J. OLSEN.

PULP SCREEN.

APPLICATION FILED SEPT. 9, 1909.

974,513. **Patented Nov. 1, 1910.**

2 SHEETS—SHEET 1.

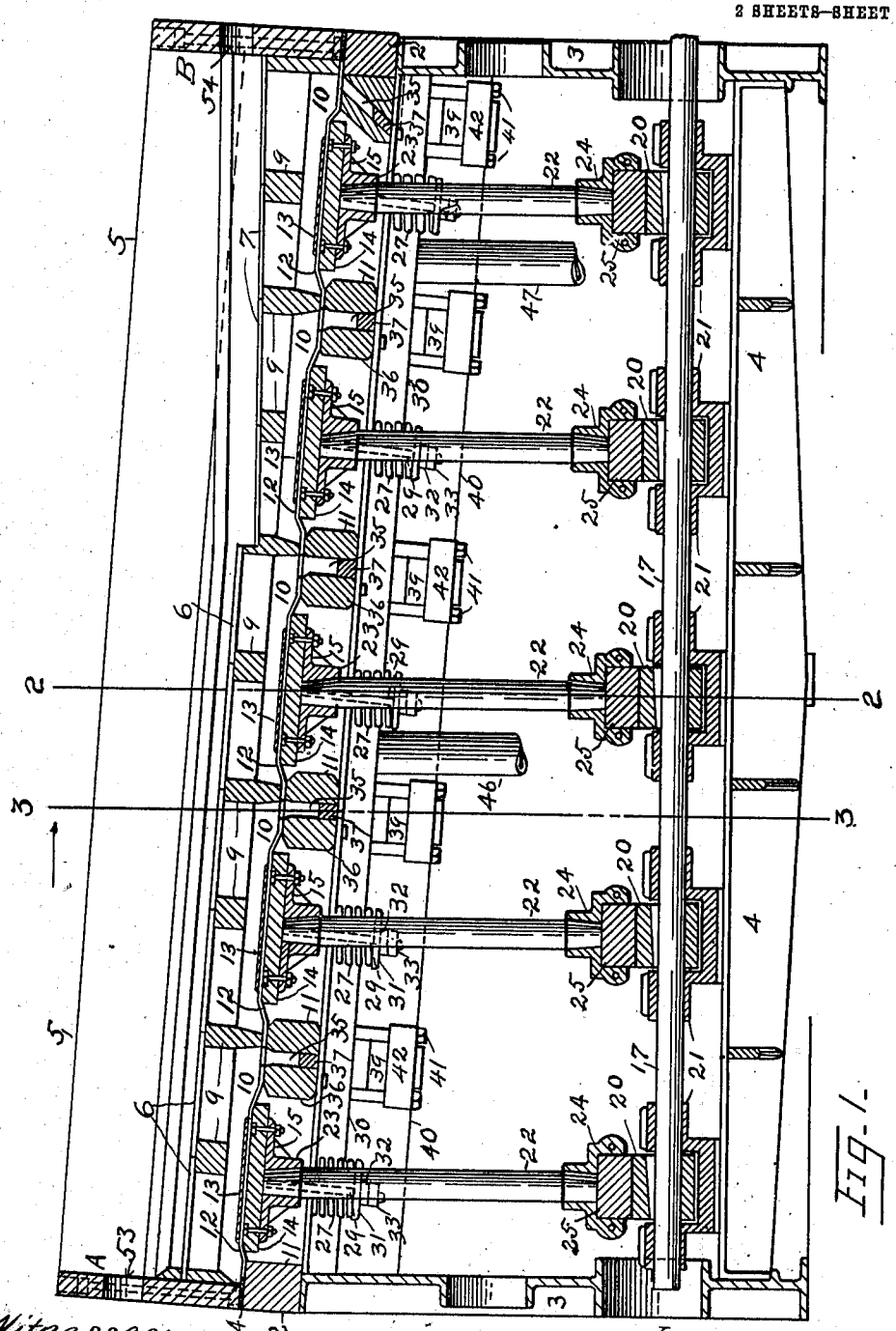

Fig. 1.

