

No. 711,815.

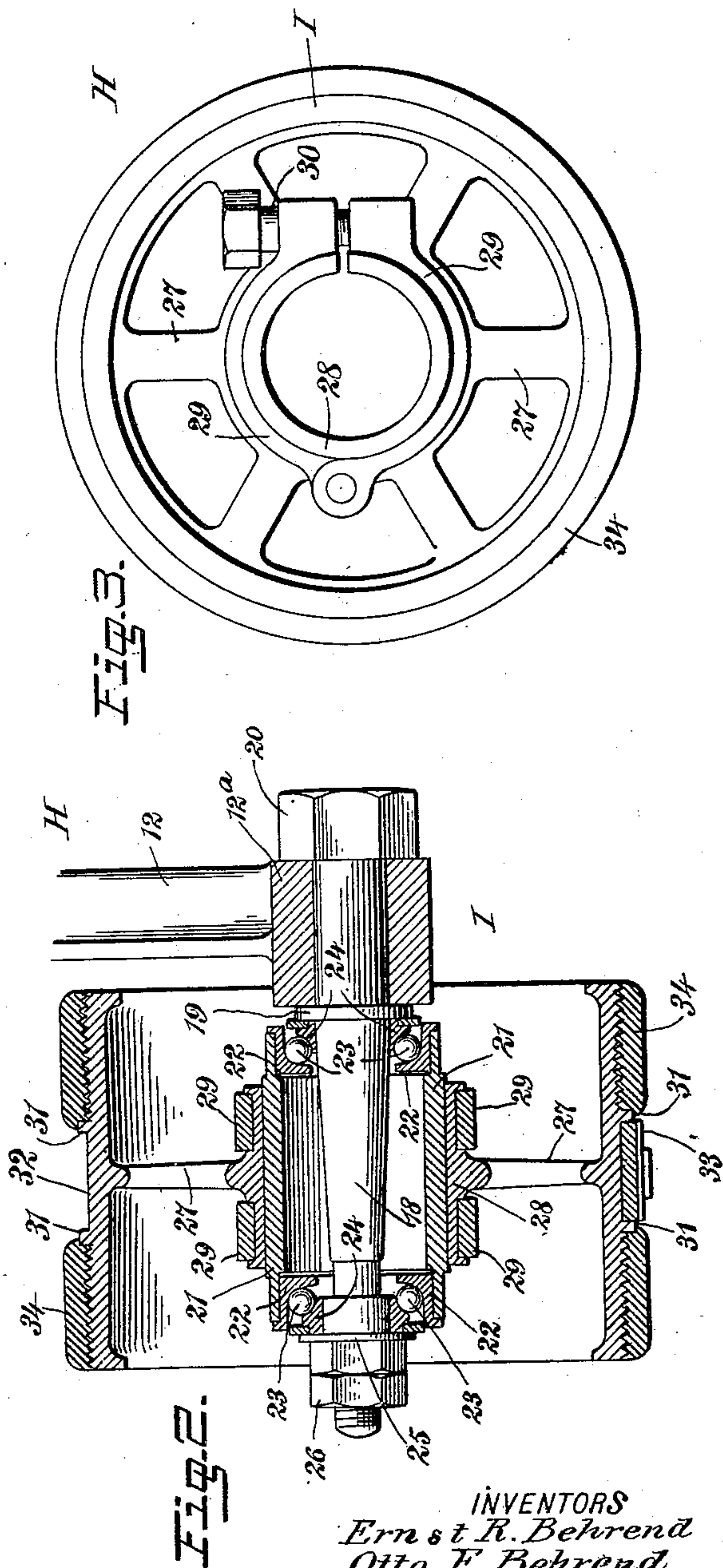
