

No. 633,089.

Patented Sept. 12, 1899.

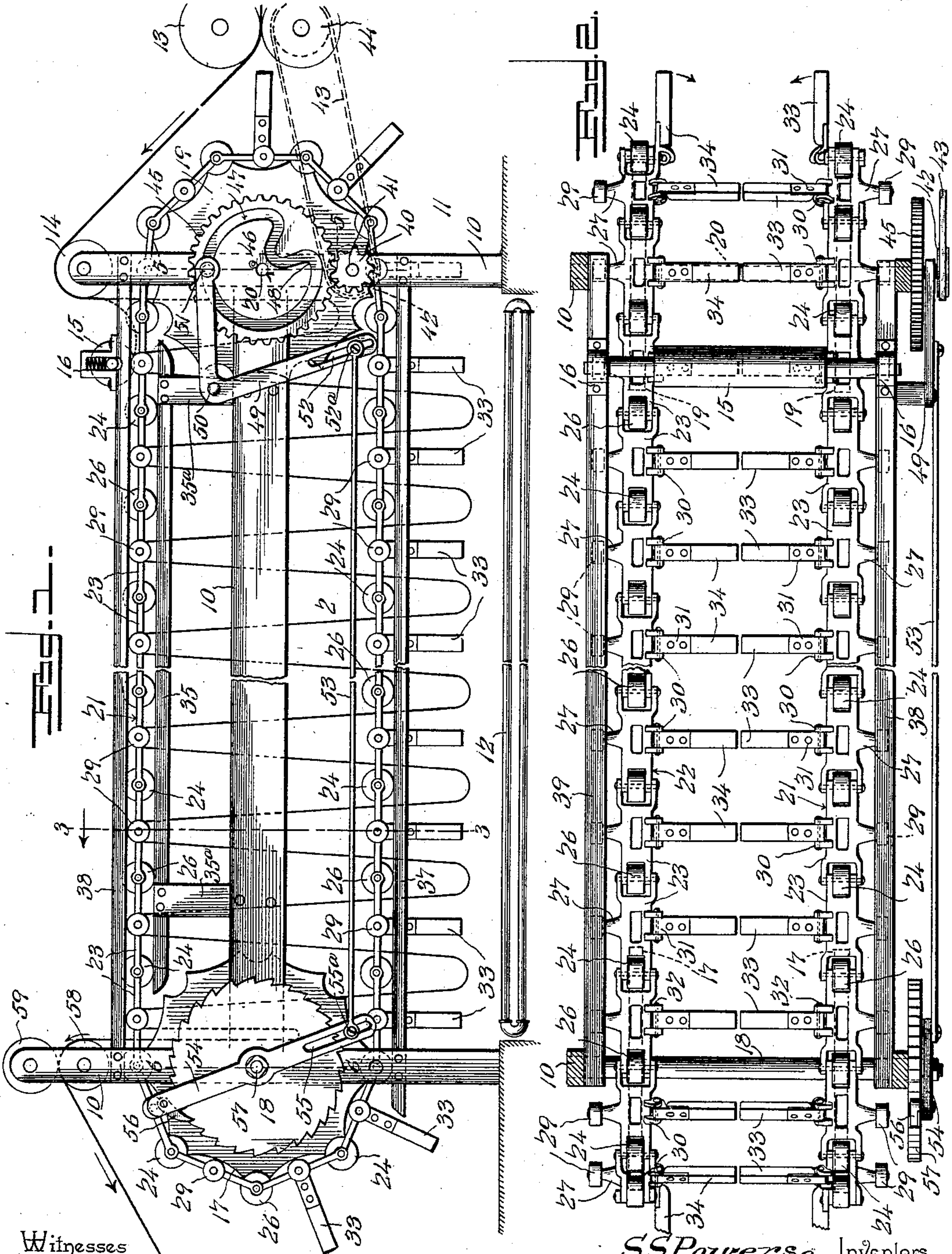
S. S. POWERS & C. R. COOK.

PULP DRYING MACHINE.

