

No. 635,511.

Patented Oct. 24, 1899.

T. H. SAVERY.

SHAKING SECTION OF FOURDRINIER PAPER MAKING MACHINES.

(Application filed June 17, 1897.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

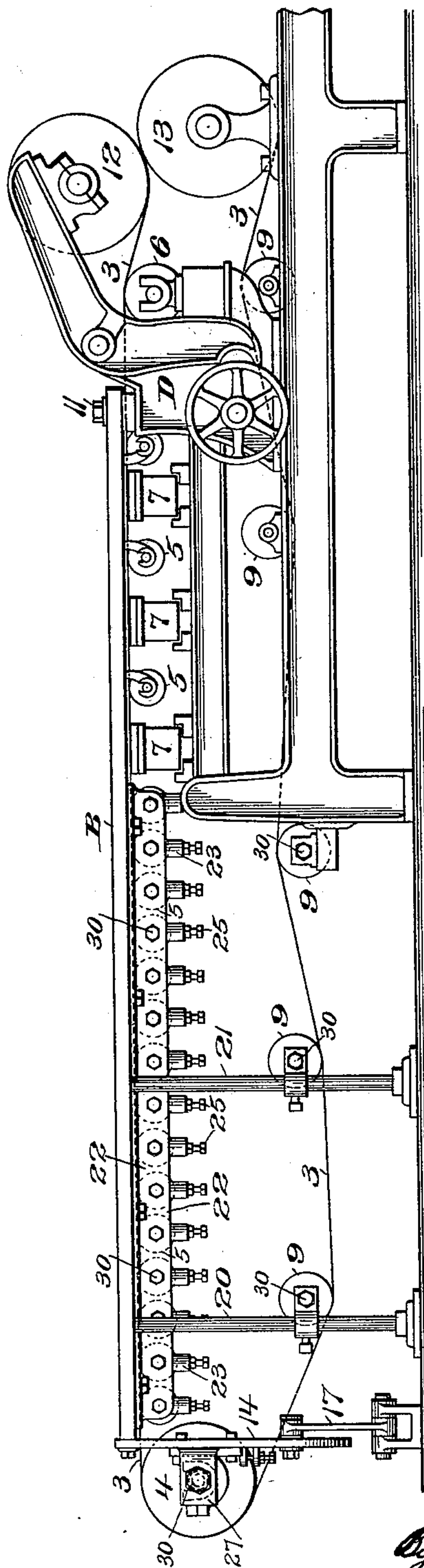


Fig. 10.