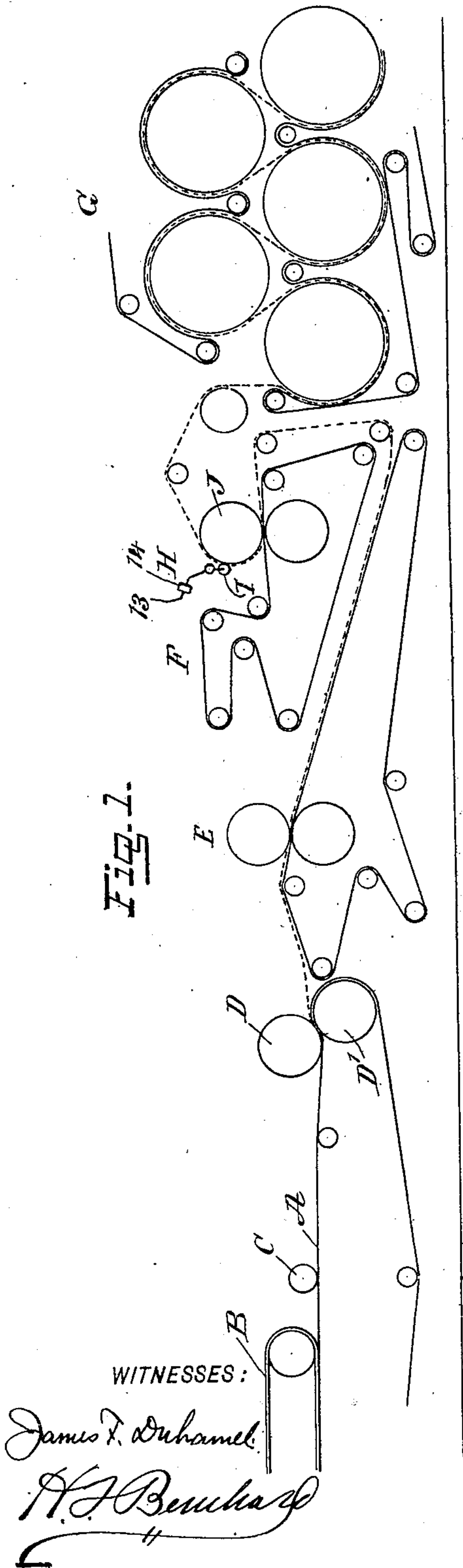
Patented Oct. 21, 1902.

