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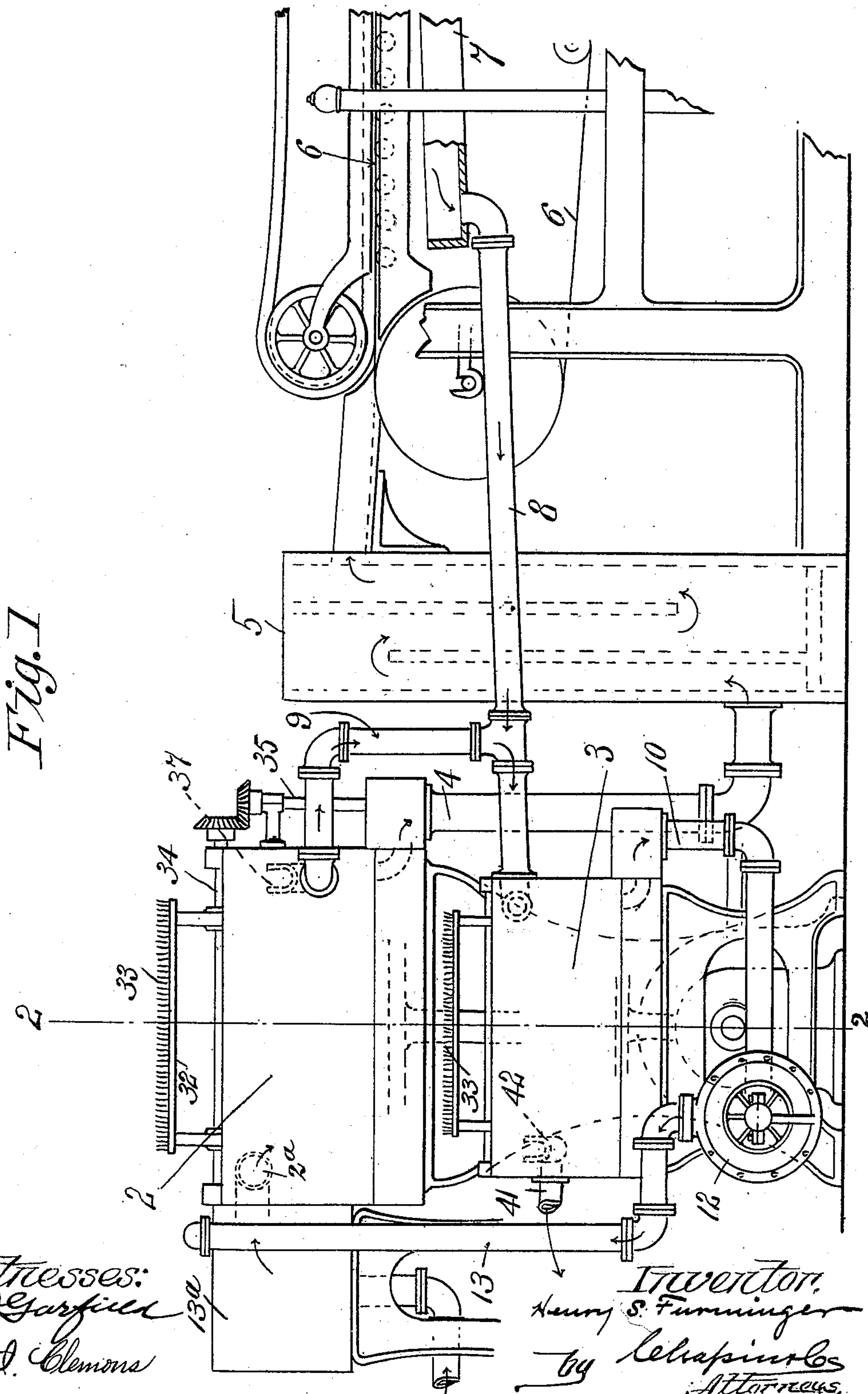
Patented Feb. 27, 1900.

