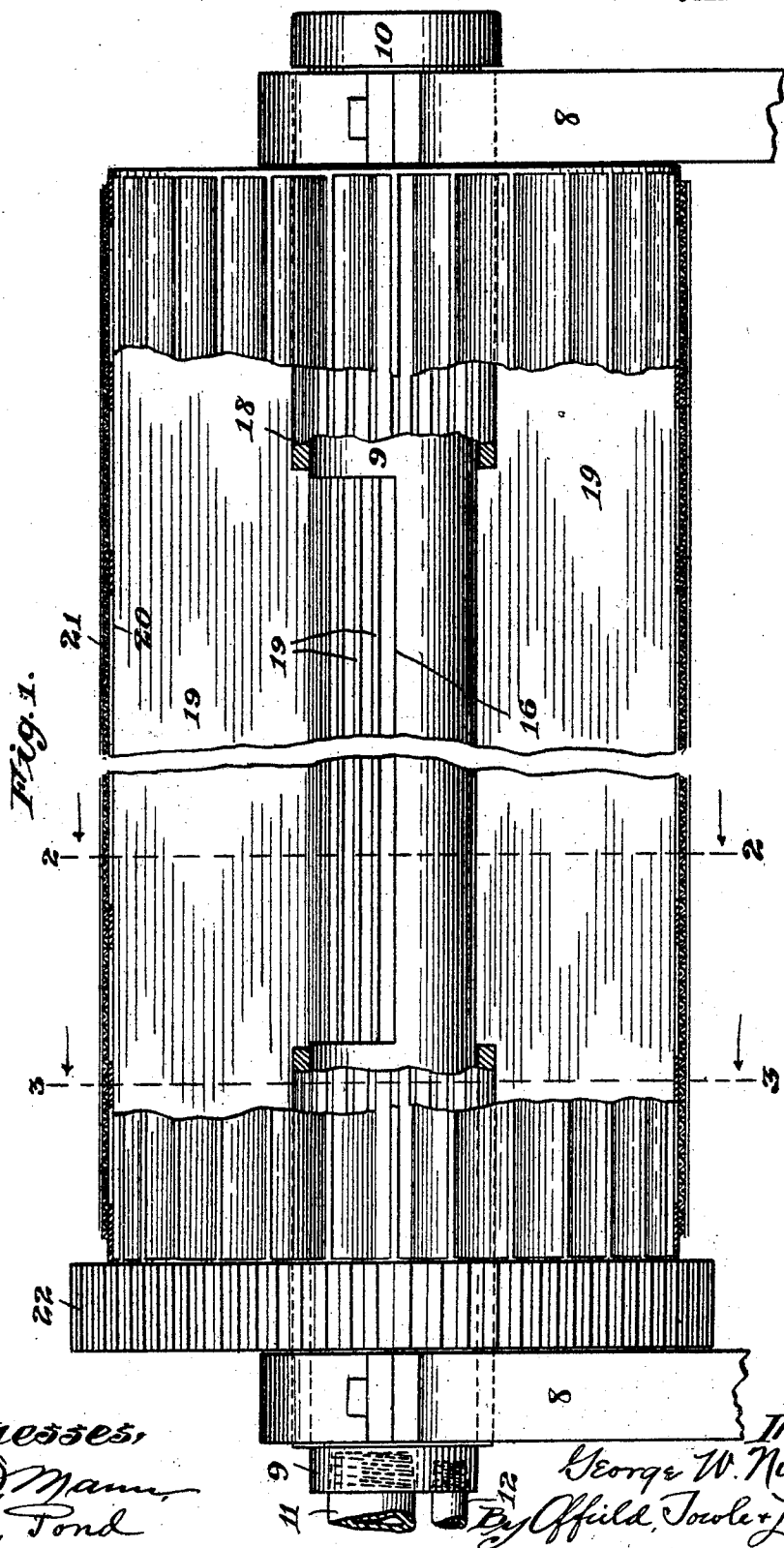


G. W. NISTLE.
PAPER FORMING AND DRYING MACHINE.
APPLICATION FILED OCT. 17, 1904.

3 SHEETS—SHEET 1.



Witnesses,
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No. 795,055.

