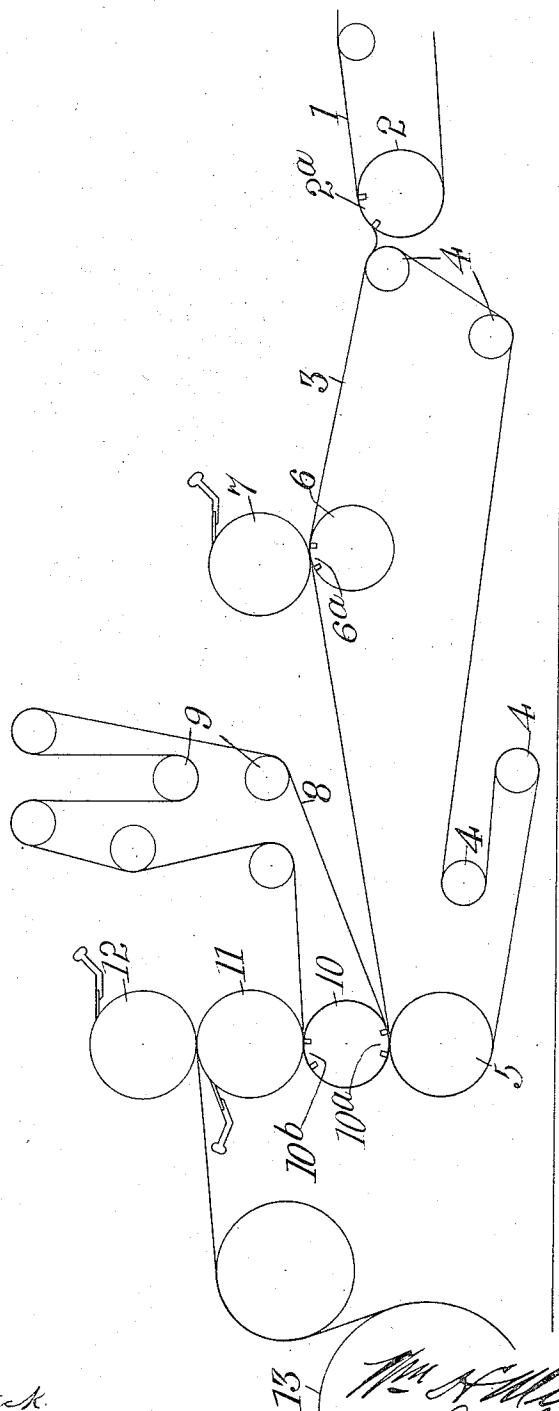


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PAPER MAKING MACHINE.
APPLICATION FILED AUG. 18, 1911.

1,163,253.

Patented Dec. 7, 1915.



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PAPER-MAKING MACHINE.

1,163,253.

Specification of Letters Patent.

Patented Dec. 7, 1915.

Application filed August 18, 1911. Serial No. 644,853.

To all whom it may concern:

Be it known that I, WILLIAM H. MILLS-
PAUGH, a citizen of the United States, resid-
ing at Sandusky, in the county of Erie and
5 State of Ohio, have invented certain new
and useful Improvements in Paper-Making
Machines, of which the following is a speci-
fication.

In the manufacture of paper by ordinary
10 methods, as on a Fourdrinier machine hav-
ing the usual couches and press rolls, the
sheet is subjected to severe pressure tend-
ing to crush and distend it, the process be-
ing practically one of repeatedly squeezing
15 out water until the sheet is in condition to
be passed over steam driers; and as the
water is expressed by the press rolls it forms
a puddle at the bite or point of contact of
the rolls, so that relatively dry paper is
20 running into this puddle, putting the sheet
in a mushy state before passing through the
bite of the rolls. These and other causes,
as the tendency of the sheet to cling to the
surface of the rolls, result in more or less
25 frequent breaks in the web, with consequent
trouble, delay and expense. Moreover, as
the sheet cannot be safely handled through
the presses above certain speeds, the rate of
production is accordingly limited.

30 My present invention is intended to obvi-
ate or lessen these difficulties and to permit
the production of paper in a continuous web
at high speeds without breaks or at least
with less danger of breaks.

35 Greater efficiency and economy in manu-
facture and improvement in the character
of the paper are also accomplished by my
invention, the sheet being more advanta-
geously treated and more effectively dried
40 than by expressing water by mechanical
compression alone, thus leaving less mois-
ture to be evaporated by the driers.

Other important advantages of my in-
vention are that the life of the felts is pro-
45 longed, and the necessity of frequent wash-
ings of the first felt avoided; also that the
construction of the press section of the ma-
chine is simplified.

