July 11, 1933. A. ALDRICH ET AL 1,917,288

SHAKE MECHANISM FOR PAPER MAKING MACHINES

Original Filed Jan. 24, 1931 2 Sheets-Sheet 1

Fig. 1

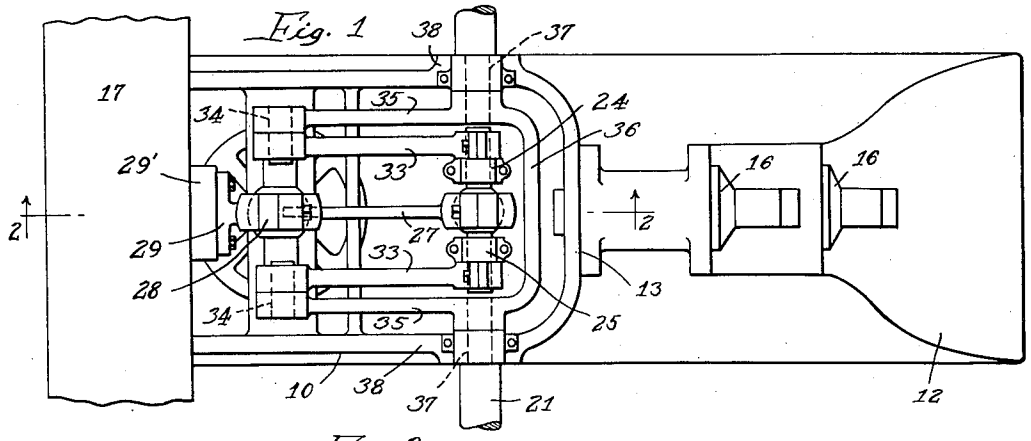
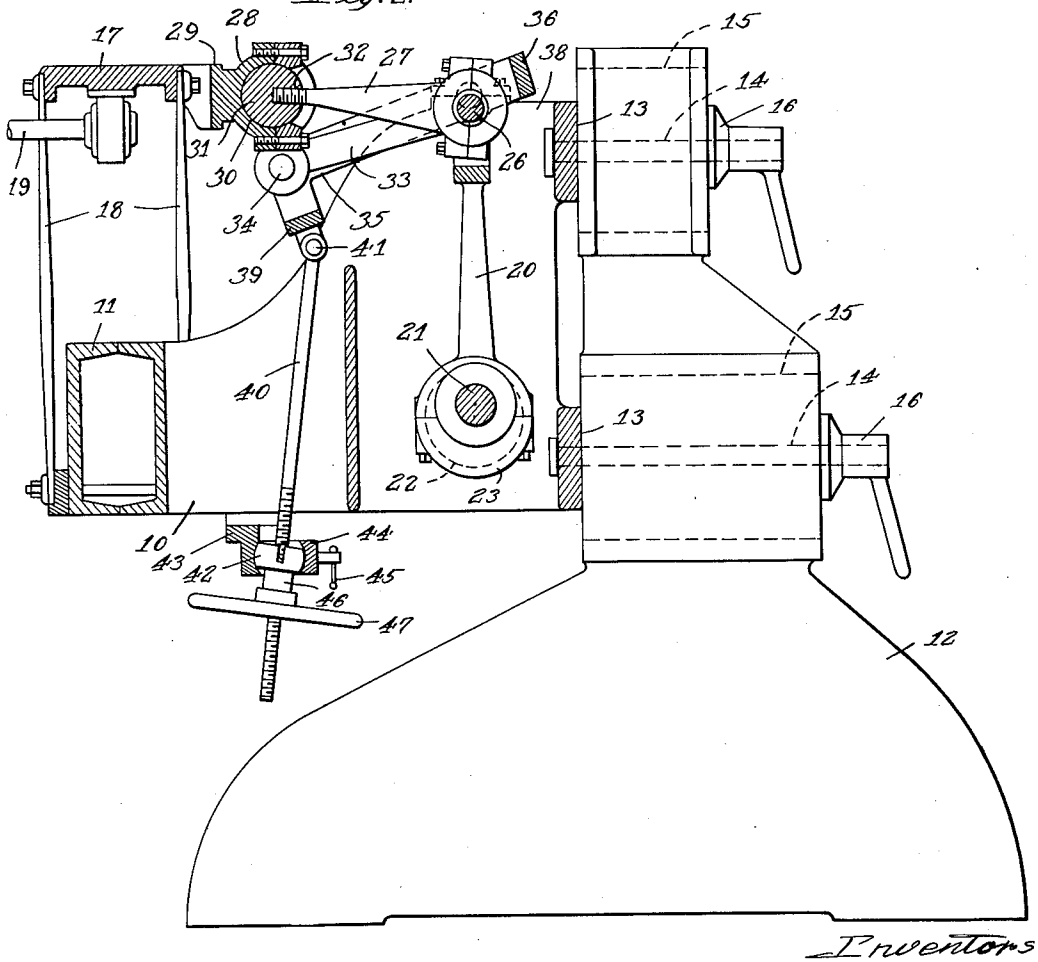


