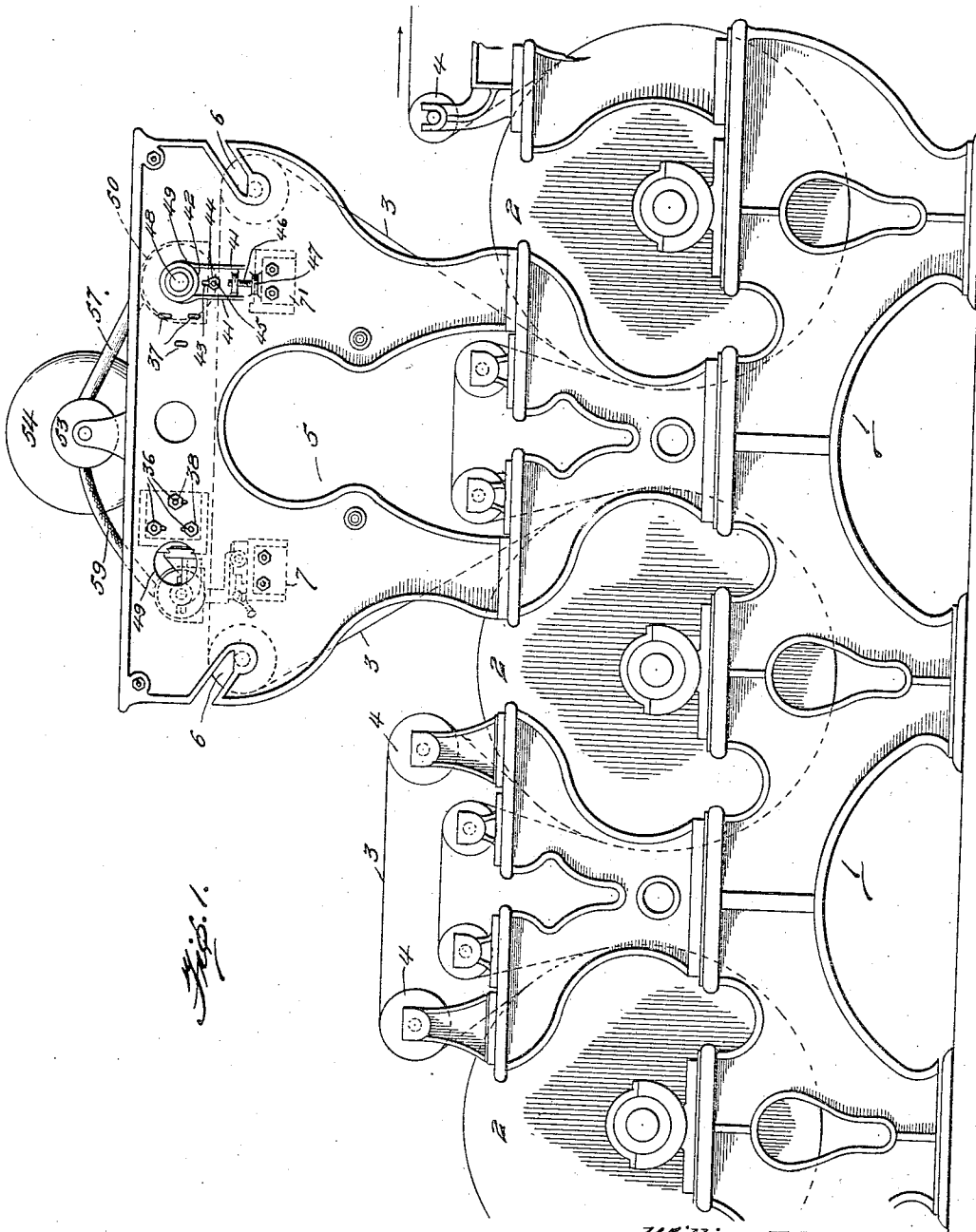


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PAPER GROOVING MACHINE.  
APPLICATION FILED JAN. 14, 1908.

979,201.

Patented Dec. 20, 1910.