The invention will be hereinafter de-
50 scribed with reference to the accompanying
drawing, and particularly pointed out in the
appended claims.

The drawing is a diagrammatic illustra-
tion of a paper making machine embodying
55 my invention, being what I now consider the
best mode of applying the principle thereof.

In said drawing the reference numeral 1
indicates the endless screen or making wire
of a Fourdrinier wet machine of the type
disclosed in my pending application, Serial 60
No. 521,535, filed October 7, 1909, the spe-
cial characteristic of which is the elimina-
tion of the usual couch rolls with their ac-
cessories, including the customary equip-
ment of flat suction boxes, and the provi- 65
sion of a revolving suction roll 2 at the de-
livery end of the making wire, which passes
around and is driven thereby; said suction
roll being adapted to maintain vacuum or
suction on a portion of its cylindrical sur- 70
face in contact with or traversed by the sheet
on the making wire, as indicated at 2^a, and
being connected with a pumping apparatus,
(not shown) adapted to maintain a substan-
tially uniform vacuum while handling large 75
volumes of air and water, so as to force a
large amount of air uniformly through the
sheet, whereby the sheet is evenly closed
and dried and more effectively than by com-
pression between the usual couch rolls, as 80
explained in my application above referred
to. In the drawing the fore part of the
making wire, its supporting table rolls and
the deckle straps, as well as the front breast 85
roll and flow box, are omitted; only so much
of the wet machine being shown as lies be-
tween the deckle pulleys and the first felt.
After passing over the vacuum surface of
the suction roll 2, the sheet is taken from 90
the making wire by hand or mechanically,
being preferably blown off by a blast pipe
inside the roll, and is deposited upon an en-
dless felt 3 or other suitable carrying me-
dium, hereinafter called the first felt, which 95
is tensioned by a system of rolls 4 and driven
by a suction roll 6. This felt carrying the
sheet of paper passes between a suction roll
6 and coacting press roll 7, so that said rolls
100 6 and 7 take the place of the usual first pair
of press rolls, the felt serving its usual func-
tions as a supporting and carrying agent
and moisture absorbing medium; however,
in this instance the sheet is subject not only
to compression between said rolls but also 105
to the action of vacuum in passing over the
vacuum area 6^a, that is the portion of the
surface of the suction roll 6 which is ex-
posed to the effect of the internal suction,
said suction roll being, of course, connected 110
with a suitable pump.

The suction roll 6 has its suction chamber
so arranged that the vacuum area 6^a extends

on both sides of the bite or point of contact of the rolls, the purpose of which is to remove or extract water and air from the felt or carrying agent on the approaching side and to hold the sheet down upon the felt or carrying agent on the opposite or departing side, preventing it from following and clinging to the press roll 7. Hence the action of the suction roll 6 is not only to dry the sheet of paper, but also to dry the felt and to hold the paper in contact with the felt. The objectionable accumulation of water at the bite of the rolls is of course prevented, and it is also found that the use of the suction roll in the relation stated exerts a cleansing action upon the felt which dispenses with the need of daily washing, as is common practice.

A second felt or carrying agent 8 tensioned by a system of rolls 9 passes around and is driven by a suction roll 10 which coacts with the roll 5 and with another roll 11, being arranged between them. Both of the rolls 5 and 11 are, like the roll 7, press or squeeze rolls. The suction roll 10, connected with a suitable vacuum pump, is equipped with two suction chambers or their equivalent, so as to provide suction areas 10^a and 10^b, one adjacent the press roll 11. The vacuum area 10^a extends on both sides of the bite or point of contact of rolls 5 and 10, while the vacuum area 10^b lies on the side of the bite between rolls 10 and 11 which is approached by the sheet in its transit. The action of the suction chamber 10^a is to remove by vacuum any surplus moisture and air from the first felt 3, as well as from the sheet of paper, and to cause the sheet to cling to the second felt 8 after having passed the bite. The second felt carrying the sheet, then passes over the suction chamber 10^b by means of which air and water is removed from the said second felt and disposed of; but after the paper has passed the bite of rolls 10 and 11 there is no further tendency for it to cling to the felt, and the roll 11 will pick the sheet from the felt and carry it around said roll from which it is removed to the driers 13; or coacting with the roll 11 there may be an additional roll 12 of rubber, stone, wood or composition. The paper passes bare between these rolls 11 and 12 which smooths out any impressions of the felts.

It will be noted that the felts 3 and 8 are arranged to take the sheet on opposite sides, obviating the difficulty of tipping the paper over in order to get the smoothing effect and pressure on both sides of the sheet. In the combination shown five rolls perform the functions of the six press rolls of the ordinary Fourdrinier machines, such machines being commonly equipped with three pairs of press rolls, the sheet being usually carried on felts through the first and second

presses and often taken bare through the third press.