Fig. 2.



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Fig. 3

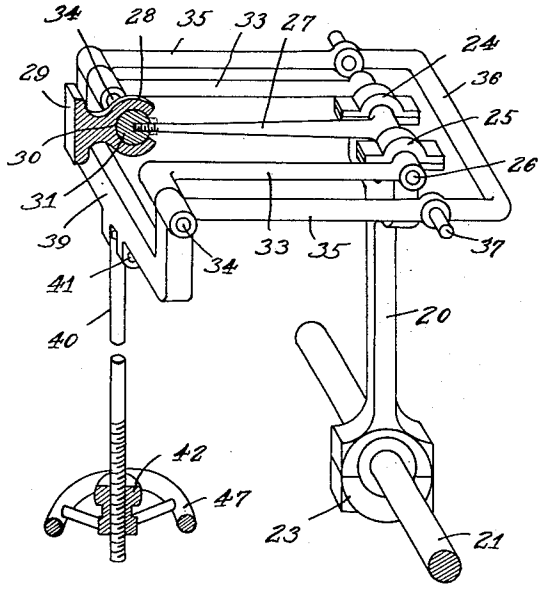


Fig. 4.

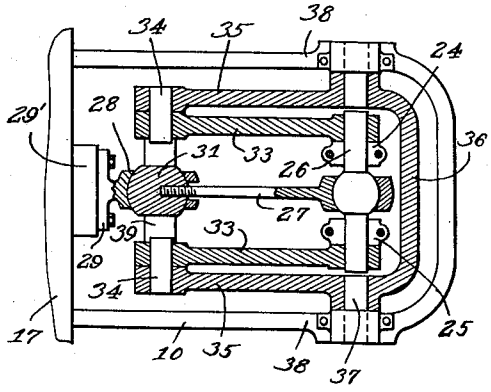


Fig. 5.