4 SHEETS—SHEET 1.



WITNESSES:

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*Henry D. Shaw*  
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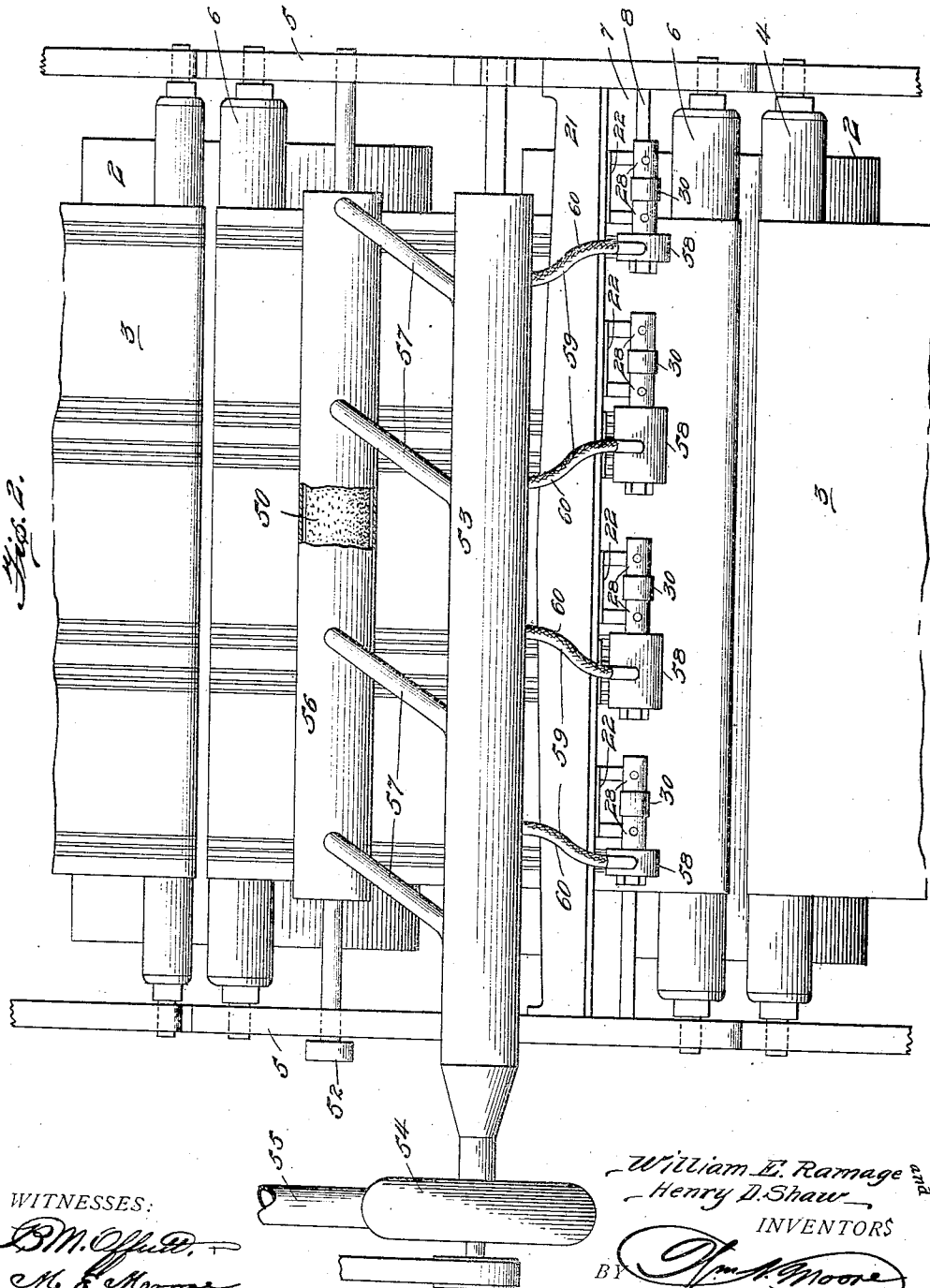
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4 SHEETS—SHEET 2.