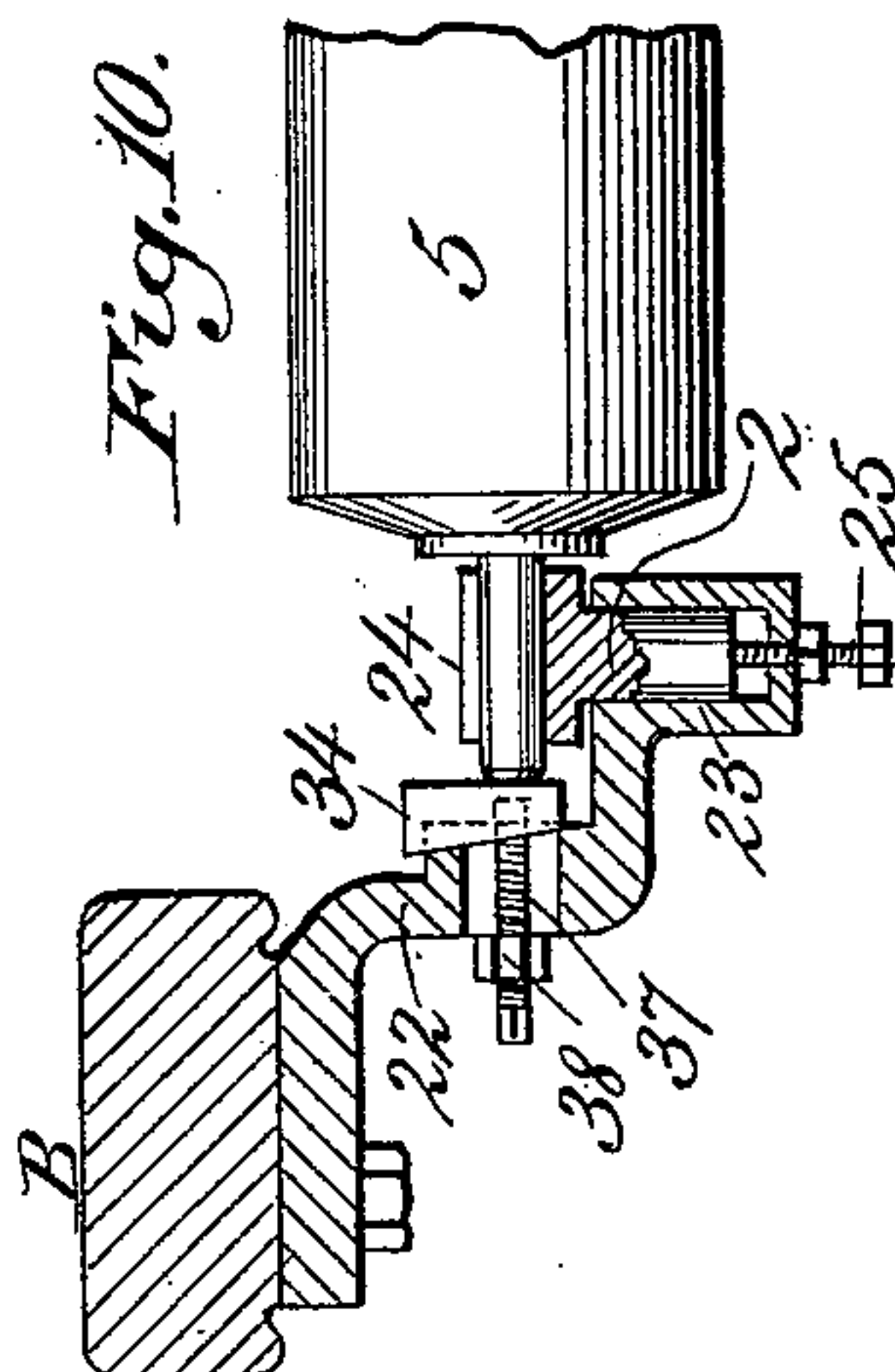
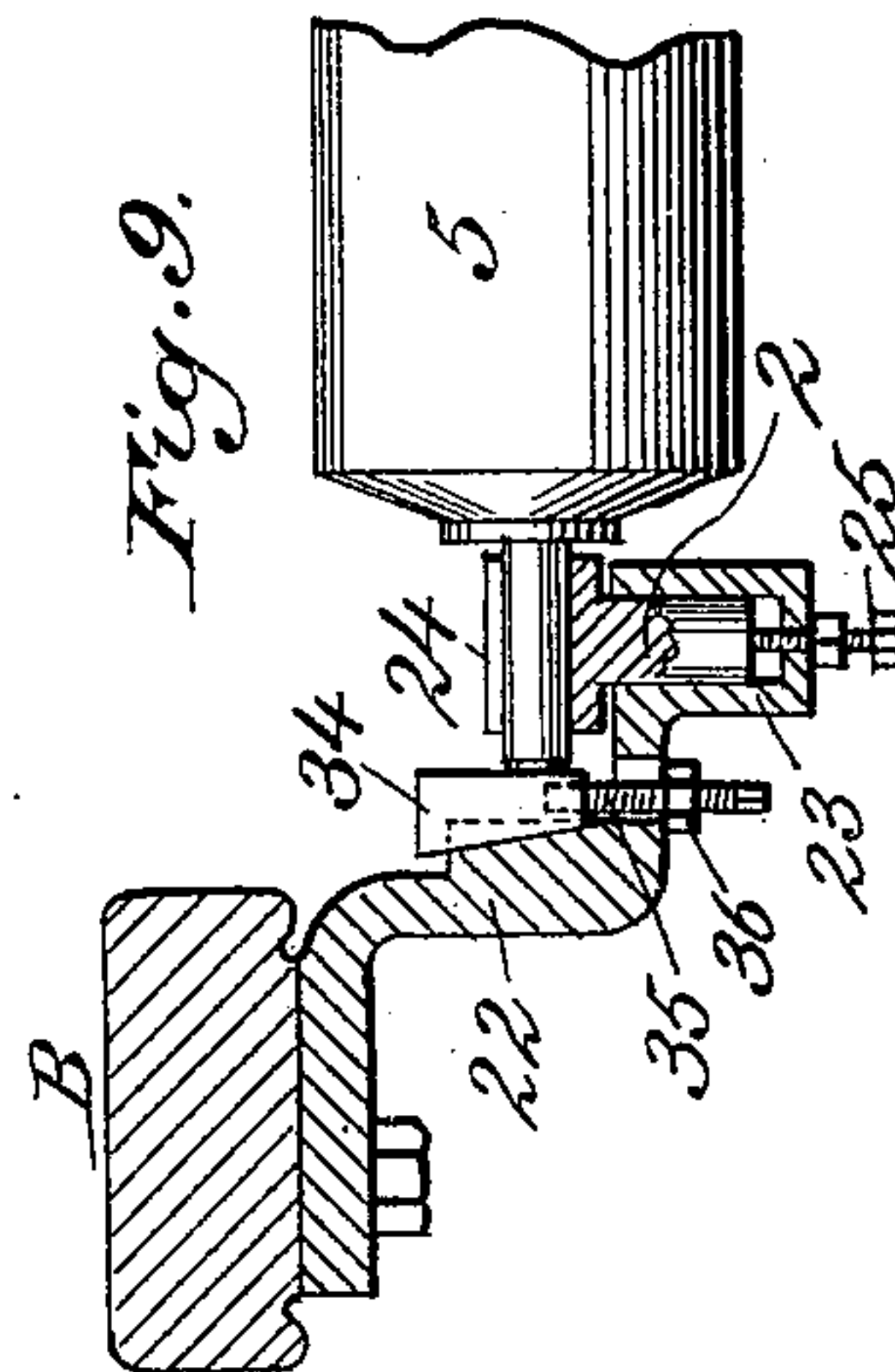


Fig. 9.



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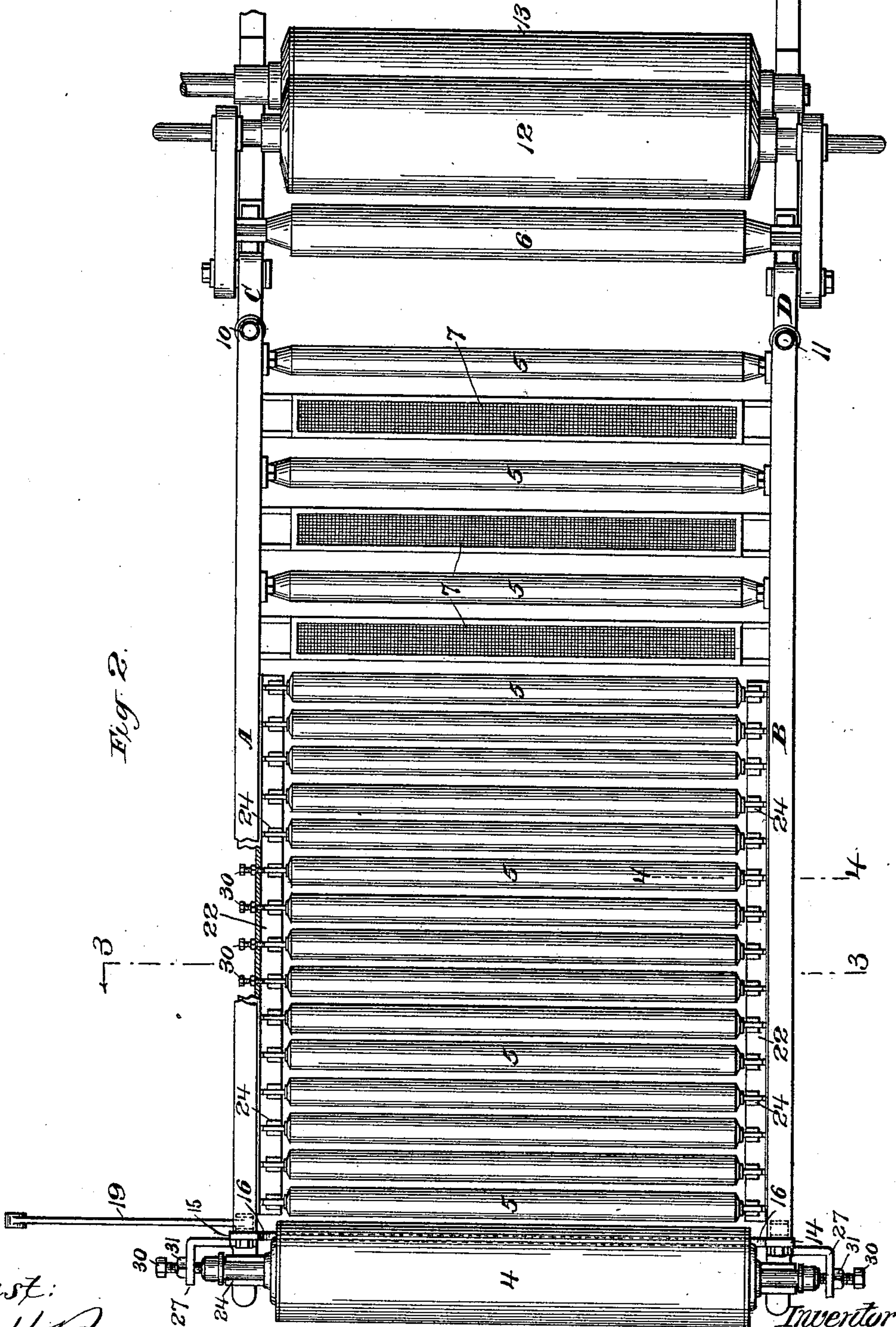
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## SHAKING SECTION OF FOURDRINIER PAPER MAKING MACHINES.

