

No. 633,241.

Patented Sept. 19, 1899.

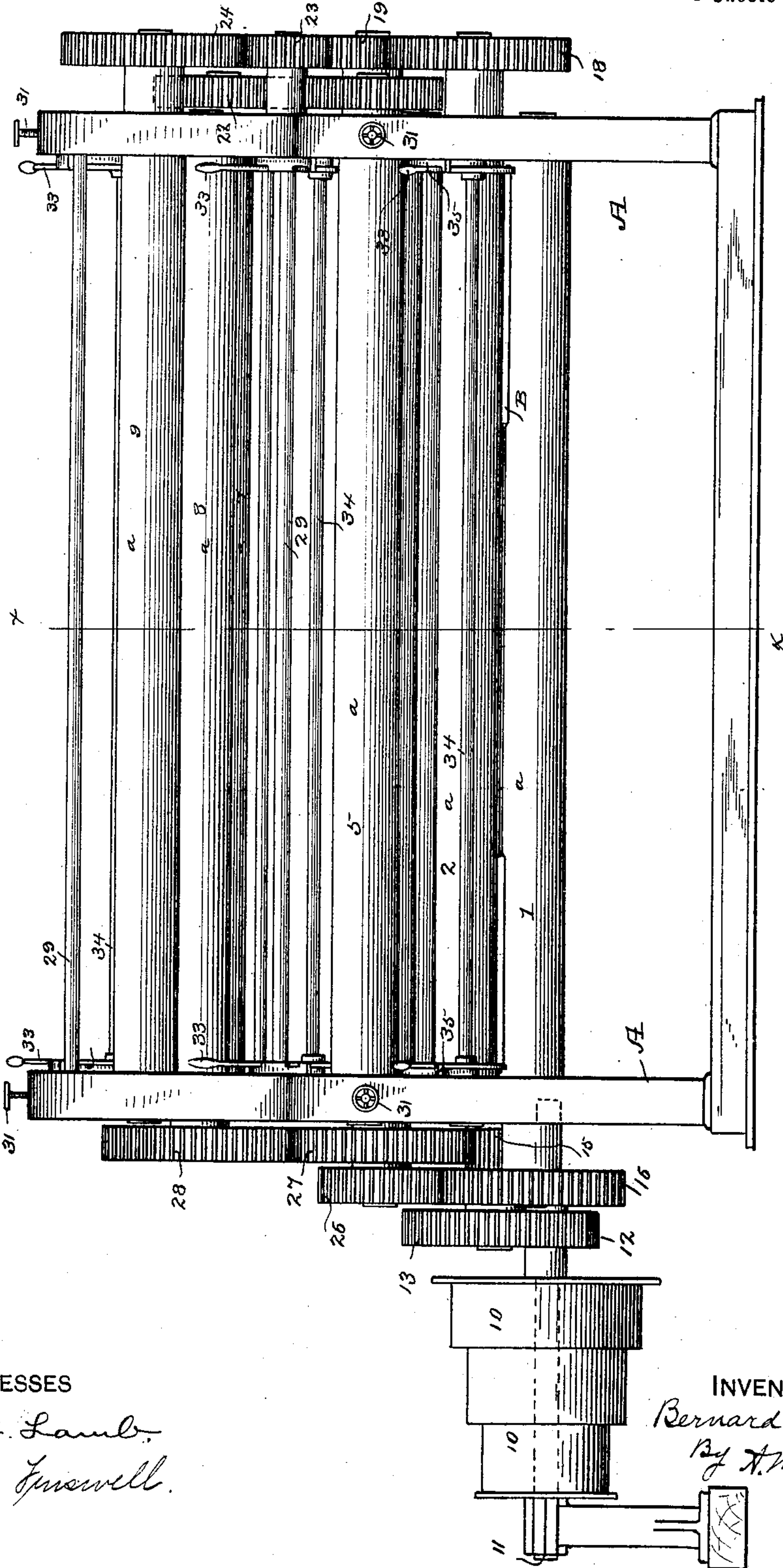
B. O. HALE.  
MACHINE FOR SOFTENING PAPER.

