

(No Model.)

4 Sheets—Sheet 1.

R. W. MONCRIEFF.
SUCTION BOX FOR PAPER MACHINES.

No. 504,885.

Patented Sept. 12, 1893.

Fig. 5.

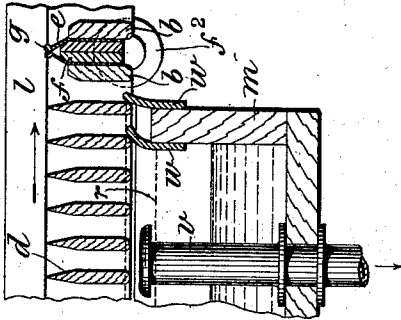


Fig. 1.

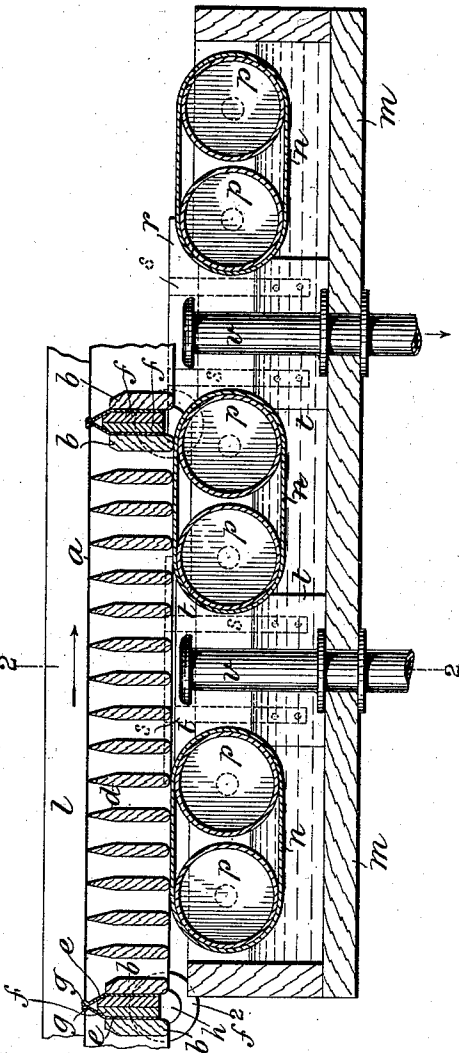
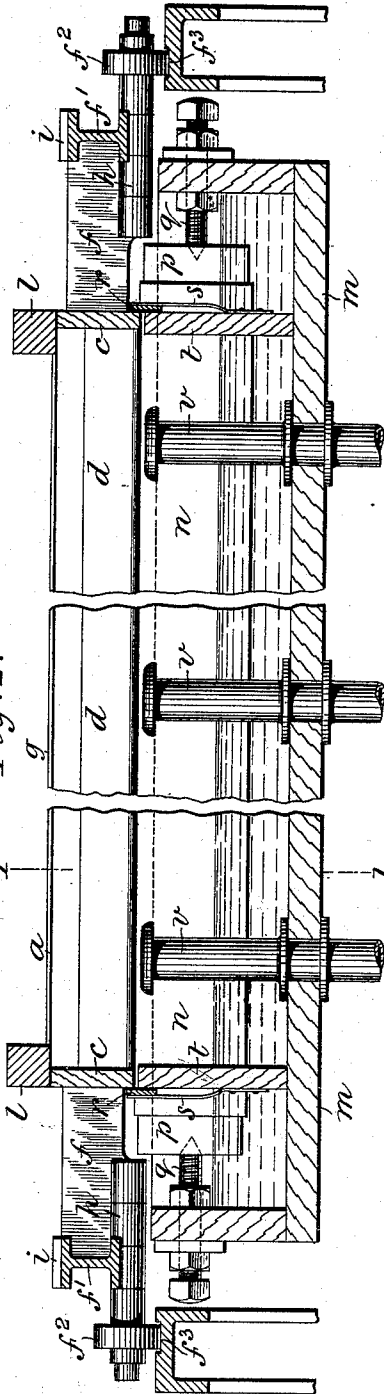


Fig. 2.



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INVENTOR:

Robert Wighton Moncrieff,
By his Attorneys:
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(No Model.)