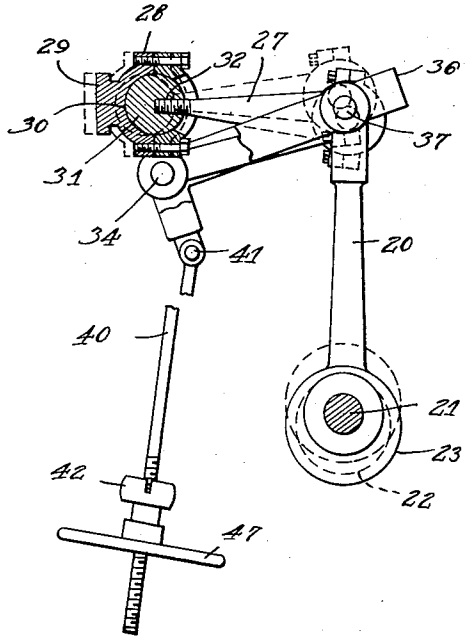
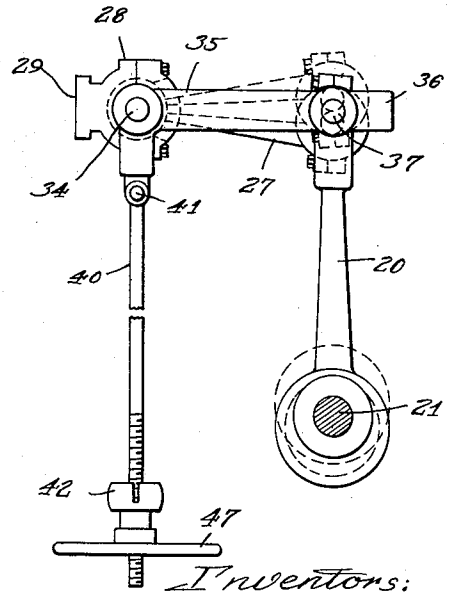


Fig. 6.



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UNITED STATES PATENT OFFICE

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SHAKE MECHANISM FOR PAPER MAKING MACHINES

Original application filed January 24, 1931, Serial No. 510,877. Divided and this application filed March 21, 1932. Serial No. 600,286.

This application is a division of application Serial No. 510,877, filed January 24, 1931, for Paper making machine and method of making paper.

It has heretofore been common in the paper machinery art to provide a shaking mechanism for imparting a vibratory movement to the table structure, forming wire and/or breast roll. Recently considerable advance has been made in reducing the weight of the portions of the machine being vibrated for the reason, among others, of enabling speeding up of the machine. However, in spite of these improvements the weight to be moved is enormous, particularly in large machines, and the speed of the machine has been hampered by the lack of adequate means and methods of applying the shake motion.

The present invention deals with improvements in the shaking parts of paper making machines and in the means and method of applying the shake motion. The invention is applicable both to Fourdrinier and cylinder paper making machines, but is herein shown for purposes of illustration as applied to a Fourdrinier machine.

In the making of paper the speed of the shake, that is, the number of complete cycles or vibrations per minute, is an important factor or function in the formation of the sheet of paper, more so since greater efforts are being made to increase the speed and consequently the production capacity of paper making machines. Furthermore, because of the varying conditions and requirements in this industry it is desired to readily adapt the shaking function to the needs of the particular job at hand. In other words, because of the different character and quality of the stock, the type and grade of paper to be produced, and the method or practice being used, it becomes necessary to properly coordinate the shake with other functions of the machine.

The object of this invention is to provide an improved shake mechanism particularly adapted for paper making machines, whereby the shake may be operated at comparatively high speeds commensurate with high speeds of the web forming element and whereby also the amplitude of the shake motion may be quickly and easily adjusted while the machine and shake are in operation.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a top plan view of a shaking mechanism applied to the table structure of a Fourdrinier paper making machine, embodying the invention;

Fig. 2 is a vertical sectional view taken substantially on the line 2—2 of Figure 1;

Fig. 3 is a diagrammatic, perspective view, partly in section on the motion transmitting parts of the shake mechanism;

Fig. 4 is a top plan view partly in horizontal section, of certain of the upper portion of the shake mechanism; and

Figs. 5 and 6 are fragmentary views of a portion of the shake mechanism illustrating the movement thereof for different adjustments.

The invention is designed for transmitting shake motion to any part of a paper making machine requiring vibratory motion and is particularly adapted for imparting such motion to the table-roll portion of a Fourdrinier paper making machine, as well as to the breast roll; and in the parent application of which this is a division there are shown individual shake mechanism units connected to different portions of the table structure and to the breast roll for transmitting shake motion at the several points. Inasmuch as the present invention deals with the principles of construction and operation of the shake mechanism per se, there is here shown but a single unit connected to the table structure of a Fourdrinier paper making machine for imparting shake motion to the table-roll portion thereof.

