June 11, 1929. J. J. LYTH 1,716,451

METHOD OF PILING CLOTH

Original Filed Feb. 21, 1919 3 Sheets-Sheet 1

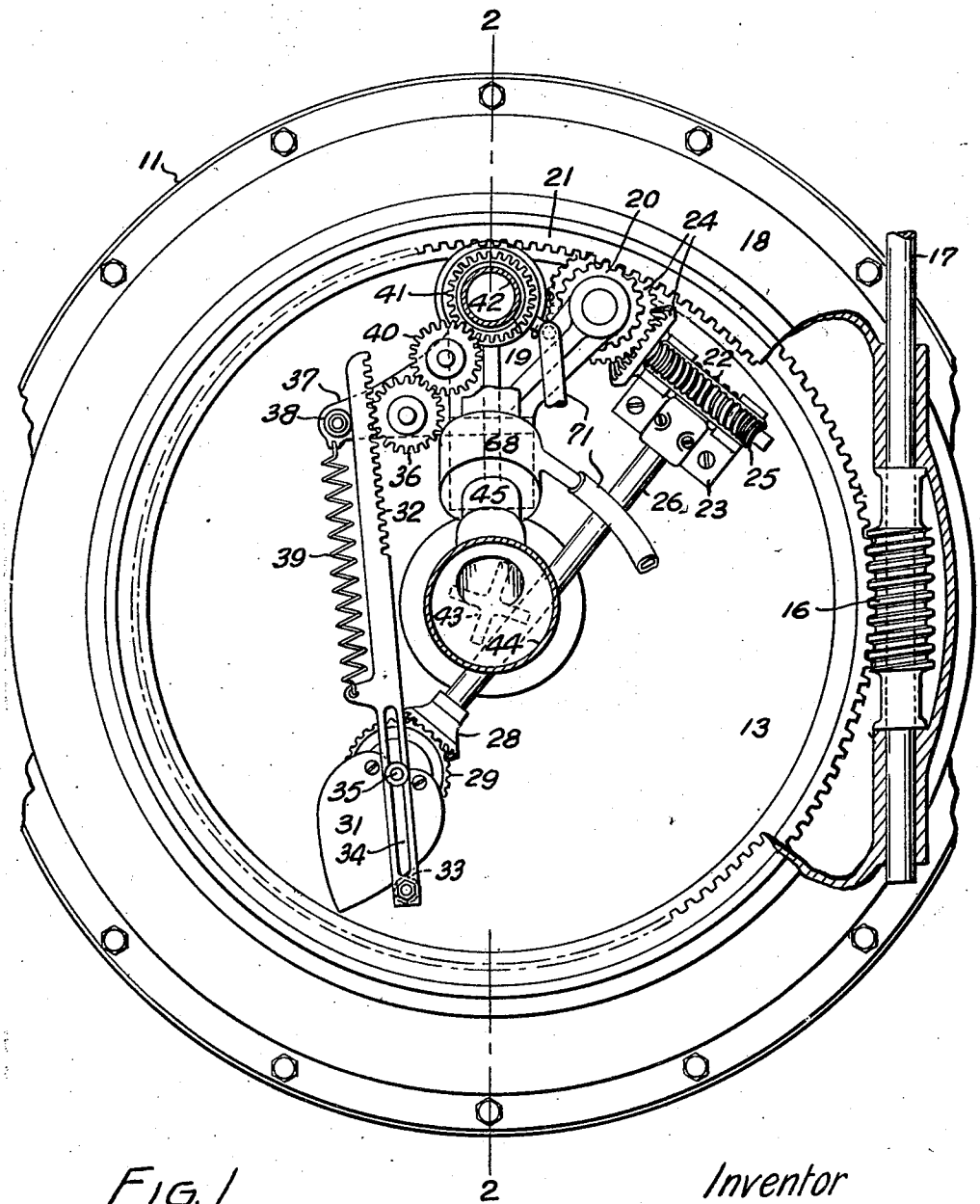



FIG. 1

Inventor
John J. Lyth
By
Attorney

June 11, 1929. J. J. LYTH 1,716,451

METHOD OF PILING CLOTH

Original Filed Feb. 21, 1919 3 Sheets-Sheet 2

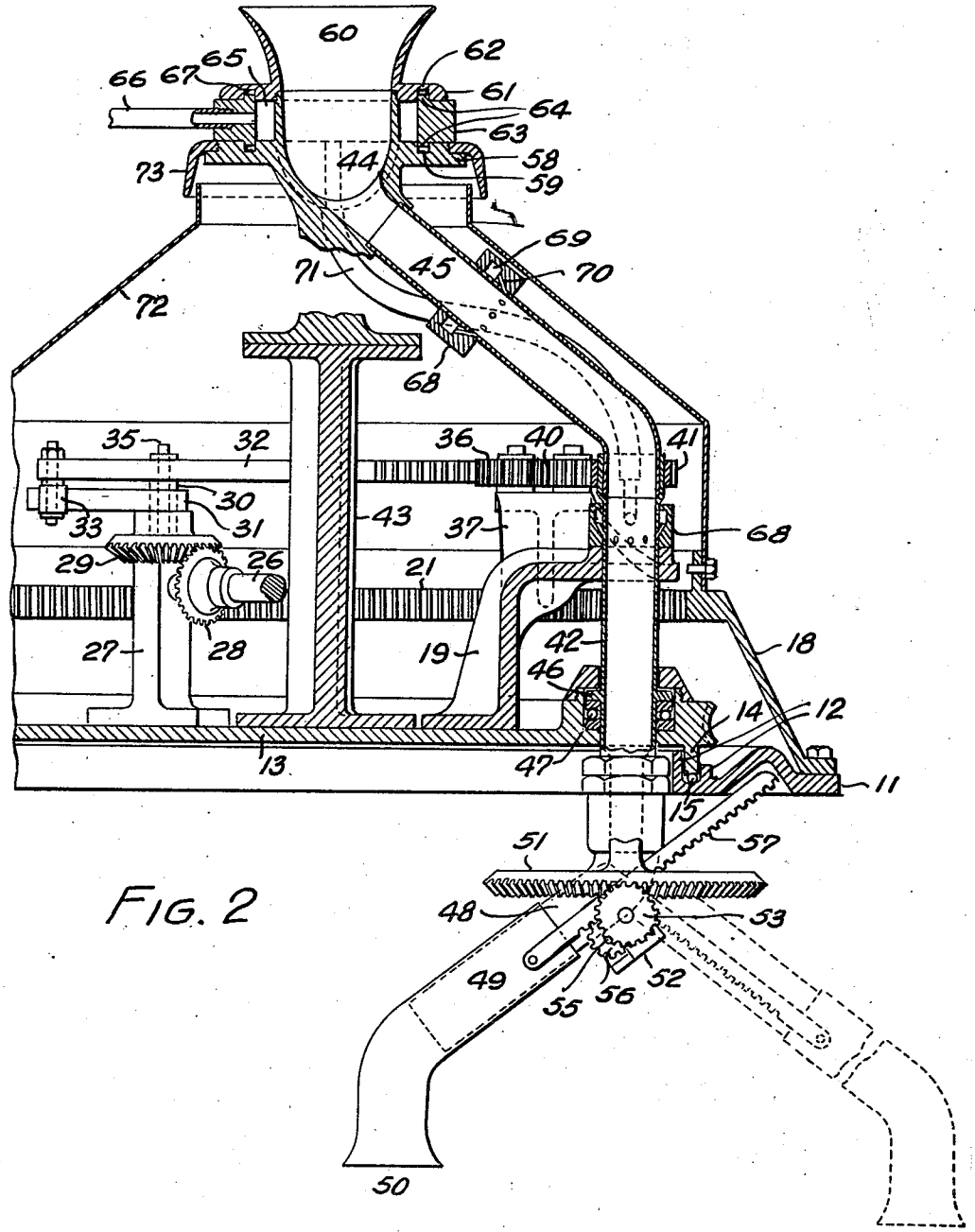



FIG. 2

Inventor
John J. Lyth
By
Attorney

June 11, 1929. J. J. LYTH 1,716,451