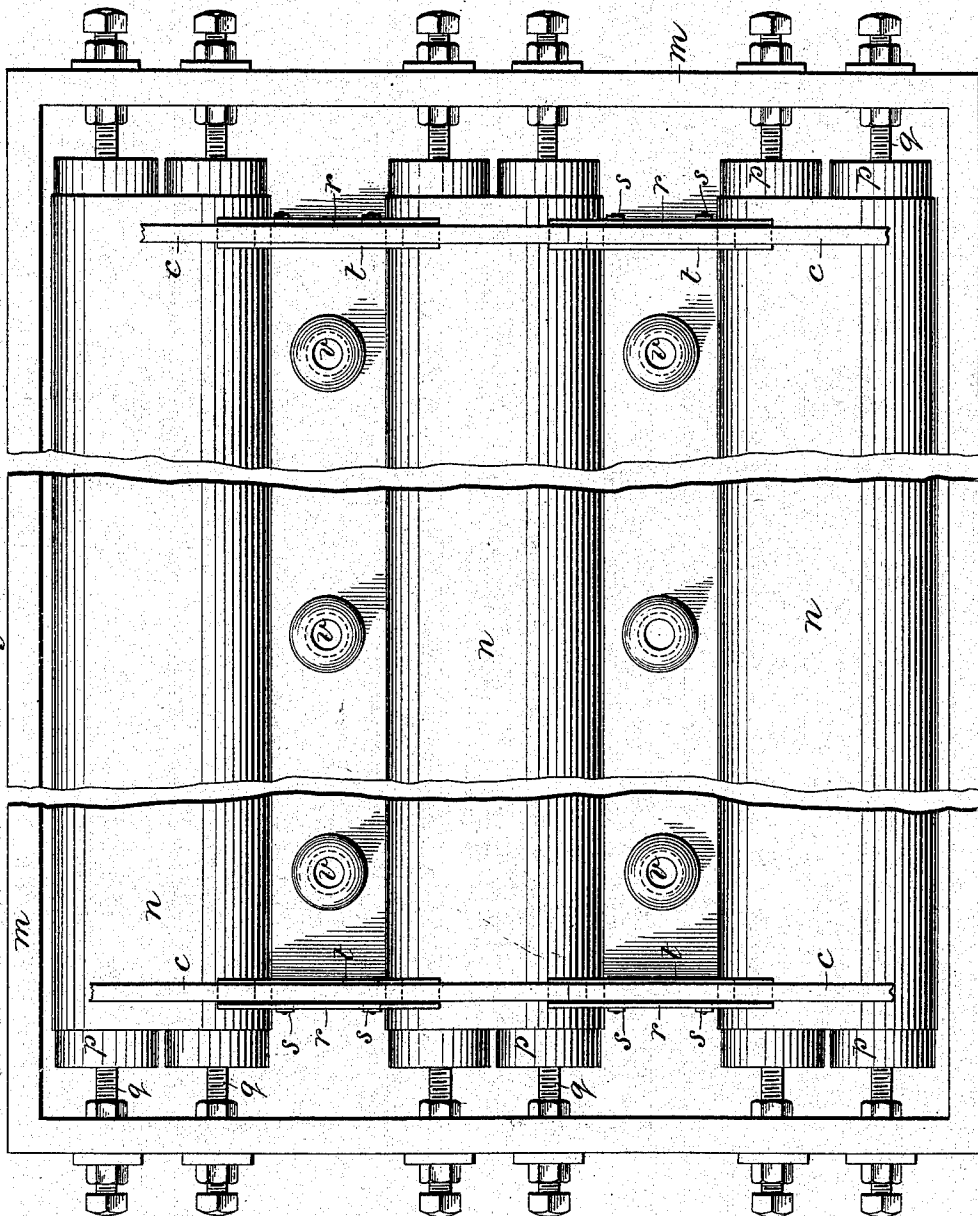
4 Sheets—Sheet 2.

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Fig. 3.



