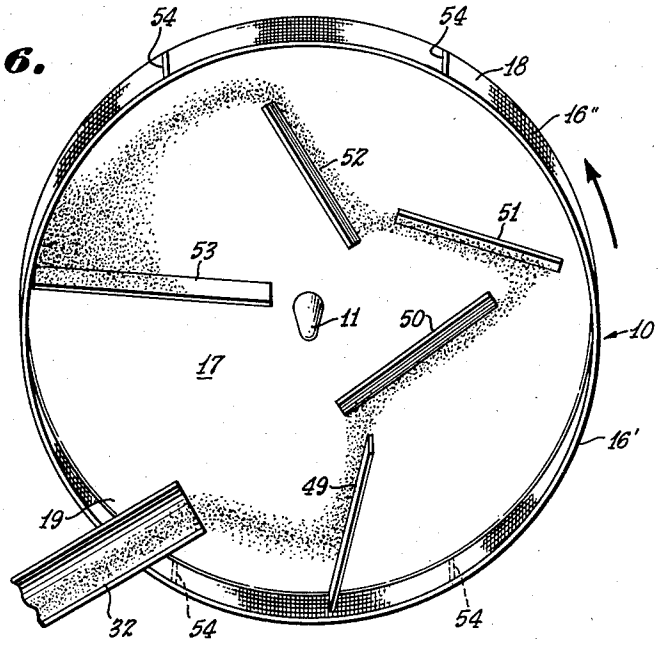



fig. 5.

fig. 6.




JEREMIAH T. MURPHY,
INVENTOR.

BY R. E. Beaupre

ATTORNEY.

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2,899,070

# SAND AND GRAVEL DRYING MACHINE

Jeremiah T. Murphy, Sun Valley, Calif.

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4 Claims. (Cl. 210—523)

This invention relates to a sand and gravel drying machine and more particularly to a drying machine in which the material is continually fed to the machine and the water is continually removed.

The drying machine of the invention utilizes a rotated, tilted pan into which the sand or gravel is fed and the water is removed at the lower position of the pan. The rotation of the pan serves to move the sand past the highest portion of the pan, during which time the sand encounters a number of angularly positioned baffles. These baffles serve to squeeze the water from the sand so that the water will run back to the lower portion of the pan and be continuously removed. One of the baffles is so positioned at an angle to the rim of the pan that rotation of the pan will continually remove the dried material by forcing the material over the side of the pan. Thus, sand or gravel can be continuously fed to the pan and the dried material will be continuously pushed over the side by the unloading baffle into any suitable container. Since the sand or gravel will pile up against the baffles, the weight of the sand will also force the water from the sand at the bottom of the pan and some sand is permitted to pass underneath the baffle towards the unloading baffle since it is in a fairly dry condition. Thus, the drying machine operates in two different manners to squeeze the water out of the sand. The present invention is more suitable than the centrifugal type now in use since the present type machines are not continuous in operation and are incapable of drying the sand or gravel sufficiently for immediate use.

It is therefore an object of the present invention to provide a sand and gravel drying machine which is continuous in operation and utilizes a number of baffles to squeeze the water from the sand.

Another object of the present invention is to provide a sand and gravel drying machine having a tilted, rotating pan into which the wet sand is continually introduced at the lower portion and from which the water, squeezed from the sand by a number of baffles, is continually removed from the lower portion.

A further object of the invention is to provide a sand and gravel drying machine in which the wet sand is placed in a tilted, rotating pan and is rotated against baffles which act to squeeze the water from the sand and also to pile up the sand to remove the water from the sand at the bottom of the pan; the dried sand being forced over the side of the pan by one of the baffles.

These and other objects of the invention not specifically set forth above will become readily apparent from the accompanying description and drawings in which:

Figure 1 is a top plan view of the drying machine illustrating the position of the various baffles.

Figure 2 is a side elevation view of the drying machine showing the drive mechanism for the tilted pan and the syphon for continuously removing the water from the pan.

Figure 3 is a vertical section along line 3—3 of Figure 2 showing the manner in which the baffles are supported relative to the tilted pan.



Figure 4 is a partial section similar to Figure 3 showing a modification of one of the baffles wherein openings are located in the bottom edge to permit the passage of sand therethrough.