According to the present invention the shake mechanism may be mounted on any suitable supporting structure. In conformity with the said parent application the shake mechanism here shown is mounted on a frame

10 in turn mounted on the side beam 11 of the table structure and supported at its opposite end on a standard 12. The table structure may be suitably supported in a stationary position when the machine is in operation and with capacity for removal laterally when changing the wire and movement vertically for adjusting the pitch of the wire, as disclosed in the parent application. The side beam 11 and standard 12 provide a stationary support for the shaking mechanism, although as contemplated in the invention claimed in the said parent application, the frame part 10 is in effect a unitary part with the side beam 11 and the shake mechanism which is mounted on said frame 10 is carried as a unit with the latter and said side beam when the table structure is removed laterally for changing the wire, and is also movable vertically with said side beam when the table structure is vertically adjusted for changing the pitch of the wire. These adjustments and the combination of the invention with structural features making possible such adjustments in order to coordinate certain functions as disclosed in the said parent application form no part of the present invention. However, as explanatory of the mounting disclosed in the said parent application and here shown for purpose of uniformity, it will be noted that the frame 10 seats against the flat, vertical coplanar faces 13 on the upright portion of the standard 12 and is adapted to be fixedly clamped thereto in any of a plurality of vertically adjustable positions. Such connection is by means of pins 14 disposed in vertical slots 15 in the standard 12 and having nuts 16 threaded on their outer ends, so that upon loosening the nuts the frame 10 may be vertically adjusted upon and with respect to the standard and upon removing the nuts the frame 10 may be removed with the table when changing the wire. As to the mounting of the shake mechanism, it will suffice to say that it may be suitably mounted and arranged with respect to the part to be vibrated, in keeping with the functions of the invention as will be presently more fully described.

In this case the part to be vibrated is the table-roll portion of a table structure of a Fourdrinier paper making machine. A part of one of the table rails is shown, designated by 17, this rail being supported upon the side beam 11 by means of a plurality of spring members 18. One of the table rolls on which the wire moves is indicated by 19, mounted on the rail 17 so as to be vibrated therewith.

The shake mechanism includes a connecting rod 20 eccentrically connected to a drive shaft 21, as by means of an eccentric 22 and an eccentric strap 23, whereby the drive shaft imparts a crank motion to the connecting rod 20. The shaft 21 may be driven by any suitable means such, for example, as an electric motor as shown in the parent application. The free end of said connecting rod 20 is bifurcated to provide spaced bearing clamps 24 and 25 in which is mounted a connecting pin 26 which extends beyond both outer sides of the bearing clamps 24 and 25. A shake transmitting link 27 is pivotally mounted at one of its ends on the connection pin 26 between the bearing clamps 24 and 25 and is pivotally connected at its other end through a ball and socket joint 28 to a connecting member 29 adapted to be bolted to a boss 29'. The ball and socket joint 28 comprises a socket 30 formed on said member 29 and a ball 31 having an internally threaded bore 32 for receiving the threaded end of the link 27. On each projecting end of the connecting pin 26 is mounted a swing link 33, the free end of which is mounted on a connecting pin 34 that in turn is mounted in the inner end of one of the spaced arms 35 of a yoke frame 36. Said yoke frame 36 is pivotally supported to swing about a fixed pivot axis provided by pivot pins 37 (Figure 1), each arm 35 being mounted on one of these pivot pins 37 and said pins being suitably mounted in coaxial relation on the side walls 38 of the abovementioned frame 10. The yoke 36 serves as an adjustable frame permitting adjustment of the swing links 33, it being apparent that by tilting the yoke on the pivot pins 37, the pivot pins 34 from which the swing links are suspended, will be swung in an arc which intersects the center of the ball 31. The purpose of this adjustment will be presently described.