PATENTED JULY 18, 1905.

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3 SHEETS—SHEET 2.

Fig. 2.
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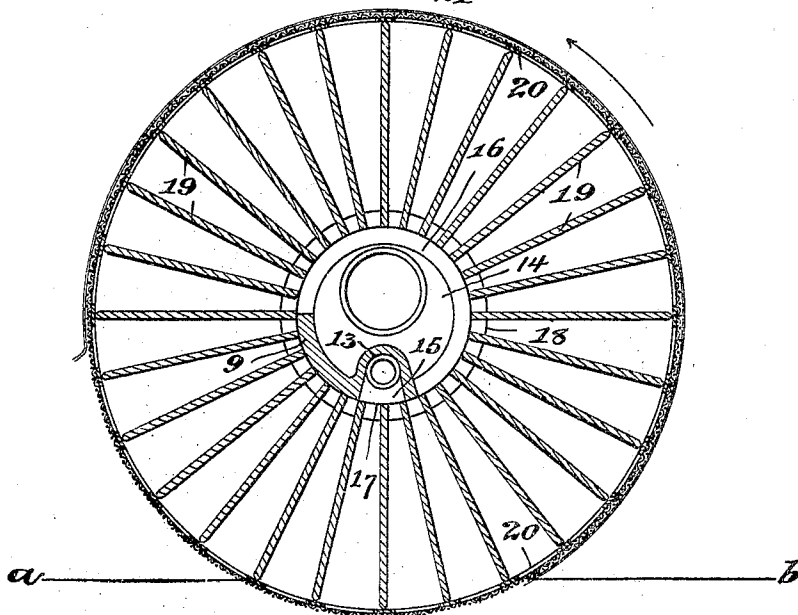
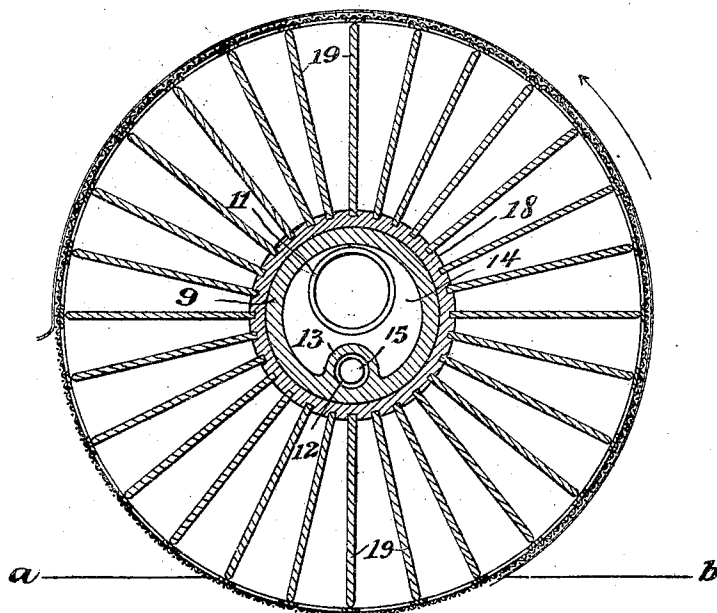


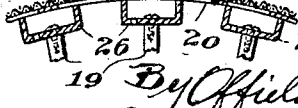
Fig. 3.



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Fig. 7.