(Application filed Nov. 5, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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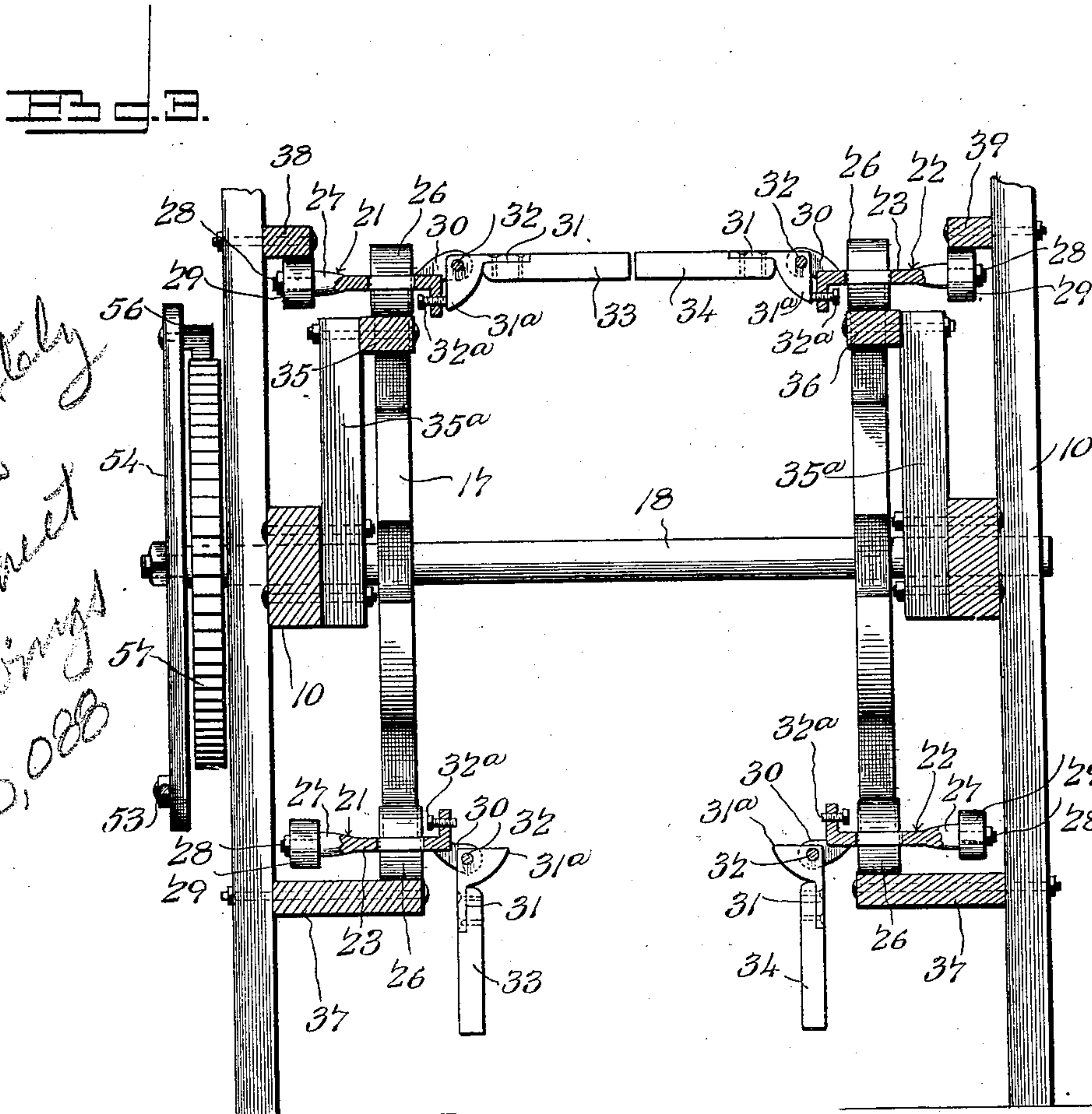
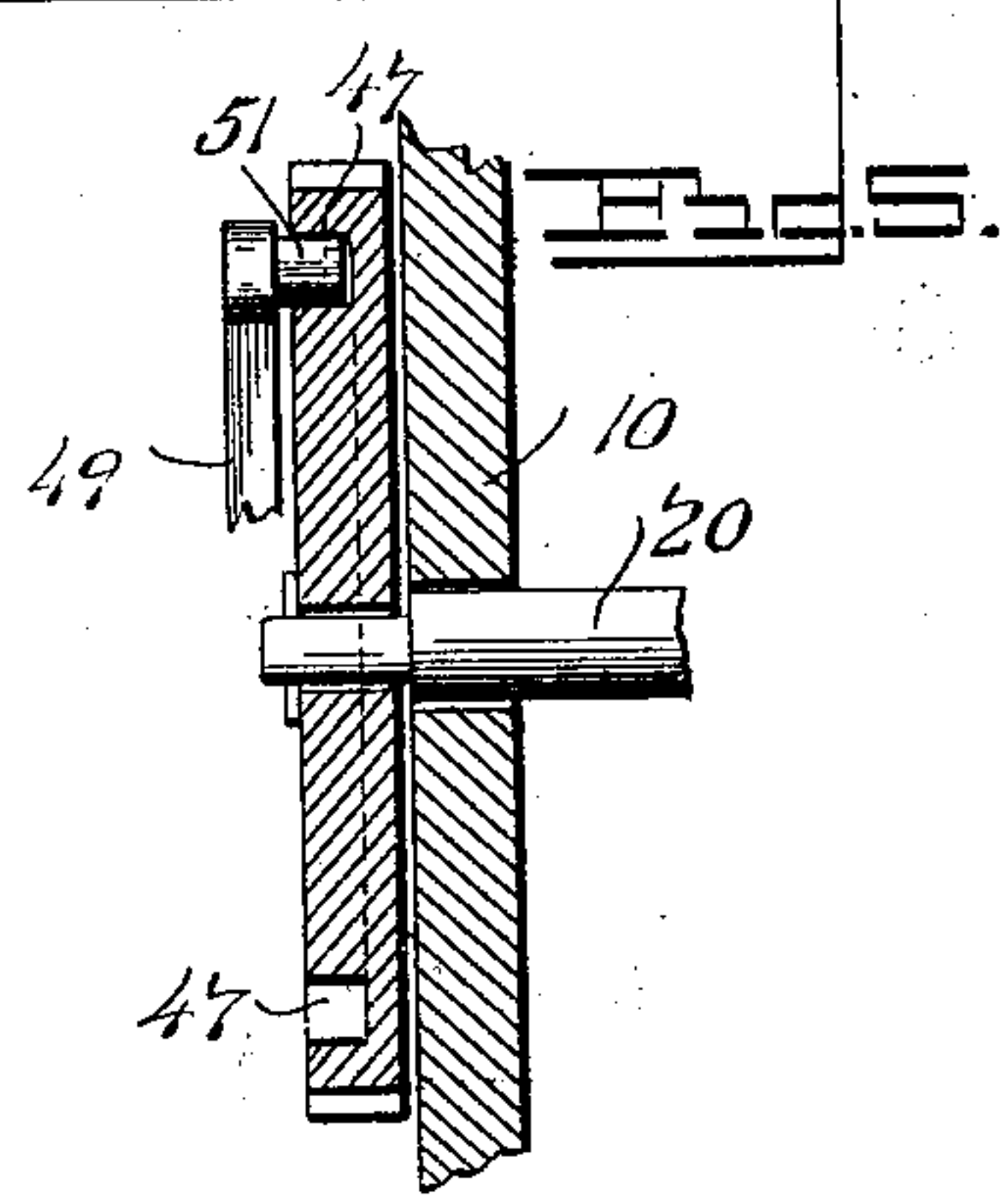