Suitable means may be employed for so adjusting the yoke frame 36 as to shift the position of the pivot pins 34. In the present instance, the arms 35 are joined at their inner ends by a cross piece 39 (Figure 2) to which a screw rod 40 is pivotally connected, as at 41, in such manner as to be held against rotation. The screw rod 40 extends downwardly below the lower edge of the frame 10. On the lower threaded end of said rod 40 there is threaded a partially split nut 42 having spherical faces and rotatably held in a retaining casting 43 formed integrally with the frame 10. Said casting 43 is split and provided with a vise clamp member 44 having a handle 45 by means of which the split spherical nut 42 may be caused to tightly engage the threaded rod 40 to hold the same against movement. Said nut 42 is provided with an integral shank 46 to which is keyed a hand wheel 47. By means of said wheel 47 the rod 40 may be drawn downwardly when the vise clamp 44 is released, to vary the position of the end of the yoke 36 carrying the cross piece 39. The hand wheel 47 thus provides a convenient means for adjusting the position of the pivot axis of the swing links 33, that is, of the pivot pins 34, to vary the amplitude of the vibration transmitted by the shaking mechanism

just described to the connected portion of the table rails.

As best shown in Fig. 6, when the pivot pins 34 are coaxial with the center of the ball 31, no motion is transmited to the member 29 which connects the shake-transmitting link 27 to the rail, but when the pivot pins 34 have been adjusted to a position out of alignment with the center of said ball 31, vibratory motion will be transmitted to said connecting member 29 depending upon the distance between the axis of the pins 34 and the center of the ball 31, approximately the maximum adjustment and consequently the greatest amplitude of shake movement being obtained when said pivot pins have been adjusted to the position shown in Fig. 5. This adjustment can obviously be made while the machine is in operation, that is, while the shaft 21 is being rotated at its normal speed for any particular job and likewise while the Fourdrinier wire is traveling at its normal speed. This permits the operator to vary the amplitude of shake in accordance with the kind of stock or "furnish" being run on the machine, regardless of the speed of operation or of changes in the speed of either the shake mechanism or the wire. Adjustments of the kind described are particularly advantageous in setting or adjusting the machine to secure the desired functional relationship between the shaking parts and the other factors which combine in formation of the paper. According to the invention not only the speed and amplitude of the shake but also the particular point of application of the shake and consequently variation of the amplitude longitudinally of the table may be quickly and readily obtained while the machine is in operation. This advantage of the invention is of particular consequence in combining the shaking functions with the character or quality of the stock and the speed and pitch of the wire. By combining these functions in the proper relationship, particularly during operation of the machine, the best formation as well as the highest production capacity of the machine may be obtained. An advantage of the invention is that the shake mechanism may be applied to any part of a paper making machine for the purpose of vibrating the same. In view the enormous weight of the parts, such for example as the Fourdrinier table, and in further view of the high speeds at which it is desired to operate these machines a considerable problem is involved. The devices heretofore employed are entirely inadequate for the purposes intended by the present invention. The shake mechanism disclosed herein embodies new principles of operation and produces new results in this art. This shake mechanism embodies such novel design and principle of operation as to allow for high speed operation, that is, it will transmit the shake movement at considerably higher frequencies than is possible with prior devices. Under normal high speed conditions of operation for which the shake mechanism is adapted, prior devices cannot be operated because of their inherent design and principle of operation and if an attempt is made to operate them at the high speeds they will be destroyed by reason of their physical limitations. It will be noted that one of the features of the improved shake mechanism is that all of the joints or bearing parts are annular or of the rotary type as distinguished from prior considerations having sliding blocks or parts reciprocating on flat bearing surfaces which must be accurately finished and fitted and are difficult to lubricate and which develop objectionable wear and are noisy. With annular bearings between the motion transmitting parts these bearings may be of a type permitting easy lubrication and take-up for wear. Furthermore, the invention provides a link motion which may be operated at high speeds as distinguished from the violent action resulting when devices of the prior art are speeded up. Another feature of the invention is that the heavy load is centralized and the work is facilitated by reason of the leverage arrangement which affords greater leverage advantage in a more compact device than compared with prior devices in this art. As shown in Fig. 2, the shake mechanism is shown as supported both by the standard 12 and the table frame 11. In practice, either or both means of support may be used, according to the particular requirements at hand. The shake mechanism may also be applied as a single unit of such suitable size and proportions as required for the part or parts to be vibrated, suitable connection being provided between the shake-transmitting link 27 and the part to be vibrated. It will also be manifest that the pivotal connections between the various links and parts making up the shake mechanism may be of suitable size, shape and proportions to transmit the heavy loads and to take up for wear.