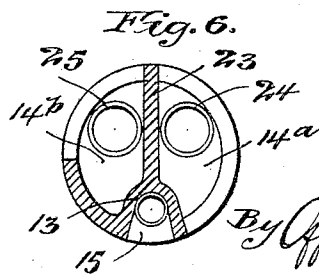
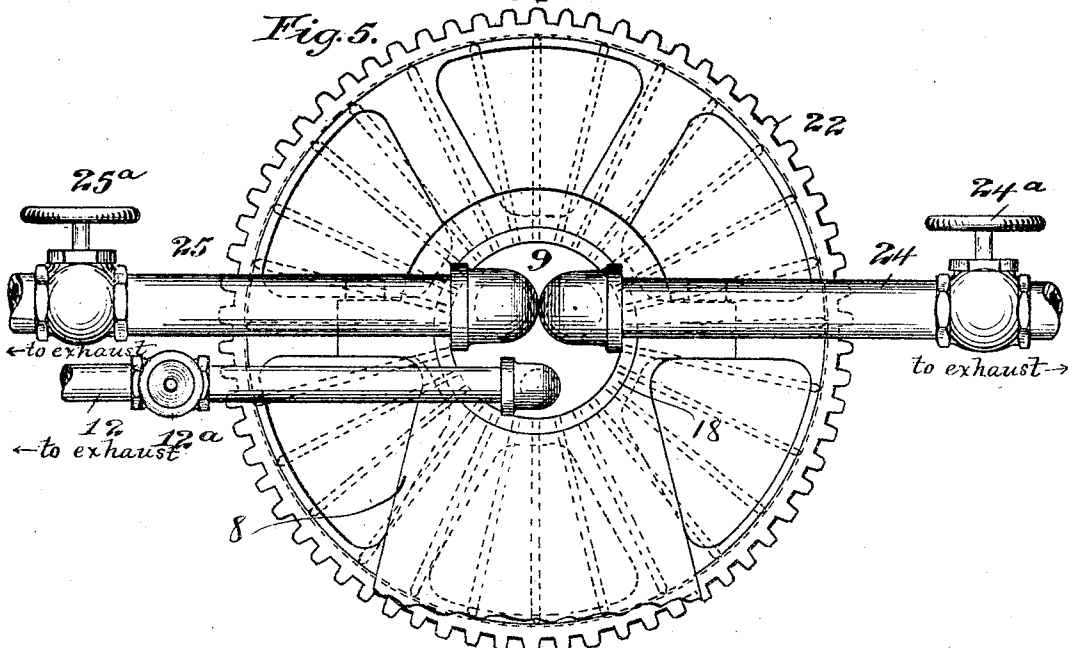
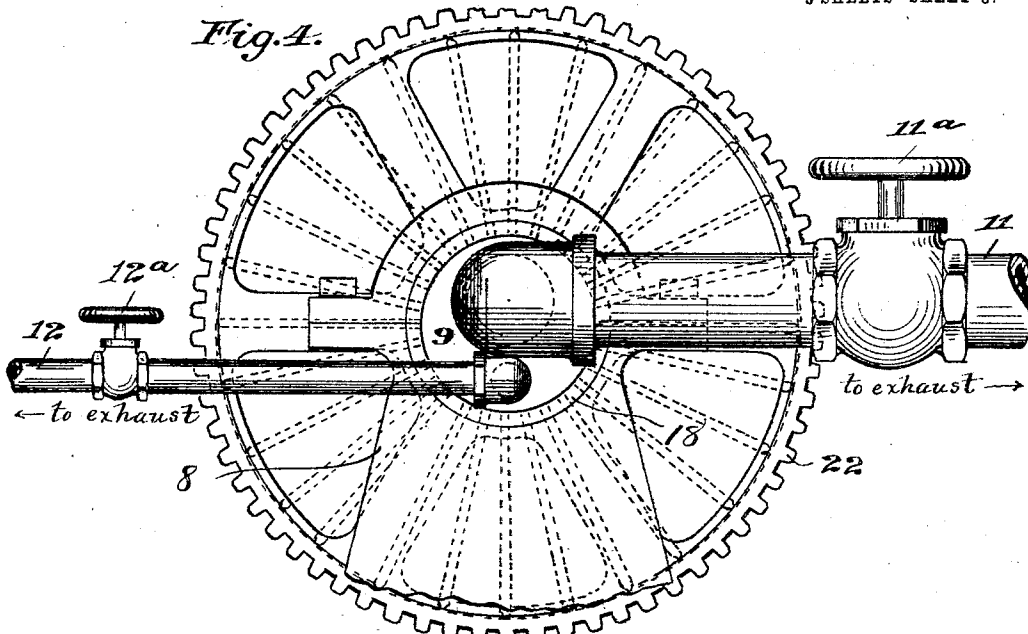


