

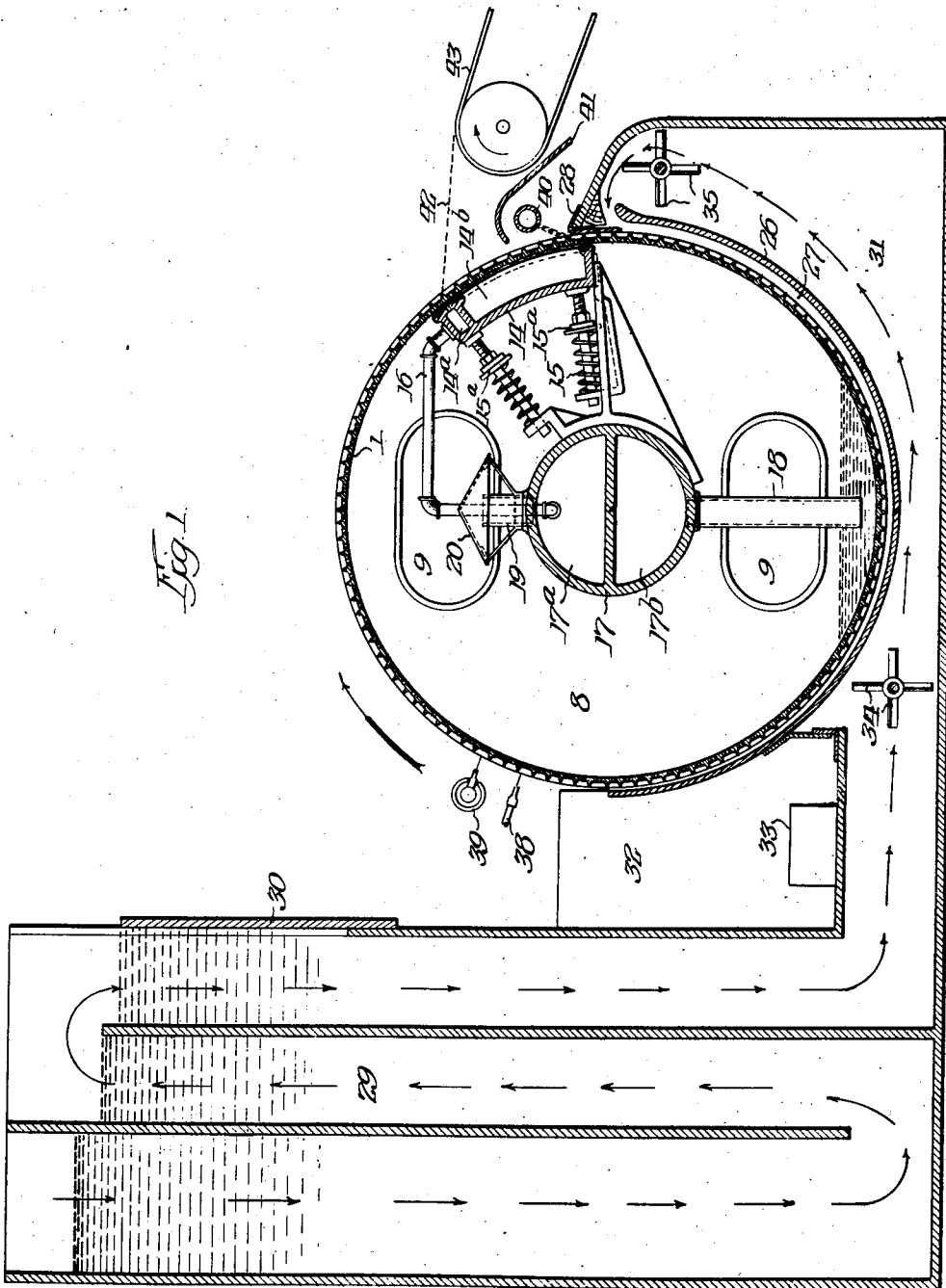
May 10, 1927.