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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

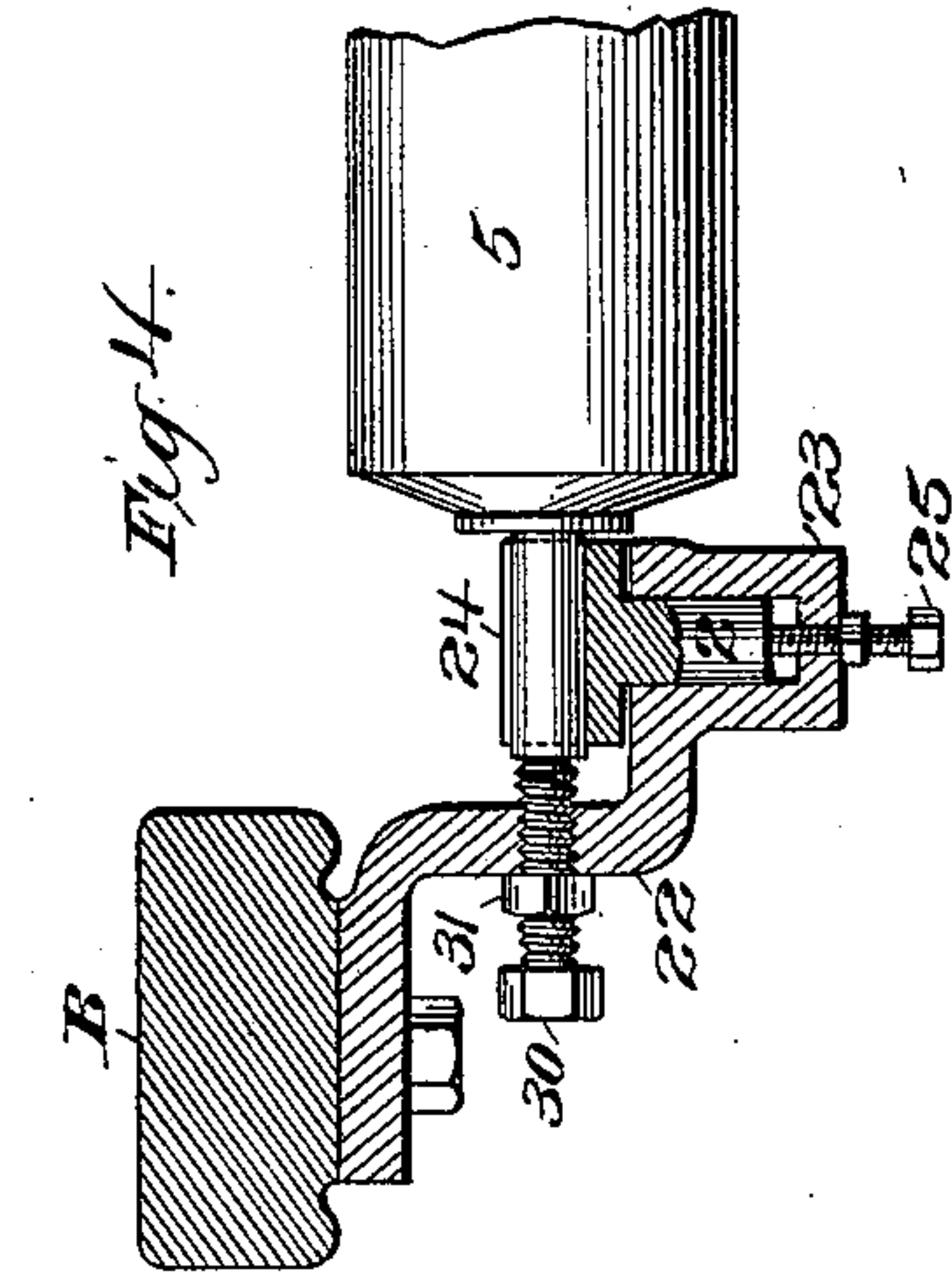


Fig. 14.

