To all whom it may concern:

Be it known that I, WILLIAM F. WHITCOME, of Chicago, Illinois, have invented a certain new and useful Improvement in Machines and Methods for Making Paper Tubes, of which the following is a specification.

This invention relates to paper containers for packing all sorts of goods. The object of the invention is to provide a machine and method of making devices of this kind in which the side walls of the container, usually though not necessarily cylindrical, are made in one continuous integral piece, instead of being made from paper cut from sheets with opposite side edges attached together.

The invention consists in a device for carrying out this object, which can be easily and conveniently constructed and operated to produce the desired result. It further consists in a container having an integral side wall of the character described, and also in the novel details of machine for making the device, all of which will hereafter be more fully set forth in the specification and in the claims.

Referring to the drawings, in which similar numerals indicate the same parts throughout the several views,—

Figure 1 is a front view of the essential working parts of a machine for carrying out this invention in its preferred form.

Fig. 2 is a side view of the device illustrated in Fig. 1, taken in section on the line 2—2 of that figure.

Fig. 3 is a sectional view of the mechanism of Fig. 1, taken on the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of a water elevating wheel or pump to be hereafter more fully described.

The hollow making, forming or mold cylinder 22 thus far described is essentially the same wheel used at this corresponding point in the manufacture of ordinary sheet paper, but this particular wheel differs from those in the prior art in that it is provided with side flanges 30 which, as the paper pulp is deposited on the wire mesh 24, give that paper pulp a definite straight border line; in other words, a cylinder of paper pulp material of definite length and with smooth ends is, through the agency of these flanges 30, formed on the wire mesh cylinder 24.

Mounted above the cylinder 22 is another hollow shaft 32 parallel to shaft 20 having rigidly attached to it by any suitable means 95 cylinder heads 34 and 36 carrying a cylindrical member 38. The shaft 32 is provided with perforations 40 which admit liquid from the interior of this second cylinder to the interior of the shaft, from which it is withdrawn by a suction pump (not shown) applied to the right hand end of this shaft 32.

The cylindrical member 38 is of peculiar construction, being made of cast fire clay, or other suitable moldable material, smoothly finished inside and out, the material of the cylinder 38 being provided with a large number of very fine substantially uniformly spaced perforations so that liquid may be drawn through this cylinder. The perforations in this cylinder 38 are made

prevent the escape of liquid, is a suitably propelled hollow shaft 20 carrying within the tank 12 the hollow wheel 22 having on its circumference a cylindrical surface of wire cloth 24.

As in all modern paper making machines, the level of the water 14 in the tank 12 is maintained at a height above the shaft 20 so that there is a constant flow of water from the tank 12 through the wire cloth 24 and the perforations 26 and 28 in the mechanical-support parts of the wheel into the interior of the shaft 20, and thence out of the right hand end of the shafts, as shown in the drawings, to a suitable pumping device, not shown, from which it is ordinarily returned to the tank 12. This flow of the water just described carries the suspended paper pulp particles in the water into contact with the revolving wire mesh 24 to which these particles of paper pulp stick until removed by means hereafter described.

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by intimately mixing fire clay or other material which is ultimately to form the cylinder with a relatively large quantity of hair of the general character used in plastering, then baking the cylinder, which process burns out the hair and leaves one perforation for each thread of hair which was in the molded cylinder before the burning operation took place. The ends of the cylinder 38 are provided with notches 42 and 44 adapted to receive the flanges 30 on cylinder 22 when the cylinder 38 is moved into contact with said cylinder 22.

In order to drain out of cylinder 38 any surplus water which is not removed by the pump heretofore referred to, attached to the end of shaft 32, the inner surface of cylinder 38 is made in the conical surface 46. As clearly appears in Fig. 3, this surface 46 on the lower half of the cylinder clearly inclines downward toward cylinder head 36 and makes connection with a drainage passage 48 formed in the cylinder head 36, which drainage passage in turn empties into one of a series of chambers 50, 51, 52, 53, formed within a hollow closed cap-like wheel 54 clamped over the end of the shaft 32 by the set screw 56, or other suitable means. The walls separating the chambers 50 to 53, just described, are in the form of spokes 58 radiating from the center of the cap 54 and are provided on the side opposite to the solid end of the cap with flanges 60 so that water-carrying channels are formed in the spokes connecting with central passages 62 entering the interior of shaft 32.