1,627,882

E. E. BERRY

PAPER MAKING MACHINE

Original Filed April 7, 1923 3 Sheets-Sheet 1



Witness:  
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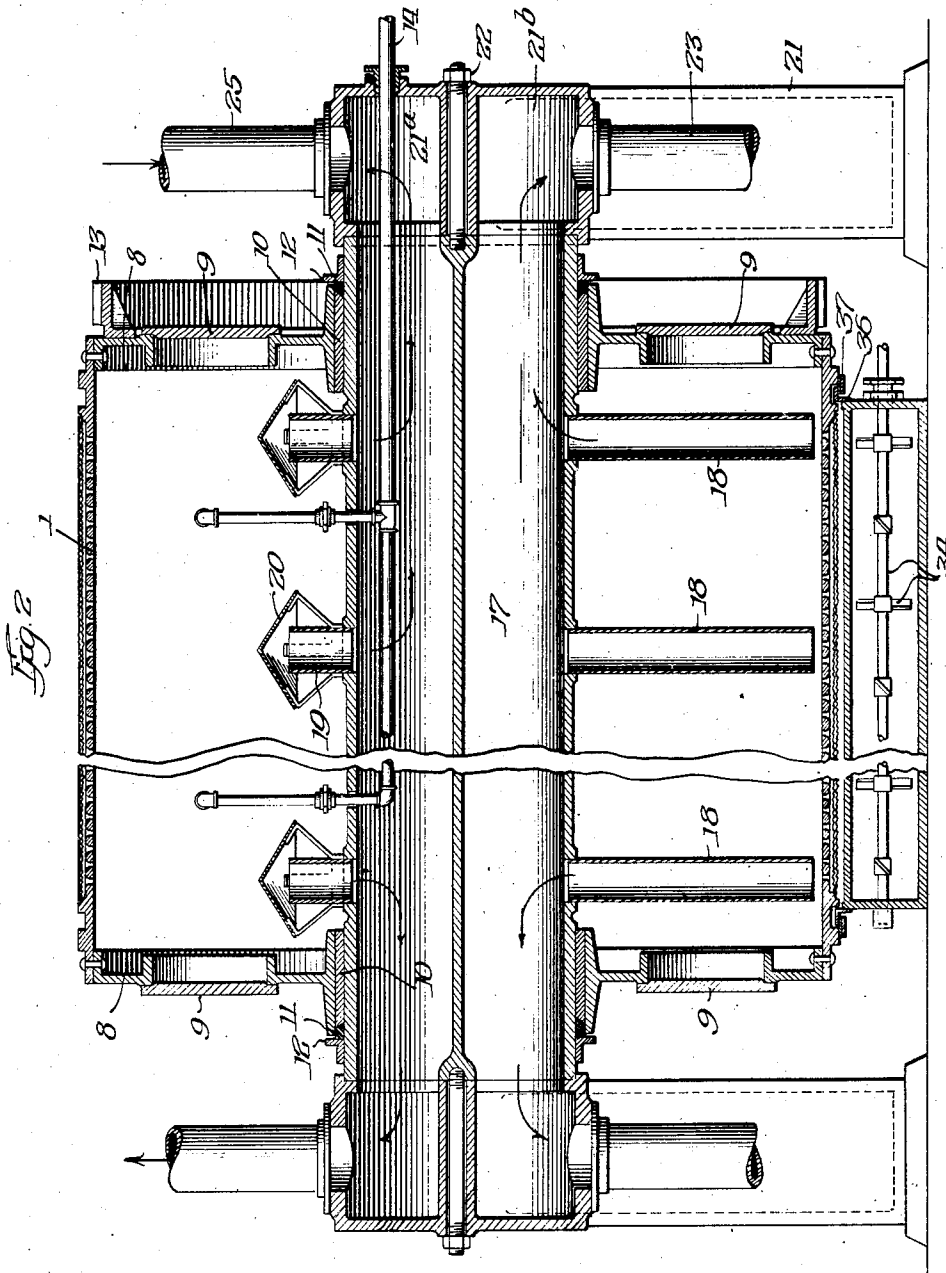
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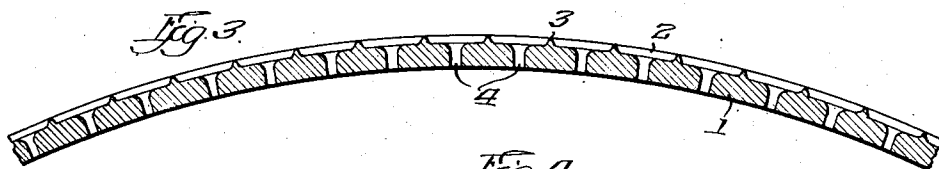
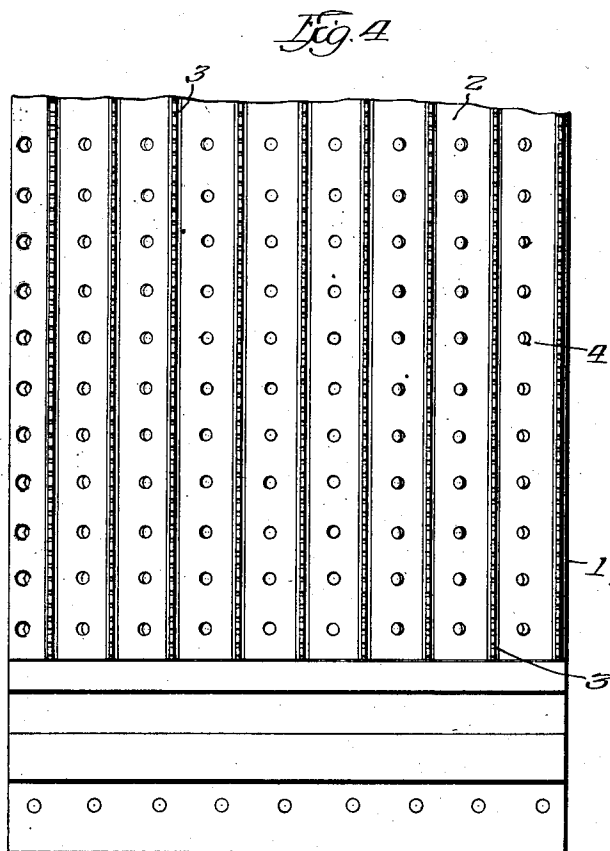