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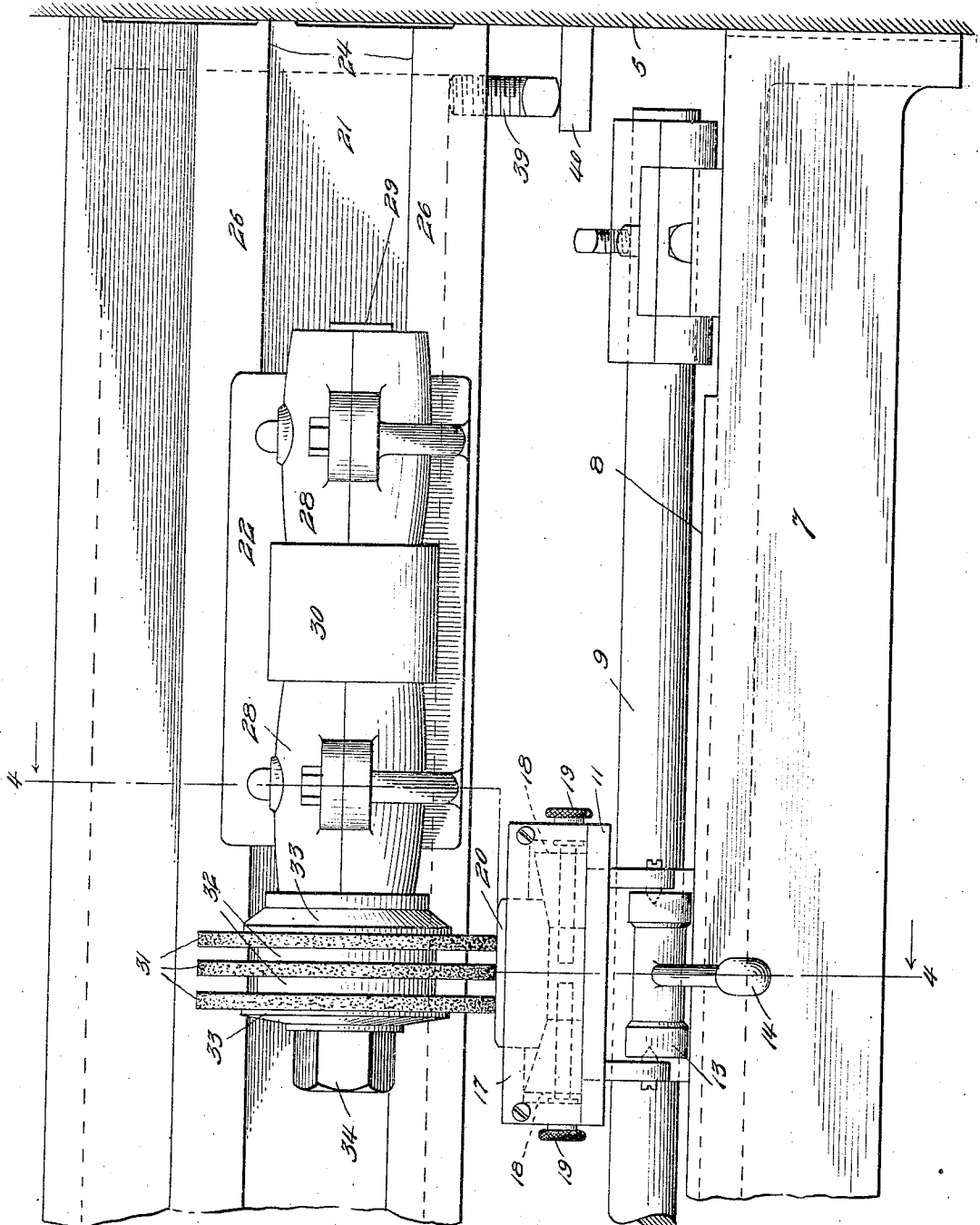
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4 SHEETS—SHEET 3.