E. R. & O. F. BEHREND.
DEVICE FOR WATERMARKING PAPER.

(Application filed Feb. 19, 1902.)

2 Sheets—Sheet 1.

(No Model.)



No. 711,815.

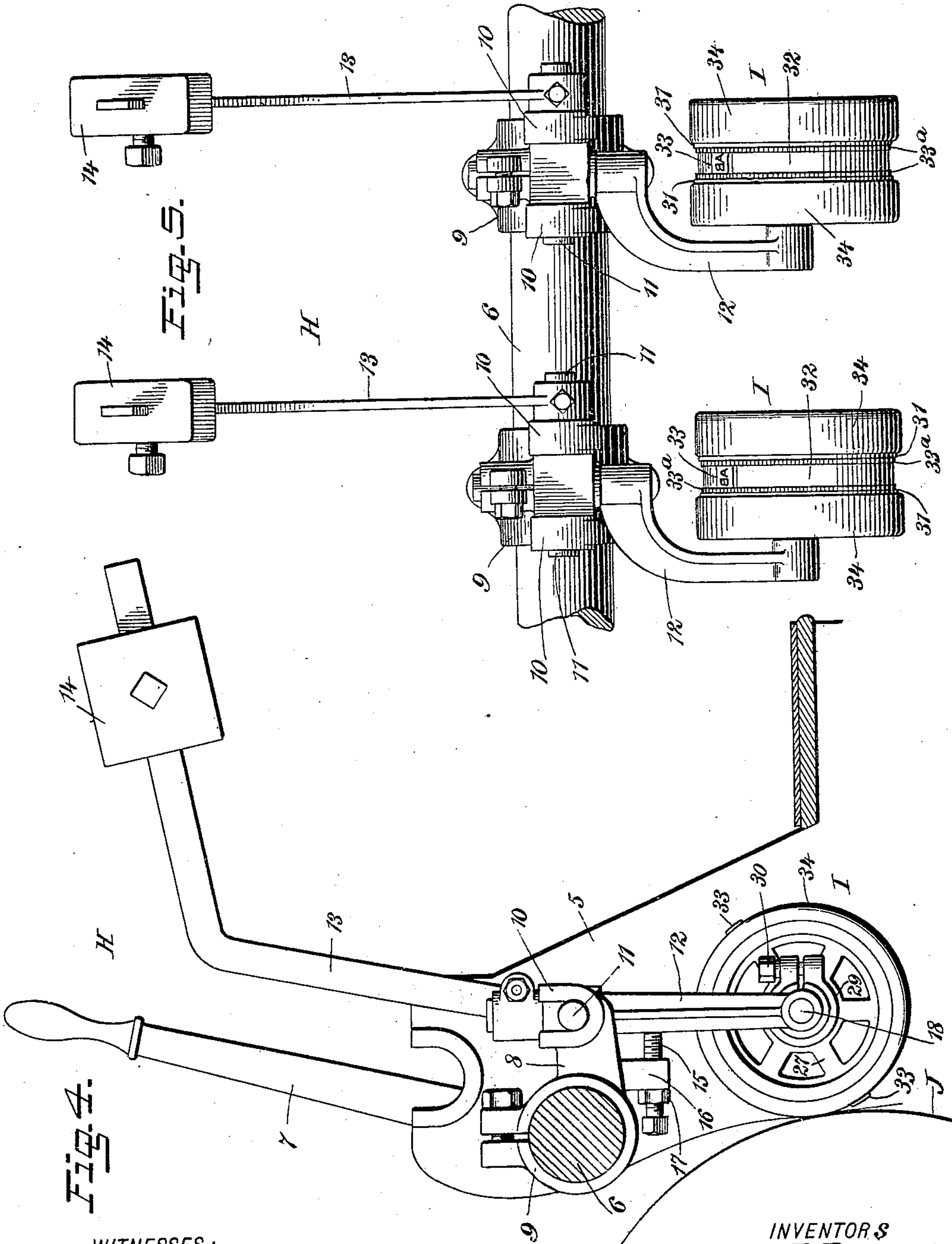
Patented Oct. 21, 1902.

E. R. & O. F. BEHREND.
DEVICE FOR WATERMARKING PAPER.

(Application filed Feb. 19, 1902.)

2 Sheets—Sheet 2.

(No Model.)



WITNESSES:

James I. Duhamel.
H. J. Berchard.

INVENTORS
Ernst R. Behrend
Otto F. Behrend
BY *[Signature]*
ATTORNEYS

UNITED STATES PATENT OFFICE.

ERNST R. BEHREND AND OTTO F. BEHREND, OF ERIE, PENNSYLVANIA.

DEVICE FOR WATERMARKING PAPER.

SPECIFICATION forming part of Letters Patent No. 711,815, dated October 21, 1902.

Application filed February 19, 1902. Serial No. 94,852. (No model.)

To all whom it may concern:

Be it known that we, ERNST R. BEHREND, a citizen of the United States, and OTTO F. BEHREND, a subject of the Emperor of Germany, both residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Devices for Watermarking Paper, of which the following is a full, clear, and exact description.

Our invention relates to a watermarking device for paper-making machines by which we are able to secure a genuine water-mark by compression of the paper fibers in a paper-web while it is yet in a damp condition, such compression of the fibers to make the water-mark taking place after the paper-web has passed the couch-rolls and before it enters the calenders.