Figure 5 is a partial vertical section similar to that of Figure 3 illustrating a modification of one of the baffles wherein the baffle is spring loaded to prevent the baffle from becoming locked against the pan by large particles.

Figure 6 is a top plan view of a modification of the invention wherein a number of baffles are utilized to squeeze the water from the sand.

Referring to the embodiment of the invention illustrated as Figures 1 to 3, the pan **10** is rotatably mounted about a tilted axis **11** which is connected to variable speed reduction gearing contained within housing **12** and the reduction gearing is connected through a pulley **13** and belt **14** to motor **15**. While the pan is illustrated as tilted from the horizontal approximately 10 degrees, it is understood that the tilt of the pan can be adjusted to the desired angle by changing the tilt of axis **11**. Also, the speed of the pan can be adjusted by adjustment of the gearing to provide the proper operating speed for the machine. The pan has a uniform rim **16** of suitable height to retain the sand during rotation of the pan and bottom **17** is connected to axis **11**. The bottom **17** has a high portion **18** and a low portion **19** as a result of the tilt of the pan. A stationary frame **20** for the baffles is positioned around the pan and has vertical legs **21** and **22** which are secured to support **23** for the machine. The leg **21** is higher than the leg **22** so that cross member **24** can be connected to the top of each leg and positioned parallel to and over the top of the pan. A first baffle **25** is secured to cross member **24** by two supports **26** and **27** which are riveted or otherwise attached to the cross member and to the back of the baffle. Also, the end of the baffle is supported by the cross member **24** by a bracket **28** which has one end **29** secured to the end of the baffle and the other end **30** is connected to the cross member. The bracket **28** and supports **26** and **27** serve to position and hold the baffle **25** at an angle to the radial line of pan **10** and the top of the baffle is tipped slightly in the direction of rotation as indicated by the arrow of Figure 1. A second baffle **31** is secured at its upper edge to the cross member **24** by suitable means such as rivets or bolts, and the top of this baffle is also tipped slightly away from the direction of rotation. The baffle **31** is positioned at an angle to the radial line of the pan such that the baffle and rim **16** form a wedge to continuously accumulate and discharge the dry sand.

The wet sand or gravel is continually introduced at the low portion **19** of pan **10** through a chute **32** which is connected to a supply of wet material contained in a hopper or similar container and the sand can be continually fed into the pan at a desired rate. In order to continually withdraw the water which has been removed from the sand by the baffles, a syphon **33** has an enlarged end **34** positioned directly above the bottom surface of the pan at the low portion **19** and the smaller end **35** is positioned below the water level **36** in a tank **37**. The tank **37** is supported by a stand **38** and a bracket **39** serves to support the syphon **33** from the stand **38**. The level **36** is continually maintained by discharge **40** at the same level as the desired level of the water within the low portion of the pan so that the end **34** of the syphon can be maintained under water and the water can be continually removed.

The lower edge of baffles **25** and **31** are spaced slightly from the bottom **17** of pan **10** to form spaces **41** and **42**, respectively, which permit a thin layer of sand on the bottom of the pan to pass under the baffles. This layer will be relatively dry because of the fact that the sand which piles up on each baffle will squeeze the water from

the layer. The spaces also prevent the bottom of the pan from becoming locked against the baffles, since oversized particles can pass through the spaces without becoming wedged between the baffles and the bottom of the pan. Also, the baffle **25** contains a notch **43** at the lower end nearest the axis **11** for the purpose of permitting dry sand to pass underneath the baffle.

The operation of the drying machine will now be described. The wet sand or other granular material is continually fed into the pan through the chute **32** and the sand will rotate with the pan until it comes in contact with the first stationary baffle **25**. The sand will pile up against the first baffle causing the water to be squeezed out of the sand and the water removed from the material will drain back to the low portion of the pan. Because of the angle of baffle **25**, the sand piling up on the baffle will be moved along the first baffle by the rotation of the pan and will leave the baffle at the end closest the axis **11**. The sand will then be rotated by the pan until it comes into contact with the second baffle **31**. Since sand is continually piling up on baffle **25** and being moved along the baffle, a considerable height and weight of sand is continually present at the baffle. Thus, the water in the sand on the bottom of the pan will be squeezed out of the sand even though the bottom of the pan is covered with water. This sand will be permitted to pass through space **41** at the bottom of the baffle and through the notch **43** which passes a higher layer at the discharge end of the baffle where the height of the sand on the baffle is the greatest. The water removed at baffle **25** will be removed by the end of the syphon **33** positioned at the lower portion of the pan.