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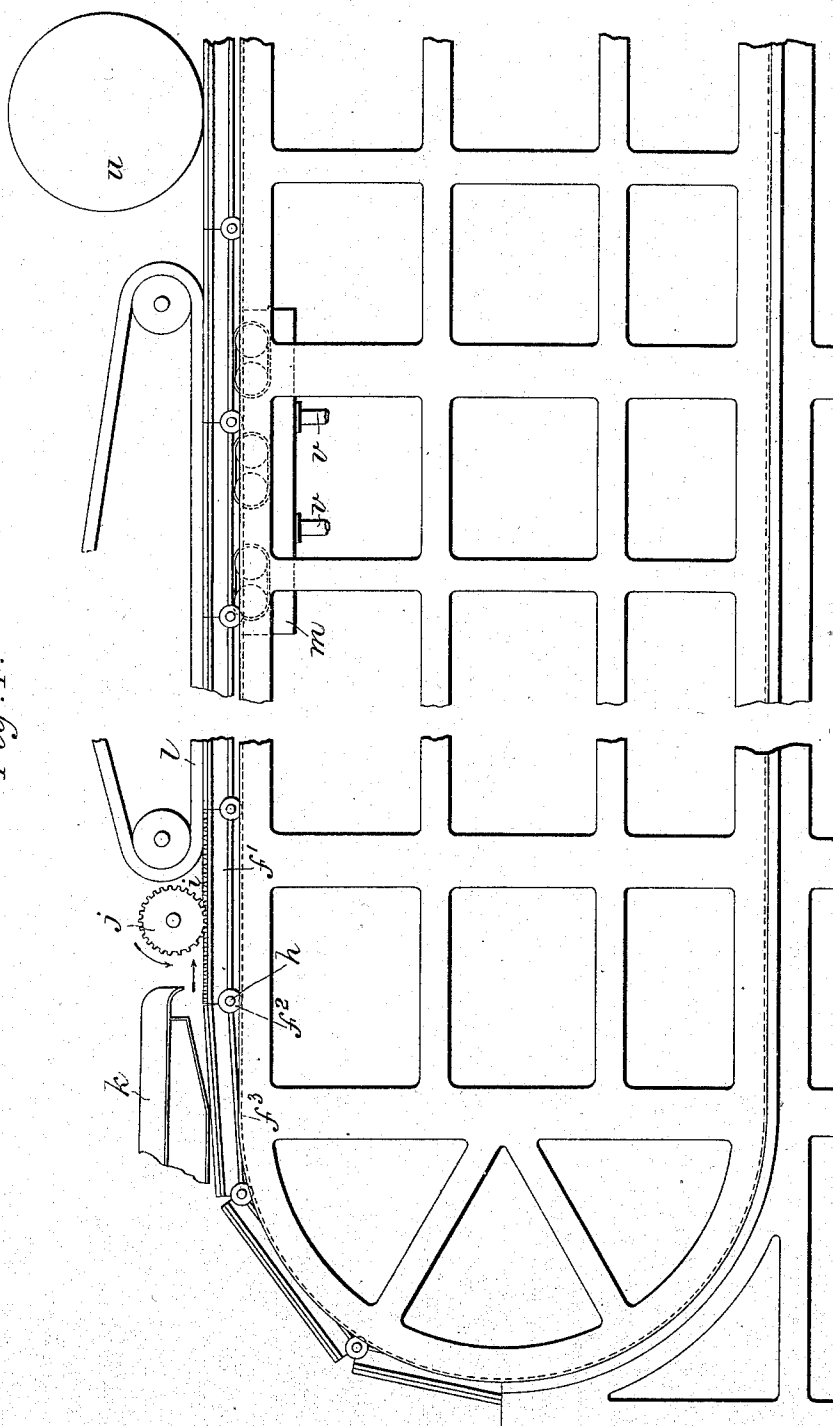
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Fig. 4.