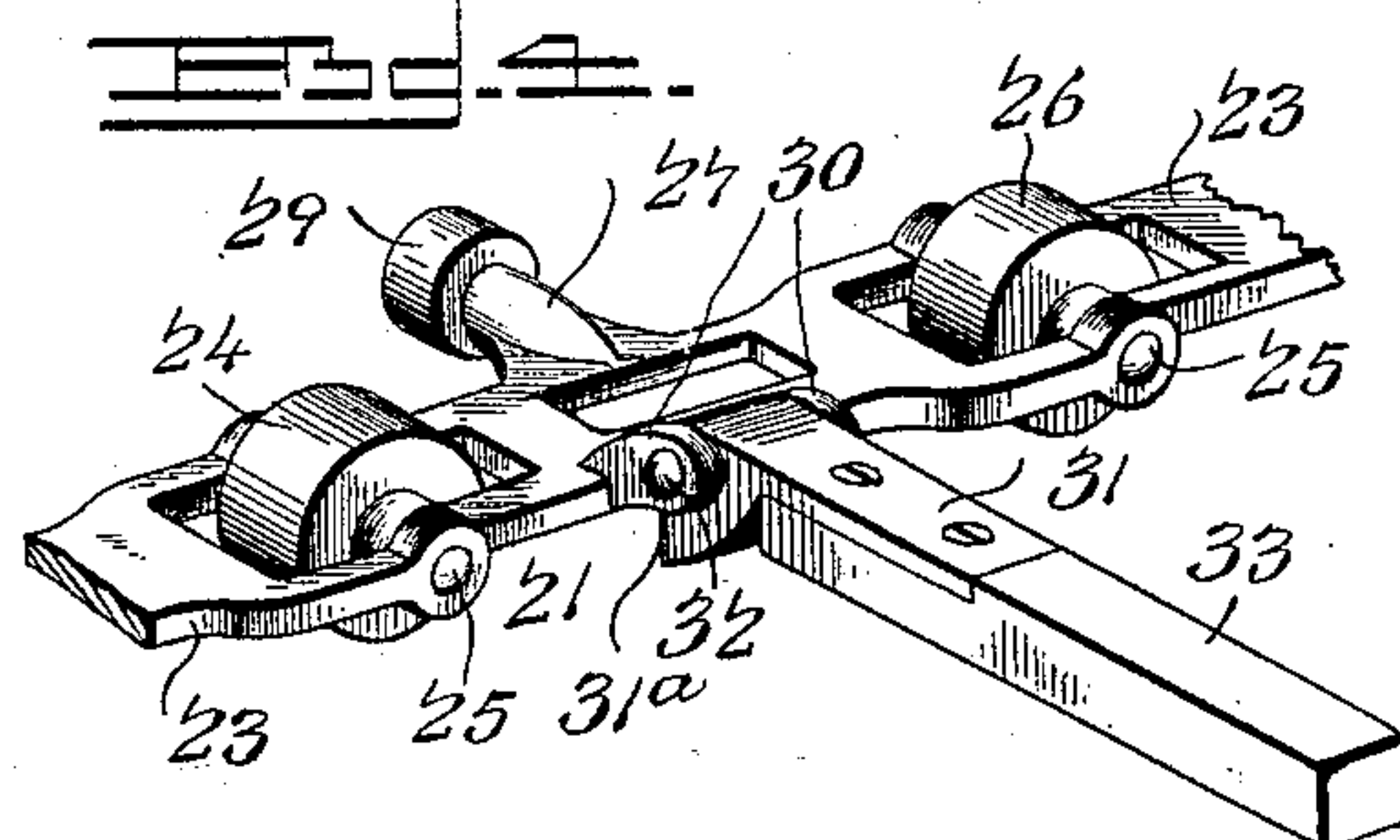
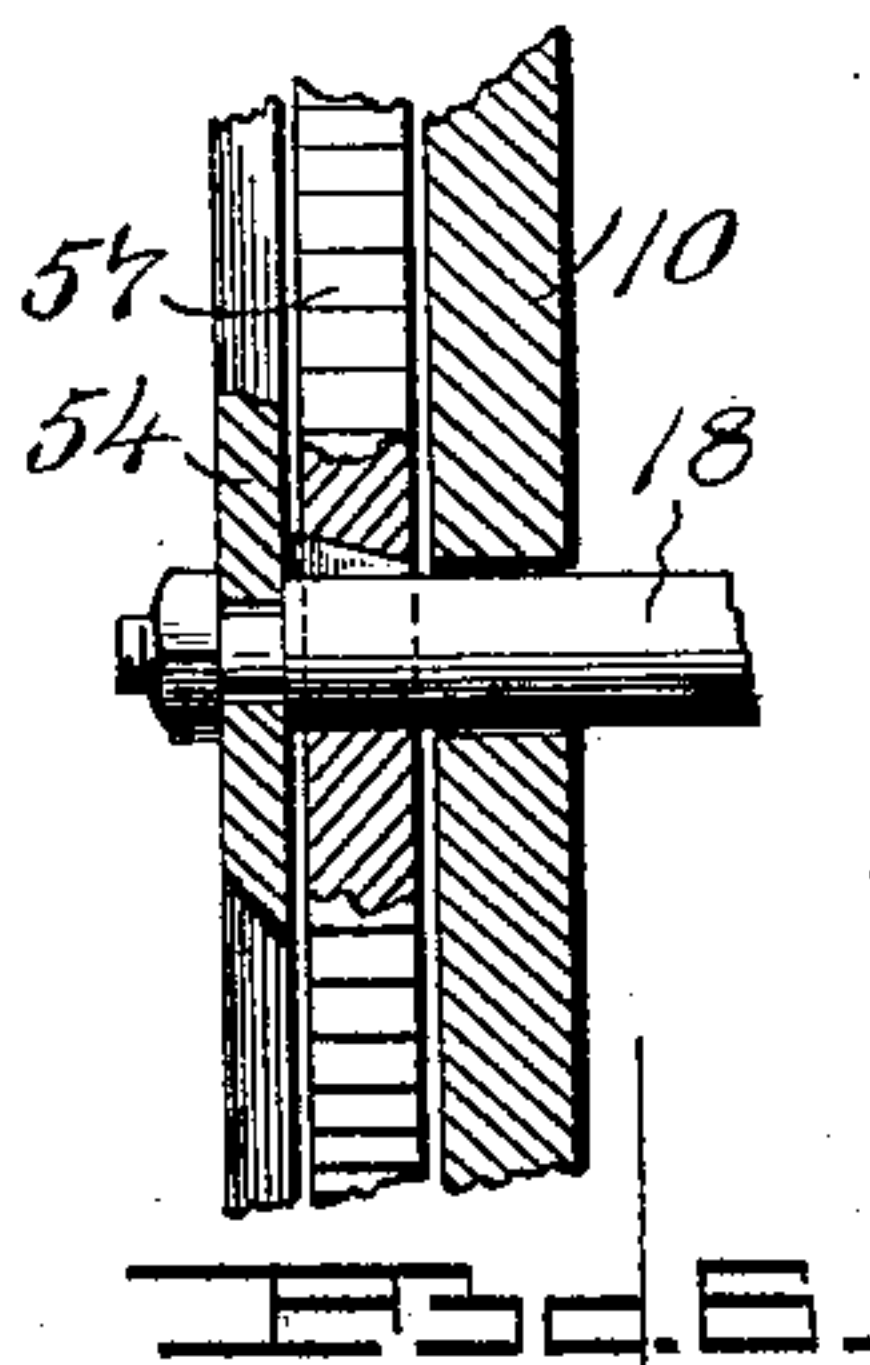