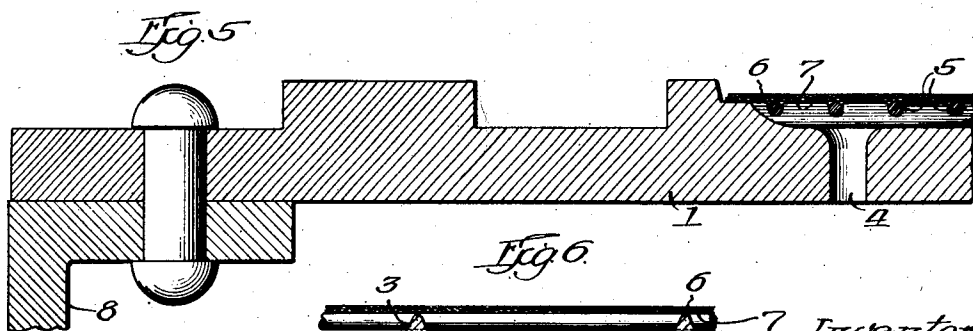
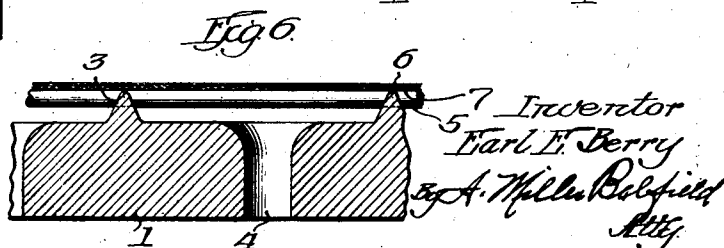
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E. E. BERRY

PAPER MAKING MACHINE

Original Filed April 7, 1923 . 3 Sheets-Sheet 3



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Patented May 10, 1927.