H. S. FURMINGER.
SCREEN FOR PAPER MACHINES.

(Application filed Apr. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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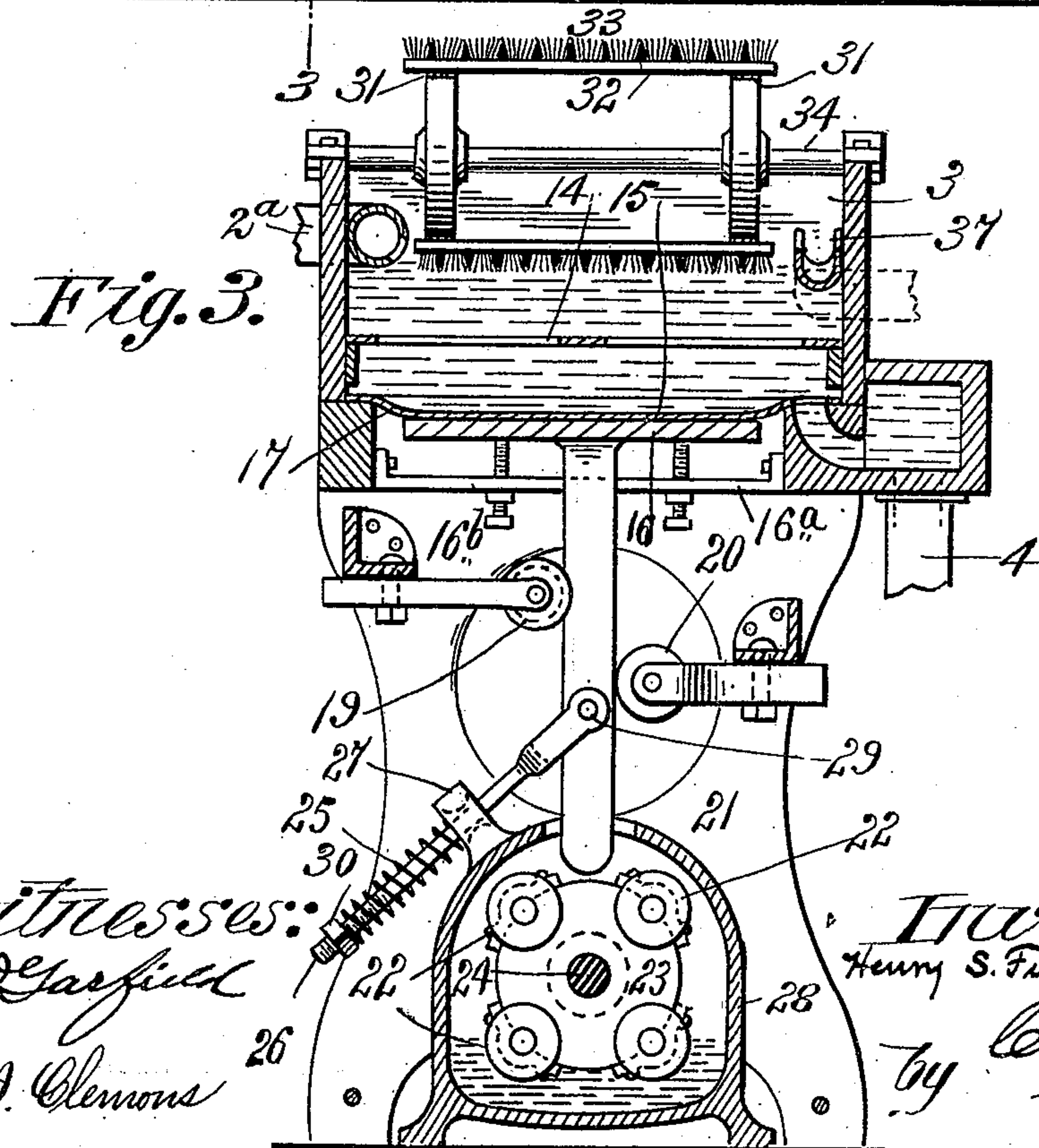
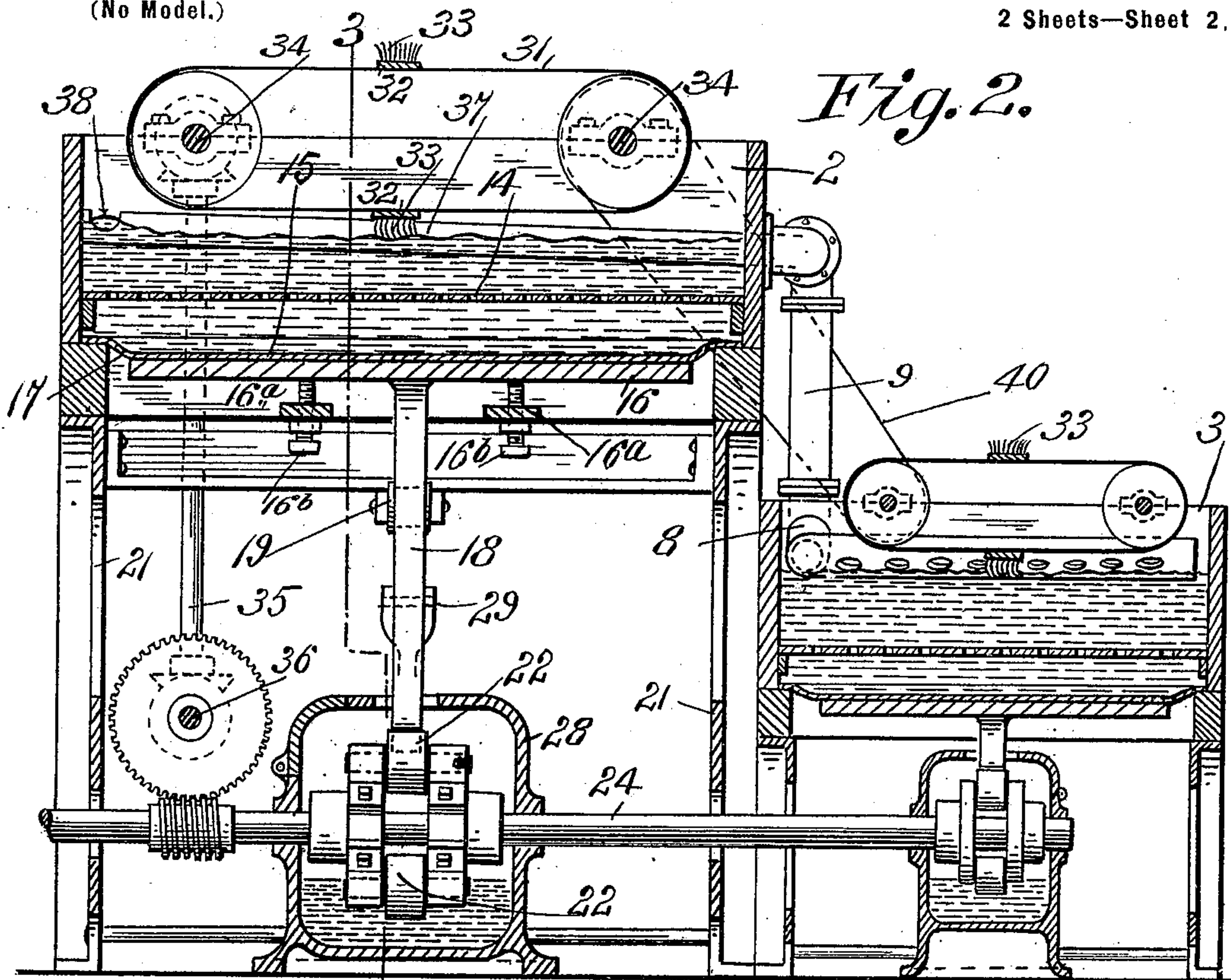
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