Fig. 1
immediately
precedes
first sheet
of drawings
of 633,088



Witnesses

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UNITED STATES PATENT OFFICE.

SMILEY S. POWERS AND CHARLES R. COOK, OF CANTON, NEW YORK.

PULP-DRYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 633,089, dated September 12, 1899.

Application filed November 5, 1898. Serial No. 695,585. (No model.)

To all whom it may concern:

Be it known that we, SMILEY S. POWERS and CHARLES R. COOK, citizens of the United States, residing at Canton, in the county of St. Lawrence and State of New York, have invented a new and useful Pulp-Drying Machine, of which the following is a specification.

Our invention relates to improvements in pulp-drying machines especially designed for drying a wet web of paper-pulp as it is delivered from a "wet-paper machine," and the object that we have in view is to provide mechanism for automatically carrying festoons or loops of wet paper-pulp through a drying-room, whereby economy of space in the intervals between the pulp festoons is attained and the pulp is thoroughly dried in its transit through the drying-room.

A further object is to provide means arranged to engage automatically with the web festoons or loops as they are formed successively in the machine to carry the festoons in a spaced condition through the drying-room, so as to permit of the free circulation of heat between the festoons and to automatically disengage the carrying devices from the festoons near the delivery end of the machine.

A further object is to provide means for feeding the wet pulp to the drying apparatus in a manner to insure the formation of the festoons or loops and also to deliver the pulp continuously in its dried condition as the festoons are presented to the delivery devices.

With these ends in view the invention consists in the novel combination of elements and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand the invention, we have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a side elevation of our improved pulp-drying machine, illustrating a part of a drying-room and a heating apparatus. Fig. 2 is a plan view, partly in section, of the drying-machine represented by Fig. 1. Fig. 3 is a vertical transverse section on the plane indicated by the dotted line 3 3 of Fig. 1, looking in the direction indicated by the arrow. Fig. 4 is an enlarged detail perspective view

of a fragment of one of the conveyer-chains, illustrating one foldable arm or bar connected with one of the chain-links. Fig. 5 is a detail fragmentary view of the driving-cam, which is mounted loosely on the shaft of the idler-conveyer drum, said view being a section on the line 5 5 of Fig. 1. Fig. 6 is a detail section on the line 6 6 of Fig. 1 to illustrate the loose mounting of the pawl-carrying lever on the shaft of the driving-conveyer drum.

Like numerals of reference denote like and corresponding parts in each of the several figures of the drawings.

We employ a suitable framework 10 to support the operative parts of our drying-machine, which is housed or inclosed within a suitable drying-room 11 or other structure. (Indicated in a general way in Fig. 1 of the drawings.)

Immediately beneath the drying-machine and within the drying-room is a suitable heating appliance 12, (shown by Fig. 1,) and this heating appliance may consist of the steam-coils or of pipes adapted for the circulation of hot air. It will be understood that we do not restrict ourselves to the employment of any particular device for heating the drying-room; but to secure maximum efficiency in the operation of the drying-machine we prefer to locate the heating appliance below and within the limits of the drying-machine, so that the heat as it ascends will circulate through and around the festoons or loops of paper-pulp in their transit through the apparatus and the drying-room.

Our drying apparatus is designed to be located contiguous to the delivery-rolls of a wet-paper machine, which rolls are indicated in a general way by the numeral 13 in Fig. 1 of the drawings, and the web of paper-pulp is thus adapted to be passed from the wet-machine directly to the drying-machine. This web of wet paper-pulp passes from the delivery-rolls 13 to and over the carrier feed-roll 14, arranged in a horizontal position at the upper side of the drying-machine at the receiving end thereof, said carrier-roll 14 having its shaft journaled in suitable bearings of the frame 10. (See Fig. 1.) A detaining or pressure roll 15 is arranged across the frame 10 in rear of the carrier-roll 14 and near the

receiving end of the drying-machine, and this roll 15 has its shaft confined within suitable housings 16, which are fixed to the frame 10, one of said housings being shown by Fig. 1. The web of paper-pulp passes over the carrier-roll 14 and below the pressure or detaining roll 15, and these rolls 14 15 coact with each other and with the delivery-rolls 13 to insure the formation of the festoons or loops in the machine, which festoons are to be engaged by the carrier appliance.