Our invention involves the application of a watermarking-roll to a paper-making machine at a point between the couch-rolls and the calenders, said roll arranged to be held by a suitable pressure device against a damp or moist web of paper on a moving cylindrical surface, such as a drying-roll or a press-roll of the paper-making machine, or over a flat surface, such as a band, said watermarking-roll being rotated on its axis in any suitable way.

The described application of a watermarking device to a paper-machine may take place at any suitable point between the couch-rolls and the calenders—as, for example, at a point opposite to a roll in the first, second, or third press of a paper-making machine in case as large a number of presses as three are used—although we do not confine ourselves to this particular point of application of the watermarking device, because under some circumstances we may place said marking device opposite to a drier or one of the rolls of the drier or press part, according to whichever position is the most suitable.

It is well known to those skilled in the art that the process of making paper on a paper-making machine is practically divided into four steps—first, forming the web of paper, which is accomplished on an endless band of wire-netting having very fine meshes; second, pressing the embryo paper-web in order to express the surplus water therefrom; third,

drying the paper-web in order to evaporate the water which is present in the web after it leaves the presses, and, finally, calendering the web, so as to finish it previous to forming the web into rolls or sheets.

So far as we are aware the operation of watermarking the paper as ordinarily practiced is to bring a wire-covered roll carrying suitable designs into contact with a very soft mass of pulpy paper while it is being carried on the endless band of wire-netting. At this step the paper is just beginning to form, so that it is in a very soft condition and readily takes an impression when making certain grades of paper. On other grades of paper it is almost impossible to secure a good plain water-mark when the paper is treated to secure the water-mark impression at the forming stage on the endless wire band of netting. We are also aware that it has been proposed to water-mark paper by means of devices situated between the dandy and couch rolls and at or near the dandy-roll, so that the embryo paper-web will have the desired impression imparted thereto before it passes through the couch-rolls. It has also been brought to our attention that means have been provided for watermarking paper after it shall have passed through the entire machine and is in a perfectly dry condition.

From the foregoing explanation it will be seen that a watermarking device has been placed opposite to the endless wire-netting at a point between the dandy-roll and the couch-roll and, second, that a watermarking device has been applied to operate on the paper as it passes between the first and second rolls of the calenders, such last-mentioned watermarking device operating on the paper-web during the calendering or finishing operation and after it shall have been dried more or less thoroughly.

It is to be understood that the old process thus far described involves the watermarking of paper at the opposite extremities of the machine—namely, when the paper is first forming and after it has been fully formed and dried.

To enable others skilled in the art to understand our invention, we have illustrated one embodiment thereof in the accompanying drawings, forming a part of this specification,

in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a skeletonized view of a part of a paper-making machine illustrating the application of our watermarking device to the second press. Fig. 2 is an enlarged vertical transverse section through one form of the watermarking-roll. Fig. 3 is an end elevation of the roll shown in Fig. 2. Fig. 4 is an enlarged sectional elevation through a part of the paper-making machine, illustrating one embodiment of means for operatively mounting the watermarking-roll; and Fig. 5 is an elevation at right angles to Fig. 4, illustrating one construction by which a series of watermarking-rolls may be individually mounted on a single shaft, so as to be adjusted simultaneously thereby.

In the ordinary paper-making machine (illustrated partly by Fig. 1) the endless wire-netting is indicated by the reference-letter A, and the deckle-strap is indicated at B. In the rear of the deckle-strap and above the endless wire-netting is the dandy-roll C, and the coacting couch-rolls D D' are at the rear end of the endless wire-netting. The paper-machine herein shown embodies two presses, (indicated at E and F for the first and second presses, respectively,) and in the rear of the second press is located one or more driers, one of said driers being indicated at G. It will be understood, however, that the watermarking device may be employed with a paper-making machine using one, two, or three presses, or more, or with a paper-making machine having one or more driers.