METHOD OF PILING CLOTH

Original Filed Feb. 21, 1919 3 Sheets-Sheet 3

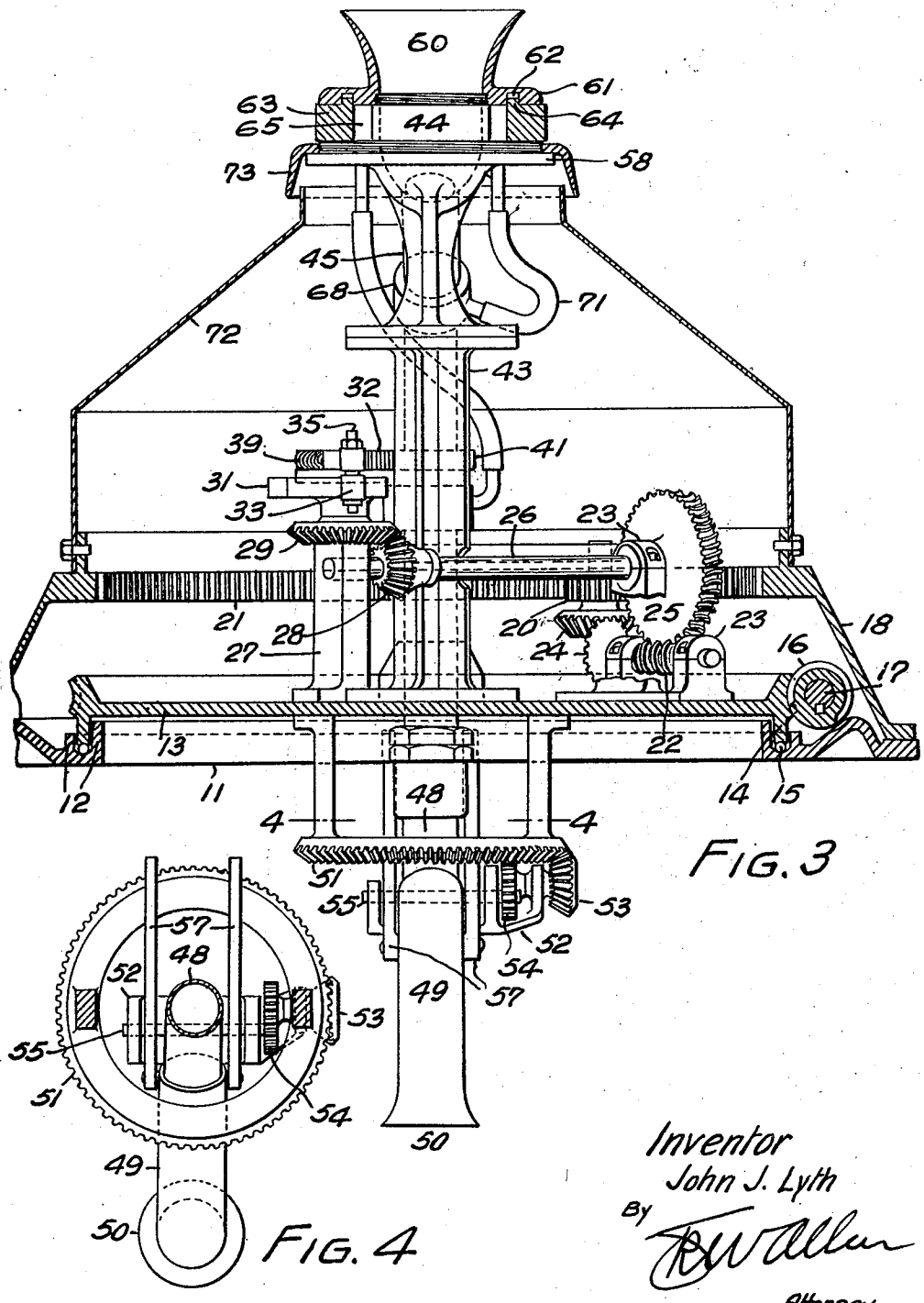



FIG. 3




FIG. 4

Inventor
John J. Lyth
By
Attorney

Patented June 11, 1929. 1,716,451

# UNITED STATES PATENT OFFICE.

JOHN J. LYTH, OF VALLEYFIELD, QUEBEC, CANADA.

## METHOD OF PILING CLOTH.

Original application filed February 21, 1919, Serial No. 278,364. Divided and this application filed March 2, 1925. Serial No. 12,624.

This invention relates broadly to improvements in the method of piling cloth, and more particularly to the piling of cloth in circular kiers, bins, vats or the like, and the object of the invention is to provide a method whereby cloth may be piled compactly and at high rate of speed in circular containers and in such a way that it may be removed without danger of snarling.