At the delivery end of the machine we provide the driving-drum 17, which is arranged in a horizontal position across the machine-frame, and the shaft 18 of this drum is journaled in suitable bearings on the frame 10, one end of said shaft being extended beyond the frame 10 for the reception of a driving-ratchet, which constitutes one element of a feed mechanism by which the endless conveyer is actuated intermittently. At the opposite or receiving end of the machine is arranged an idler-drum 19, the shaft 20 of which is journaled in proper bearings on the machine-frame and in a position to make the idler-drum parallel to and in line with the driving-drum 17. These drums are shown as consisting of heads provided with notches, which constitute seats for the rollers of the strands forming the endless carrier. The strands or chains 21 22 of the endless carrier are adapted to fit around the driving and idler drums, and said strands are parallel to each other near opposite sides of the machine-frame, whereby the strands are spaced apart to accommodate the pairs of foldable bars or arms which serve to carry the festoons of the paper-web. Each strand or chain of the endless carrier consists of a series of links 23, which are shown more clearly by Fig. 2 and in detail by Fig. 4. Each link has a narrow forked end to receive a roller 24, which is journaled loosely on a pintle 25, and the other wide end of this link is forked to receive the narrow end of an adjacent link and the roller 26, which is journaled in like manner within said adjacent link, the rollers 24 and 26 being similar to each other. The links forming the strand or chain are connected pivotally together by a series of pintles, which pass through the forked contiguous ends of the links and also serve as the journals for the rollers 24 26. Each link is furthermore provided with a laterally-extending short arm 27, which is made integral with the link at a point between the forked ends thereof and which extends beyond the outer edge of the link for a suitable distance to present a roller beneath a guide-track in a manner to obviate tipping or displacement of the link. Said arm 27 is reduced to form a stud 28, on which is loosely fitted the roller 29. The link is furthermore provided with lugs 30, which are disposed on the opposite or inner edge of the plate or body of the link, and between these lugs is loosely fitted a plate 31, which is attached pivotally to the lugs by the pin 32.

It will be understood that each strand or chain of the endless conveyer consists of the series of links pivotally connected together and that said links are arranged to present the loose pivoted plates on their inner facing or opposing edges, as shown very clearly by Figs. 2 and 3. The pivoted plates 31 of the conveyer strands or chains serve to carry the two series of arms or bars 33 34, and these bars are secured firmly to the plates so as to move therewith.

The links of the conveyer-chains are arranged in coincident positions so as to dispose the bars 33 34 in pairs, and the bars on the upper sides of the endless chains are adapted to assume the alined positions indicated by Figs. 2 and 3, while the bars on the lower sides of the conveyer-chains drop or fall to the vertical position shown by Fig. 3, thus disposing the lower series of bars out of the path of the festoons of the paper-web.

Each hinged or pivoted plate 31 is provided with an offset or shoulder 31^a, which is adapted to abut against a stop-screw 32^a, which is supported in the link at one side of the pivot 32, whereby the shoulder and screw limit the play of the plate on its pivot when the link assumes the position shown by Fig. 3; but on inversion of the link after it passes around the driving-drum 17 the bar and plate drop or fall by gravity to the vertical position shown by Figs. 1 and 3.

The bars or arms 33 34 on the upper side of the endless carrier and while in their alined horizontal positions are adapted to sustain the festoons of the paper web and to carry the latter horizontally through the machine, and to prevent torsional strain on the links of the carrier-chains we provide the upper track-rails 35 36, which are disposed in horizontal positions within the machine-frame and lie below the upper lengths of said conveyer-chains for the rollers 24 26 of the links to ride thereon. These track-rails 35 36 are parallel to each other in the same horizontal plane, and they extend nearly throughout the length of the machine-frame, from the receiving end thereof to the discharge end. These rails may be secured in the machine-frame by the vertical bars 35^a, which are attached to the rails and to the frame so as to lie out of the path of the festoons of the paper web. The rollers of the conveyer-chains are adapted to ride upon the track-rails and said rails sustain the conveyer-chains against sagging under the weight of the paper web and the leverage exerted by the carrier-bars by which the web festoons are suspended within the machine. As shown by Figs. 1 and 3, we prefer to provide rails 37 at the lower part of the machine-frame for the under links of the conveyer-chains to travel thereon when returning to the receiving end of the machine; but these lower rails are not essential and may be dispensed with, if desired. Said rails may be fastened directly to the machine-frame, as shown by Fig. 3, and

they are disposed within the inner edges of the links and the pivots 32, which attach the bar-carrying plates to the chain-links, whereby the bars may fold to the vertical position shown by the drawings. To prevent tipping of the chain-links under the weight of the bars or arms and the web festoons suspended thereby and to insure proper positioning of the chain-links in order to carry the web through the machine, we provide the rails 38 39 for the rollers 29 to ride against when the web festoons are suspended by the bars. These rails 38 39 are fastened to the frame 10 above the rails 35 36, parallel thereto and in vertical planes outside of said rails 35 36, whereby the rails 38 39 occupy positions for the rollers 29 to ride against the lower sides thereof. The elevated track-rails 38 39 extend beyond the ends of the upper track-rails 35 36 and above the driving and idler drums 17 19, thus insuring the conveyer-links assuming proper positions as they leave the idler-drum 19, because the rollers 29 will ride against said elevated rails 38 39.