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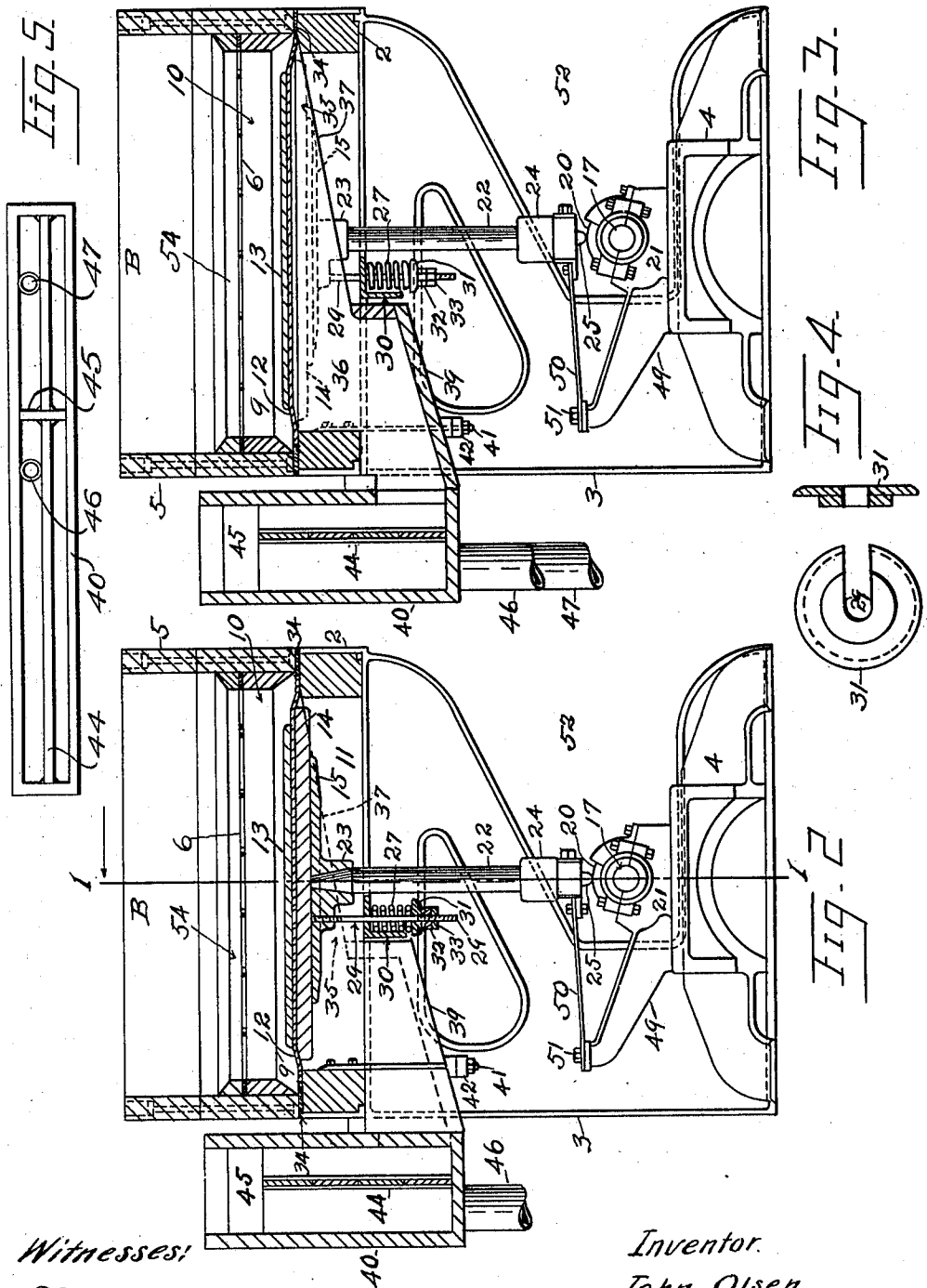

Fig. 5

Fig. 3

Fig. 4

Fig. 2

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UNITED STATES PATENT OFFICE.

JOHN OLSEN, OF WATERTOWN, NEW YORK.

PULP-SCREEN.

974,513. Specification of Letters Patent. Patented Nov. 1, 1910.

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To all whom it may concern:

Be it known that I, JOHN OLSEN, a citizen of the United States, residing at Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Pulp-Screens, of which the following is a specification.

This invention relates to improvements in screens, designed for use in the manufacture of pulp, fiber and like materials employed in making paper and paper products.