The drawings herein diagrammatically illustrate the principles of the invention and it should be understood that in putting the invention into actual practice changes may be made in the construction and arangement of parts without departing from the principles herein disclosed and set forth in the appended claims, wherein—

What is claimed is:

1. In a Fourdrinier paper machine, a table structure having a table-roll part adapted to be vibrated, a connecting rod operated by a crank motion, and mechanism operating between the connecting rod and said table roll part for shaking the latter by operation of the crank motion and for varying the amplitude of the shake movements, said

mechanism having all of its motion-transmitting parts of fixed length and articulated one to another with annular bearings at all articulations, whereby to enable high speed shaking of the table-roll rails.

2. In a Fourdrinier paper making machine, a table structure having a table-roll part adapted to be vibrated, and shake mechanism comprising a connecting rod adapted to be operated with a crank motion, a link pivotally connected at one end to the connecting rod and at its opposite end with said table-roll part for transmitting shake motion thereto, a swing link pivotally connected at one end to the connecting-rod end of the shake-transmitting link, and means providing a pivot axis for said swing link at its opposite end and permitting adjustment of said pivot axis for the purpose of varying the amplitude of the shake motion transmitted to said table-roll part.

3. In a Fourdrinier paper making machine, a table structure having a table-roll part adapted to be vibrated, and shake mechanism comprising a connecting rod adapted to be operated with a crank motion, a link pivotally connected at one end to the connecting rod and at its opposite end with said table-roll part for transmitting shake motion thereto, a swing link pivotally connected at one end to the connecting-rod end of the shake-transmitting link, and means providing a pivot axis for said swing link at its opposite end and permitting adjustment of said pivot axis for the purpose of varying the amplitude of the shake motion transmitted to said table-roll part, all of said connections having annular bearings and the distance between bearings of all motion transmitting parts being of fixed dimensions at all times, whereby to allow high speed shaking of the table-roll part.

4. In a Fourdrinier paper machine, a table structure having a table-roll part adapted to be vibrated, and shake mechanism comprising a rotating drive shaft, a connecting rod eccentrically connected to and driven by said drive shaft, a shake transmitting link pivotally connected at one end to the connecting rod and at its opposite end to said table-roll part, a swing link pivotally connected at one end to the connecting rod coaxial with the pivotal connection of the shake-transmitting link therewith, and an adjustable pivot support for the opposite end of the swing link the position of which is adjustable while the machine is in operation to determine the amplitude of vibration transmitted by said shake-transmitting link to said table-roll part.

5. In a paper making machine, a shake-transmitting link, a connecting-rod pivotally connected at one end of the shake-transmitting link, means rotating about a fixed axis for imparting crank motion to the connecting-rod, a swing link pivotally connected at one end to the connecting-rod end of the shake-transmitting link, an adjusting frame pivotally mounted to swing about a fixed axis and pivotally connected at its free end to the end of the swing link remote from its connection to the connecting rod, and means for adjusting the frame to position its free end in any of a plurality of positions about its fixed pivot axis, whereby to vary the amplitude of motion transmitted by said shake-transmitting link.