1,627,882

# UNITED STATES PATENT OFFICE.

EARL E. BERRY, OF BELOIT, WISCONSIN, ASSIGNOR TO BELOIT IRON WORKS, OF BELOIT, WISCONSIN, A CORPORATION OF WISCONSIN.

## PAPER-MAKING MACHINE.

Application filed April 7, 1923, Serial No. 630,484. Renewed April 27, 1925.

My invention relates to paper making machines, and especially to machines known as the cylinder type machine.

One of the objects of the invention is to provide a simple and practical construction of suction mold for paper making machines.

Another object of the invention is to provide a construction which will make it possible to run the cylinder at high speeds, higher than heretofore employed.

Another object of the invention is to arrange for removing the sheet from the cylinder mold without the aid of couch roll or felt.

In the accompanying drawings Fig. 1 is a vertical section of a paper making machine embodying my invention, showing the cylinder mold, the vat and head box;

Fig. 2 is a longitudinal section taken lengthwise of the mold and vat;

Fig. 3 is a cross section of a portion of the cylinder mold;

Fig. 4 is a plan view of part of the same; and

Figs. 5 and 6 are sectional views of a portion of the cylinder mold wall on an enlarged scale.

Referring to the drawings, the cylinder mold construction consists of a cylinder 1, having longitudinally extending grooves 2, between which are projections 3, said projections terminating in sharp edges and each groove having communication with interior of cylinder through the holes 4. The projections 3 are cut crosswise by special grooves running circumferentially of cylinder and which support a spirally wound wire 5, the surface of which is even with edge of projections (Fig. 5). The edges of projections 3 and the outside surface of spiral wires support wire webs 6 and 7. The ends of cylinder mold are closed by the circular heads 8 which have openings with removable covers 9. The center of each head forms a bearing 10 for rotating the cylinder mold upon a stationary hollow shaft, and said bearing is made comparatively air tight by the packing 11 which is held in position by the collar 12, which also takes the end thrust of the cylinder. The cylinder is rotated by the gear 13 attached to circular end head.

A box 14 extending lengthwise of the cylinder 1 and supported from the hollow shaft engages the upper inside periphery of cylinder, said box being divided into two

compartments 14<sup>a</sup> and 14<sup>b</sup>, and held against the cylinder by the adjustable springs 15 and adjustable stops 15<sup>a</sup>, being provided so as to regulate the pressure of said box against the cylinder. One of the compartments 14<sup>a</sup> in box 14 is supplied with compressed air through the pipe 16, thereby relieving a portion of the web from the internal suction of the mold and providing a place for removing the sheet. A stationary hollow shaft 17 forms journals at the ends upon which the cylinder mold rotates. Said hollow shaft is divided into two compartments 17<sup>a</sup> and 17<sup>b</sup> by a longitudinal portion extending diametrically across same, the lower compartment 17<sup>b</sup> having communication with lower part of cylinder by the pipes 18 for the purpose of removing the liquid drawn to the inside of mold. The upper compartment has communication with upper part of mold by the pipes 19 for exhausting the air from inside of mold, the ends of these pipes having hoods 20 for keeping the liquid from getting into air suction lines.