It is obvious that the system illustrated may be extended as may be found advantageous, using any number of suction rolls coacting with squeeze rolls that may be desired.

The action of the machine is entirely automatic in carrying the sheet of paper after it is passed on to the first felt and through the presses until the time for the removal of the same; and no breaks of the paper can likely occur on the felts, so that the machine can safely be run at high speed.

The squeeze rolls coacting with the suction rolls may be moistened to keep their surfaces in condition, and may be supplied with the usual doctors to prevent the paper from carrying around said rolls when it is first passed through them. Any suitable type of suction roll mechanically adapted to operate with heavy vacuum and to maintain vacuum on a portion of a cylindrical surface may be used. I prefer the type of suction roll disclosed in my Reissued Patent No. 1300, dated April 19, 1910, in combination with a positive rotary vacuum pump as set forth in my pending application, Serial No. 521,535, aforesaid. It will be understood the effective vacuum surfaces of the rolls are no wider than the sheet of paper, for which purpose, on account of the different widths which are manufactured, the suction chambers of the rolls should be provided with adjustable end packing heads, as well understood in the art; an illustration being given in my said pending application.

While the preferred and most advantageous embodiment of my invention is with a Fourdrinier web machine of the character herein noted, it may also be advantageously applied to ordinary Fourdrinier and other types of paper machines; the arrangement of the felts and coacting suction and squeeze rolls may also be modified in a variety of ways, and the number of coacting rolls also varied; thus in its broadest aspect my invention comprehends the first felt 3 and coacting rolls 6 and 7, or any equivalent arrangement, without essentially including the second felt and rolls 5, 10, 11; hence I do not intend to restrict myself to the specific construction illustrated and described.

I claim as my invention and desire to secure by Letters Patent:

1. In a paper machine, a suction roll, and felt or other carrying agent which passes with the sheet over and covers the vacuum area of said suction roll, and a press roll in contact or coacting with the suction roll where suction is taking place.

2. In a paper machine, a felt or other carrying agent for the sheet, and a suction roll having a vacuum area covered by said felt and coacting press or squeeze roll between

which the felt or carrying agent passes with the sheet, the vacuum area of the suction roll extending to both sides of the bite or point of contact of said rolls, for the purpose of removing water and air from the felt or carrying agent on one side and holding the sheet down upon the felt or carrying agent on the other side.

3. In a paper machine, a felt or other sheet carrying agent, and a suction roll having a vacuum area covered by said felt and coacting press roll between which the felt or carrying agent passes with the sheet, the suction roll being adapted to exert suction in advance of the bite or point of contact between the rolls so as to remove the water which is expressed.

4. In a paper machine, a felt or other sheet carrying agent, and a suction roll having a vacuum area covered by said felt and coacting press roll between which the felt or carrying agent passes with the sheet, the suction roll having vacuum surface behind the bite or point of contact of the rolls to hold down the sheet on the felt or carrying agent and prevent it from following the press roll.

5. In a paper machine, a felt or other carrying agent, two pairs of coacting rolls between which the felt or carrying agent passes with the sheet, each pair of rolls comprising a suction roll and a press roll, the suction rolls being arranged to apply suction to opposite sides of the sheet.

6. In a paper machine, a plurality of pairs of coacting rolls, each including a press roll and suction roll, and felt or other sheet conveying means passing with the sheet between each pair of rolls.

7. In a paper machine, a plurality of pairs of coacting rolls, each including a suction roll and press roll, and sheet conveying means passing with the sheet between each pair of rolls.

8. In a paper machine, a plurality of suction rolls and press or squeeze rolls coacting upon the sheet being made, the rolls of the several pairs being arranged to apply suction and pressure on both sides of the sheet.

9. In a paper machine, two felts or other sheet carrying agents from one of which the sheet is transferred to the other, and a suction roll and coacting press roll, the felts or carrying agents passing in the same direction between said rolls, whereby moisture is extracted by the pressure, the felts and the suction, and the transfer is effected by suction.

10. In a paper machine, a felt or other moisture absorbing sheet carrying agent, a press roll around which it passes, a second felt or other moisture absorbing carrying agent, a suction roll around which the latter passes, said rolls coacting where suction is taking place.

11. In a paper machine, a felt or other

moisture absorbing sheet carrying agent, a press roll around which it passes, a second felt or other moisture absorbing carrying agent, a suction roll around which the latter passes, said rolls coacting where suction is taking place, and said suction roll having a vacuum area on both sides of the bite or point of contact of the rolls, whereby water and air is removed at one side and the sheet is sucked onto the second felt on the other side of the bite.