In a previous Patent, No. 1,403,126, granted the 10th day of January 1922, I have described a method of simultaneously transporting and impregnating cloth with bleaching or other fluid, and which consists briefly in passing the cloth in rope form through a conduit by means of a current of impregnating fluid. In a previous application, Serial No. 278,364, filed 21st February, 1919 (Patent No. 1,528,065, granted the 3rd day of March 1925) of which the present application is a division, I have disclosed an apparatus adapted for piling cloth uniformly in circular containers. The present invention resides briefly in passing cloth through an oscillating or swinging directing means which is preferably a tubular conduit, the lineal speed of the cloth being greater than the lineal speed of the free end of the conduit, with the result that a cloth rope in place of lying smoothly along the path traced by the conduit mouth is deposited in what may be described as a looped or puckered formation constituting a pile along the path traced by the conduit mouth. In order to obtain the described results it has been found that the lineal speed of the cloth must be at least twice the lineal speed of the conduit mouth. The invention further resides in relatively varying the speed of the cloth and conduit so as to vary the size or number of the loops and the size of the pile resulting therefrom along the path traced by the conduit mouth. To facilitate the movement of cloth through the conduit a transporting fluid is passed through the conduit.

In order to obtain a more complete understanding of the invention, reference is made to the accompanying drawings illustrating one form of apparatus suitable for carrying out the method, and in which:

Fig. 1 is a plan view of the piling device.

Fig. 2 is a vertical sectional view on the line 2—2, Figure 1.

Fig. 3 is an elevation of the device as viewed from the left-hand side of Figure 2.

Fig. 4 is a section on the line 4—4, Figure 3.

Referring more particularly to the drawings, 11 designates a base ring provided at its inner edge with a pair of spaced upstanding flanges 12 which form between them a ball race and also a guide for a large horizontally disposed worm wheel 13 which closes the central opening of the ring and is held in position by a depending peripheral flange 14 which runs between the flanges 12 upon the ball bearing 15. The worm wheel 13 is rotated by means of a worm 16 fixed on a shaft 17 journalled in the casing 18, which is in turn mounted on the ring 11, the shaft being driven by any suitable external means. All the parts of the piling mechanism proper are mounted upon and rotate with the gear 13. Toward its periphery the gear 13 is provided with a bracket 19 carrying a pinion 20 which meshes with a rack 21 carried by the casing 18 and which is in effect a stationary internal gear. A worm 22 is mounted in a suitable frame 23 on the gear 13 and is driven from the internal gear 21 through bevel gears 24. The worm 22 drives a worm wheel 25 rigidly secured to a shaft 26, one end of which is journalled in the frame 23 and the other end in a pedestal 27 secured to the gear on the opposite side of its centre from the frame 23. A bevel pinion 28 is rigidly secured to the shaft 26 and meshes with a bevel gear 29 mounted on a stud 30 projecting upwardly from the pedestal 27. A heart-shaped cam 31 is rigidly secured to the gear 29 and operates a rack 32 by means of a roller 33 carried by the rack and bearing against the face of the cam. This rack is provided with a slot 34 through which passes a pin 35 projecting from the stud 30. The rack meshes with a pinion 36 rotatably mounted on an extension 37 of the bracket 19. One end of the rack is supported by the bracket extension 37 and is held in mesh with the pinion 36 by a roller 38, while the other end of the rack is supported on the cam. The rack is held in predetermined relation to the cam by the pin 35 and the roller 38. In order to keep the roller 33 against the face of the cam a spring 39 is secured between the rack and the bracket extension 37. The pinion 36 in turn meshes with an intermediate gear 40 which meshes with a gear 41 fixedly mounted on the upright tubular conduit section 42.

A standard 43 is mounted in the centre of

the gear 13 and carries at its upper end a cup 44, from the bottom of which a tubular conduit section 45 leads in an inclined direction to a point over the upright conduit section 42 where it turns downwardly and passes into the enlarged upper end of the section 42. The section 42 passes downwardly through the gear 13, being provided with a thrust collar 46 resting on a ball bearing 47 carried by the gear 13. Below the gear 13 the conduit section 42 is rigidly connected to a further conduit section 48 which turns from a vertical to an inclined direction. A further section of conduit, designated 49, is slidably mounted on the inclined portion of the section 48 and terminates in a downwardly opening mouth 50. A gear toothed ring 51 is suspended from the gear 13 concentric with the upright conduit section 42. A bracket 52 is provided on the conduit section 48 and supports a pinion 53 meshing with the ring gear 51. This pinion drives through meshed gears 54 a shaft 55 journalled in the bracket 52 and extending transversely of the conduit section 42. Rigidly mounted on this shaft 55 on each side of the tube are pinions 56 which mesh with racks 57 connected to the conduit section 49.