Our invention contemplates the employment of a watermarking device, which is indicated in its entirety by the reference-letter H and which is located at a point to operate on the paper while it is in a damp condition and after it shall have passed beyond the couch-rolls D D'.

In a paper-machine having two presses we prefer to locate the marking device H opposite to a roll of the second press; but if the machine employs three presses it is preferable to locate the marking device opposite to a roll of the third press. It may sometimes be desirable, however, to locate the marking device opposite to the first press or at the first or second driers, and it will therefore be understood that we reserve the right to locate the said marking device opposite to the paper-web at a point between the couch-rolls and the calenders.

We will now proceed to describe one specific embodiment of means for watermarking the paper, reference being had more particularly to Figs. 2, 3, 4, and 5.

The numeral 5 indicates part of the framework of the paper-making machine, in which is journaled a transverse shaft 6, to one end of which shaft is attached a hand lever or crank, (indicated at 7.) One or more outwardly-extending hangers or arms 8 are clamped, as at 9, to this transverse shaft, and

said hangers or arms are each bifurcated or forked and are provided with upwardly-opening bearings 10, the same being adapted to receive the pivots or trunnions 11 of the roll-carrying arms 12, the latter being arranged to depend below the supporting hangers or arms 8.

The watermarking-roll (one or more of which may be used) is indicated by the reference character I, and it is idly or loosely mounted on the lower end of one depending arm 12. This watermarking-roll is held under pressure and against the surface of the paper-web, the latter passing around a revoluble roll, such as J, which forms a part of the paper-making machine, and in Figs. 1, 4, and 5 this tension device is shown in the form of an upwardly and rearwardly extending bent arm 13, which is adapted to carry an adjustable weight or counterpoise 14. It will be understood, however, that the particular form of tension or pressure device may be varied within wide limits, and that we reserve the right to substitute a spring for the weight herein shown.

The movement of the depending arm 12 toward the roll J and under energy of the tension device is regulated by the employment of an adjustable stop, which is shown in the form of a set-screw 15, which is mounted in a depending lug 16 of the outwardly-extending hanger or arm 8. This set-screw is adjustable in the lug to lie in the path of the roll-carrying arm 12, and said set-screw is confined at its adjusted position by the check-nut 17. (See Fig. 4.)

The watermarking-roll is supported laterally of the arm 12 by the arbor 18, the same having a collar 19, adapted to abut against an eye 12^a at the lower extremity of the arm 12. Through this eye passes one end of the arbor, which receives a clamping-nut 20, said nut and the collar cooperating with the eye-formed end of the arm to clamp the arbor firmly on said arm. (See Fig. 2.)

21 designates a sleeve or bushing which is provided at its end portions with the ball-bearing cups 22, adapted to receive the bearing-balls 23, which ride upon the cones 24, that are fitted to the projecting portion of the arbor 18, whereby the sleeve or bushing is adapted to rotate with great freedom upon the arbor. A washer 25 is fitted on the arbor to engage one of the ball-bearings, and this washer is held in place by the nuts 26, whereby the sleeve or bushing may be readily dismounted from the arbor.

The watermarking-roll I is a cylinder having radial arms 27, which are joined to a hub 28, that is adapted to fit the sleeve or bushing 21, and this hub of the watermarking-roll is secured upon the sleeve or bushing 21 by the clamps 29, (see Figs. 2 and 3,) each clamp having a screw or bolt 30. The external active surface of the roll I is provided with the annular circumferential ribs or flanges 31, which are arranged parallel to

each other on opposite sides of the transverse center of said roll, thus reserving a space 32, which is adapted to receive the type 33, as indicated in Figs. 2, 4, and 5.

5 The type or type-plates may be secured to the roll I by any suitable means, such as by screws; but in Fig. 5 we have shown elastic bands 33^a for holding the type-plate in the reserved space 32 of the roll.

10 The active surface of the roll is, furthermore, provided with the cushions 34, which may be of rubber or other suitable material and secured or attached to the roll on opposite sides of the circumferential flanges 31.