(No Model.)

(Application filed Oct. 12, 1896.)

3 Sheets—Sheet 1.

Fig. 1.



WITNESSES

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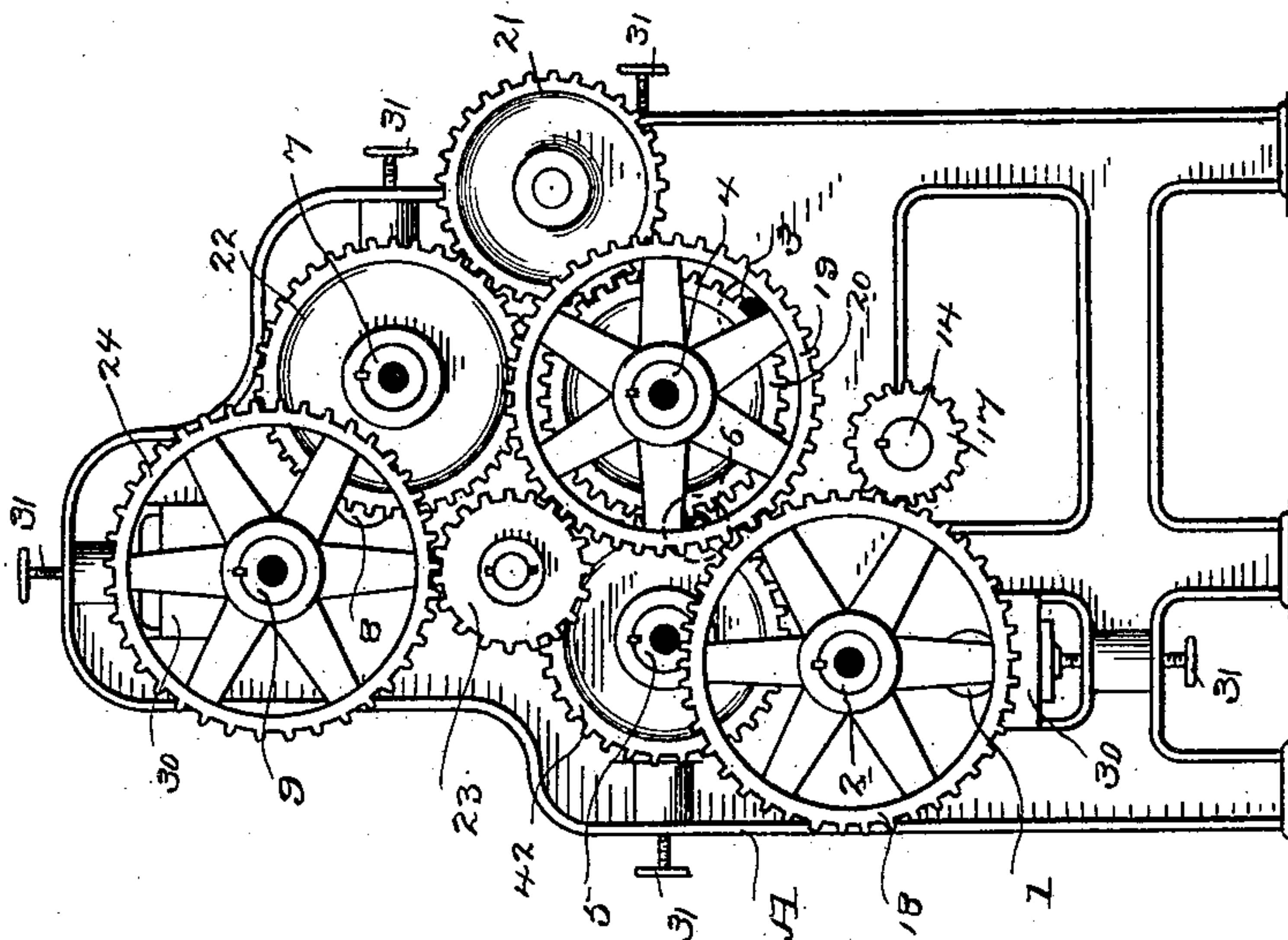
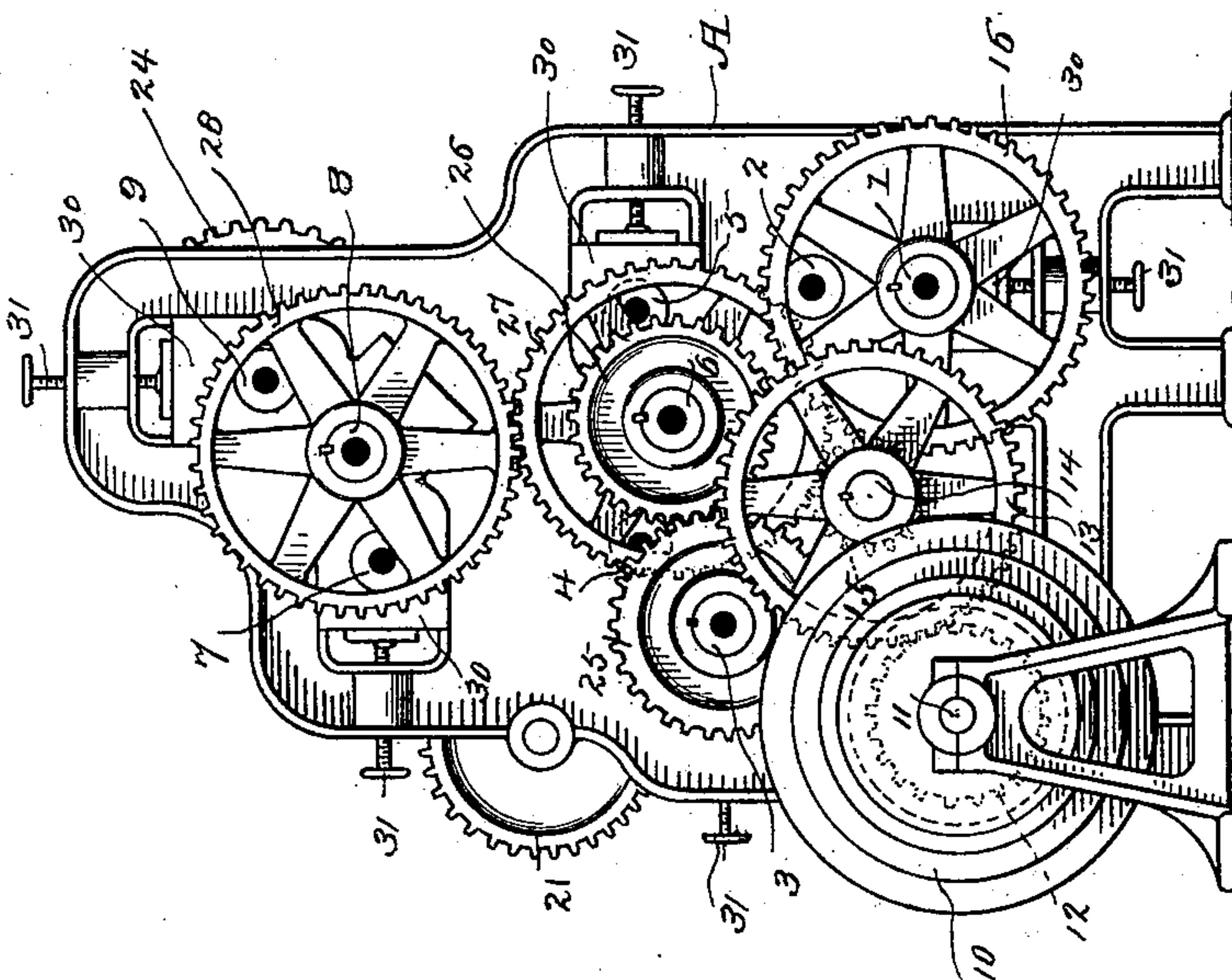


Fig. 2.