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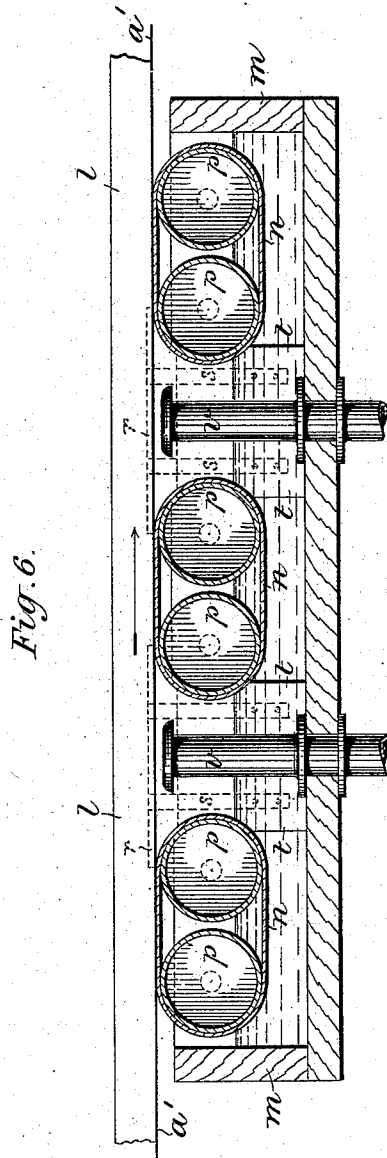
(No Model.)

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UNITED STATES PATENT OFFICE.

ROBERT W. MONCRIEFF, OF MANCHESTER, ENGLAND.

SUCTION-BOX FOR PAPER-MACHINES.

SPECIFICATION forming part of Letters Patent No. 504,885, dated September 12, 1893.

Application filed November 21, 1892. Serial No. 452,739. (No model.)

To all whom it may concern:

Be it known that I, ROBERT WIGHTON MONCRIEFF, of Manchester, England, have invented certain new and useful Improvements in Suction-Boxes for Paper-Machines, of which the following is a specification.

My invention has reference to paper making machines and its object is to provide more efficient means for extracting the water or moisture from the pulp while upon any suitable interstitial paper former, as traveling paper making molds or upon an endless paper making wire web, and also to reduce the wear and tear of molds or machine wire web. It is applicable to machines of the kind in which are employed separately laid or woven molds hinged or connected together so as to form an endless series or chain of traveling molds which successively receive the pulp from a pulp box or other source of supply and also to machines of the kind in which an endless wire web is employed as in a Fourdrinier machine.

The improvements consist in the construction of the machines with an airtight or sealed vacuum chamber below the line of travel of the molds or endless wire web (as the case may be) between the pulp supply and the couching roll or point where the paper quits the molds or wire web, the top of the said airtight or sealed chamber being formed partly by the pulp itself and partly by the under side of the dekle straps, the bottom by the water in a suction box fitted with suction pipes, the sides by contact beds or surfaces beneath the paper former of a more or less yielding or elastic nature preferably consisting of thin flexible sheets or belts of air tight material exposed to the air at one side and at the other contacting with the under side of the paper former, with which in the case of separate mold machines the lower edge of the cross bars and frames of the molds, and in the case of endless wire web machines the under side of the wire web, come in close contact, at a plurality of points which beds cover a plurality of the interstices of the paper former and extend substantially across the entire under face of the paper former, and the ends by devices which are situated in the suction box and press against the side edges of the paper former, that is, in the separate

mold machine, against the mold edges, and in the endless wire web machine against the wire web edges. The beds or surfaces of a more or less yielding or elastic nature with which the lower edges of the frames and cross bars of the molds or the under surface of the endless wire web (as the case may be) come in contact so as to form the sides of the air tight chamber, preferably consist of endless belts of india rubber or other suitable material passed round light rollers that are free to turn on axes which are at right angles to the line of travel of the molds or endless wire web, so that as the molds or wire web travel the close contact with the belt causes the rollers to rotate and the belt to travel. A constant joint is thus formed over a considerable area the extent of which will depend upon the length of the belt. In the separate mold machine the frames and cross bars of the molds are made exactly level at the bottom and deep enough to come below the level of the under edge of the traveling links or frames by which they are carried.

In the accompanying drawings:—Figure 1 is a section taken longitudinally on the line 1—1 of Fig. 2 (the suction pipes being in elevation) of a portion of a paper making machine constructed with separate molds and having a suction box, suction pipes and air tight or sealed chambers arranged in accordance with the preferred form of my invention. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a plan of the suction box and of the devices fitted therein, parts of the end frames of the mold being also seen. Fig. 4 is a diagrammatic partial side elevation on a smaller scale of the paper making machine and illustrating the general arrangement of the machine and the position of the suction box. Fig. 5 is a fragmentary section on the same line as Fig. 1 illustrating a modification. Fig. 6 is a longitudinal section, the same as Fig. 1, but illustrating the application of my invention to an endless wire web machine.