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*Fig. 3.*

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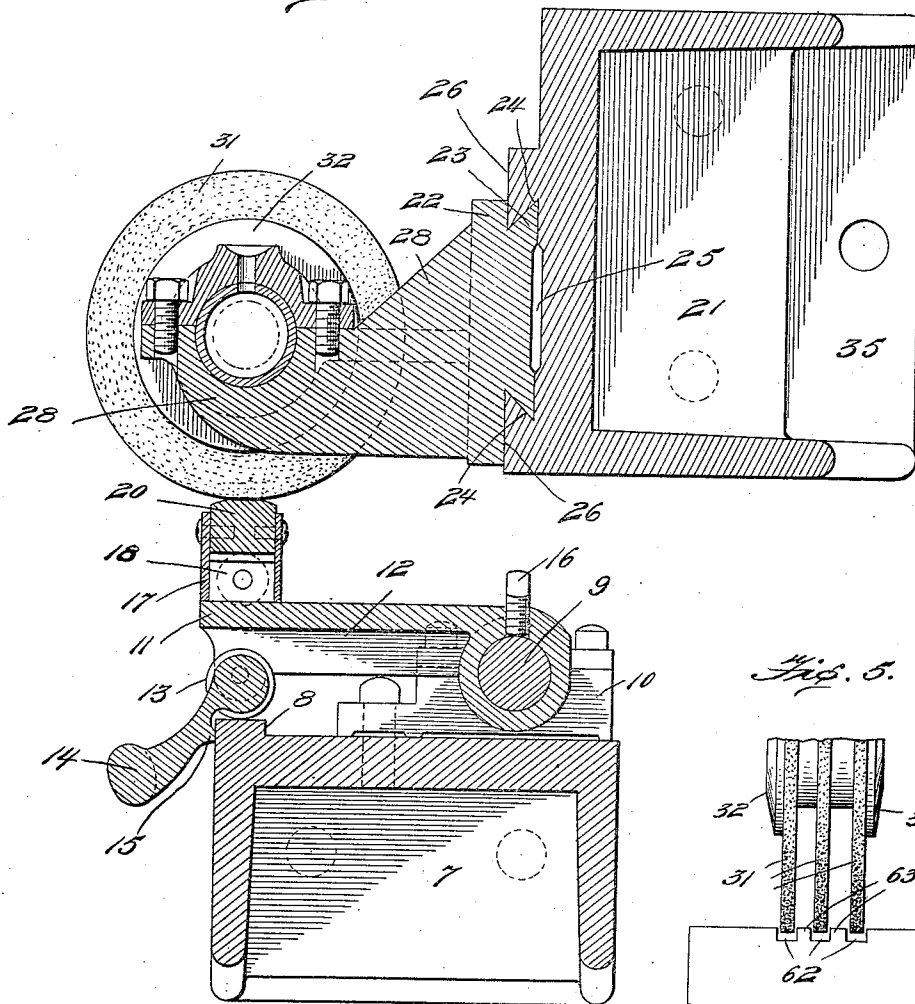
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4 SHEETS—SHEET 4.

*Fig. 4.*



*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

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TO BERKSHIRE HILLS PAPER COMPANY, OF ADAMS, MASSACHUSETTS.

## PAPER-GROOVING MACHINE.

979,201.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed January 14, 1908. Serial No. 410,747.

*To all whom it may concern:*

Be it known that we, WILLIAM E. RAMAGE and HENRY D. SHAW, citizens of the United States, residing at Adams, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Paper-Grooving Machines, of which the following is a specification.

Our invention relates to improvements in paper grooving machines, and has for its object the provision of simple and efficient mechanism for forming grooves in certain portions of the paper or parchment to render such portions more flexible and easy to handle. In books which are handled a great deal such as loose-leaf ledgers and the like, the leaves along the binding edge or hinge portion are subject to a great deal of strain and are very liable to become worn and to finally tear, but we are able with our improvements to render the leaves more flexible along their hinge edge without sacrificing the strength of the leaf, so that the leaves may be handled with greater ease and less strain, and will in fact be more durable and last the longer for such treatment.

Another object of our invention is to provide practical means for cleaning, smoothing and burnishing the grooved portion of the paper so that such grooved portion while being more flexible than the rest of the sheet, shall present the same surface and appearance and possess substantially the same strength and wearing quality as the balance of the sheet, and also to provide means for removing the loose fibers or cuttings during the grooving operation.

A further object of the invention is the provision of paper grooving mechanism which shall be adjustable in its construction so that the groove may be formed of the desired depth, width and shape, and one or a number of grooves may be cut at will and upon any portion of the paper.

A final object of our invention is to produce grooving mechanism which shall be practical and efficient in every particular and with the above objects in view, our invention comprises an adjustable platen or support for the paper, one or more cutters journaled to cooperate with the platen to form grooves in the paper, and means for cleaning the grooves of all loose fibers and to leave such grooved portions with a smooth surface.