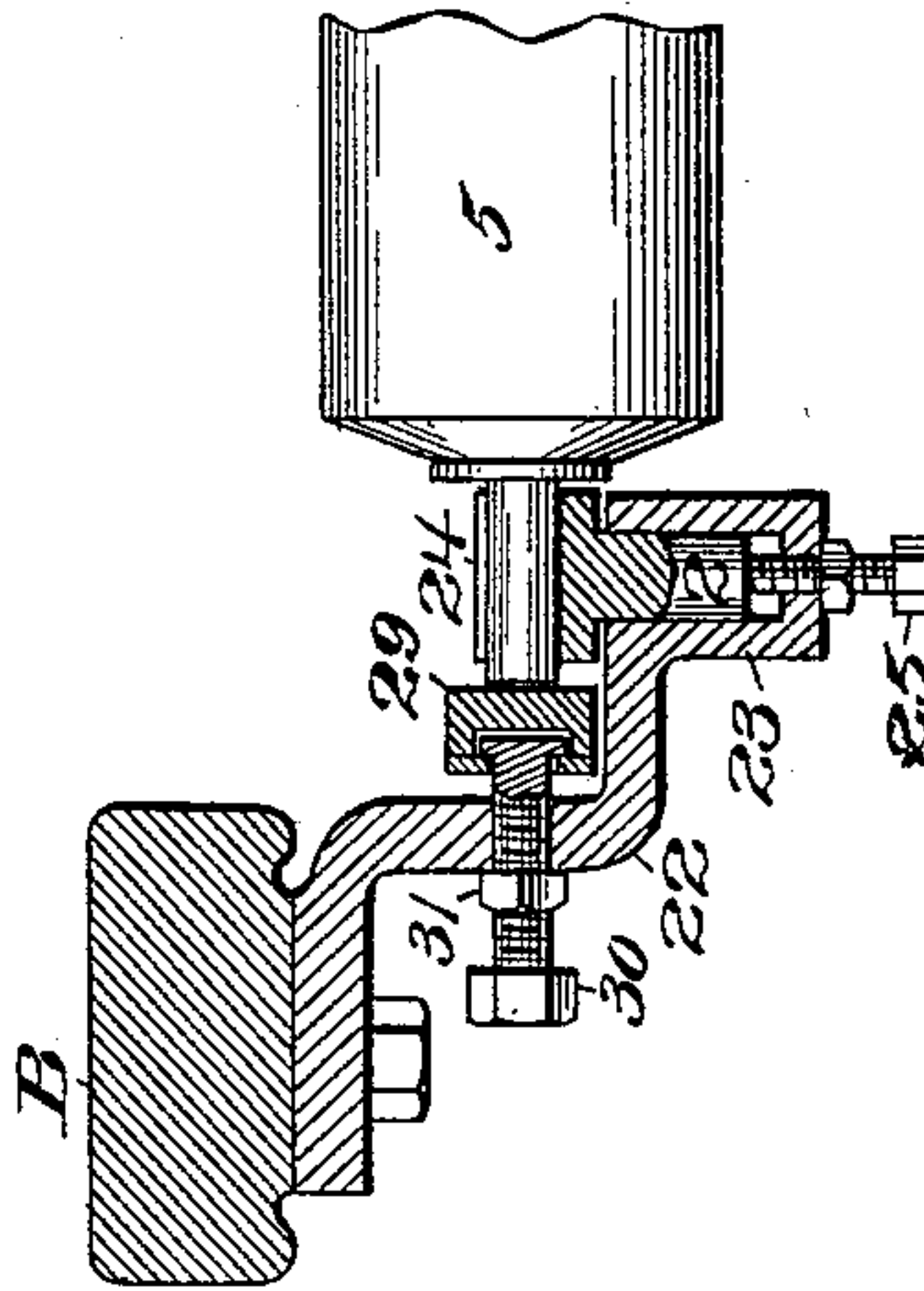


Fig. 6.

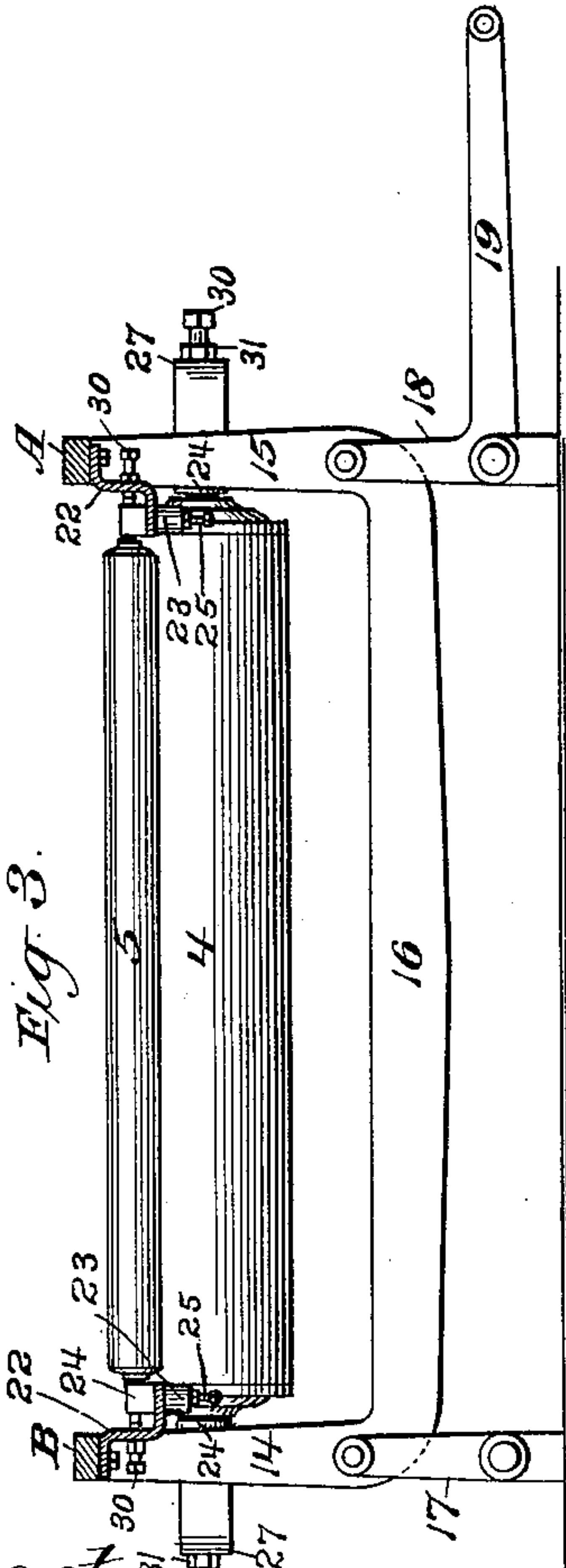


Fig. 3.