The sand engaging the baffle **31** will pile up in the same manner as on baffle **25** in order to squeeze additional water from the sand. Since the baffle **31** is positioned at an angle to the rim **16** to form a wedge between the rim and the baffle, the rotation of the pan will move the sand along the baffle towards the rim **16** where the dried sand will be permitted to fall over the edge into a suitable receptacle. The water removed by baffle **31** will flow back to the lower portion **19** of the pan where it will be removed, along with the water from baffle **25**, by the syphon **33**. It is apparent that the sand leaving baffle **25** will move to the higher portion of the pan where no water will be present because of the tilt of the pan and thus, no water will contact the sand prior to engaging baffle **31**.

As the water level at the lower portion of the pan rises above the level **36** in tank **37**, it will be continually removed by the syphon **33** and discharged through the passage **40**. Since a thin layer of sand can also pass underneath the baffle **31**, because of space **42**, the end **34** of the syphon is enlarged and positioned slightly above this thin layer so that sand will not be removed along with the water by the syphon. The end **34** of the syphon is positioned ahead of the chute **32** so that the sand being loaded into the pan will move directly toward the baffle **25** and away from the end **34** of the syphon. It is understood, of course, that the syphon can be replaced by any suitable water removal device, such as a suction pump, in order to continually remove the water from the lower portion **19** of the pan. The squeezing action of the baffles results from the fact that the baffles require the sand to change its direction of movement since the rotation of the pan wants to make the sand go in a circular path whereas the baffle causes the sand to take an angular path in respect to the radial line of the pan. The thin layer of dried sand passing underneath the baffle **25** can mix with the dried sand leaving the inner end of the baffle so that a part of this layer can pile up on the baffle **31** along with the other sand. The space **41** permits a layer of sand to pass under baffle **31** solely to prevent wear and jamming between the baffle and the pan.

The angle of the baffles **25** and **31** can be adjusted in order to provide proper operation of the machine and the baffles can be vertically positioned rather than tipped back from the direction of rotation. As illustrated in Figure 4, the notch **43** could be replaced by a number of circular openings **44** which can be positioned along the lower edge of the baffle, either over the full length of the baffle or over any portion of the length, such as at the inner end only as illustrated. The size, number and spacing of the openings can be selected to give the desired operation. The circular openings serve to permit the sand dried from the weight of the sand on the baffle **25** to pass in the same manner as the notch **43**. Of course, the unloading baffle **31** will not contain the notch **43** or openings **44** since it is desired to remove all the dried sand piling up on this baffle.

Referring to Figure 5, a modification of the support of the baffles **25** and **31** is illustrated in which the baffle **25** is shown as being spring mounted from the cross member **24**. The baffle **25** has threaded openings to receive the end of bolts **45** and **46** which are slidably mounted in openings in the cross member **24**. The springs **47** and **48** are positioned around the bolts **45** and **46**, respectively, between the upper edge of the baffle and the lower edge of the cross member **24** so that the baffle **25** is held in position by engagement of the heads of the bolts with the cross member. Thus, in the event that large pebbles or other obstructions enter the space **41**, the baffle **25** can move upwardly against the springs to let the oversized particles pass without binding the pan against the baffle. It is understood that the same structure can be used to support baffle **31**.