The ends of hollow shaft 17 are supported in the pedestals 21 which are divided interiorly into compartments 21<sup>a</sup> and 21<sup>b</sup> which correspond to compartments 17<sup>a</sup> and 17<sup>b</sup> in hollow shaft 17, and form a continuous passageway thereto. The pedestals are held tightly against the ends of shaft 17 by bolts 22 forming a comparatively air tight joint between the two. A pipe 23 leading from the lower chamber 21<sup>b</sup> of the pedestal 21 is connected to a water pump or other suitable means for removing the liquid from the interior of cylinder, and another pipe 25 leading from upper chamber of pedestal is connected to a suitable air suction pump for exhausting the air from the interior of cylinder, the suction exerted in pipes 18 being greater than that exerted in pipes 19 so as to lift water in said pipes 18. Thus substantially the entire interior of the cylinder is subject to the suction and to the same suction, and consequently the paper is formed and dehydrated by the same suction. This has the advantage of giving continuity and uniformity. Also, the water which would roll down and spoil the paper, above member 32, is pulled down into cylinder and discharged.

A partition 26 for fibre bearing liquid encloses the lower half of the cylinder mold and is so constructed that the passageway

27 between it and mold can be varied in size and shape as desired. A piece of flexible material 28 is connected to outer casing of vat and allowed to rub against the web of mould, the pressure on the outside and the suction from the inside of mold holding the flexible piece of material firmly against the web and preventing the fibre bearing liquid from escaping at this point. A head box 29 extends much higher than ordinarily above the vat for storing the fibre bearing liquid, said head box having an adjustable gate 30 for regulating the height of liquid in head box and thereby regulating the velocity and pressure of the liquid in passageway between vat and mold. The head box 29 has communication with passageway between vat and mold by the passageway 31. By having the high head box 30, the flow of pulp may be given the same speed of travel in passage 27 as the surface of the cylinder, thereby making a good fibre in the paper and avoiding botching which might otherwise take place, and permits high speed on part of cylinders. This speed of travel continues to substantially the overflow. A chamber 32 is provided between head box and mold for retaining or catching the surplus liquid overflowing between vat and mold, and also the surplus liquid overflowing from adjustable gate in head box. Liquid may escape from chamber 32 through the opening 33 and be pumped back to head box for re-use.

The passageway or chamber between head box and entrance to vat is provided with agitators 34 and 35, said agitators consisting of propeller blades revolving upon a shaft with the pitch of blades placed in opposite directions, so as to thoroughly mix and distribute the fibres in liquid. A semi-cellular flange 36 extends from side walls of vat, the outside surface of which is even with the outside of an extension to cylinder surface. A flexible metallic strip 37 with fabric lining engages the two surfaces and forms a comparatively water tight joint thereby preventing the fibre bearing liquid leaking from the vat.

Small jets of water 38 and 39 are directed against the formed sheet of fibres on web of mold, thereby cutting even and straight edges on the sheet. The jet 39 is connected to a flexible hose and slides lengthwise of mold in a slotted pipe, making it possible to move the jet across the sheet of fibres while mold is revolving and cut a wedged shaped sheet which is necessary in passing sheet to other parts of the paper making machine.

A spray pipe 40 is provided at point where mold enters the vat and for the purpose of cleaning the web before it again enters the fibre bearing liquid said spray pipe has a shield plate 41 which prevents water spattering on to sheet of paper that is being removed from mold. The sheet of paper 42 is

shown passing from the web of mold to the first press felt 43 of the paper making machine, being thus taken from the roll without the use of a couch or other separate roll, thereby permitting high speed and avoiding wear on the cylinder surface. The suction removes sufficient water to release the paper, which is thus well dried so that no pressing roll is needed.

It will be understood that changes and modifications may be made without departing from the spirit of the invention.

What I claim is:

1. In a paper making machine, the combination of a hollow rotary perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing water from the interior of said member and other suction means for reducing air pressure in said member above the water.

2. In a paper making machine, the combination of a rotary hollow perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing water from the bottom of said member, and other suction means for reducing air pressure in the member above the water.

3. In a paper machine, the combination of a rotary hollow perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing water from the interior of the member and other suction means for reducing air pressure in the upper portion of the member.