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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

GEORGE W. NISTLE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO EVERETT W. BROOKS AND ONE-THIRD TO ROBERT L. GIFFORD, OF CHICAGO, ILLINOIS.

PAPER FORMING AND DRYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 795,055, dated July 18, 1905.

Application filed October 17, 1904. Serial No. 228,779.

To all whom it may concern:

Be it known that I, GEORGE W. NISTLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper Forming and Drying Machines, of which the following is a specification.

My invention relates to the manufacture of paper and other sheeted material from fibrous pulp, having reference more particularly to that class of machines which are employed in extracting the moisture from the sheet of paper or other pulp as it comes from the digesting-vats.

In the manufacture of paper or other sheeted material from fibrous pulp there is at present extensively employed a system which includes, among other features, a cylinder having a perforated periphery that is submerged in the pulp-vat nearly to its highest point, said cylinder being provided with a fluid-discharge-passage through its end whereby as it is rotated the water flowing thereinto through the perforated peripheral shell deposits a thin coating of the pulp on said peripheral surface, from the upper portion of which the moist sheet of pulp thus deposited is received on an endless blanket which passes between squeezing-rolls which remove a portion of the water, leaving the remaining moisture to be removed by heat. My invention has for its leading object to simplify the mechanism employed in this process through the construction of a cylinder which shall be capable of performing the functions of both the pulp-collecting and the pulp-drying mechanisms above referred to, and this I accomplish through the provision of a roll or cylinder having a perforated peripheral surface mounted upon a hollow shaft containing a plurality of separated ports opening to the interior of the cylinder, said ports communicating successively with different portions of the periphery of the cylinder and operating upon the latter with varying vacuum effects. The cylinder is dipped into the pulp-vat to the extent only of a portion of its lower pe-

riphery, and a port of the hollow axis communicating with such submerged portion of the periphery is subjected to a vacuum of sufficient strength to attract to said submerged portion of the periphery the particles of pulp in the desired thickness, the remaining port or ports being subjected to a vacuum or vacua of different degrees of strength, preferably greater, to extract the moisture from the pulp thus collected on the cylinder as the latter revolves over said other port or ports of the shaft. In this way a certain minor portion of the periphery of the cylinder is applied to the function of collecting the pulp in a sheet of the desired thickness, according to the strength of the vacuum maintained, and the remaining portion of the periphery is applied to the function of drying out the sheet thus collected through the application of another vacuum or vacua of suitable strength or intensity to effect such drying operation.

A machine embodying the principle of my invention in the best mechanical form thereof which I have as yet devised is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation, partly in longitudinal section, of my improved collecting and drying cylinder. Fig. 2 is a cross-sectional view on the line 2 2 of Fig. 1. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 1. Fig. 4 is an end view of the left-hand end of the machine as shown in Fig. 1. Fig. 5 is a similar end view of a modified form embodying an extension of the same principle. Fig. 6 is a cross-sectional view of a hollow divided and ported shaft, such as is employed in the modified form of Fig. 5; and Fig. 7 is a detail illustrating the preferred means for supporting the perforated shell of the cylinder upon the outer ends of the radial spokes.