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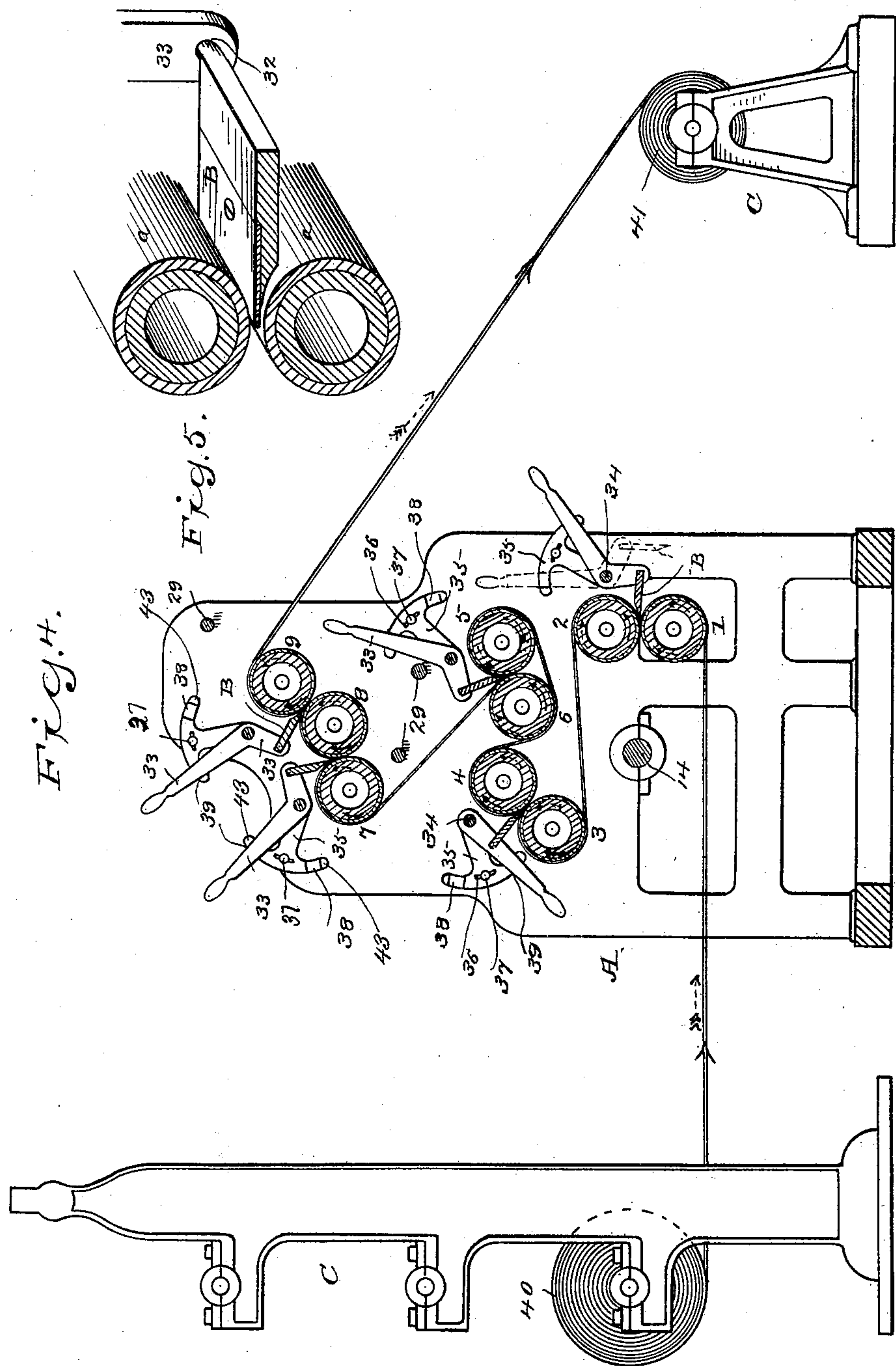
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WITNESSES