12. In a paper machine, a felt or other sheet carrying agent, a press roll around which it passes, a second felt or sheet carrying agent, a suction roll around which the latter passes, having a vacuum area covered by said second felt, said rolls coacting where suction is taking place, and another press roll coacting with said suction roll at a point beyond.

13. In a paper machine, a felt or other sheet carrying agent, a press roll around or over which it passes, a second felt or sheet carrying agent, a suction roll around which the latter passes, said rolls coacting where suction is taking place, and another press roll coacting with said suction roll at a point beyond and where the suction area ends.

14. In a paper machine, two felts or other sheet carrying agents, coacting rolls on which they respectively pass, one being a press roll and the other a suction roll arranged to effect transfer of the sheet from one felt or carrying agent to the other, the vacuum area of said suction roll extending at both sides of the bite or point of contact of the rolls.

15. In a paper machine, a roll and a felt or other sheet carrying agent in contact therewith, a suction roll and a second felt or other sheet carrying agent in contact therewith, said rolls coacting where suction is taking place, and another press roll beyond coacting with said suction roll where suction is taking place.

16. In a paper machine, a roll and a felt or sheet carrying agent in contact therewith, a suction roll coacting with said roll and having a second felt or other sheet carrying agent in contact therewith, said suction roll having a vacuum area at both sides of the bite or point of contact between said rolls, and another roll coacting with said suction roll which also has a vacuum area in advance of the bite or point of contact of the suction roll and last mentioned roll.

17. In a paper machine, a felt or other sheet carrying agent, a suction roll and coacting press roll between which the felt or carrying agent passes with the sheet, another coacting suction roll and press roll between which the felt or carrying agent passes with the sheet, the last mentioned suction roll having a second felt or carrying agent thereon and being relatively ar-

ranged to transfer the sheet thereto from the first felt.

18. In a paper machine, a suction roll and plurality of rolls coacting therewith, and a felt or other sheet carrying agent passing with the sheet in contact with said suction roll and between it and the coacting rolls, said suction roll having a vacuum area on both sides of the bite of the first coacting roll and having a vacuum area only in advance of the bite of the last coacting roll.

19. In a paper machine, a suction roll and plurality of rolls coacting therewith, and a felt or other sheet carrying agent passing with the sheet in contact with said suction roll and between it and the coacting rolls, said suction roll adapted for application of suction at the bites of the coacting rolls but only in advance of the bite of the last coacting roll, whereby the sheet will follow the said last roll.

20. In a paper machine, a suction roll and a plurality of coacting rolls, a felt or other sheet carrying agent passing with the sheet between the suction roll and first coacting roll, and a second felt or other sheet carrying agent traveling in contact with said suction roll and passing between it and the second co-acting roll.

21. In a paper machine, a suction roll and a plurality of coacting rolls, a felt or other sheet carrying agent passing with the sheet between the suction roll and first coacting roll, and a second felt or other sheet carrying agent traveling in contact with said suction roll and passing between it and the other roll, there being no application of suction beyond the bite of the last coacting roll, and a press roll coacting with the said last roll to press and smooth the sheet after leaving the suction roll.

22. In a paper machine, a suction roll and a plurality of press rolls coacting therewith, and a felt or other sheet carrying agent covering the vacuum area of said suction roll

and passing with the sheet in contact with said suction roll and between it and the other rolls.

23. In a paper machine, a suction roll and coacting press roll, a felt or other sheet carrying agent passing with the sheet between said rolls, and a second felt or carrying agent passing in contact with the suction roll and adapted to take the sheet from the first felt, said suction roll exerting suction at the bite of each coacting roll.

24. In a paper machine, a suction roll and coacting press roll, a felt or other sheet carrying agent passing with the sheet between said rolls, the suction roll having thereon a sheet carrying agent covering the vacuum area of said suction roll and adapted to take the sheet from the first felt or carrying agent, and another press roll coacting with the suction roll and arranged to carry the sheet therefrom.

25. In a paper machine, the combination with means for forming the sheet, of a felt or other sheet carrying agent, and coacting rolls between which the same passes, with the sheet, including a suction roll and press roll, suction being exerted at the bite of said rolls, the vacuum area of said suction roll being covered by said felt.

26. In a paper machine, the combination with a making wire and suction roll over which it passes, of a felt or other carrying agent upon which the sheet is taken from the making wire, and coacting press and suction rolls between which the felt or carrying agent passes with the sheet, suction being exerted at the bite of said rolls, the vacuum area of said suction roll being covered by said felt.

In testimony whereof I affix my signature, in presence of two witnesses.

WILLIAM H. MILLSPAUGH.

Witnesses:

H. D. JAMESON,
O. J. WORTH.