6. A paper making machine as set forth in claim 5, in which the adjusting frame is in the form of a yoke the opposite arms of which are pivotally mounted on a fixed axis, and in which a pair of swing links are employed, one at each side of the shake-transmitting link, said pair of swing links being disposed between the spaced arms of the adjusting frame and being pivotally connected to the free end of said arms, whereby the shake-transmitting link and the connecting-rod are centrally disposed with respect to the swing links and the spaced arms of the adjusting frame.

7. A paper making machine as set forth in claim 5, in which parts are so arranged that the adjusting frame may be adjusted between two extreme positions, one in which no shake motion is transmitted and the other in which a maximum motion is transmitted, and whereby the amplitude of shake motion is varied by setting the said frame at any of various positions intermediate said extreme positions.

8. A paper making machine as set forth in claim 5, in which the adjusting frame is in the form of a yoke the opposite arms of which are pivotally mounted to tilt about a fixed axis, and in which a pair of swing links are employed, one at each side of the shake-transmitting link, said pair of swing links being disposed between the spaced arms of the adjusting frame and being pivotally connected to the free end of said arms, whereby the shake-transmitting link and the connecting-rod are centrally disposed with respect to the swing links and the spaced arms of the adjusting frame, and in which the parts are so arranged that the adjusting frame may be adjusted between two extreme positions, one in which no shake motion is transmitted and the other in which a maximum motion is transmitted, and whereby the amplitude of shake motion is varied by setting the said frame at any of various positions intermediate said extreme positions.

9. In a paper making machine, a connecting-rod operated with a crank motion, a shake-transmitting link pivotally connected to the connecting-rod, a swing link pivotally connected at one end to the connecting-rod end of the first mentioned link, and means providing a pivot axis for said swing link

at its opposite end and permitting adjustment of said pivot axis for the purpose of varying the amplitude of the shake motion transmitted by said shake-transmitting link.

10. In a paper making machine, a connecting-rod operated with a crank motion, a shake-transmitting link pivotally connected to the connecting-rod, a swing link pivotally connected at one end to the connecting-rod end of the first mentioned link, and means pivotally supporting said swing link at its opposite end and permitting adjustment of its pivot axis for the purpose of varying the amplitude of the shake motion from zero to a given maximum.

11. In a paper making machine, a connecting-rod operated with a crank motion, a shake-transmitting link pivotally connected to the connecting-rod, a swing link pivotally connected at one end to the connecting-rod end of the first mentioned link, means providing a pivot axis for the opposite end of the swing link, and means for adjusting the position of said pivot axis in an arc concentric with the pivoted connection of the swing link and the connecting-rod whereby to vary the amplitude of the shake motion transmitted by the shake-transmitting link.

12. In a paper making machine, an operating part adapted to be continuously reciprocated with a uniform stroke, a shake-transmitting link pivotally connected to said operating part, and means pivotally connected to said shake-transmitting link coaxial with the pivotal connection thereof to said operating part and mounted to swing about a pivot axis, the location of which pivot axis is adjustable for varying the amplitude of shake motion transmitted by said shake-transmitting link.

13. A paper making machine having a shake-transmitting member operated by a crank motion, means for varying the amplitude of the shake motion from zero to a given maximum through the intermediary of a link motion one of the links of which is adjustable between two extreme positions for correspondingly varying the amplitude of the shake motion.

14. In a paper making machine, shake mechanism having all motion-transmitting parts of fixed length and articulated one to another with annular bearings at all articulations, whereby to enable high speed shake motion.

15. In a paper making machine, a shake-transmitting part, a connecting-rod operated with a crank motion, and mechanism operating between the shake-transmitting part and the connecting-rod for oscillating the former by the crank motion of the latter and for varying the amplitude of the oscillations, said mechanism having all motion-transmitting parts of fixed length and articulated one to another with annular bearings at all articulations.

In witness of the foregoing we affix our signatures.

LAURA J. A. NEESE,
ELBERT H. NEESE,
Executors of the Estate of Alonzo Aldrich, Deceased.

EARL E. BERRY.