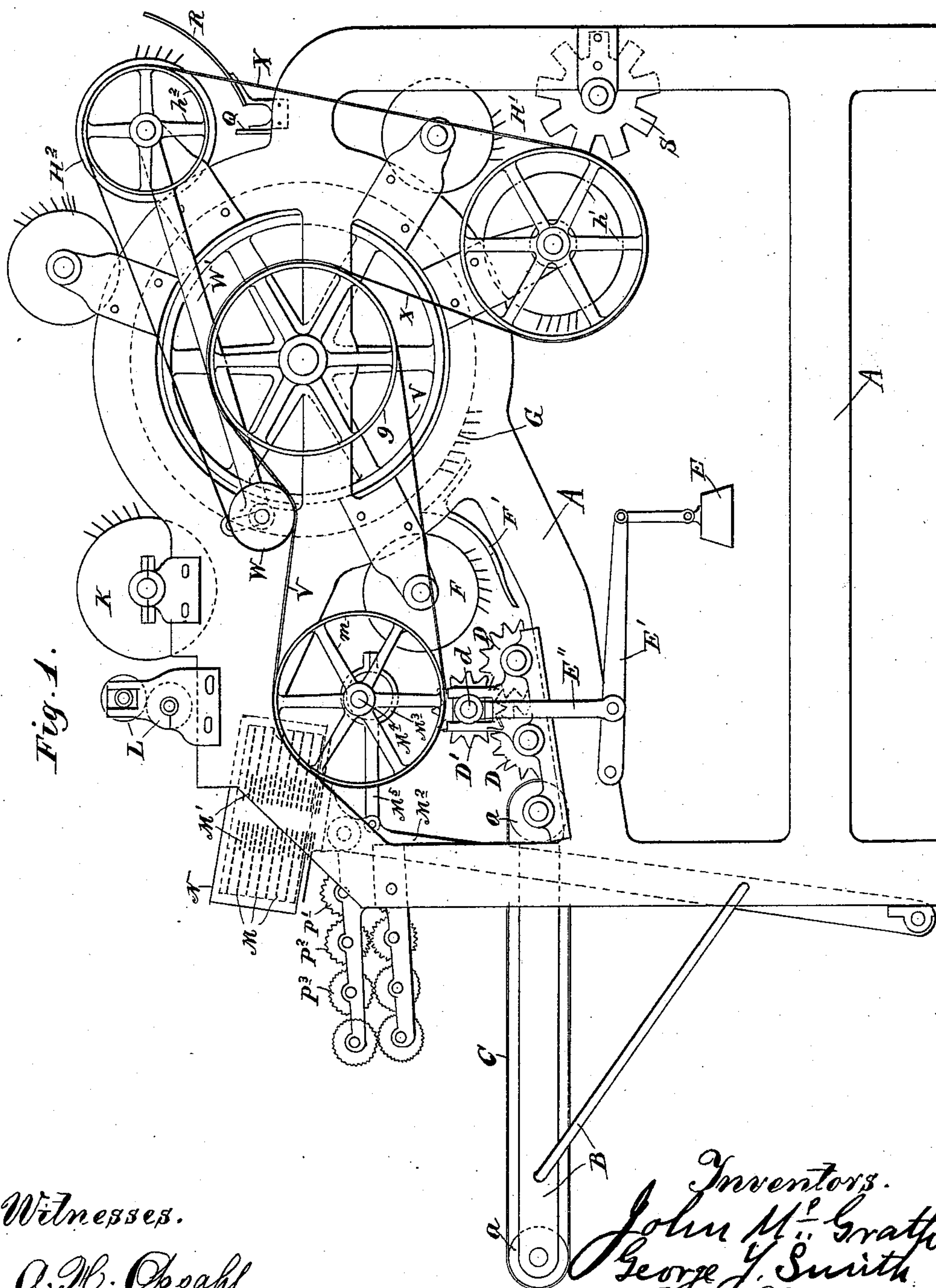


(No Model.)