Referring first to the machine illustrated by Figs. 1 to 4, wherein the paper former is as usual interstitial and consists of molds, each mold consists of the surface *a* of woven wire carried and supported by side frames *b*, end frames *c* and cross bars *d*. The side frames *b* are secured together with in-

terposed metal strips *ee* to bars *ff* placed transversely to the line of travel. The strips *ee* extend up to the level of the mold surface *a*, and the dekle wires *gg* are soldered or otherwise connected thereto. The bars *ff* to which the side frames *b*, *b*, of each mold are secured extend beyond said side frames and are connected by hinges *hh* to the corresponding bars *ff* of the adjoining molds to enable the molds to travel round the ends of the main framing of the machine as seen in Fig. 4. The two bars *ff* of each mold are connected at their ends to two bars *f'f'* placed at right angles thereto, and the four bars *ff'f'f'* thus connected constitute a traveling link or frame by which the corresponding mold is carried. The bars *f'f'* are formed with racks *ii* with which gear toothed wheels one of which is shown at *j* Fig. 4, these toothed wheels being driven by motion transmitted from any suitable prime mover. They impart a regular onward movement to the endless chain of molds, the racks on the bars *f'f'* of the molds coming successively into gear with said wheels. There are rollers *f²f²* on the frames *f'f'* to run in guides *f³f³* on the main framing of the machine.

k, Fig. 4, is the pulp box from which pulp flows in a uniform stream or sheet upon the molds as they successively pass under it.

ll are the dekle straps passing round guide rollers as usual.

All the parts above referred to in the description of the drawings are of known construction except that for the purpose of my invention the side frames *b*, *b*, end frames *c* and cross bars *dd* of the molds instead of being made as heretofore somewhat less deep than the bars *ff'f'f'* are made deep enough to come below the level of the under edge of these bars, and the said frames *b*, *b* and *c* and said cross bars *dd* must be exactly level at bottom, which has not hitherto necessarily been the case.

m is a suction box situated below the line of travel of the molds between the pulp box *k* and the couching roll *u*. The suction box shown in the drawings is arranged for the formation of two air tight or sealed chambers according to my invention, but the number of such chambers is optional; one will in many cases suffice while there may be more than two if thought desirable. The box *m* may be partly filled with and kept constantly supplied with water from any convenient source; its level while the machine is at work will be maintained at any suitable point in any usual manner. In the suction box are contact beds, those shown in Figs. 1 to 4 being three endless sheets or belts *nn* of air tight thin flexible india rubber or other suitable material, which contact at one side with the paper former and are exposed at the other side to the air. Each of these belts passes round two rollers *pp* that are free to turn on axes *qq* at right angles to the line of travel

of the molds. The under edge of the side and end frames and cross bars of each successive mold as this travels above the suction box bears closely upon each belt *n* in turn, and the rollers are thereby caused to rotate and the belts to travel. It will be readily understood that constant joints are thus formed between the belts *n* and the under edge of the mold frames and cross bars, and that in operation the air pressure forces the belts into intimate contact with the former when there is a suction in the box.

The belts constitute contact-beds extending substantially across the entire width of the under side of the paper former, and contacting therewith at a plurality of points whereby they cover a plurality of the interstices thereof to prevent leakage thereunder. The first belt and the second belt in conjunction with the successive cross bars *dd* and side frames *b*, *b* of the traveling molds form the two sides of the first air tight chamber and the second belt and the third belt (when such is employed) similarly form the two sides of a second air tight chamber. The water in the box *m* forms the bottom of the said chamber or chambers, and the pulp on the mold surface in conjunction with the dekle straps *ll* the top of same. The ends of the said chambers are formed by boards or blocks *tt* and rubber-faced plates *rr* in conjunction with the end frames *cc* of the molds; the plates *rr* are kept pressed by springs *ss* against the side edges of the paper former, this edge in the construction shown being the mold ends, the top of these plates just clearing the bottom of the bars *ff*. The springs *ss* are supported by the blocks *tt* which are fixed in the suction box *m*.