The result of this construction is that as shaft 32 is rotated by any suitable means, water on the lower portion of surface 46 of cylinder 38 travels down that surface through passageway 48 into the adjacent chamber 50, 51, 52 or 53 to which the particular passageway 48 then at the bottom of the cylinder connects. As the shaft 32 then rotates the water which has, in the manner described, just passed into a particular one of the chambers 50—53 is carried by the adjacent spoke 58 upward until said spoke is on an incline above the center of shaft 32, whereupon the water in that particular chamber drains out of its adjacent passageway 62 into shaft 32 from which it is removed by the suction pump. In other words, the case 54 with its spoke device serves in connection with the suction pump applied to shaft 32 the function of a rotary pump for elevating into the interior of shaft 32 such water within cylinder 38 as may not be withdrawn by the normal suction of the suction pump which acts through perforations 40.

Above the two shafts 20 and 32 is another shaft 70 parallel to each carrying a finishing roll 72 heated by any suitable means, as for instance hot gases passing through the passages 74 in the shaft 70 and the hollow interior space 76. This finishing roll 72 is kept at such a temperature that when it is applied to paper pulp on cylinder 38 it dries the same into a fixed dry cylinder of paper material. Such a cylinder of paper 80 is shown on cylinder 38 and is removable therefrom by pushing a stripper collar 82 from the full line position of Fig. 3 to the left toward and through its dotted line position of that figure. In order to permit the ready removal of the paper cylinder 80, the exterior surface of cylinder 38 is tapered slightly to the left, as viewed in Fig. 3.

As each paper cylinder 80 is removed from cylinder 38, it falls into a suitably supported conveyer 84 adapted to conduct it to any suitable point desired.

In the operation of the entire device, the three shafts are set in motion and the suction pump on shaft 32 is set in operation. The shaft 32 is first moved so that cylinder 38 is in substantial contact with the wire mesh 24 on cylinder 22, as shown in full lines in Fig. 1. The pump on cylinder 32 is acting and creating a constant suction inward through all of the perforations in cylinder 38. The outflow of water from shaft 20 causes the paper pulp in tank 12 to deposit on the wire mesh 24 of cylinder 22 and be carried by that cylinder out into contact with the surface of cylinder 38 to which these particles of paper pulp are at once forced to adhere by the suction just described always existing on the surface of the cylinder 38. This cylinder 38 continues to rotate until it has received a coating of paper pulp of the desired thickness, several layers being usually applied, whereupon the operator moves shaft 32 over to the dotted line position of Fig. 1 into contact with press or couch roll 72 which, being heated, dries or irons the moisture out of the pulp on cylinder 38, thus forming the finished paper cylinder 80. The operator now moves shaft 32 back to the intermediate position shown in Fig. 3, and operates the stripper 82 with the result that the finished product is delivered to the conveyer 84. During the time that cylinder 38 is in contact with cylinder 22, any water within the cylinder 38 not readily removable by the normal air suction within
the cylinder is removed by the supplemental pump device 50-60, heretofore described.

From the foregoing it is seen that a machine of this invention produces from the water suspended paper pulp a finished cylinder of paper without splices or patches and without any tendency to assume anything but its normal cylindrical form, this without any waste whatever which must necessarily exist where cylinders are made from blanks cut from sheets of paper.

It is obvious that within reasonable limits, cylinders of any length, long or short, may be made by suitably designing the particular machine for the particular use.

While this device has been applied to paper only, it may obviously be applied to other materials which can be manipulated in the same way without departing from the invention.

In the particular machine here illustrated, a substantially cylindrical container is provided for, but obviously by properly designing the shape of the members 24, 38 and 72 and adjusting the angularity of the shafts 30, 32 and 70, the device may be applied to making conical containers without departing from the essential features of this invention.

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

1. In a device of the class described, the combination of a hollow cylinder, a horizontal shaft carrying the cylinder, the inner wall of the cylinder being inclined toward one end of the cylinder, a hollow cap on the end of the cylinder to which said inner surface inclines provided with a plurality of separated compartments each communicating with the interior of the cylinder adjacent to the inner surface thereof, and with a passageway in the shaft, the interior of said compartments being so shaped and arranged that when a given compartment is at the bottom of the cylinder below the shaft, liquid in that cylinder drains into that particular compartment by which it is carried, as the cylinder rotates, up to a position where it can drain out of said compartment into the passage within the shaft.