HENRY STREET FURMINGER, OF MITTINEAGUE, MASSACHUSETTS.

SCREEN FOR PAPER-MACHINES.

SPECIFICATION forming part of Letters Patent No. 644,227, dated February 27, 1900.

Application filed April 18, 1899. Serial No. 713,443. (No model.)

To all whom it may concern:

Be it known that I, HENRY STREET FURMINGER, a citizen of the United States of America, residing at Mittineague, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Screens for Paper-Machines, of which the following is a specification.

This invention relates to paper-manufacture, and has especial reference to the pulp-screening devices located at the head of a paper-making machine, one object of the invention being to improve the construction of that type of screen-boxes which have flexible bottoms that are given a vibratory movement for the purpose of inducing the flow of pulp through the screen-plates and keeping the slits of the latter clear of obstructions.

A further object of the invention is to provide means for disposing of the scum and floating particles of pulp which are found on the surface of the mass in the screens and for saving as great a proportion as possible of the fiber contained in said floating portions and which involves also an improvement in the process of making the paper.

The improved mechanism and method of handling the pulp which constitutes this invention are fully set forth in the following specification and claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of the head of a paper-machine, showing the screening devices in end view and connections running to the paper-machine. Fig. 2 is a sectional view of the screens on line 2 2, Fig. 1. Fig. 3 is a sectional view on line 3 3, Fig. 2.

In practice the screen-boxes would be divided off into compartments below the surface of the screen-plates, each of which would be provided with a flexible bottom, as it is quite obvious that it would be impracticable to make a box having a flexible bottom made in one piece as wide as many of the ordinary paper-machines are made to-day.

In the drawings the screen-box is shown having a flexible bottom in one piece and in this shape answers all the requirements of the application and saves needless duplication and at the same time permits the illustration of essential parts of the invention on

a larger scale than would be possible otherwise.

Referring now to Fig. 1 the main screen is indicated by the numeral 2 and the auxiliary screen by 3. Screened pulp from the box of the main screen 2 is delivered through a pipe 4 into the lower part of the head-box 5, from whence it flows onto the wire 6 of the paper-machine.

7 represents the save-all and water therein, which drains from the pulp on the wire 6 and which always carries more or less fiber, as well as size and coloring-matter, and runs back from the save-all through a pipe 8 to the top of the auxiliary screen-box. This pipe is entered by a pipe 9 between the save-all and the auxiliary screen-box, which conveys into said pipe 8 froth or scum and floating particles of pulp removed from the top of the mass of pulp in the main screen-box by means to be described farther on. This scum carries fiber and other material swept from the top of the mass in the main screen-box, and said fiber is to a great extent washed through the auxiliary screen 3 by the considerable volume of water returned to said screen from the save-all 7, which also carries considerable fiber. The product of the auxiliary screen 3 passes through pipe 10 to the pump 12 and by it is sent up by the pipe 13 to the box 13^a, from which it enters with unscreened pulp into the main screen-box, where by becoming mixed with the mass of pulp therein of much greater density the fiber carried by said products of the auxiliary screen-box is saved.

Fig. 1 illustrates the above-described construction as a whole.

The construction of the screens 2 and 3 is clearly shown in Figs. 2 and 3.

The screen-box of the main screen 2 is made of some suitable material, usually wood, in which the screen-plates 14 are supported. The bottom 15 of said box is made of some flexible material, preferably of some textile material and rubber, which is secured to an inwardly-projecting part of the frame of the said screen-box in such manner as to make a water-tight construction. A stiffening-plate 16 is secured to the under side of said flexible bottom 15 and corresponds in outline to the form of said bottom, but of smaller area than

the latter, whereby that part 17 of the flexible material between the edges of said plate 16 and the inner edge of the bottom of the box will constitute a hinge on which the said bottom may swing, as said plate is by suitable mechanism given a vertically-vibrating movement. As it is important to be able to adjust the degree of vertical movement the flexible bottom 15 shall have, a bar 16^a is located on each side of the center and underneath thereof, and suitable bolts 16^b in said bars may be turned up against the under side of the plate 16 for limiting the degree of downward movement of the flexible bottom during its vibratory movements. In this manner the required action of the vibratory bottom on the mass of pulp in the screen can be regulated according to the requirements of different grades of stock and without altering or adjusting the bottom-actuating mechanism. Said movement is imparted thereto by a stem 18, secured to the center of the plate 16, which stem is supported in vertical alinement by two oppositely-placed rolls 19 and 20, supported on the frame 21, which supports the main screen 2. These rolls are adjustable toward and from said stem 18 and are flanged to embrace the edges of the latter, which is of rectangular form in cross-section. The vibratory vertical movements are imparted to the flexible bottom 15 by the engagement of the lower extremity of said stem 18 with a series of rolls 22, mounted between two disks 23, fixed on a shaft 24. These rolls are so arranged that after one roll has passed under the end of the stem 18 and lifted the bottom 15 said stem is permitted to drop in between the roll which has just given it an upward impulse and the next one following it, and this downward movement of the bottom 15 and the stem 18 is accelerated by the retraction of a spring 25, which is located on a rod 26, between the headed outer end thereof and a lug 27, cast on a casing 28, which incloses the stem-operating rolls and the opposite end of which rod is pivotally secured to said stem 18 at 29. The upward movement of the stem 18 compresses this spring, and the tension thereof may be varied by the nut 30 on the end of the rod. The disks 23, carrying the rolls 22, are inclosed in said casing 28, in whose opposite sides are suitable bearings for the driving-shaft 24. This casing is adapted to contain a quantity of oil wherein the lower edge of said disks may be continuously immersed for the proper lubrication of the rolls 22, whose work is very severe.