Referring to the drawings, 8 designates each of a pair of uprights in which is secured a stationary hollow shaft 9, one end of which may be closed, as by a cap 10, while the other end communicates with a pair of pipes 11 and 12, leading to the suction side of suitable vacuum-pumps or other air-exhausting de-

vices. The stationary hollow shaft 9 is divided longitudinally by an inwardly-extending semicircular partition 13 into two bores or chambers, the larger of which, 14, communicates with the suction-pipe 11, while the smaller, 15, communicates with the suction-pipe 12. The chamber 14 of the shaft is ported by means of a rectangular opening 16, which, as shown, extends widthwise through approximately nine-fourteenths of the circumference of the shaft, while lengthwise it stops considerably short of the two ends of the shaft, as is clearly shown in Fig. 1. The smaller chamber 15 is similarly ported by means of a rectangular opening 17, which extends widthwise the full width of the chamber and lengthwise to the same extent as the opening 16.

Surrounding the shaft 9 is the frame or spider of the cylinder, consisting of a central hub 18, having a plurality of radially-extending arms or spokes 19, the outer edges of which latter support a cylindrical perforated shell 20, which latter supports a covering of woven wire or other perforated or reticulated material, (indicated by 21.) The hub 18, as herein shown, is made in two sections which respectively surround those portions of the central stationary shaft lying beyond either end of the ports or openings 16 and 17, said sections of the hub being rigidly united by the inner ends of the spokes 19 set therein. Said hub-sections and spokes may all be cast in one piece. Said arms or spokes 19 are solid throughout and extend the entire length of the cylinder, as shown in Fig. 1, thus, in effect, dividing the cylinder into a plurality of independent adjacent sectors, each of which is successively brought into communication with and cut off from the chambers 14 and 15 as the cylinder revolves on its stationary shaft, since the space between the ends of adjacent spokes is open and unobstructed throughout the longitudinal space between the two sections of the hub 18. The cylinder may be turned by any suitable train of gearing from a source of power, a gear 22 being herein indicated as mounted on one end of the roll for this purpose.

The operation is as follows: Assuming that the cylinder is dipped into the pulp to the extent indicated in Figs. 2 and 3, wherein the line *a b* indicates the upper surface of the liquid, the vacuum transmitted through pipe 12, chamber 15, and port 17 is operating in and through those sectors of the cylinder the lower ends of which are submerged, whereby the pulp suspended and floating in the liquid is attracted to the submerged surface of the cylinder and gathers thereon in a sheet of greater or less thickness, according to the strength of the vacuum employed. Assuming that the cylinder turns in the direction indicated by the arrows, the pulp thus collected is carried upwardly and on emerging

from the liquid is immediately subjected to the pulling action of the other vacuum operating through pipe 11, chamber 14, and port 16. This latter vacuum acts upon the pulp until it reaches a point opposite the left-hand horizontal edge of port 16, as shown in Fig. 2, at which point the interior space of the sectors is cut off by the solid portion of the stationary hollow shaft, whereupon the sheet of pulp may be stripped off by a suitable scraper (not shown) and carried thence to a receiving-drum or to another cylinder for still further drying, if necessary. In practice a minor vacuum will ordinarily be exerted through chamber 15 and port 17, while a major vacuum will operate upon the sheet through its longer travel around the wider port 16, and both the absolute and relative degrees of vacuums thus maintained can be readily controlled, as experiment may suggest, by means of valves 11^a and 12^a, interposed in the pipes 11 and 12, respectively.

In the modification illustrated by Figs 5 and 6 the larger vacuum-chamber 14 of the stationary hollow shaft is divided by a solid partition 23 into two separate vacuum-chambers 14^a and 14^b, with which communicate at the end of the shaft suction-pipes 24 and 25, respectively, having controlling-valves 24^a and 25^a. This form of apparatus provides for the application of a plurality of different vacuum effects upon the major periphery of the cylinder during the drying operation. It is obvious that the same principle might be applied also to a similar longitudinal division of the smaller vacuum-chamber 15, if found desirable, to vary the vacuum effect on different parts of the submerged portion of the cylinder, while the same principle is also capable of still further extension by further subdivision of either or both of the vacuum-chambers of the shaft.