The object of the invention is to provide a novel, simple and effective device for screening or straining pulp and fiber of various kinds, a portion of the machine being arranged on an incline in the direction of its length for increasing the velocity of flow of the stream of unscreened material over the plates, the adjacent portion of the machine being flat or level for retarding the flow of the pulp to permit the mass to be diluted to assist in the final screening of the fiber remaining after it has passed from the inclined portion.

A further object is to provide means for separating the stock of pulp screened by the inclined portion of the machine, from the stock screened by the flat portion, and also for returning the latter stock to and re-screening the same by the inclined plates. And a further object is to provide novel and simple means for operating the suction mechanism, and for conducting the strained pulp from the vacuum chambers.

The invention consists principally of an elongated vat or trough having a bottom composed of a series of finely slotted screen plates, the plates at the head of the vat being disposed on an incline toward the tail of the machine, the inclined portion extending past the middle of the vat. The plates at the tail end of the vat being arranged horizontal or level, and disposed on a slightly lower level than the lower end of the inclined plates.

The invention further consists of a series of individual vacuum chambers arranged beneath both the inclined and level screen plates.

The invention further consists of a series of inclined flexible diaphragms forming the bottoms of the vacuum chambers, the inclination of the diaphragms extending regularly from the head to the tail of the machine; the said diaphragms being operated in one direction by means of cam actuated piston or plunger rods which decrease in length regularly from the head to the tail of the machine, said diaphragms being operated in the opposite direction by a series of springs supported independently of said piston rods; and the said diaphragms and rods all being operated by a common horizontal power driven shaft equipped with suitable cams.

The invention further consists of a series of novel self-cleaning outlets and flow spouts for carrying away the screened stock from the vacuum chambers.

The invention further consists of the features and parts set forth in the detail description which follows, illustrated by the accompanying drawings, and then particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a central longitudinal section, substantially on line 1—1 of Fig. 2, showing the construction and arrangement of the principal parts of the pulp screen. Fig. 2 is a vertical cross-section taken on line 2—2 of Fig. 1. Fig. 3 is a similar cross-section, taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged detail view of the split plate or washer which holds the suction spring in place. Fig. 5 is a reduced top plan view of the flow-box, showing the transverse and longitudinal partitions.

Similar characters of reference designate corresponding parts throughout the several views.

In the drawings, 2 represents the bellows frame, of a pulp screen, which is mounted upon end legs or standards 3. The entire bellows frame is built on an incline extending regularly from the head A to the tail B of the machine, and may be constructed of hard wood or any other suitable material. The legs 3 are preferably made of cast iron, and are connected or tied together at their lower ends by a girder 4.

Upon the bellows frame 2 is mounted the screen vat or trough 5, which is also built on an incline corresponding to the frame. The bottom of the vat is composed of a series of finely slotted screen plates 6 and 7. The screen plates 6 are preferably set in the vat 2 at an angle to the horizontal as shown in Fig. 1, and these plates constitute the inclined section, which preferably extends past the middle of the machine. The plates 7 are set in the vat in true horizontal posi-

tion, as also shown in Fig. 1, the level of the plates 7 being slightly lower than the lowest end of the inclined plates 6. The plates 6 and 7 are preferably made of metal, having fine and regular slots (not shown) through which the pulp or fiber is drawn during the process of screening. The plates are all mounted upon cross girts 9 which are secured to the sides of the vats.

Underneath the plates 6 and 7 is arranged a series of vacuum chambers 10, each of which comprises the space directly below two adjacent plates. The vacuum chambers are separated by cross-timbers 11 forming part of the frame, spaced at regular intervals through the machine. The bottom of each vacuum chamber is formed by a flexible diaphragm, consisting of a sheet of rubber 12, which passes between wooden plates 13 and 14, all of which are mounted upon and supported by a metallic base 15. The outer side and end edges of the diaphragms 12, are secured to the timbers of the bellows frame in the usual manner to permit of the flexing and the vibrating of the same.

17 represents a power driven shaft which extends horizontally through the lower portion of the machine, and which is suitably supported in bearings supported by the girder 4. At intervals throughout the length of the shaft 17, and corresponding to the centers of the several diaphragms, are located a series of cams 20, each keyed to the shaft 17 between bearings 21 mounted upon the girder 4. To operate the diaphragms, *i. e.* to raise them, a series of piston rods or plungers 22 of different length are provided, there being one rod for each diaphragm, the upper end of each rod entering and tightly fitting a downwardly extending hub 23, formed on the underside of the diaphragm base 15, the lower end of each rod 22 is fitted with a casing 24, in which is secured a wooden or metallic shoe 25, which rides upon the cam 20, the shoe connecting with the cam by contact only. The cams 20 are preferably 4-throw (not shown), and therefore serve to raise the diaphragms four times each revolution of the shaft 17.