The cup 44 is provided below its edge with an outwardly projecting flange 58 having a groove 59 in the upper surface thereof concentric with the cup and centered in the axial line of the gear 13. A funnel 60 is secured to the upper edge of the cup and is provided at its bottom with an out-turned flange 61 having a groove 62 concentric with and directly above the groove 59. In the spaces between the flanges 58 and 61 a ring 63 is mounted having flanges 64 engaging in the grooves 59 and 62 to hold the ring concentric with the cup. The inner diameter of this ring is somewhat larger than the outer diameter of the cup so that an annular space 65 is formed into which the cloth transporting fluid may be supplied through a pipe 66. Washers 67 U-shaped in cross section are mounted in the grooves 59 and 62 to form fluid-tight joints between the ring and its supporting flanges. Collars 68 are secured to the conduit sections 42 and 45. These collars are provided with annular spaces or channels 69 from which ducts 70 lead into the conduit at acute angles to the axes of the sections and in a downward direction. Fluid is conveyed from the annular channels 65 to the channel 69 through flexible pipes 71. In order to enclose all the mechanism a hood 72 of approximately frustoconical form is connected to the casing 18 and is overlapped at its upper edge by a cape 73 carried by the flange 58.

The operation of the device is as follows:— When a kier or other circular container is to be filled, the piling mechanism is placed on the open mouth of the kier, the lower end of the conduit being inwardly swung for that purpose. The end of a rope of cloth that is to be fed into the kier is inserted through the funnel 60 and cup 44 and worked down through the sections 45, 42, 48 and 49 of the conduit. This may be assisted by establishing a current of the transporting or impregnating fluid through the conduit. It will be noticed from Figures 2 and 3 that the lower part of the conduit extends below the ring 11 and into the kier. The device is set in operation by supplying power to operate the worm 16 which slowly rotates the gear 13 carrying the piling mechanism. As this rotation progresses the pinion 20 will be rotated by reason of its engagement with the stationary internal gear 21 and this motion is transmitted through the gear train 24, 22, 25, 28 and 29 to the cam 31. This cam reciprocates the rack 32, which in turn causes rotation of the gear 36 alternately in opposite directions. This motion is transmitted through the gears 40 and 41 to the conduit section 42 which is caused to rotate alternately in opposite directions. The proportioning of the gears is such that the conduit section 42 rotates approximately only ½ revolution in each direction. This rotation of the upright conduit section 42 causes the inclined sections 48 and 49 carried by it to sweep through the semi-circular path extending from a point under the mechanism to a point beyond the outer periphery thereof. As this motion occurs the bevel pinion 53 is rotated by reason of its engagement with the fixed ring gear 51 and communicates its motion to the rack 57 which is reciprocated and in turn reciprocates the conduit section 49 on the section 48.

The gears are so proportioned and the device so set that when the lower inclined conduit sections 48 and 49 are inclined toward the centre of the apparatus the section 49 is drawn up on the section 48 but when they sweep around so that they are directed away from the vertical axis of the machine the section 49 is thrust outwardly on the section 48. In other words, the conduit mouth 50 reaches further from its rotative centre, which is the axis of the upright section 42, when it is directed away from the central axis of the machine than when it is directed toward the central axis. The object of this arrangement is to obtain a maximum sweep with a minimum distance between the axis of the conduit section 42 and the axis of the machine, which distance is fixed by the size of the kier mouth, the mouth being made as small as possible to facilitate tight sealing. It will be remembered that the gear 13 is constantly rotating at lower speed and therefore the conduit section 42 revolves about the centre of the gear 13 and so travels in a circular path at the same time that it rotates about its own axis. Preferably the proportioning of the various