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# UNITED STATES PATENT OFFICE.

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## MACHINE FOR SOFTENING PAPER.

SPECIFICATION forming part of Letters Patent No. 633,241, dated September 19, 1899.

Application filed October 12, 1896. Serial No. 608,569. (No model.)

*To all whom it may concern:*

Be it known that I, BERNARD O. HALE, a citizen of the United States, residing at Derby, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Machines for Softening Paper; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of the class of paper which is used in various ways in the manufacture of clothing either as a lining or as puffing where a bouffant effect is desired—as, for example, in bustles and puffed sleeves; and the object of my invention is to devise a novel process of and mechanism for softening the paper, which before entering the machine herein described is quite hard and stiff.

With these ends in view I have devised the novel process and mechanism of which the following description, in connection with the accompanying drawings, is a specification, numbers and letters being used to designate the several parts.

Figure 1 is a front elevation of the machine complete. Fig. 2 is an elevation as seen from the left in Fig. 1. Fig. 3 is an elevation as seen from the right in Fig. 1. Fig. 4 is a diagrammatic view illustrating the position of the separators relatively to the rolls when the machine is in use, the rolls being in vertical section, as on the line *xx* in Fig. 1. Fig. 5 is a detail sectional perspective, on an enlarged scale, illustrating the construction and arrangement of the rolls and separators.

The essential feature of my invention is that a strip of paper is continuously folded or doubled between pairs of rolls and is kept from rubbing against itself by separators. The edges of the separators are in no sense cutting edges, but are made thin enough to allow the rolls to impart a sharp but constantly-changing fold to the strip of paper, which is drawn inward to approximately the center by the first roll of each pair and drawn out by the second roll of each pair, the fold

being at approximately the center, but the line of the fold changing as the strip of paper is drawn through. By the term “center” I mean a point midway between the axes of the two rolls.

A denotes framework, which may be of any ordinary or preferred style, and 1, 2, 3, 4, 5, 6, 7, 8, and 9 denote rolls journaled in the framework. These rolls are shown as made hollow and are each provided with an outer surface *a*, of rubber or other suitable material. Power is applied by means of a belt (not shown) passing over the belt-pulleys 10 on a shaft 11. 12 denotes a gear-wheel on this shaft, which meshes with a gear-wheel 13 on a shaft 14. 15 (see dotted lines in Fig. 2 and full lines in Fig. 1) denotes a pinion on a shaft 14, which meshes with a gear-wheel 16 on roll 1, imparting movement to said roll, said pinion also meshing with a gear-wheel 27 on roll 6, imparting movement thereto. Roll 6 also carries a gear-wheel 26, which meshes with a gear-wheel 25 on roll 3, imparting movement thereto. Roll 8 receives movement by means of a gear-wheel 28 on said roll, which meshes with gear-wheel 27 on roll 6. On the opposite end of shaft 14 (see Fig. 3) is a pinion 17, which meshes with a gear-wheel 18 on roll 2, imparting movement thereto. Gear-wheel 18 meshes with a gear-wheel 19 on roll 4, imparting movement thereto. Roll 4 also carries a gear-wheel 20, which meshes with an idler 21, which in turn meshes with a gear-wheel 22 on roll 7, imparting movement thereto, said gear-wheel 20 also meshing with a gear-wheel 42 on roll 5, imparting movement thereto. Gear-wheel 19 on roll 4 also meshes with an idler 23, which in turn meshes with a gear-wheel 24 on roll 9, imparting movement thereto. I am thus enabled to reduce the number of pinions and gears to the smallest number possible, dividing the driving strain between the two ends of the frame, and to provide that the rolls of each pair or group shall all turn in the same direction. 29 denotes tie-bars extending between the end pieces of the frame to make the frame rigid.