4. In a paper machine, the combination of a hollow rotary perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing water from the interior of the said member and other suction means for reducing air pressure in the interior of said member above the level of the material in the vat.

5. In a paper machine, the combination of a hollow rotary perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing water from the interior of the said member and other suction means for reducing air pressure in the interior of said member above the level of the material in the vat, and also above the water in said member.

6. In a paper machine, the combination of a hollow rotary perforate member having an open interior, a vat in which said member is substantially one-half immersed, and means for separating the formed paper film from the rotary member comprising a compressed air device located between the top of the cylinder and the point where the downwardly moving portion of the cylinder

enters the vat, whereby substantially the entire upper surface of the rotary member is available for drying the paper film.

7. In a paper machine, the combination of a rotary hollow perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing the water from the interior of the said member, and other suction means for reducing air pressure within that portion of said member on which the paper film is formed.

8. The combination of a rotary hollow cylinder having a perforated cylindrical wall, of a tank or vat for paper material in which said cylinder is partially immersed, means for establishing a condition of low air pressure in said cylinder and means for pneumatically withdrawing liquid from the interior of the cylinder, the means for establishing a partial vacuum in the cylinder comprising a tubular stationary shaft for the cylinder provided with apertures communicating with the interior of the cylinder and a connection for said tubular shaft for establishing communication with an air pressure reducing apparatus, and the means for withdrawing liquid from the cylinder comprising a separate compartment in said tubular shaft also connected with air pressure reducing apparatus, pipes extending from said compartment down to substantially the bottom of the cylinder and pipe connections for withdrawing liquid from said compartment.

9. The combination of a hollow rotary cylinder having a perforated cylindrical wall, a vat for paper material in which said cylinder is partially immersed, a tubular shaft on which the cylinder is mounted, said shaft being formed of two longitudinal compartments one above the other, the shaft being provided with outlets from the upper compartment to the interior of the cylinder to permit exhaustion or partial exhaustion of air from said interior, suction pipe connections for said compartments, and the lower compartment being provided with downwardly extending pipes extending to substantially the bottom of the cylinder for withdrawing liquid from the same.

10. The combination of a hollow rotary cylinder having a perforated cylindrical wall, a vat for paper material in which said cylinder is partially immersed, a tubular shaft on which the cylinder is mounted, said shaft being formed of two longitudinal compartments one above the other, the shaft being provided with outlets from the upper compartment to the interior of the cylinder to permit exhaustion or partial exhaustion of air from said interior, suction pipe connections for said compartments, and the lower compartment being provided with downwardly extending pipes extending to

substantially the bottom of the cylinder for withdrawing liquid from the same, said tubular shaft being mounted on pedestals having hollow upper ends comprising two compartments whereof the upper ones are connected with the upper compartment of the hollow shaft and the lower ones connected with the lower compartment of the hollow shaft, said pipe connections being connected to said pedestals so as to communicate with the compartments thereof.

11. In a paper machine, the combination of a rotary hollow perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing the water from the interior of the said member, and other suction means for reducing air pressure within that portion of said member on which the paper film is dried.

12. The combination of a rotary hollow cylinder having a perforated cylindrical wall, a tank or vat for paper material in which said cylinder is partially submerged, means whereby a condition of partial vacuum may be established within the cylinder so as to cause formation of a paper film thereon and means for neutralizing the reduced air pressure for a portion of the cylindrical wall, said means comprising a box arranged within the cylinder and covering a portion of the cylindrical wall and compressed air pipes leading to said box, said box having two compartments one of which is provided with compressed air and the other of which covers an adjacent portion of the cylinder wall.

13. The combination of a rotary hollow cylinder having a perforated cylindrical wall, a tank or vat for paper material in which said cylinder is partially submerged, means whereby a condition of partial vacuum may be established within the cylinder so as to cause formation of a paper film thereon, means for neutralizing the reduced air pressure for a portion of the cylindrical wall, said means comprising a box arranged within the cylinder and covering a portion of the cylindrical wall and compressed air pipes leading to said box, said box having two compartments one of which is provided with compressed air and the other of which covers an adjacent portion of the cylinder wall, and spring controlled means for forming a tight connection between said box and the interior of the cylinder wall.