gears is such that the gear 13 rotates several times while the upright conduit section 42 rotates through two half-revolutions; that is, while the lower inclined conduit portion oscillates through one complete cycle; say, from the kier centre to the wall and back to the centre. As the conduit is also revolved bodily by the gear 13 it is evident that with the speed relation just outlined, the mouth of the conduit will trace an approximately spiral path. The cam 31 which causes oscillation of the conduit also causes the angular speed of its oscillation or swinging motion to vary; the speed increasing as the mouth moves toward the kier centre or vertical axis of the machine, and vice versa. Since the revolution speed of the conduit is constant and the oscillation speed increases toward the centre, it follows that the convolutions of the path are not parallel as in a true spiral, but are increasingly spaced apart as the kier centre is approached. Since the whole conduit revolves about the kier centre at uniform angular speed, it follows that the lineal speed of the conduit mouth in the approximately spiral path is much greater at the circumference than at the centre of the kier. The cloth feeds through the conduit at uniform lineal speed greater than the highest lineal speed of the mouth, with the result that the cloth falls in a pile along the path traced by the mouth of the conduit. The size of the pile increases from the wall to the centre of the kier owing to the decreasing lineal speed of the conduit mouth. This variation in the size of the cloth pile is compensated for by the variation in the spacing of the path convolutions which enables the larger pile toward the centre of the kier to be flattened out and expanded radially of the kier by the weight of successive layers of cloth, with the result that the cloth is deposited in a layer which is ultimately of uniform thickness and occupying a horizontal plane. Each time the conduit mouth travels from the centre to the circumference of the kier or vice versa, one layer of cloth is deposited, the thickness of each layer is several times the thickness of the cloth rope owing to the greater lineal speed of the cloth feed as compared to the lineal speed of the conduit mouth. To produce the desired piling of the cloth along the path the speed of the cloth feed must be at least twice the greatest lineal speed of the mouth and is preferably several times the mouth speed.

It will be understood that by proper variation of the gear ratios and consequently of the ratio of revolution to oscillation, the conduit mouth may be caused to trace any desired path between the approximately spiral path described and a substantially radial path.

In order to pass the cloth through the conduit with sufficient speed a current of fluid such as water or bleach liquor is established through the conduit and serves to lubricate or float the cloth through the conduit. This fluid may be supplied under pressure or if a sufficient volume is used may be allowed to flow merely by the action of gravity. While a means has been provided for the introduction of the fluid at a plurality of points, it will be understood that the invention is not confined to the multiple introduction of the fluid either at a plurality of points in the length of the conduit or at a plurality of points around the conduit as shown. If a sufficient volume of liquid is used pressure may be dispensed with as already stated and the liquid may be merely delivered into the upper end of the conduit along with the cloth rope. When a liquid is used the cloth becomes loaded with the liquid and piles much more compactly than is possible with hand piling or where the cloth is substantially dry. If surplus liquid is drained out of the kier during the piling the cloth will be packed in course of piling to about the same density as ordinarily obtains after boiling. This dense filling largely or wholly obviates delays for cloth to settle and by the uniformity of filling ensures even bleaching and freedom from kier stains. If the fluid used is hot bleach liquor the boiling may be commenced as soon as the kier is filled and closed, thus eliminating delays usually necessary to impregnate the cloth with bleach liquor before boiling is commenced.

From the foregoing description it will be seen that according to this invention cloth may be handled at a high rate of speed and piled with uniform density in a kier or other container, thus enabling more cloth to be placed in the kier and by the elimination of hand piling enabling the cloth to be impregnated with a bleach liquor or the like prior to or during its insertion in the kier, thus shortening the time of passage of the cloth through the bleachery and enabling any given size of equipment to handle a greatly increased tonnage of cloth per month. The regularity of the piling effected according to this invention obviates overturned piles and snarling upon removal, such as often occurs with hand piling.

While the cloth directing means has been shown and described as a tubular conduit, the lower portion of which swings or oscillates in a horizontal plane, it will be understood that the invention may be carried out by means of other devices substituted for a tubular conduit to guide the cloth and lay it in a bin or kier, and also that the lower portion of the conduit or equivalent mechanism may be arranged to swing or oscillate in a vertical or substantially vertical plane without departing from the spirit of the invention and without affecting the successful carrying out of the process.