The conveyer of our machine is moved intermittently, while the devices for feed in the paper-web to and carrying it from the machine operate continuously in order to secure the formation of the loops or festoons in the paper web. To effect the intermittent movement of the endless conveyer, we provide a pawl-and-ratchet feed mechanism, which in the embodiment represented by the drawings is adapted to be driven by gear connections with one of the rolls of the wet-paper machine. A driving-gear pinion 40 has its shaft 41 journaled in proper bearings on the machine-frame 10, and to this shaft is fixed a pulley 42, that receives a belt 43, which is propelled by a pulley 44 on one of the roll-shafts 13, as indicated by Fig. 1. This gear-pinion 40 meshes with a master-gear 45, having its shaft journaled in proper bearings on the machine-frame at the receiving end of the drying apparatus, and this master-gear carries a cam 46, which is provided with a groove or track 47, having a high point 48. (See Fig. 1.) A bell-crank lever 49 is fulcrumed at 50 to a suitable part of the machine-frame, and one arm of said lever is provided with a roller or shoe 51, which is adapted to travel in the cam-groove 47, so as to ride against the high point 38 thereof. The other arm of this bell-crank lever has a longitudinal slot 52, in which is secured an adjustable wrist-pin 52^a, that serves to pivotally attach a rod or pitman 53 to the bell-crank lever. A ratchet 57 is secured fast to the protruding end of the shaft which supports the driving-drum 17, and on the hub of this ratchet is loosely fitted a pawl-carrying lever 54, which is disposed in an upright position outside of the machine-frame and alongside of the ratchet 57. The lower arm of this upright lever 54 is provided with a slot 55, in which is adjustably secured a wrist-pin 55^a, which connects the rod or pitman 53 to the

lever 54, and it will thus be seen that the pitman 53 serves to operatively connect the bell-crank lever with the pawl-carrying lever. It is also evident that the pitman 53 may be adjusted on the bell-crank lever or the pawl-carrying lever, or on both levers, to vary the throw or travel of the pawl, and thus the endless conveyer may be moved more or less, according to the adjustment desired. The upper end of the pawl-lever 54 carries a feed-pawl 56, which is adapted to engage with the teeth of the ratchet 57, and as the cam actuates the levers and pitman to swing the pawl in a forward direction said pawl slips idly over the teeth of the ratchet; but on the reverse movement of the levers the pawl turns the ratchet and the drum 17 to move the endless conveyer a proper distance for the separation of the festoons of the paper web.

At the delivery end of the drying-machine we provide a delivery-roll 58, the shaft of which is journaled in proper bearings on the machine-frame, and above this delivery-roll is a pressure-roll 59, which coacts with the roll 58 to hold the paper web under tension. The web of paper is carried from the rolls 58 59 to a roll 60 of a winding-machine of any standard construction; but as this winding-machine is no part of our apparatus we have not deemed it necessary to illustrate or describe the same.

The operation may be described as follows: The paper web is delivered continuously from the rolls 13 of the wet-paper machine to the rolls 14 15 of the drying apparatus, while the cam-and-ratchet feed mechanism operates to move the endless conveyer intermittently. As the conveyer is actuated and as it travels around the idler-drum 19 the hinged plates 31 and certain of the bars or arms 33 34 assume horizontal positions between the chains of the conveyer. The paper web being fed continuously to the machine and the conveyer being actuated at intervals, opportunity is given to the paper web to form a loop or festoon at the receiving end of the drying-machine, and as soon as a proper length of the web has been supplied to form a festoon the conveyer is actuated by its feed mechanism to present a pair of the bars 33 34 in a position to engage with the festoon. As the conveyer is moved this pair of bars or arms carry the festoon from beneath the roll 15, and the paper web being fed continuously another festoon is formed for engagement by the next pair of arms or bars 33 34 on the succeeding movement of the conveyer. This operation is continued until the machine is filled with a plurality of paper festoons, as shown by Fig. 1, and the festoons are thus carried through the machine in a suspended condition from the plurality of arms or bars. As the festoons are moved with the conveyer they are exposed to the heat supplied by the heating appliance 12, and as the festoons are spaced the heat has free access to the paper, so as to thoroughly dry the latter as it is carried

through the machine. The paper web is moved by the rolls 58 59 and the rolls 60 of the winding-machine, and the bars or arms move with the conveyer-chains around the driving-drum 17 until they reach the lower side of said drum. When the conveyer-chains travel around the drum 17, the links 23 are inverted and the plates 31, with the attaching bars or arms, drop or fold to the vertical positions, so as to lie outside of the path of the suspended paper festoons, and the bars or arms are thus separated to enable them to return with the lower lengths of the conveyer-chains without striking against the suspended paper festoons.

From the foregoing description it will be understood that the paper-carrying arms or bars are attached permanently to the chains of the conveyer and that said bars are adapted to assume horizontal positions when they are to be used for carrying the paper festoons, while on their return movement they are folded out of the path of said festoons. It is not necessary in our machine to feed the carrier-bars to the conveyer-chain at the receiving end of the machine nor to remove said bars at the delivery end of the machine. The bars adjust themselves automatically as they pass around the drum at the receiving end of the machine, so that they may engage with the paper festoons as they are produced; but on the return travel of the conveyer the bars fold out of the way of the suspended festoons.