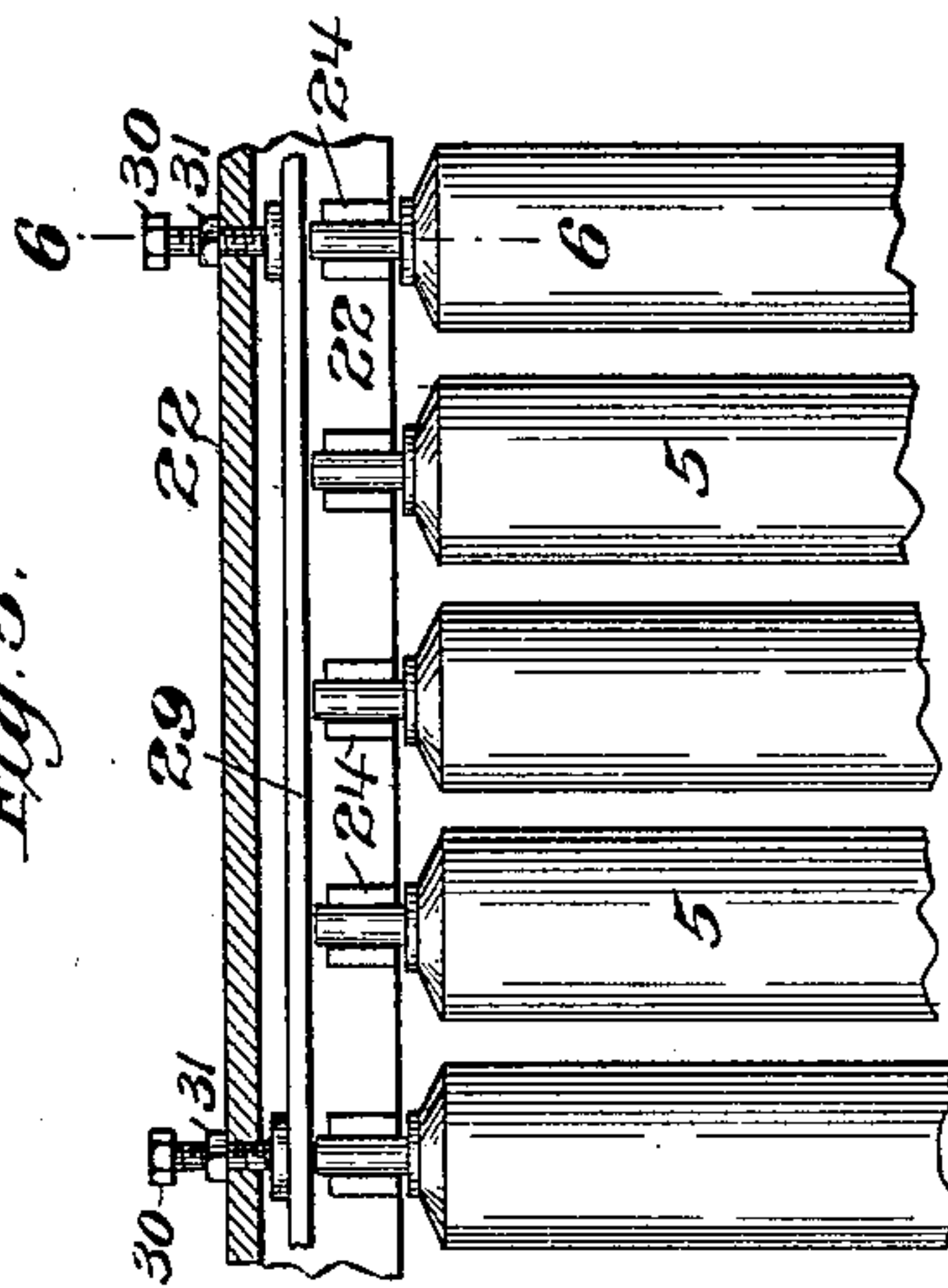


Fig. 5.

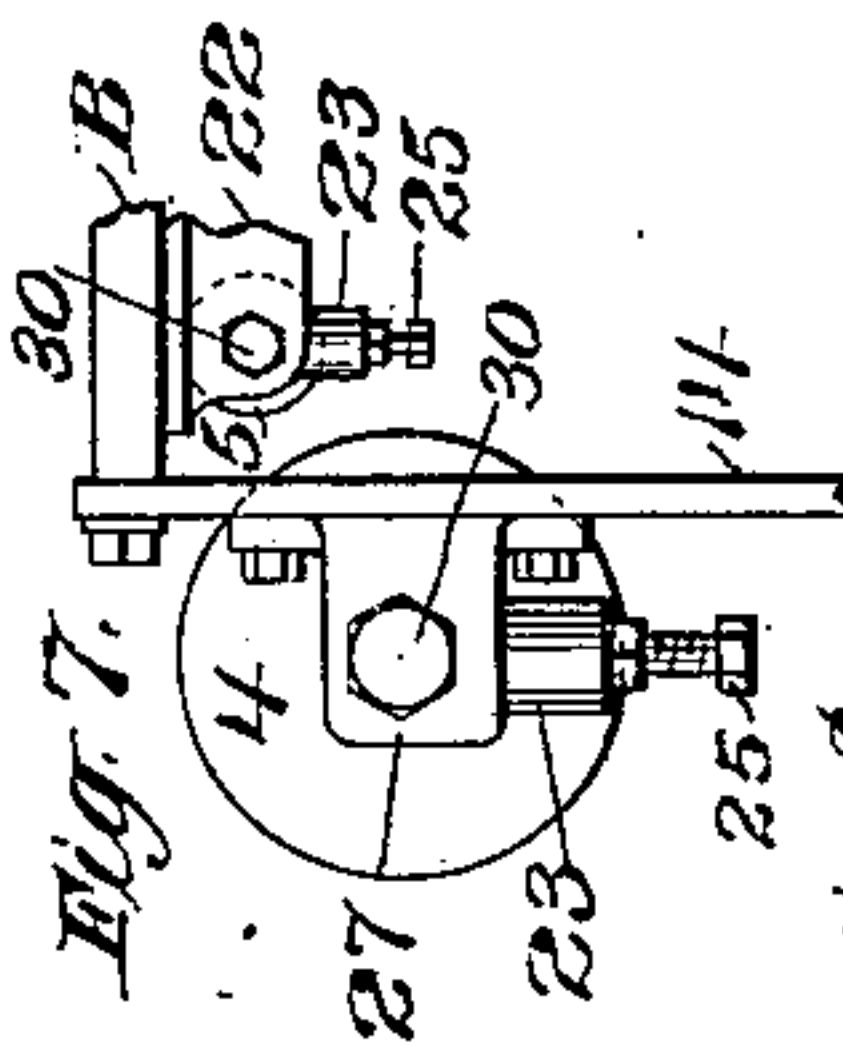


Fig. 7.