14. A paper machine comprising a perforate, hollow rotary member having an open interior, a tubular shaft on which said member is mounted, said shaft being divided into upper and lower compartments, openings in the upper compartment communicating with the open interior of the rotary member, a suction connection communicating with said upper compartment for estab-

lishing an exhaust condition in the open interior of said rotary member, pipes extending downwardly from the lower compartment of the tubular shaft and having their lower ends located near the bottom of the rotary member, a pump connection for the lower compartment for causing exhaust of water from the bottom of the rotary member, and a vat for paper forming material in which said rotary member is partially immersed.

15. In a paper machine, the combination of a rotary hollow perforate member having an unobstructed interior, a vat in which said member is partially immersed, suction means for withdrawing the water from the interior of the said member, and other suction means for reducing air pressure within that portion of said member on which the paper film is formed and dried.

16. A paper making machine having a partially submerged hollow rotary member with an unobstructed perforate wall and also having suction means for withdrawing water from the interior of said member, and other suction means for maintaining a constant vacuum condition within the portion of the cylinder where the paper is formed.

17. A paper making machine having a partially submerged hollow rotary member with an unobstructed perforate wall and also having suction means for withdrawing water from the interior of said member and other suction means for maintaining a constant vacuum condition within the portion of the cylinder where the paper is dried.

18. In a cylinder paper machine, a cylinder whose outside periphery has grooves extending longitudinally of same, each groove having independent communication with the interior of the cylinder, said grooves so shaped and located in reference to each other that a projection is formed between each groove, said projection terminating on the outside in a comparatively sharp edge, each projection being intersected by spiral grooves running circumferentially of the cylinder and supporting a spirally wound wire, the spiral grooves being of such depth that outside of spiral wound wire is even with sharp edges of projections, thereby forming an even surface over entire outside surface of cylinder, said surface supporting one or more wire webs and forming separate compartments at each groove which are comparatively air tight in reference to each other.

19. In a cylinder paper machine, a cylinder mold each end of which is closed by a circular head, the center of each head having a bearing for rotating said mold upon a stationary hollow shaft, said bearing being so constructed as to form a comparatively air tight joint between interior and exterior of mold, the end heads of mold hav-

ing openings with air tight covers which are removable for gaining access to interior of mold.

20. A paper making machine having a partially submerged hollow rotary member with an unobstructed perforate wall and also having suction means for withdrawing water from the interior of said member, and other suction means for maintaining a constant vacuum condition within the portion of the cylinder where the paper is formed and dried.

21. In a paper making machine, the combination of a hollow rotary member having an unobstructed perforate wall, a vat in which said member is partially submerged, suction means for withdrawing the water from the interior of the cylinder and other suction means for reducing air pressure in the operative portion of said member.

22. The combination with the hollow perforate rotary cylinder, of means for creating a vacuum condition along substantially the entire inner surface of the cylinder, and means for supplying compressed air to the inside of the cylinder at a point in the periphery of the cylinder, and means for supplying air at atmospheric pressure at an adjacent point.

23. A paper machine having a partially submerged hollow rotary member with an unobstructed perforate wall or shell and means for maintaining a constant vacuum condition throughout the entire interior of the cylinder, excepting where the paper is taken off and the cylinder washed.

24. The combination with a hollow rotary perforated forming member, of a tank or vat in which the rotary member is partially submerged, a central tubular member around which said member revolves, said tubular member having a plurality of separate longitudinal compartments, and also having openings affording communication between one of said compartments and the interior of the rotary member and liquid withdrawing means carried by said tubular member and extending downwardly therefrom for conducting water upwardly from the lower portion of said member, said liquid withdrawing means being in communication with the other compartment of said shaft.