15 It is evident that we may employ as many of the watermarking-rolls as are necessary, owing to the width of the web or sheet of paper. In Fig. 5 we have represented a series of these marking-rolls I individually mounted
20 in a detachable manner on the shaft 6, whereby the rolls may be separately dismounted as desired. These rolls are individually hung or pivoted in the hangers 8, so as to be held by their tension devices in engagement with
25 the damp or moist paper-web after the latter shall have been fully formed and subjected to the action of the couch-rolls, one or more presses, and partly to the action of the drier or driers, whereby the type are adapted to
30 coöperate with the roll J to compress the fibers of the damp or moist web of paper and to produce therein a sharp and well-defined water-mark. It is evident that the shaft 6 may be rocked or adjusted by the lever 7, so
35 as to make the series of hangers 8 withdraw the rolls I from engagement with the paper-web, thus simultaneously moving all the rolls of the series to inactive positions.

40 Although we have shown and described a series of rolls on the rock-shaft 6, it is evident that a single roll may be used and that this one roll may be of any desired length, so as to extend either part way or entirely across the machine.

45 In our invention each roll is intended to contain one, two, or more removable and interchangeable types or designs, the same being made of rubber or other suitable material, as most preferred, and secured in a suitable
50 way to the surface of the roll between the flanges 31. Each roll is driven separately—as, for example, by contact with the paper-web or with the opposing roll J of the paper-making machine, but it is evident that the
55 roll may be driven by any suitable form of gearing.

The pressure of the marking-roll, which is of comparatively small diameter with relation to the roll J, is determined and regulated
60 by the spring or weight tension device. In our case the small marking-roll is independent of the machine and of all other marking-rolls which may be embodied in the machine. It is not necessary to change the rolls to produce a new design, because the type may be
65 fastened to small plates, which can be attached to or detached from the marking-roll

at pleasure. The detachable type are quite inexpensive and any desired number of them may be attached to the roll.

70 In a paper-making machine we secure the best results by having the watermarking-roll driven frictionally by contact with the moving or traveling paper-web and by mounting said watermarking-roll on ball-bearings or
75 their equivalents, so as to rotate with great freedom. At the same time this frictionally-driven and freely-revoluble roll is held in active position by a tension device, which makes the roll operate under pressure on the wet pa-
80 per-web.

The cushion-surfaces of the marking-roll secures the desired frictional engagement between the roll and the moving web of paper, and as this roll is revoluble with great free-
85 dom it is possible to secure a peripheral speed of the roll equal to the lineal speed of the moving paper-web. This is a very advantageous feature of the improvement, because the marking-roll is prevented from “drag-
90 ging” on the paper-web, so that the water-mark in the paper-web is exceedingly clear and distinct, the machine can be run or operated at practically unlimited speed and the productive capacity of the apparatus thereby
95 increased, and all liability of the paper-web becoming torn or mutilated is obviated.