My invention is not limited to any special



number of pairs of rolls or to any special arrangement of the rolls.

It is of course obvious that the rolls must be so arranged relatively to the separators  
5 that the two rolls operate in connection with each separator. In the present instance I have shown five separators arranged in such a manner that the strip of paper is alternately folded in opposite directions by contact with  
10 the rolls and have shown nine rolls so arranged as to impart to the paper five folding operations. In order to provide for different thicknesses of paper, it is necessary that one roll in each pair of rolls should be adjustable.  
15 In the present instance I have shown rolls 2 4 6 8 as stationary and rolls 1 3 5 7 9 as journaled in boxes 30, which are made adjustable by means of screws 31.

B denotes the separators. In the present  
20 instance I have shown the edge or operative portion of the separators as detachable from the body thereof. This is in order that the operative portion of the separators may be made of thin material and yet have a firm  
25 backing.

It will of course be apparent that the separators must be adjustable relatively to the rolls. In the present instance I have shown the separators as provided with trunnions 32,  
30 which are journaled in levers 33, themselves pivoted to rods 34, which extend across the machine from between the end pieces of the frame, there being a lever at each end of each of the rods 34. 35 denotes adjusting-plates,  
35 which are pivoted on rods 34 concentrically with the levers and are provided with curved slots 36, through which set-screws 37 pass. The object of these adjusting-plates is to give the finest possible adjustment to the separators,  
40 this adjustment being obtained by loosening the screws and moving the adjusting-plates in either direction, as may be required. Each adjusting-plate is provided with a locking-notch 38, which is adapted to receive the corresponding lever and hold the separator out  
45 of the operative position, as shown in dotted lines in Fig. 4, and with a locking-notch 39, which when engaged by the lever locks the separator at the operative position, as shown  
50 in full lines in Fig. 4, it being of course understood that as soon as the lever is swung to the inoperative position the separator will drop down wholly out of the way of the rolls.

43 denotes stops at the ends of the adjusting-plates, which prevent the levers from being swung entirely off from the locking-plates.

40 denotes a roll of paper to be operated upon, and 41 a roll of paper that has passed through the machine. These rolls are carried by suitable standards C, which may be  
60 of any ordinary or preferred construction and are ordinarily wholly disconnected from the framework of the machine proper.

The operation is as follows: The manner in  
65 which the machine is threaded up—i. e., the manner in which the paper to be softened is passed over the rolls and the separators—is

clearly illustrated in Fig. 4. The function of each pair of rolls is to draw the paper inward to approximately the center and fold or double it over continuously, thereby softening it.  
70 Each separator lies close in between a pair of rolls and acts to keep the paper from rubbing against itself. In practice the paper ordinarily used for this purpose has a crinkled  
75 surface, which it is desirable to retain in the softened condition of the paper. It is obvious that if the paper was passed through the rolls in such a manner that the surface at any point came in contact with the surface at  
80 another point there would be a tendency to abrade the paper and destroy the crinkled surface. This abrasion of the paper is wholly prevented by using a separator between each pair of rolls. In the present instance the paper  
85 from the roll 40 first passes partially around the roll 1, then is folded between rolls 1 and 2, and then it partially passes around roll 2, said rolls acting to draw it in, fold it, and draw it out again. In the present grouping  
90 of rolls the strip of paper that is being operated upon passes next to rolls 3 and 4, between which is another separator, the operation of folding being repeated as before. The same operation is repeated by another separator  
95 acting in connection with rolls 5 and 6, and the same operation is repeated twice more in connection with rolls 7, 8, and 9, which are so grouped with relation to two separators as to perform two folding operations upon the  
100 paper.