25. The combination of a rotary hollow perforated forming member, a tank or vat in which the rotary member is partially submerged, a central tubular member around which said member revolves, said tubular member having a plurality of longitudinally extending compartments and also having apertures forming communication between one of said compartments and the interior of the rotary member and pipes attached to said tubular member and extending downwardly therefrom and in communication with the other of said compartments.

26. The combination with a rotary hollow

perforated forming member, of a tank or vat in which the rotary member is partially submerged, a central tubular member around which said member revolves, said tubular member being provided with a plurality of longitudinal compartments, and having apertures or openings forming communication between one of said compartments and the interior of the rotary member, pipes attached to said tubular member and extending downwardly therefrom and in communication with another of said compartments, and chambered pedestals supporting said central member and having chambers in communication with the compartments thereof.

27. The combination with a rotary hollow perforated forming member, of a tank or vat in which the rotary member is partially submerged, a tubular supporting shaft provided with a plurality of longitudinal compartments, said shaft having apertures or openings forming communication between one of said compartments and the interior of the rotary member, pipes attached to said tubular shaft and extending downwardly therefrom and in communication with another of said compartments, chambered pedestals supporting said shaft and having chambers in communication with the compartments thereof and suction pipes connected with said pedestals so as to communicate with the chambers thereof.

28. A machine of the class specified comprising a tank or vat, a rotary forming cylinder partially immersed in said tank or vat, a fixed tubular shaft on which same is mounted, tubular members extending down from said shaft to the lower portion of the cylinder, chambered pedestals supporting said shaft and connected with interior thereof, a suction device connected with said pedestals and water discharge pipes extending from said pedestals.

29. A machine of the class specified having a tank or vat, a rotary forming cylinder partially immersed in said tank or vat, and also having suction means for forming and drying the paper and for withdrawing moisture therefrom, said suction means comprising a fixed hollow shaft having separate compartments for the drying and water withdrawing pressures, air pipe connections to same, and water outlet pipes for water discharge, said shaft being supported by chambered pedestals having compartments for connection with said shaft compartments, said air and water discharge pipes being connected with said pedestals.

30. A machine of the class specified hav-

ing a tank or vat, and a hollow rotary perforated forming member partially immersed in said tank or vat, and also having a centrally arranged structure provided with a plurality of longitudinally extending compartments and pedestals supporting said central structure and each provided with a plurality of chambers communicating respectively with the compartments of said central structure.

31. A machine of the class specified having a tank or vat, and a hollow rotary perforated forming member partially immersed in said tank or vat, and also having a centrally arranged structure provided with a plurality of longitudinally extending compartments and pedestals supporting said central structure and each provided with a plurality of chambers communicating respectively with the compartments of said central structure and pipes connected with said pedestals and communicating with the chambers thereof.

32. A machine of the class specified having a tank or vat, and a hollow rotary perforated forming member partially immersed in said tank or vat, and also having a centrally arranged structure provided with a plurality of longitudinally extending compartments one for air and another for water and pedestals supporting said central structure and each provided with a plurality of chambers communicating respectively with the compartments of said central structure and air suction pipes connected with the pedestal chambers which communicate with the air compartment of the central structure and other pipes connected with the pedestal chambers which communicate with the water compartment of the central structure.

33. The combination of a rotary forming member, a tubular support therefor, said support having a longitudinally extending partition dividing it into upper and lower compartments, whereof the upper compartment is for withdrawing air from the upper portion of the rotary member and the lower compartment is for withdrawing water from the lower portion thereof, and suction pipes communicating with the ends of said compartments, said pipes being connected to the upper ends of pedestals which are attached to the ends of said tubular support, said pedestals having partitions forming continuations of the tubular support partition and dividing said pedestals into compartments communicating with said pipes.

In witness whereof, I hereunto subscribe my name this 2nd day of April A. D., 1923.

EARL E. BERRY.