From the foregoing description it will be readily seen that the invention resides in the

piling of cloth by conducting the cloth to a moving delivery point which is the conduit mouth 50, the lineal speed of the cloth passing through the delivery point being greater than the lineal speed of the moving delivery point, with the result that the cloth is deposited in a multitude of small loops which combine to form a pile along the path of the delivery point. It will also be seen that the invention further resides in varying the lineal speed of the delivery point according to its distance from the centre of the kier or other container. In addition, it will be seen that the invention still further resides in obtaining the necessary speed of cloth movement through the delivering device by loading or saturating the cloth with a suitable liquid, which loading also serves to effect the desired density of piling. While under ordinary conditions the lineal speed of the cloth feed will be more than twice the highest lineal speed of the conduit mouth, that is, when the conduit is following the outermost convolution of its path, it will be understood that the device will operate quite efficiently with lower speeds of cloth feed, providing the lineal speed of the cloth feed is never less than the maximum lineal speed of the conduit mouth.

Having thus described my invention, what I claim is:—

1. A method of piling roped cloth uniformly over a circular surface, which consists in transporting cloth to a moving discharge point at a lineal speed at least twice the lineal speed of movement of the discharge point.

2. A method of piling cloth, which consists in transporting cloth to a discharge point, moving the discharge point at lineal speed increasing simultaneously with increase of the distance of the discharge point from the centre of the pile and vice versa, the cloth being transported at higher lineal speed than the speed of lineal movement of the discharge point.

3. A method of piling roped cloth which consists in passing the cloth through a movable conduit, and moving the conduit at such speed that its discharge end will travel at a lineal speed not more than half the lineal speed of passage of the cloth through the conduit, whereby the cloth will be deposited in a pile along the path traced by the discharge end of the conduit.

4. A method of piling cloth which comprises laying the cloth along an approximately spiral path, the convolutions of which are increasingly spaced apart toward the centre of the spiral.

5. A method of piling cloth which comprises laying the cloth along an approximately spiral path, the convolutions of which are increasingly spaced apart toward the centre of the spiral, the amount of cloth per unit length of the pile being greater at the inner end of the path than at the outer end.

6. A method of piling cloth in a circular container, which comprises laying the cloth in loops in an approximately spiral pile, and increasing the lineal speed of the piling point relatively to the lineal speed of cloth coming to and leaving the piling point as the distance of the piling point from the outer convolution of the pile increases and vice versa.

7. A method of piling roped cloth which comprises passing the cloth through a movable conduit by means of a current if liquid serving to load the cloth and sweep the same through the conduit at high lineal speed, and moving the discharge end of the conduit alternately toward and away from a central point, and simultaneously around such point.

8. A method of piling roped cloth which comprises passing the cloth through a movable conduit by means of a current of liquid serving to load the cloth and flow the same through the conduit at high lineal speed, and moving the conduit alternately toward and away from a central point and simultaneously around such point, the angular speed of conduit movement being substantially uniform and the radial speed increasing toward such central point and decreasing away from such central point, the total lineal speed of the conduit discharge end being less than half the lineal speed of cloth movement through the conduit.

9. A method of piling roped cloth which comprises simultaneously loading cloth and conveying the same to and from a moving piling point by means of a stream of liquid, and moving the discharge point alternately toward and away from a central point and simultaneously around such point, the angular speed of the delivery point being constant and the radial speed progressively increasing toward the centre and decreasing away from the centre.

10. A method of piling roped cloth which comprises simultaneously loading cloth and conveying the same to and from a moving discharge point by means of a stream of liquid, and moving the discharge point alternately toward and away from a central point and simultaneously around such point, the lineal speed of the discharge point in the circumferential direction decreasing as it approaches the centre and increasing as it recedes from the centre, while at the same time its speed in the radial direction increases as it approaches the centre and decreases as it recedes from the centre.

11. A method of piling roped cloth which comprises passing the cloth by means of a current of fluid through a directing device moving along a predetermined path over a circular area, and depositing the cloth in varying amount along said path by moving the directing device at lineal speed increasing from the centre to the periphery of the piling area and vice versa.

12. A method of piling roped cloth which consists in passing the cloth through a movable conduit and moving the conduit in such manner that its discharge point travels around and simultaneously toward or away from a central point, the radial speed increasing and the circumferential speed decreasing as the discharge end of the conduit approaches the central point and vice versa.

13. A method of piling roped cloth, which comprises passing the cloth through a moving conduit and moving the conduit in such manner that its discharge end travels repeatedly over substantially the entire surface of a circular piling area, the lineal speed of the cloth being at all times greater than the total lineal speed of the discharge end of the conduit and varying according to the location of the conduit discharge end relatively to the circular piling area.

In witness whereof, I have hereunto set my hand.

JOHN J. LYTH.