Our invention further consists of paper grooving machinery embodying certain other novel features of construction, combination and arrangement of parts substantially as disclosed herein and as illustrated in the accompanying drawings, in which:

Figure 1, is a side elevation of a paper machine showing our improved paper grooving mechanism mounted to cooperate therewith. Fig. 2, is a top plan view of the same. Fig. 3, is an enlarged front elevation of the grinder or cutter in combination with the platen or paper support. Fig. 4, is a sectional view to illustrate the relative arrangement of the cutter, platen and the paper being operated on, the view being taken on the line 4-4 of Fig. 3. Fig. 5, is a broken detail view of a modified form of platen or paper support.

Our invention is designed especially to be attached direct to the paper making machine so that the web of paper is acted upon during the process of its manufacture and thus the grooved paper may be produced at as rapid a rate as the plain paper itself; but of course it will be understood that our grooving machine may be operated as such entirely independent of a paper making or other machine. It has been found very practicable to introduce our device in connection with paper machines of the Fourdrinier type and it is illustrated in such connection in the drawings herewith.

Referring now to the drawings by numeral; The numeral 1, designates the frame of a paper making machine and 2, the drier rolls journaled therein. The web of paper 3, is caused to pass over these drier rolls in the course of its manufacture, and the guide rolls 4, serve as guiding means for the web. We find that it is preferable to groove the paper while it is in a practically dry condition and before it has been sized, and we therefore prefer to locate the grooving mechanism upon the paper machine in advance of the last drier roll, it being shown in such position in the accompanying drawings, but of course the particular location of the device is optional and may be governed by different requirements.

The grooving machine comprises a frame 5, which is suitably mounted upon the paper machine or otherwise, and at the ends of this frame are mounted the guide rolls 6, over which the web of paper travels. A

horizontal cross bar 7, is arranged in the forward portion of the frame in rear of the first guide roll which is provided with a raised ledge or trackway 8, along its forward upper edge and a guide rod 9, is mounted in brackets 10, upon the cross bar, which cross bar may be of inverted channel iron type as shown or, other suitable formation. A carriage 11, is supported upon the cross bar, the carriage having a rearward sleeve extension 12, slidably engaged upon the guide rod 9, and an eccentric cam 13, is pivoted in the forward portion of the carriage which engages the trackway and supports the forward edge of the carriage.

The cam is provided with a weighted handle 14, which by reason of its weight causes the cam to normally hold the forward edge of the carriage in uplifted position. A stop or abutment 15, is formed on the cam handle to engage the edge of the trackway and a set screw 16, is carried by the sleeve to engage the guide rod and hold the carriage in adjusted position upon the guide rod. Along the upper forward edge of the carriage is arranged a box 17, in which are slidably confined the pair of oppositely disposed wedge blocks 18, there being thumb screws 19, journaled in the opposite ends of the box and engaging the wedges to regulate the position of the wedges. A platen or supporting block 20, is confined in the upper portion of the box, the lower edges of the platen being oppositely inclined toward the ends and such inclined portions resting upon the wedges, so that by operating the thumb screws to withdraw or extend the wedges, the platen may be adjusted in a vertical plane. This platen or paper support is preferably made of hardened steel and with a slightly rounded upper edge over which the paper is adapted to pass.

Above the platen supporting cross bar and somewhat in rear of the same, is another cross bar 21, which acts as a support for the cutter head. The cutter head 22, has a rib 23, on its rear face provided with beveled edges 24, which engage and interlock with the groove 25, formed in the face of the cutter head support, the groove 25 having overhanging beveled edges 26, to interlock with the inclined edges of the rib on the cutter head, so that a dove-tail joint is thus provided between the cutter head and the support therefor to allow of the cutter head being adjusted laterally, and a set screw serves to hold the cutter head in adjusted position. The cutter head is provided with a pair of outstanding journal brackets 28, in which is journaled the horizontal cutter shaft 29, and the pulley 30, fixed on said shaft may be connected by belt or, otherwise to rotate the shaft. The cutters consist of one or more disks 31, preferably of emery or the like abrasive material, the disks (when there are

more than one disk), being held in the proper spaced relation by the spacing rings or washers 32, the disks being clamped between the annular flanges 33, and held by the securing nut 34. In this way, by loosening the clamping nut on the end of the shaft, any number of cutters may be mounted thereon in any desired spaced relation, so that either one or a number of parallel grooves may be cut in the paper. The cutters are preferably rotated at a high rate of speed and in a direction opposite to the travel of the paper. The cutters are also adjustable in a vertical plane in this manner; the cutter head supporting bar has angular ends 35, in which are mounted three or more bolts 36, which work through vertically arranged slots 37, formed in the frame, the nuts 38, on the ends of these bolts serving to secure the supporting bar when adjusted to the proper height. Set screws 39, are engaged in the ends of the cutter head support and bear on the stationary ledge 40, so that by adjusting these set screws the cutter head support may be raised or lowered at will.