It is seen from the above description of the main screen 2 that the rotation of the shaft 24 will impart to the bottom 15 of the screen-box a succession of vibrations or impulses of a violent nature—viz., the stem 18 instead of being operated by an eccentric or crank motion receives what may be more properly termed a succession of "short sharp blows" on the end thereof, and the action of the flexible bottom on the screen-plates is in the nature

of a quick puff rather than in the nature of suction, as is the case when said flexible bottom is operated by a crank motion or a motion of similar nature. The action of screen-plates is much accelerated by the movements imparted to the flexible bottom by the rolls 22, and the plates are always comparatively clear and in operative condition.

In the brief description of the construction of the devices embraced in this application it was stated that the scum and other floating particles taken from the surface of the main screen 2 were conducted to a second or auxiliary screen 3. This, as shown in Fig. 2, is precisely like the screen 2, except that it is of smaller size. Therefore a description of this auxiliary screen is needless. As shown in Figs. 1 and 2, it is located alongside of the main screen 2 and the shaft 24 extends under both, and the means for vibrating the bottom of the second screen is in all respects like that employed for the main screen 2. The auxiliary screen 3, however, coacts with the screen 2 in handling the pulp for the paper-machine of which the screens form part, and the particular coöperative arrangement of the two screens is as follows: On the main screen 2 are two continuously-running belts or chains 31 31, which have a line of movement transversely of the natural flow of pulp as it enters the screen-box from the pipe 2^a (see Fig. 3 and dotted lines in Fig. 1) and leaves it through the pipe 4. One of these belts is located near each side of the screen-box, and bars 32, extending from one belt to the other, are secured thereto. On these bars are suitable brushes 33. The belts 31 run over pulleys on two shafts 34 34, one of which has a bevel-gear thereon in mesh with another bevel-gear on the end of a vertical shaft 35, which is in turn connected by suitable gears with the horizontal shaft 36, and the latter by worm-and-gear connection with the driving-shaft 24. Thus the brushes 33 on the bars 32 of the belts 31 are supported in position to have a slow traverse movement across the surface of the pulp in the screen-box above the screen-plates and, as stated, across the direction of the natural flow of said pulp, and any scum or floating particles in the pulp are by means of these brushes swept toward one side of the screen-box.

Along one of the sides of the screen-box which is parallel with the line of movement of the belts or chains 31 is an inclined trough 37, whose highest end is next to the end of the box toward which the said scum is swept by the brushes 34, and in the side of this trough is a cut 38, extending down to substantially the level of the pulp. As the brushes sweep the scum toward the end of the box it will heap up in front of said brushes and run into the trough 37 through the aperture 38. Said trough leads through the side of the screen-box, and the pipe 9 into which said trough merges, carries said scum and whatever may have been forced by the brushes over into the

trough 37 down through the side of the box of the auxiliary screen 3, where it is treated in all respects as in the box of the main screen 2, and whatever is brushed off from the top 5 of the pulp in the screen 3 goes to waste.