As already stated, the number of rolls and separators used, and consequently the number of folding operations, is not of the essence  
105 of my invention and may of course be varied to suit the special quality of paper that is being operated upon and the use for which the paper is intended.

Should the machine be changed from thicker to thinner paper, the adjustable rolls—in the  
110 present instance rolls 1, 3, 5, 7, and 9—are moved toward their companion rolls more or less, as may be required. If changed from thinner to thicker paper, the adjustable rolls are moved slightly away from their companion  
115 rolls.

Should it be necessary at any time to change the position of any of the separators relatively to the rolls in connection with which they operate, the adjustment of the separators may  
120 be readily effected by lifting the levers 33 corresponding to the separators it is desired to adjust out of the locking-notches 39, then loosening the corresponding set-screws 37, and moving the adjusting-plates slightly toward  
125 or from the rolls, as may be required. The adjusting-plates are then locked in position by tightening up the set-screws, and the separators are again placed in position by means of levers 33, which are placed in the locking-  
130 notches 39. Should it be desired at any time to place any of the separators wholly out of the way of the rolls, the corresponding levers are removed from locking-notches 39 and



placed in locking-notches 38 in the adjusting-plates. The separators will then drop down out of the way, as clearly shown in dotted lines in Fig. 4.

5 It should be understood that the edges of the separators have nothing whatever to do with the softening process. It should also be understood that after the paper has been put in place the separator may be withdrawn en-  
15 tirely, and the paper will remain between the rolls and be drawn inward to approximately the center by one roll and folded there and will be drawn out again by the other roll in precisely the same manner as if the separator  
20 was used. The separator in use simply prevents the paper from abrading against itself as it is drawn into and out of the rolls. The separator is also used, when the machine is being threaded up, to introduce the paper in  
25 folded condition between the rolls, this being done by first withdrawing the separator by means of its lever, running or threading the sheet over the edge of the separator, then moving the separator to its innermost position  
30 permitted by the adjusting-plates, so as to double the sheet between the rolls, and then slightly withdrawing the separator, so that its edge will be drawn away from the fold of paper, but leaving the separator in position to prevent the adjacent surfaces of the paper from rubbing against each other.

Having thus described my invention, I claim—

35 1. In a machine of the character described, the combination with a pair of rolls and mechanism for rotating said rolls in the same direction, of a separator having trunnions at each end and levers in which said trunnions are journaled and adjusting-plates pivoted  
40 concentrically with the levers and having locking-notches engaged thereby so that the

separator may be locked either in or out of the operative position.

2. In a machine of the character described, the combination with a pair of rolls and  
45 mechanism for rotating said rolls in the same direction, a separator having trunnions at each end and levers in which said trunnions are journaled, of adjusting-plates pivoted concentrically with the levers and provided  
50 with locking-notches for the levers and curved slots 36 through which set-screws 37 pass so that a fine adjustment of the separators relatively to the rolls may be effected.

3. In a machine of the character described  
55 the combination with the groups of rolls and mechanism for rotating said rolls in the same direction, of the separators having trunnions at each end and levers in which said trunnions are journaled and adjusting-plates piv-  
60 oted concentrically with the levers and having locking-notches engaged thereby so that the separators may be locked either in or out of operative position.

4. In a machine of the character described,  
65 the combination with a pair of rolls and mechanism for rotating said rolls in the same direction, a separator having trunnions at each end and levers in which said trunnions are journaled, of adjusting-plates pivoted  
70 concentrically with the levers and provided with locking-notches for the levers and stops 43 which prevent the levers from being swung off from the locking-plates, substantially as described, for the purpose specified.  
75

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

BERNARD O. HALE.

Witnesses:

JOHN A. WILKINSON,  
J. TOMLINSON.