Vertical guideways 41, are formed near the rear portion of the frame and in said guideways are slidably confined the journal brackets 42. The brackets are slotted longitudinally at 43, to receive the stationary securing bolts 44, and the nuts 45, on said bolts clamp the journal brackets in their adjusted position. Adjustment screws 46, mounted in the lower ends of the brackets engage the stationary lugs 47, and serve for raising and lowering the brackets. A brush shaft 48, is journaled in the adjustable journal brackets, the shaft passing through enlarged openings 49, in the sides of the frame to allow clearance for the adjustment of the shaft. A rotary brush 50 is mounted on the shaft and this brush is preferably long enough to reach across the web of paper and clean the entire surface thereof, including the grooved portions.

Some means has to be provided for disposing of the cuttings and loose fibers created by the cutter wheels as otherwise these fine particles or dust would get into the animal sizing and would stick to the wet portion of the paper, thereby spoiling the process. To this end, a pneumatic suction apparatus is provided in the shape of a main collector pipe 53, which is in connection with a suitable exhaust fan or blower 54, and a dust collector or receiver 55. A hood 56, is placed over the brush and is connected by tributary or branch pipes 57, with the main collector pipe, the branch pipes preferably being placed on a slant in the direction of the exhaust current as shown. Hoods 58, are also placed over each of the cutters and these hoods are connected to the main collector pipe by the tributary pipes 59. These last named tributary pipes are flexible in order

to allow adjustment of the hoods with respect to the cutters, and these flexible pipes may consist of a canvas or fabric covering 60, which may be held expanded by means of internal rings not shown, or other forms of flexible piping may be used. Thus suction is produced in the collector pipes by means of a fan or other air-exhausting apparatus and most of the dust is carried away directly from beneath the cutters, and the balance of the dust is taken up from underneath and around the brush, so that the paper is left perfectly clean.

The operation of the machine is as follows: When used in connection with a paper making machine, the paper is led up from the last or near the last drier roll when in a dry or almost dry condition, over the guide roll at the front end of the grooving machine and between the adjustable platen and the cutters. The cutters being rotated in a direction opposite to the travel of the paper make a smooth clean cut in the surface of the paper and the depth of the cut may be regulated by adjusting the platen. By using any number of cutters and of any desired conformation, the number and shape of the grooves may be governed to suit different conditions. The cutters may be rendered inoperative by simply lifting the cam on the platen carriage, thereby lowering the platen and the paper supported thereby from contact with the cutters. As shown in the top plan view, Fig. 2, the cutters may be operated in single sets or a number of cutter sets may be mounted on the same shaft. The arrangement shown in this figure is for grooving an extra wide sheet of paper which is afterward to be divided into three strips, the strips having a hinge portion along each edge. The paper after leaving the cutters then passes under the burnishing brush which is also rotated in a direction opposite to the travel of the paper. This brush cleans the grooved portions of all loose fibers which might have escaped the first set of dust collectors, and as it is rotated at a high rate of speed, it leaves the grooves with a hard smooth finish equal to the rest of the surface of the paper. A platen may be provided for the support of the paper beneath the brushes if desirable. The brushes may be operated by a pulley 52, on the end of the brush shaft or other driving connections may be employed. The paper after leaving the grooving machine is then passed through the slitters or rotary knives which cut it into the proper sized strips, it is then sized, calendered, finished and dried in a drying loft or otherwise. In this way, the grooves receive a coat of sizing and are afterward finished in the same manner as the plain portion of the paper, so that the grooved portions while possessing greater flexibility than the balance of

the sheet, still possess practically the same strength and smooth finish as the rest of the sheet, and on account of the sizing in the grooves, and the fact that in calendering, the sheet proper is pressed to about one half its original thickness or practically to the thickness of the grooves, the grooved portion is of substantially the same thickness as the sheet proper.