The construction of the screen 3 is similar to that of the main screen 2 and is provided with similar devices for sweeping scum, &c., from the surface of the pulp, one of the shafts 10 34 having a belt connection 40 running to one of the belt-carrying shafts of the screen 3. Whatever material is swept from the surface of the pulp in the screen 3 will go to the waste-box through the pipe 41, leading from trough 15 42, (shown only in dotted lines in Fig. 1,) and whose arrangement and functions are the same as those of the trough 37 of the main screen 2. (Shown in Fig. 3.)

The return of the water from the save-all 20 directly to the auxiliary screen 3 and the mingling of the materials swept from the surface of the main screen 2 with the water from the save-all operate to so dilute the mass in the auxiliary screen 3 that a great per cent. 25 of fiber which in the ordinary process would go to waste is saved and by means of the pump 12 returned to the box 13^a, from which the main screen 2 is supplied.

Having thus described my invention, what 30 I claim, and desire to secure by Letters Patent of the United States, is—

1. Pulp-screening devices for paper-machines comprising a main screen-box and an auxiliary screen-box, flexible bottoms in said 35 boxes, stiffening-plates for said bottoms, and means for imparting consecutive shocks to said bottoms in a line transverse to the surfaces thereof, an outlet in the main screen-box substantially on the line of the normal 40 pulp-level therein and leading into said auxiliary screen-box, means for sweeping the surface of the pulp in said main screen-box toward said outlet therein, and means for varying the degree of the vertical movements of 45 the flexible bottom in said main screen-box, and a suitable tubular connection from the bottom of the main screen-box, to the paper-machine, substantially as described.

2. Pulp-screening devices for paper-machines comprising a main screen-box and an auxiliary screen-box, flexible bottoms for said 50 boxes, an outlet extending from a point near the surface of pulp in said main screen-box to said auxiliary screen-box, a shaft extending under said boxes, and means on said shaft 55 for imparting to said flexible bottoms consecutive shocks, and for regulating the force thereof, and devices on the main screen-box for sweeping the surface of the pulp therein 60 toward the outlet leading to said auxiliary screen-box, and a suitable tubular connection from the bottom of the screen-box to the paper-machine, substantially as described.

3. In a pulp-screen for paper-machines, a box, a screen-plate therein, a flexible bottom 65 therefor, and means for imparting consecutive shocks to said bottom consisting of a shaft, a series of rolls suitably mounted thereon for rotation in a fixed vertical plane, a rigid stem supported for reciprocatory vertical move- 70 ment under and in contact with said bottom, and whose lower extremity intercepts the plane of rotation of said rolls whereby said stem is lifted and dropped by each of said rolls, and means for adjusting said stem ver- 75 tically relative to the path of rotation of said rolls, substantially as described.

4. In a paper-machine, the following instrumentalities in combination: a main screen-box, an auxiliary screen-box, flexible bottoms 80 therefor, an outlet at the level of the pulp in said main screen-box, and a pipe leading therefrom to said auxiliary screen-box, means for sweeping the surface of pulp in said main screen-box toward said outlet; a shaft ex- 85 tending under said boxes, and means on said shaft for imparting consecutive shocks to said bottoms, a save-all, and a pipe connection therefrom leading into the pipe connecting the two screen-boxes; a pump connected with 90 said auxiliary screen and delivering into said main screen, and a tubular connection from the latter to the paper-machine, substantially as described.

5. Pulp-screening devices for paper-machines comprising a main screen-box and an auxiliary screen-box, an outlet from a point 95 substantially at the level of pulp in the main screen extending to said auxiliary screen-box, a flexible bottom for said main screen-box, and means for imparting thereto a vertically-reciprocating movement, and devices on said 100 main screen-box for sweeping the surface of the pulp therein toward said outlet, and a tubular connection between the main screen-box and the paper-machine, substantially as 105 described.

6. In a paper-machine the following instrumentalities in combination: a main screen-box, an auxiliary screen-box, flexible bottoms 110 therefor, an outlet substantially at the level of pulp in said main screen-box extending to said auxiliary screen-box, means for sweeping the surface of the pulp in said main screen-box toward said outlet, means for imparting 115 vertically-reciprocating movements to said bottoms, a save-all, a conduit from the latter to said auxiliary screen-box and from the latter to said main screen-box, and mechanism 120 for elevating pulp from said auxiliary to said main screen-box, substantially as described.

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