2. In a device of the class described, the combination of a rotatable cylinder of substantially fire-proof material provided on its surface with a multiplicity of perforations through which air is drawn by a suitable vacuum pump, means for bringing particles of paper pulp into contact with said rotating cylinder so that they may be drawn onto the surface of said cylinder, and means for compressing and drying the paper pulp directly upon the cylinder, for the purposes set forth.

3. In a device of the class described, the combination of a tank containing paper pulp material suspended in liquid, a hollow rotatable cylinder having a perforated circumferential surface rotatable in said liquid, the interior of said cylinder communicating with a suitable discharge port located below the normal surface of the liquid in the tank, whereby particles of paper material in said liquid are normally deposited on the circumference of said cylinder as it rotates, flanges on the ends of said cylinder defining the length of the paper material deposited on said cylinder, a second rotatable cylinder in substantial contact with said first cylinder provided with superficial perforations leading to an air pump device constantly drawing air through said perforations, said second cylinder meshing with the flanges of the first cylinder, whereby the two cylinders are rotated a cylinder of paper of definite length is deposited upon the second cylinder, and means for there after drying the paper upon said second cylinder, for the purposes set forth.

4. In a device of the class described, the combination of a tank containing paper pulp material suspended in liquid, a hollow rotatable cylinder having a perforated circumferential surface rotatable in said liquid, the interior of said cylinder communicating with a suitable discharge port located below the normal surface of the liquid in the tank, whereby particles of paper material in said liquid are normally deposited on the circumference of said cylinder as it rotates, flanges on the ends of said cylinder defining the length of the paper material deposited on said cylinder, a second rotatable cylinder in substantial contact with said first cylinder provided with superficial perforations leading to an air pump device constantly drawing air through said perforations, said second cylinder meshing with the flanges of the first cylinder, whereby as the two cylinders are rotated a cylinder of paper of definite length is deposited upon the second cylinder, and means for there after drying the paper upon said second cylinder, for the purposes set forth.

5. In a device of the class described, the combination of a rotatable cylinder provided with means for providing a suction through a multiplicity of perforations on its surface, a second cylinder provided with heating devices adapted to mesh with the first cylinder to dry out paper material placed theron, and means for supplying the first cylinder with paper material.

6. In a device of the class described, the combination of a tank constantly provided with liquid carrying paper material in suspension, an elevating device for removing small quantities of the paper material out of and above the tank, a mold member shaped to correspond with the article to be formed, provided with means for causing the paper material so elevated from the tank to ad-
here thereto, and means for pressing and
drying the paper material on said mold into
the desired dry product corresponding in
form to the form of said mold.

7. In a device of the class described, the
combination of a tank constantly provided
with liquid carrying paper material in sus-
pension, an elevating device for removing
small quantities of the paper material out
of and above the tank, a mold member
shaped to correspond with the article to be
formed, provided with means for causing
the paper material so elevated from the tank
to adhere thereto, means for pressing and
drying the paper material on said mold into
the desired dry product corresponding in
form to the form of said mold, and a stripp-
ing device for removing the finished prod-
uct from the mold.

8. The method of making a paper object
consisting in applying one or more layers of
wet paper material to a suitable mold corre-

doning to the form desired, extracting
through the mold the moisture from the

9. In a device of the class described, the
combination of a tank constantly provided
with liquid carrying paper material in sus-
pension, an elevating device for removing
small quantities of the paper material out
of and above the tank, a mold member
shaped to correspond with the article to be
formed provided with means for causing
the paper material so elevated from the tank
to adhere thereto, means for pressing and
drying the paper material on said mold into
the desired dry product corresponding in
form to the form of said mold, said mold
member being adapted for moving first to
a position where it takes paper material
from said elevating device, and second to a
position where it is in engagement with said
pressing and drying means, for the purposes
set forth.

In witness whereof, I have hereunto sub-
scribed my name in the presence of two wit-
nesses.

WILLIAM F. WHITCOME.

Witnesses:

Dwight B. Cheever,
M. S. Rosenzweig.