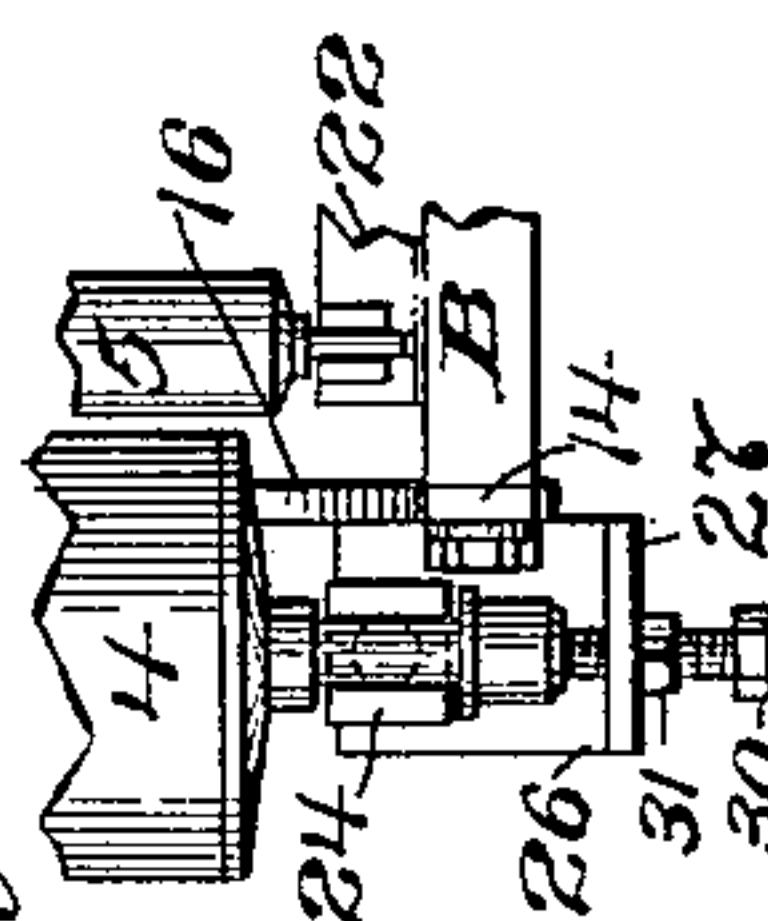


Fig. 8.

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# UNITED STATES PATENT OFFICE.

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SHAKING-SECTION OF FOURDRINIER PAPER-MAKING MACHINES.

SPECIFICATION forming part of Letters Patent No. 635,511, dated October 24, 1899.

Application filed June 17, 1897. Serial No. 641,740. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS H. SAVERY, a citizen of the United States, residing at Wilmington, county of New Castle, and State of Delaware, have invented certain new and useful Improvements in Shaking-Sections of Fourdrinier Paper-Making Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to paper-making machines of that class known as "Fourdrinier" machines, and more particularly to the shaking-section thereof, whereby the water-saturated stuff while being conveyed onward by the wire apron is agitated by means of a lateral shaking operation, through which the interlocking or intertwining action of the fibers is accomplished, whereby the stuff is caused to take upon itself a web-like structure. In such machines the wire-cloth upon which the water-saturated stuff is carried runs over and is supported by a series of table-rolls on the shaking-section, and the shaking-section usually carries also a breast-roll at the front end, over which the wire-cloth passes to the table-rolls, and a number of supporting and guiding rolls, by which the correct position, movement, and tension of the wire-cloth are secured. The shaking-section is pivotally mounted at the rear or couch-roll end, so as to swing horizontally, and the other end is vibrated laterally at a high rate of speed, usually about two hundred and fifty times a minute, the vibratory movement at the breast-roll end being usually about a quarter of an inch and varying in extent from this point to nothing at the rear end or pivot-point of the shaking-section. The desired result of the action of this shaking-section upon the paper stuff is to cause the fibers contained in the stuff to so move relatively to each other as to cause them to be interwoven or intertwined, or, as it is usually called, "felted" together, so that a web will be formed, with its fibers so related that when the same is pressed as it passes the couch-rolls, where a large portion of the water it contains is expressed, it will form a substantial web of fibers suitably felted for further treatment. As is well understood by paper-manufacturers the operation upon the mass of stuff

on such a shaking-section is one of the most important in the whole process of paper-making and requires, in order to produce anything like perfect results, that the movement of the shaking-section and wire-cloth thereon shall be of just the amount and character required for felting the fibers, and that any variation from the exact amount or character of movement required will cause defects in the felting of the fibers in the stuff, which defects will appear in the finished product. The greatest skill and care are necessary, therefore, in the construction, mounting, and operation of the various parts of such shaking-sections in order to secure the required vibratory or shaking movement of the parts of the heavy shaking-section, combined with the proper rear movement of the wire-cloth thereon, carrying the paper stuff with it.

Heretofore the proper position and relation of the table-rolls, breast-roll, and wire supporting, guiding, and tension rolls with respect to each other and to the moving parts of the shaking-section, by which these rolls are carried and vibrated, have depended upon the construction and mounting of these parts with great skill and care. The results attained in such constructions as heretofore made have been satisfactory to a certain extent; but, as is well known among paper-manufacturers, many defects exist in the finished product of such machines, and such defects increase largely with increase in speed of the shaking-section, so that the speed attainable in such machines with good results is strictly limited, and constant effort has been made for many years to discover the cause of these defects and a remedy therefor. I have discovered that many of these defects are caused by very slight inaccuracies in the relation of the rolls to the parts of the shaking-section by which the rolls are supported and vibrated and that a greatly-improved product may be secured at a higher rate of speed than has heretofore been possible in such machines by providing adjustable devices for securing the proper relation of these rolls to the parts of the shaking-section by which they are supported and vibrated, so that the rolls shall be carried positively by the shaking-section throughout its entire movement and the uniform concerted action of all the parts of the shaking-section