The downward movement of each diaphragm is accomplished by a coil spring 27 which pulls the diaphragm away from the plates 6 and 7 following each lift by the cam. Each spring 27 is mounted upon a rod 29, the upper end of which is anchored in the diaphragm base 15, thence passes through an angle iron 30 secured to the frame 2, thence through the spring, the lower end of the rod being fitted with a split retaining plate 31, and a series of adjusting nuts 32 and 33. The upper end of the spring 27 bears against the angle iron 30. To repair or replace the spring 27, the nuts 32 and 33 are first loosened, the plate 31 removed, and then the spring may be passed freely over the nuts in either direction.

The suction or vacuum chambers 10 are formed by the screen plates, and the diaphragms, and by the meeting of the girts 9 and cross timbers 11, and other parts of the vat and bellows frame, between all of which is disposed a suitable packing 34, to make air-tight and water-tight joints.

The liquid pulp which is strained by suction through the plates 6 and 7, is temporarily held in the separate vacuum chambers 10, and is thence drained off through narrow transverse outlet passages 35, which are formed between the cross timbers 11 and another like timber 36, of the bellows frame. In order to render the outlet passages 35 self-cleaning, and also to facilitate the flow of the screened stock, the said passages are provided with an inclined bottom 37, which extends from one side of the machine's frame a short distance past the center, from which point the passage 35 is bottomless. Under this construction, the pulp flows with considerable current down the inclined bottom 37, and has a tendency to continually wash and prevent the settlement and accumulation of the fine grit and other solid particles forming a part of the liquid mass. From the lower end of the inclined bottoms 37 of the outlet passages, the pulp makes an abrupt drop of several inches into flow spouts 39, and thence passes into a common flow-box 40, which extends along the rear side of the machine, and connects with, and is supported by, the spouts 39. The flow-spouts 39 are supported in operative position by a series of hanger-bolts 41 and saddles 42. The flow-boxes 40 are divided longitudinally by a sectional dam 44, which is employed for regulating the level of the screened pulp for maintaining the vacuum in the suction chambers 10. The dam 44 is also used for raising or lowering the level of the screened pulp in the vacuum chambers for increasing or diminishing the volume of stock screened. The flow-box 40 is preferably divided by a transverse partition 45 for separating the pulp screened by the inclined plates 6, from that screened by the flat plates 7.

46 represents a stock pipe connecting with the flow-box for carrying the screened stock from the inclined plates to the head-box or storage-tanks, and 47 represents a pipe employed for returning the pulp screened by the flat plates back to the source (not shown) of the unscreened stock, from which it may be pumped and redelivered to the head of the machine in the usual manner for rescreening by the inclined plates.

49 represents a metallic arm or part mounted upon the girder 4, and extending rearwardly from each cam 20 and bearing 21, the free outer end of which supports a

flat spring 50, the spring being held in place by a bolt 51. The inner end of the spring 50 connects with the casing 24 carried by each plunger. These springs are employed for supporting and steadying the lower ends of the plungers, for holding them truly in line and engagement with the cams.

The legs or standards 3 are made in the form shown in Figs. 2 and 3, having a large recess or opening 52 extending from the front of the machine inwardly past the center, to facilitate the applying and removing of the main shaft 17.

53 represents an opening in the head of the vat through which the stock to be screened is supplied to the vat, and 54 is an opening in the tail end of the vat for the escape of the slivers, chips and other coarse refuse which fails to pass through the plates 7.