In each air tight chamber are the open ends of suction pipes *vv* which are connected with vacuum pumps. Three suction pipes to each chamber will generally be found a suitable number, but there may be a greater or lesser number. The open ends of the pipes *vv* should be as near as practicable to the mold frames and cross bars without coming in contact therewith. It will readily be understood that when communication is opened with the pumps a vacuum will be created in the air tight chamber and that the water or moisture in the pulp lying on the surface of the molds will be extracted as these molds pass successively over the said chamber.

In the modification represented in Fig. 5 the second side of the air tight chamber instead of being formed by contact of the mold frames and cross bars with an india rubber belt is formed by contact of said frames and cross bars with thin flexible air tight sheets or strips of india rubber or other suitable material *vv*, of which there may be two as shown, or more, fastened to the side of the suction box *m*.

In Fig. 6, *a'* represents an interstitial paper former consisting of an endless wire web which as it travels is in close contact with the

upper surface of the endless belts *n n*. The plates *r r* are at such a position that they press partly against the side edges of the web *a'* and partly against the dekle straps *l*.

5 What I claim, and desire to secure by Letters Patent, is—

1. In a paper making machine, the combination with a traveling interstitial paper former, of a suction water box below the line
10 of travel of said paper former, a suction pipe in said box, and a bed in said box consisting of a thin flexible sheet of air tight material contacting at one of its sides with the under side of said paper former across substantially
15 the entire width of the under face thereof and exposed to the air at its other side, said sheet, when a suction is created in said box, pressing under the pressure of the outer air tightly against the under side of said paper former
20 where it contacts therewith, and thereby preventing leakage into the suction box, substantially as and for the purpose set forth.

2. In a paper making machine, the combination with a traveling interstitial paper
25 former, of a suction box below the line of travel of said paper former, a suction pipe in said box, and plates contacting with the side edges of said paper former to prevent leakage at said edges into said box, substantially as
30 and for the purpose set forth.

3. In a paper making machine, the combination with a traveling interstitial paper former, of a suction box below the line of
35 travel of said paper former, a suction pipe in said box, beds in front of and behind said pipe each contacting with the under side of said paper former across substantially the entire width of its under face, each contacting with its said face at a plurality of points,
40 whereby each covers a plurality of interstices of said paper former and prevents leakage between the latter and the beds into said box, and plates contacting with the side edges of said paper former and preventing leakage
45 at said edges into said box, substantially as and for the purpose set forth.

4. In a paper making machine, the combination with a traveling interstitial paper former, of a suction box below the line of

travel thereof, a suction pipe in said box, and
50 beds in front of and behind said suction pipe contacting with the under face of said paper former to prevent leakage under the latter, and consisting of endless belts *n* contacting with said paper former across substantially
55 its entire under face, and rollers *p* carrying said belts, substantially as and for the purpose set forth.

5. In a paper making machine, the combination with an endless traveling interstitial
60 paper former consisting of a plurality of molds hinged together and having surface *a* of woven wire carrying a wet web of paper, frames *b*, edge frames *c*, and cross-bars *d* supporting said surface *a*, of track *f*³ carrying said former
55 horizontally throughout a portion of its travel, suction box *m* beneath said former at the point of its horizontal travel, a suction pipe *v* within said box, flexible beds at each side of said suction pipe contacting with the under
70 faces of a plurality of said cross-bars *d*, and extending across substantially the entire width of the paper former to prevent leakage between the latter and said beds into
said box, boards *t* beneath said edge frames *c*
75 of the paper former between said beds, and plates *r* contacting with the outer sides of said boards and the outer edge frames *c* of the paper former, and closing the joint there
80 between to prevent leakage into said box at the edges of said paper former, all combined and arranged substantially as and for the purpose set forth.

6. In a paper making machine, the combination with a traveling paper former of the
85 suction box *m*, suction pipes *v*, rollers *p p*, endless traveling belts *n n* adapted to form close contact with the under side of said paper former, boards *t t* and plates *r r* kept in contact with the sides of said paper former sub-
90 stantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT W. MONCRIEFF.

Witnesses:

FRED MARTIN,
WILLIAM KAY.