thus secured. These inaccuracies in the relation of the rolls of the shaking-section to the parts by which they are supported and carried have been caused partly by defects in original construction, as it is practically impossible, even with the highest skill and care, to make the parts of the shaking-section so true and uniform that such inaccuracies shall not exist, and these original inaccuracies are increased and the defects in the product resulting therefrom rendered more serious by wear of the parts of the shaking-section, especially wear between the ends of the rolls and those parts of the shaking-section engaging the ends of the rolls and by which the rolls are moved endwise as the frame is vibrated, the wear between these parts being large on account of the pressure required to move the rolls endwise at the high rate of speed required and the rapid increase of wear resulting from pounding in case of any play between the rolls and the parts by which they are moved. Although these inaccuracies may be very small and the irregularity in movement resulting therefrom such as to escape observation in the operation of such machines at the high speed at which the shaking-sections are vibrated, the smallest looseness or play of the rolls in the shaking-section, with the slight and very rapid movement to which these rolls are subjected, will necessarily cause the rolls to move out of concert with the frame, so that in place of the uniform vibration of the rolls, if positively carried with the frame of the section, they will be thrown by the frame first in one direction and then in the other, the frame thus pounding upon the ends of the rolls, producing an irregular action of the rolls and wire-cloth, which is very detrimental to the quality of the product. In the case of the table-rolls also this results in a non-uniform movement of the different rolls, so that some will move before others or different rolls of the series even be moving in opposite directions, and thus the wire-cloth be subjected to tension in different directions at the same time by inharmonious movement of adjacent rolls or some parts pulled against tension of rolls at that time stationary and tending to hold the wire-cloth from moving to and fro, which action I find is the cause of many defects in the finished paper. By the present invention, resulting from this discovery of the cause of defects in paper as produced by Fourdrinier machines with shaking-sections as heretofore constructed, I remedy these defects by providing adjustable devices for securing the proper relation of the rolls in the shaking-section to the parts by which they are moved, so as to compel their uniform concerted movement exactly in accordance with the movement of the shaking-section independently of inaccuracies in construction and fitting of the parts as originally made and of wear of the parts in the operation of the machine. Means of various forms may be used

for this purpose; but I preferably employ a screw or wedge adjustable so as to take up accurately any looseness or play between the ends of the rolls and the parts of the shaking-section by which they are moved endwise as the frame is vibrated, so as to correct any inaccuracies in original construction or fitting and compensate for wear of the parts by which such looseness and play is caused. In machines constructed in accordance with my invention I preferably apply this adjusting or compensating means to all the wire-rolls of the shaking-section, including the table-rolls, breast-roll, and the supporting and guiding rolls, and the best results are produced by such constructions; but greatly-improved results and increase of speed over such machines as heretofore constructed is secured by applying such means only to some of the rolls, and it is obviously less important as applied to the rolls near the rear end of the shaking-section, where the vibratory movement is slight, than to the rolls at the front end of the shaking-section, where this movement is larger. The most important results are secured in the case of the table-rolls, especially when independent adjusting means are applied to the different rolls, so that each or some of these rolls may be adjusted independently of the others and the uniform movement of the different rolls secured irrespective of the variations in construction or mounting of the different rolls; but improved results over such machines as heretofore constructed may be secured by applying a single adjusting means to a series of these rolls, especially in the case of those near the rear end of the shaking-section, where the movement is slight, and the invention, broadly considered, includes such a construction.

For a full understanding of the invention a detailed description of a construction embodying all the features of the invention as applied in their preferred form and to substantially all the rolls of a shaking-section will now be given in connection with the accompanying drawings, forming a part of this specification, and the features forming the invention then specifically pointed out in the claims.

In the drawings, Figure 1 is a side elevation of so much of a Fourdrinier paper-making machine as is necessary for explanation of the present invention. Fig. 2 is a plan view thereof. Fig. 3 is a sectional elevation as seen on the transverse line 3 of Fig. 2 looking to the left. Fig. 4 is an enlarged view taken on the section-line 4 of Fig. 2 and showing more particularly the preferred mode of mounting the table-rolls. Fig. 5 is an enlarged plan view of a number of the table-rolls, showing a modification especially applicable to the rolls at the rear end of the section. Fig. 6 is a sectional elevation taken on the line 6 of Fig. 5. Fig. 7 is an end elevation of the breast-roll and one of the table-rolls with vertical and endwise adjustment. Fig. 8 is a plan view



of the same. Figs. 9 and 10 show modified constructions.

The various parts composing the shaking-section of the machine shown are carried by side frames A B, which are respectively connected at their rear ends by pivots 10 11 with the fixed machine side frames C D, which support the couch-rolls 12 13. The front portions of these side frames A B are connected together by means of a shake-frame, shown as formed of vertically-depending members 14 15 and a cross-bar 16, by which the opposite side frames are held in parallelism and maintained rigidly at the required distance apart. The shake-frame 14 15 16 is in turn supported from the fixed frame of the machine by pivoted arms 17 18, the latter of which is ordinarily provided with a lever-arm 19, converting it into a bell-crank, to which a rocking motion is suitably imparted to vibrate the shake-frame and with it the side frames A B and other parts of the shaking-section and attachments carried thereby. These side frames A B are supported near their front ends by vertical standards, as 20 21, on each side connecting with the side frames and stepped in base-blocks or otherwise connected so that they may partake of the lateral movement of the shaking-section. The breast-roll 4 is supported in brackets extending from the vertical members 14 15 of the shake-frame, and the endless wire-cloth 3, upon which the stuff to be formed into paper is carried, leads from this breast-roll over a series of smaller table-rolls 5, which are supported in bearings carried by the side frames A B and over the usual suction-boxes 7, and from these rolls 5 said wire-cloth passes over a guiding-roll 6 to and between the couch-rolls 12 13 and returns around roll 13 and over supporting and guiding rolls 9 to the breast-roll 4, some or all of which rolls 9 are arranged to be adjustable vertically to regulate the tension of the wire-cloth. Ordinarily a large number of the table-rolls 5 are employed, but a sufficient number is shown for the purpose of illustrating this invention. A modern mode of hanging these table-rolls is best illustrated in Fig. 4, in which each side bar A B has depending from its lower side a bracket 22, and these brackets are, at suitable points, recessed, as at 23, to receive the stems 2 of bearings 24 for the journals of the rolls 5, which bearings 24 may be raised and lowered by screws 25. These bearings are thus vertically adjustable, so that the table-rolls 5 may have their surfaces truly alined.