The operation of my combined inclined and flat pulp screen is very simple. The power is first turned on and shaft 17 begins to rotate, and cams 20 and springs 27 start the vibrating of the diaphragms 12. The liquid mass of pulp is then delivered to the head of the machine through the opening 53, and flows in a steady stream of suitable depth downwardly across the inclined plates 6 with considerable velocity. The pulp that is sucked through the plates 6 will be the highest grade of stock the machine is capable of screening, according to the gage of the slots in these plates. The portion of the stream of pulp which flows on and falls upon plates 7 of the flat portion of the machine will contain all the slivers, chips and coarse grit which fails to be drawn through the inclined plates 6. A considerable amount of serviceable high-grade pulp will naturally be carried on to the flat plates together with the coarse refuse, and as the diaphragms beneath the flat plates are vibrated the same as the other diaphragms, practically all of the fine pulp is screened before the refuse is discharged through the opening 54 at the tail end of the machine. To facilitate the complete screening of the pulp remaining in the mass of coarse material, through the plates 7, water may be added to the flat portion of the machine in order to thin the mass sufficiently to effect perfect screening. All of the stock screened through the inclined plates is then conducted by pipe 46 to the storage tanks or presses, while all of the stock screened by the flat plates 7 is returned through pipe 47 to the source of unscreened stock for redelivery to the high end of the plates 6 for rescreening as described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. A pulp screening mechanism, comprising an elongated vat having a screen, and a plurality of separate suction devices arranged in series beneath said screen for draining portions of the stream of pulp therethrough, each of said devices having an outlet for the screened pulp, said screen consisting of two sections, one of said sections arranged at an angle to the horizontal, whereby the stream of pulp flows at a substantially constant high speed from end to end thereof, the other section of the screen being arranged horizontal and adapted to receive and screen the residue of the pulp which flows from the first section.

2. A pulp screening mechanism comprising an elongated vat, a series of independent vacuum chambers each having a diaphragm and an inclined outlet, means for vibrating said diaphragms, and two screens in said vat for forming the upper wall of said chambers, one of said screens arranged at an angle to the horizontal, so that a stream of pulp will flow down it, and portions of said stream will be drawn into the chambers beneath said screen, the other screen arranged horizontal and adapted to receive and screen the pulp which flows from the first screen.

3. A pulp screening mechanism, comprising an elongated vat, a series of independent vacuum chambers each having a diaphragm and an inclined outlet, means for vibrating said diaphragms, two screens in said vat for forming the upper wall of said chambers, one of said screens arranged at an angle to the horizontal, so that a stream of pulp will flow down it, and portions of said stream will be drawn into the chambers beneath said screen, the other screen arranged horizontal and adapted to receive and screen the pulp which escapes from the first screen, and means for separating the pulp drawn through the two screens, so as to permit the pulp drawn through the horizontal section to be rescreened by the angular section.

4. In a pulp screening mechanism, an elongated vat, a series of independent vacuum chambers each having a diaphragm, means for vibrating said diaphragms, an inclined outlet for each vacuum chamber, and a plurality of screen plates forming the upper wall of said chambers, a number of said screen plates being arranged in the same plane at an angle to the horizontal, the remaining plates arranged horizontal, the latter plates being adapted to screen the residue of the pulp after the stream passes off the angular plates.

5. In a pulp screening mechanism, an elongated vat having a screen which is inclined at an angle to the horizontal, and having a second screen arranged horizontal, a series of separate vacuum chambers under said screens, a diaphragm for each vacuum chamber, a separate inclined outlet for each chamber, a flow spout for each outlet, a divided flow box, one compartment in said

flow box adapted for receiving the pulp screened by the inclined screen, the other compartment adapted for receiving the pulp drawn through the horizontal screen, and means for returning the pulp drawn through the horizontal screen to the source of unscreened stock for redelivery to the inclined screen for rescreening.

6. A pulp screen comprising a vat, a screen inclined in the direction of the length of the vat, a second screen arranged horizontal and abutting the low end of said first screen, independent vacuum chambers arranged in series beneath said screens, a diaphragm in each vacuum chamber, the said diaphragms being substantially parallel with the inclined screen, and arranged at an angle to the flat screen, rods for operating the diaphragms in one direction, springs for operating the diaphragms in the opposite direction, a flow-spout for each vacuum chamber, and a flow-box having a separate compartment for the series of vacuum chambers beneath each screen.

7. A pulp screen comprising an elongated vat, an inclined screen and a horizontal screen arranged end-to-end in said vat, non-communicating vacuum chambers beneath each of said screens, a diaphragm for each vacuum chamber, said diaphragms substantially parallel to the inclined screen and at an angle to the horizontal screen, means for vibrating said diaphragms, a laterally inclined outlet for each vacuum chamber, a flow-spout for each of said chambers, and a flow box having non-communicating compartments for receiving the pulp drawn through said screens.

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

JOHN OLSEN.

Witnesses:
GEO. W. TRIPP,
ERNEST G. MARTIN.