We have found it advisable under certain conditions to support the paper from the sides while being grooved, rather than from underneath, and in Fig. 5, is shown a form of platen for supporting the paper in this way. Here the upper edge of the platen is formed with a series of grooves 62 therein, of slightly greater width than the cutters, there being ribs 63, provided to support the paper between the cutters. While only two forms of paper supports have been illustrated, other forms may be employed to suit different conditions and requirements and the platens may be made of other material than steel.

As all the parts of the machine are adjustable, the multiplicity, arrangement and shape of the grooves may be varied to suit different conditions and requirements, and while illustrated as applied to a paper making machine, our improved grooving mechanism may be operated entirely independently of any other mechanism whatsoever.

From the foregoing description taken in connection with the drawings, the operation and advantages of our grooving machine will be readily understood and appreciated, and it will be apparent that we have produced a device of this character which has an extended field of usefulness, and which accomplishes all the results herein aimed at, in a thorough and eminently satisfactory manner.

We claim:

1. In a paper grooving machine, the combination with cutters, of brushes for cleaning the grooved portions of waste fiber.
2. In a paper grooving machine, the combination with means for grooving the paper, of brushes for cleaning and smoothing the grooved portions.
3. The combination with a paper making machine, of means for grooving the paper, and brushes for cleaning and smoothing the grooved portions of the paper.
4. The combination with a paper making machine, of means for grooving the paper, and brushes for cleaning the paper and imparting a smooth finish to the grooved portions of the paper.
5. The combination with a paper making machine, of means for grooving the paper, and brushes for cleaning the paper and smoothing the grooved portions.
6. In a paper grooving machine, the combination with adjustable cutters, of brushes

for cleaning and smoothing the grooved portions of the paper.

7. In a paper grooving machine the combination of a paper support, means for  
5 grooving the paper, and brushes for cleaning the grooved portions of the paper.

8. A paper grooving machine comprising an adjustable platen, cutters to cooperate with the platen, and brushes for cleaning the  
10 paper after being grooved.

9. A paper grooving machine comprising a platen, cutters cooperating with the platen, and brushes for cleaning the paper and smoothing the grooved portions.

15 10. A paper grooving machine comprising a paper support, cutters to cooperate therewith, and brushes for cleaning the grooved portions, the parts being adjustably mounted.

20 11. A paper grooving machine comprising an adjustable paper support, cutters adjustably mounted to cooperate therewith, and brushes adjustably mounted for smoothing the grooved portions of the paper.

25 12. The combination with means for grooving fabric, means for removing the material of such grooves, and means for burnishing such grooved portions.

30 13. A paper grooving machine, comprising a platen having a groove in its upper surface, a cutter cooperating therewith, and means for cleaning the grooved portions of the paper.

35 14. A paper grooving device comprising a support, a carriage adjustably mounted on the support, a platen carried by the carriage to support the sheet of paper, means for adjusting the platen, a cutter or cutters adjustably mounted above the platen, means  
40 for removing the waste material from the cutters, means for brushing the grooved portions of waste material, and means for removing the waste material from the brushing means.

45 15. In a paper grooving machine, the combination of a paper-support having a groove

therein, means for grooving the paper, mounted above the groove in said paper-support, and rotary means adapted to engage and clean the paper after grooving. 50

16. In combination with a paper machine, a support, a carriage laterally adjustable on said support, means for raising and lowering the carriage, a paper-supporting platen mounted in the carriage, means for adjusting said platen, cutters adjustably mounted above and adapted to cooperate with the platen in forming grooves in the paper, means for brushing the grooved portions of loose fibers, and means for collecting and  
55 removing the loose fibers from the paper. 60

17. In a paper grooving machine, the combination of a paper-support, means for grooving the paper and rotary means adapted to engage and clean the paper after grooving. 65

18. In a paper grooving machine, the combination of means for grooving the paper, and rotary means adapted to engage and clean the paper after grooving. 70

19. In a paper grooving machine, the combination of cutters for grooving the paper and rotary means adapted to engage and clean the paper after grooving.

20. In a paper grooving machine, the combination of a paper-support having a groove therein, a cutter for grooving the paper, mounted above the groove in said paper-support, and rotary means adapted to engage and clean the paper after grooving. 75 80

21. In a paper grooving machine, the combination of a platen having a groove in its upper surface, a cutter cooperating therewith, and a brush for cleaning the grooved portions of the paper. 85

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM E. RAMAGE.

HENRY D. SHAW.

Witnesses:

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JAS. H. McGRATH.