Referring now to the improvements embodying the present invention, each of the table-rolls 5 is shown as provided at each end with an adjusting-screw 30, turning in a hole tapped in bearing-bracket 22, and having its end bearing against the end of the journal of the table, a lock-nut 31 preferably being used, as shown, for retaining the screw in position when adjusted. It is obvious that by the adjustment of these screws 30 the greatest ac-

curacy in position of the rolls 5 relatively to the side frames A B may be secured, any looseness or endwise play of the rolls in their bearings due to slight defects in construction or wear between the ends of the rolls and the brackets compensated for, and the endwise movement of the rolls in exact harmony with each other and with the other parts of the shaking-section secured. With the adjusting-screws at each end of the rolls, moreover, it is possible to adjust the rolls longitudinally, so as to secure exactly the position of the rolls in the frame for attaining the best results. It will be understood, however, that these adjusting-screws may be used only at one end of the rolls, in which case, however, the position of the rolls will be changed slightly in adjusting, and the construction shown is much preferable. While this screw construction is preferably used, it will be understood that any other suitable means may be employed for this purpose, such as sliding wedges with means for holding them in their adjusted position. I have shown two such constructions in Figs. 9 and 10. In Fig. 9 a vertically-sliding wedge-plate 34 is used, sliding in an inclined groove on the inner side of the bracket 22 and bearing against the end of the table-roll 5. A bolt 35 extends downward from the wedge-plate through an opening in the bracket 22 and is provided with an adjusting-nut 36, by which the wedge-plate 34 may be drawn down, and thus adjusted to take up any endwise play of the roll in the section. The construction shown in Fig. 10 is the same, except that the wedge-plate 34 has a bolt 37 extending sidewise through an opening in the bracket 22 and provided with a nut 38, by which the wedge-plate 34 is locked in position when adjusted as desired.

While it is preferable that the rolls be provided with independent means for securing the result desired, so that each of the rolls may be adjusted relatively to the others, improved results over constructions heretofore in use may be secured by providing a single adjusting means for a series of rolls, especially the rolls near the rear end of the section where the movement is slight. Thus, as shown in Figs. 5 and 6, a bearing-plate 29 for the ends of the shafts or journals of the rolls 5 is interposed between the ends of a number of the shafts or journals and the side rails and adjusted by screws 30. This enables the use of adjusting means at a lesser number of points; but the best results are not thus attained. The same result of providing a single adjusting means for a series of rolls may be secured in the construction shown in Figs. 9 and 10 by using a single wedge-plate 34 for a number of rolls. The breast-roll 4 also is preferably provided with similar adjusting means and the supporting and guiding rolls 9. The breast-roll, as shown in detail in Figs. 7 and 8, is provided with adjusting means by widening its supporting-brack-



ets 26 and providing them with a vertical member 27 to receive an adjusting-screw 30, acting as in the case of the table-rolls. In the details, Figs. 7 and 8, the breast-roll is shown as equipped also with means for vertical adjustment, as in the case of the table-rolls. The same construction of end adjusting-screws shown in Fig. 1 is used in connection with the supporting and guiding rollers 9 at the front end of the shaking-section, and the other rolls 5 may be similarly equipped, although the slight movement at the rear end of the shaking-section makes this less important. Although this adjustable means is shown as provided for the greater number of the table-rolls and is preferably used also with respect to the breast-roll and supporting and guiding rolls, it is not absolutely necessary that each and every roll shall be provided with it. In many instances the provision of this improvement with respect to a portion of the table-rolls, especially that portion of them which receives the greatest movement, will secure greatly-improved results in such a machine, and the application of the improvement to the breast-roll alone will be found greatly advantageous, and therefore the invention, broadly considered, is to be understood as including a construction in which only the breast-roll or only some of the table-rolls are so equipped. It is to be noted, however, that in all the Fourdrinier paper-machines which the art now employs the best results will be obtained if substantially all the rolls above referred to are provided with the improvement.

What I claim is—

1. In a Fourdrinier paper-making machine, the combination with the shaking-section and rolls mounted therein and by which the wire-cloth for the forming-web is supported, guided and moved to and fro, of adjusting means for taking up endwise play of the rolls in the shaking-section to secure the concerted movement of the rolls with the section, substantially as described.

2. In a Fourdrinier paper-making machine, the combination with the shaking-section and rolls mounted therein and by which the wire-cloth for the forming-web is supported, guided and moved to and fro, of members engaging the ends of the rolls to compel their movement with the section, and means for adjusting the relative position of said members and the rolls to take up endwise play of the rolls in the shaking-section and secure the concert-

ed movement of the rolls with the section, substantially as described.

3. The combination with the shaking-section and vibrating wire-cloth of a Fourdrinier paper-making machine, and a roll over which the wire-cloth passes, of adjusting means for taking up endwise play of the roll in the shaking-section to secure the concerted movement of the roll with the shaking-section, substantially as described.

4. The combination with the shaking-section and vibrating wire-cloth of a Fourdrinier paper-making machine, and a roll over which the wire-cloth passes, of members at opposite ends of the roll moving with the shaking-section and engaging the roll to compel its movement with the section, and means for adjusting said members to take up endwise play of the roll in the shaking-section and secure the proper position and movement of the roll, substantially as described.

5. In a Fourdrinier paper-making machine, the combination with the shaking-section and a series of table-rolls mounted therein, of members engaging the rolls to compel their endwise movement with the section and adjustable to take up endwise play of the rolls in the shaking-section and secure the concerted movement of the rolls with the section, substantially as described.

6. In a Fourdrinier paper-making machine, the combination with the shaking-section and a series of table-rolls mounted therein, of adjusting devices for adjusting independently of each other the position of the different rolls and taking up endwise play between the rolls and the parts of the shaking-section by which they are actuated, substantially as described.

7. In a Fourdrinier paper-making machine, the combination with the shaking-section and a series of table-rolls mounted therein, of adjustable devices at opposite ends of the rolls for securing the proper position of the rolls and taking up endwise play of the rolls in the shaking-section to compel their concerted movement with the section, said devices being arranged for adjustment of the different rolls independently of each other, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

THOMAS H. SAVERY.

Witnesses:

C. J. SAWYER,  
A. L. KENT.