Changes may be made in the form of some of the parts, while their essential features are retained and the spirit of the invention embodied. Hence we do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

What we claim is—

1. In a paper-drying machine, the combination with parallel strands or chains arranged to travel in horizontal paths, of pairs of foldable arms pivoted to said strands or chains and extending inwardly toward each other when in active positions, means to reduce torsional strain on said arms and the strands or chains, and guide-tracks in operative relation to the chains or strands, substantially as described.

2. In a paper-drying machine, an endless conveyer consisting of parallel strands or chains, and foldable arms permanently connected to the strands and arranged in pairs to extend inwardly toward each other when in their active positions, substantially as described.

3. In a paper-drying machine, an endless conveyer comprising parallel strands or chains and foldable arms or bars hinged to the opposing edges of the strands or chains to assume alined positions on the upper side of the conveyer and, on the inversion of said chains, to drop or fold automatically into vertical positions out of the path of paper festoons

suspended by the upper bars, substantially as described.

4. In a paper-drying machine, an endless conveyer consisting of parallel strands or chains, a series of hinged plates connected to said strands or chains, carrier-bars attached to the hinged plates and arranged to assume alined positions on the upper side of the conveyer, and stop devices to limit the folding of the hinge-plates when the bars assume active positions, substantially as described.

5. In a paper-drying machine, the parallel endless chains each provided on one side with arms, and tracks against which the arms are adapted to ride, combined with foldable arms pivoted to the opposite sides of the chains and adapted to extend toward each other when in active positions, and other tracks or rails upon which the chains are adapted to travel, substantially as described.

6. In a paper-drying machine, an endless conveyer consisting of parallel chains having each link thereof provided with a friction-roller and with an offstanding arm carrying the roller-shoe, combined with foldable arms each connected to one of the chain-links, track-rails on which the rollers of the chain-links are adapted to ride, and other track-rails in operative relation to the roller-shoes on the arms of the chain-links to reduce torsional strain on the chains when the foldable arms are in active positions, substantially as described.

7. In a paper-drying machine, an endless conveyer consisting of parallel chains or strands provided with the carrier-rolls and with other rolls disposed in different vertical planes with the carrier-rolls, and two series of foldable arms connected with said strands or chains, in combination with track-rails upon which the carrier-rolls of the chains are adapted to travel, and other track-rails occupying elevated positions at one side of the first-named track-rails for the side rolls to ride against the same, substantially as described.

8. In a paper-drying machine, an endless conveyer having its chains composed of pivoted links which are provided with offstanding arms, guide-rollers journaled on these arms of the links, and bar-carrying plates hinged to the edge of the conveyer-links opposite to the offstanding arms, in combination with rails upon which the conveyer-links are adapted to travel, and other rails against which the rolls travel to prevent tipping of the links under the leverage of the festoon-carriers and the weight thereon, substantially as described.

9. In a paper-drying machine, the chain-links pivoted together and each provided, at a point intermediate between the pivotal connection with adjacent links, with an adjustable stop-screw, combined with foldable arms each pivoted to one of the said chain-links at a point adjacent to the stop-screw, and each arm having an angular shoulder arranged to

impinge against the stop-screw and to limit the movement of the arm when it assumes an active position with relation to the chain, for the purpose described, substantially as set forth.

10. In a paper-drying machine, the combination of horizontal drums, an endless conveyer having its strands or chains fitted partially around said drums to travel in horizontal paths, two series of foldable arms pivoted to the opposing sides of the conveyer-chains and arranged to extend inwardly toward each other when in active positions on the upper lengths of said conveyer-chains, and an intermittent feed mechanism associated with one of said drums, substantially as described.

11. In a paper-drying machine, the combination of a pair of drums, an endless conveyer having two series of foldable arms connected permanently thereto, a feed mechanism for moving the conveyer intermittently, and means for continuously feeding a paper web in the path of said foldable arms, substantially as described.

12. In a paper-drying machine, the combination of a pair of drums, an endless conveyer operatively fitted to said drums and having two series of foldable arms permanently connected thereto, a ratchet on one of the drum-shafts, a feed-lever having a pawl to engage with said ratchet, a driving-cam,

and means actuated by said cam and connected with the feed-lever to rotate the drum intermittently, substantially as described.

13. In a paper-drying machine, the combination of a pair of drums, an endless conveyer fitted to said drums and provided with two series of foldable arms which are permanently connected thereto, a ratchet on one of the drum-shafts, a cam on the other drum-shaft, means for rotating the cam continuously, a bell-crank lever controlled by the cam, a feed-lever having a pawl which engages with the ratchet, and a pitman connecting said levers, substantially as described.

14. In a paper-drying machine, the combination of a pair of drums, an endless conveyer having two series of foldable arms connected pivotally thereto, a ratchet on one of the drum-shafts, a driving-cam, a bell-crank lever actuated by the cam, a feed-lever having a pawl, and a pitman having its ends attached adjustably to the bell-crank lever and the feed-lever, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

SMILEY S. POWERS.
CHARLES R. COOK.

Witnesses:

J. E. JOHNSON,
J. FRED. HAMMOND.