Another modification of the invention is illustrated in Figure 6 wherein only the position of the various baffles is indicated and it is understood that suitable supports for the baffles can be provided to hold the baffles in rigid position. In this modification, five baffles, **49**, **50**, **51**, **52** and **53** are utilized in order to obtain additional squeezing of the sand and thus remove additional water. The baffle **49** is angularly positioned to receive the sand from chute **32** and the same will be moved inwardly along the baffle and leave the inner end of the baffle at a position opposite the inner end of baffle **50**. The baffle **50** is positioned at an angle to move the sand received from baffle **49** toward the rim **16** and the sand will leave the outer end of baffle **50** at a position such that it will rotate against the outer end of the baffle **51**. The sand received by baffle **51** will move towards the inner end of the baffle because of the rotation of pan **10** and will leave the baffle in position to move against the inner end of baffle **52**. The sand leaving baffle **52** will be received by baffle **53**, which is positioned at an angle to the rim to form a wedge between the rim and the baffle, and the baffle **53** will unload the dry sand from the pan in the same manner as baffle **31** of Figure 1. The pan has a rim **16'** which consists of a fine screen **16''** continuous around the rim and rigidly supported by members **54** positioned around the pan and secured to the bottom of the pan. The openings in the screen are smaller than the grains of material within the pan so that water removed by baffles can continually drain through the screen at the lower portion of the pan without loss of material. The screen eliminates the need for syphon **33** so that either the screen or the syphon could be utilized in the machine of Figures 1 and 6. While the modification of Figure 6 shows the use of five baffles, it is understood that the invention contemplates the use of any suitable number of baffles positioned to provide the proper drying of the sand. The baffles illustrated in Figure 6 can be rigidly or spring supported in any suitable manner and can have openings or notches in the lower edges to permit the passage of dry sand.

By the present invention, a novel sand and gravel drying machine is provided in which baffles are utilized to continually squeeze water from the sand. The tilt of the pan can be adjusted in accordance with the size and weight of the material being dried and by the amount of liquid in the material. Also, the speed of the pan can

be adjusted up to a speed where the material starts to move toward the outside edge of the pan under the influence of centrifugal force. When a single notch 43 is utilized, it is preferably positioned at the discharge end of the baffle since the sand is highest at this end, but the position of the notch can be varied since sand piles up over the whole length of the baffle. The angle, size and location of the individual baffles and the speed and tilt of the pan can be varied to provide proper operation of the machine for any material to be dried and it is understood that the use of the machine is not limited to the drying of sand and gravel. Various other modifications are contemplated and may be readily resorted to by those skilled in the art without departing from the spirit and scope of the invention as hereinafter defined by the appended claims.

What is claimed is:

1. A machine for drying granular material such as sand and gravel comprising a tilted pan having a flat floor and an upstanding rim, means rotatably mounting said pan around a tilted axis providing a lower portion to which liquid from material in said pan will drain by gravity and a higher portion from which liquid will drain to said lower portion, means for rotating said tilted pan about said tilted axis, means for continually loading wet material into said lower portion of said pan, a first nonrotatable baffle depending into said pan with the lower edge thereof positioned adjacent to and spaced slightly above said pan floor and being arranged angularly to the radial lines of said pan to pile up wet material and cause such piled up material to move by action thereon of said rotating pan in a direction across the radial lines of the pan, said first baffle serving to squeeze a portion of the liquid from said material, a second nonrotatable baffle depending into said pan and positioned adjacent to said pan floor and angularly to the radial lines of said pan to receive and pile up material leaving said first baffle, said second baffle being positioned to form a wedge with said rim at said higher portion of said pan and at such an angle thereto as to move the piled up material toward the rim at said higher portion and to cause discharge thereof over the edge of said rim adjacent to the upper portion of said tilted pan by the rotation of said pan and the liquid removed by the squeezing action of said first and second baffles being directed to flow away from the discharge edge by the tilt of said pan and to return by gravity to said lower portion of said pan, and means located at the lower portion of said pan for continually withdrawing liquid removed from the material.



2. A machine for drying granular material as defined in claim 1 wherein a plurality of additional depending nonrotatable baffles are spaced around said pan between said first and second baffles and formed of a length less than the radius of said pan, each of said additional baffles being angularly positioned with respect to the radial lines of said pan in order to pile up said material and discharge the material to the next baffle, one of said additional baffles receiving the material from said first baffle and another of said additional baffles discharging to said second baffle.

3. A machine as defined in claim 2 wherein passage means are provided at the lower edge of at least one of the baffles to permit a portion of the sand piled up against the baffle to move through the baffle after having been dried by the sand piling up above it on the baffle.

4. A machine for drying granular material as defined in claim 1 wherein a support bracket extends across the diameter of said pan above the rim thereof, and means fixed to said support bracket for upwardly resiliently supporting said first baffle in spaced relation and depending into said pan and spaced so that the lower edge of each of said baffles is resiliently urged toward and positioned spaced from and adjacent to said floor.

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