One of the important features of our invention is that the watermarking-roll is placed in a position to operate effectively on the
100 work after the paper-web is fully formed and while it is in a wet condition, thus making the device operate under the most favorable circumstances to secure a superior quality of watermarked paper. As is well known, the
105 spread-out sheet of pulp-stock deposited on the shaking and traveling endless wire (indicated at A) of the ordinary Fourdrinier machine is carried to and between the couch-rolls D D', and at this point the sheet of
110 pulp-stock is converted into a continuous wet paper-web, after which it is subjected to the action of the presses (one or more) in order to express the surplus moisture from the web. According to our invention the web of
115 paper is watermarked before it is exposed to the drying action of the heated driers (at J) and while said web is in its wet condition and subsequent to the complete formation of the product by the couch-rolls. This means
120 for treating the production enables us to secure a sharply-defined, ineffaceable, genuine water-mark in the paper-web, which result cannot be secured by the ordinary method of watermarking paper by the usual dandy-
125 roll. Paper produced on a machine equipped with our improvements cannot have the water-mark obliterated or seriously impaired when subjected to the severe caustic-soda test well known to those skilled in the art of
130 making paper.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A paper-making machine having a marking-roll provided with type-faces arranged to attenuate a paper-web along the lines of the water-mark, said marking-roll being situated
5 between the couch-rolls and the driers, and means for holding said roll under pressure and in the path of a paper-web.
2. A paper-making machine having a marking-roll situated between the couch-rolls and
10 the driers, said marking-roll provided with type-faces and with a frictional driving-surface which is exposed beyond or outside of the type-faces and is adapted to have direct engagement with a traveling wet paper-web,
15 whereby the marking-roll is frictionally driven at a speed substantially equal to that of the paper-web.
3. A paper-making machine having in combination a marking-roll situated between the
20 couch-rolls and the driers, and a tension or pressure device cooperating with said marking-roll.
4. A paper-making machine having between the couch-rolls and the driers a marking-roll
25 which is provided with projecting type-faces arranged to displace the fibers in a wet paper-web and thereby attenuate the latter along the lines of a water-mark, said type being removably secured to the roll, and means
30 for holding said roll in the path of the wet web and under pressure in excess of that exerted by the roll itself.
5. In a paper-making machine, a water-marking-roll provided with cushion-surfaces
35 adjacent to a type-receiving space.
6. In a paper-making machine, a water-marking-roll carried by a tension-controlled arm and adapted to be quickly withdrawn from engagement with the paper-web by a
40 conveniently-placed handle or lever.
7. A paper-making machine having a water-marking-roll situated between the couch-rolls and the driers, said roll being mounted to rotate with freedom and disposed in cooperative relation to a moving part of the machine, combined with a tension device actively connected to the marking-roll and holding the latter under yielding pressure in the path of a wet paper-web.
45
8. In a paper-making machine, a water-marking-roll provided with spaced cushion-surfaces and with an intermediate type-receiving surface.
50
9. In a paper-making machine, a water-marking-roll provided with cushion-surfaces,
55 a type-surface between the cushions, and

means for removably securing type in said type-surface.

10. In a paper-making machine, the combination of a hanger-arm, a watermarking-roll journaled thereon, and a tension device for holding said roll normally in an active position. 60

11. A paper-making machine having a rock-shaft disposed between the couch-rolls and the driers, watermarking-rolls mounted on said shaft and supported thereby in the path of a wet web of paper, and means for rocking the shaft to withdraw the series of rolls from their active positions. 65 70

12. A paper-making machine having a rock-shaft, a series of marking-rolls mounted removably on the shaft, means for rocking the shaft, and tension devices operable to hold the rolls under pressure in their active positions; said shaft and the marking-rolls thereon being disposed between the couch-rolls and the driers. 75

13. In a paper-making machine, the combination of a rock-shaft, a marking-roll pivoted thereon, and a tension device for holding the marking-roll normally in an active position. 80

14. In a paper-making machine, the combination of a rock-shaft having a hanger, and an arm pivotally supported by the hanger and having a marking-roll and a tension device. 85

15. In a paper-making machine, the combination of a rock-shaft having a series of hangers, a series of marking-rolls, each having means whereby it may be pivotally and removably mounted in the hangers, and separate tension devices for the marking-rolls. 90

16. A paper-making machine having a water-marking-roll disposed between the couch-rolls and the driers, said roll being mounted by ball-bearings and held to its active position by a tension device. 95

17. In a paper-making machine, the combination of a pivoted arm, a marking-roll, a spindle attached to the arm and arranged for the roll to be revolvably mounted thereon, and a counterpoise for the arm. 100

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses. 105

ERNST R. BEHREND.
OTTO F. BEHREND.

Witnesses:

F. PERCY KLUND,
JNO. E. FILBERT.