Fig. 7 illustrates the preferred means of mounting the shell of the cylinder upon its spokes, said means consisting of channel-bars 26, secured centrally at the outer ends of the spokes 19 and at their outer edges directly supporting the perforated shell 20. This construction promotes the perfect cross-sectional circularity of the shell by reason of increasing the number of internal supports thereof and decreasing the space between said supports.

From the foregoing it will be seen that my invention provides an apparatus in which both the forming and drying of the sheet may be performed on a single roll or cylinder through the application of separate vacuum effects to different peripheral portions thereof, which vacuum effects may be varied and regulated, as found most efficient, to create the different desired effects upon the pulp. Of course the several suction-pipes might be connected to as many different exhausting devices of different capacities; but when said

pipes are equipped with the controlling-valves, as shown and described, whether manual or automatic, it is feasible to connect all of said pipes to a single source of vacuum, said valves permitting regulation of the vacuum effects transmitted through the several pipes to the degree or degrees desired.

While I have described the machine as designed for use in the manufacture of paper and contemplate that such will be its principal application, yet it is evident that it might advantageously be employed in the manufacture of sheeted felt or any other sheeted material made from a fibrous pulp. Furthermore, while I have disclosed the air-exhaust devices as connected with but one end of the stationary hollow shaft of the apparatus, yet it will be evident that such connection might be made to both ends of said shaft, if desired, within the principle of the invention.

It is evident that the spirit and principle of my invention are capable of embodiment in other forms of apparatus than the particular forms herein shown and described. Hence I do not limit the invention to the particular mechanical embodiment herein presented except to the extent indicated in specific claims.

I claim—

1. The combination with a cylinder having a perforated shell adapted to dip into a pulp-vat, of an internal cylindrical stationary valve on which said cylinder is mounted, and means for exerting a plurality of vacuum effects radially from said valve through the interior of said cylinder operative upon different parts of its periphery, substantially as described.

2. The combination with a cylinder having a perforated shell adapted to dip into a pulp-vat, of an internal cylindrical stationary valve on which said cylinder is mounted, and means for exerting a plurality of vacuum effects of different degrees radially from said valve through the interior of said cylinder operative upon different parts of its periphery, substantially as described.

3. The combination with a cylinder having a perforated shell adapted to dip into a pulp-vat, of an internal cylindrical stationary valve on which said cylinder is mounted, and means for exerting radially from said valve through

the interior of said cylinder a minor vacuum effect upon the submerged portion of the periphery and a major vacuum effect upon the exposed portion of the periphery, substantially as described.

4. The combination with a cylinder having a perforated shell adapted to dip into a pulp-vat and interiorly subdivided into a plurality of independent sectors in which are to be maintained different degrees of vacuum, of an internal cylindrical stationary valve containing ports communicating with various sources of vacuum and adapted to transmit the various vacuum effects therethrough to different parts of the periphery of said cylinder, substantially as described.

5. The combination with a cylinder having a perforated shell adapted to dip into a pulp-vat and interiorly subdivided into a plurality of independent sectors, of an internal cylindrical stationary valve on which said cylinder is rotatably mounted, said valve being divided longitudinally into independent suction-chambers, one of said chambers being connected to a source of vacuum and having a port adapted to communicate successively with the sectors of the submerged portion of the shell, and another chamber connected to another source of vacuum and having a port adapted to communicate with sectors of the exposed portion of the shell, substantially as described.

6. The combination with a cylinder having a hub cut out through its intermediate portion, a plurality of solid spokes extending from end to end thereof, and a perforated shell adapted to dip into a pulp-vat, of a stationary hollow shaft on which said cylinder is rotatably mounted, said shaft being divided longitudinally into a plurality of vacuum-chambers having ports communicating with the interior of said cylinder, and means for applying vacuums of different degrees to said vacuum-chambers, substantially as described.

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Witnesses:

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