3 Sheets—Sheet 1.

J. McGRATH & G. Y. SMITH.
METHOD OF SEPARATING FIBER AND APPARATUS THEREFOR.
No. 456,155. Patented July 21, 1891.



Witnesses.
A. B. Opahl
Frank D. Merchant,

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By their Attorney.
Jas. F. Williamson

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

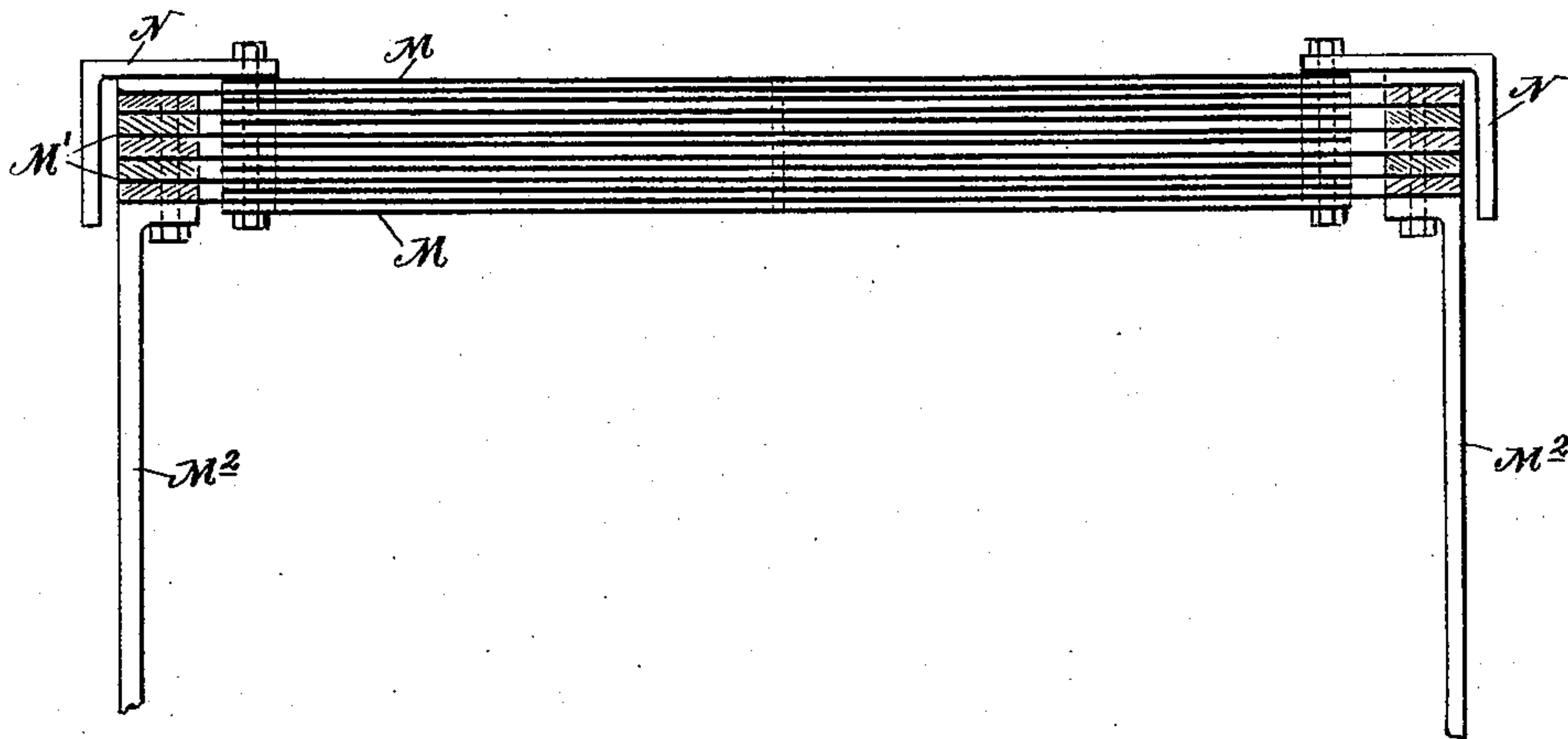
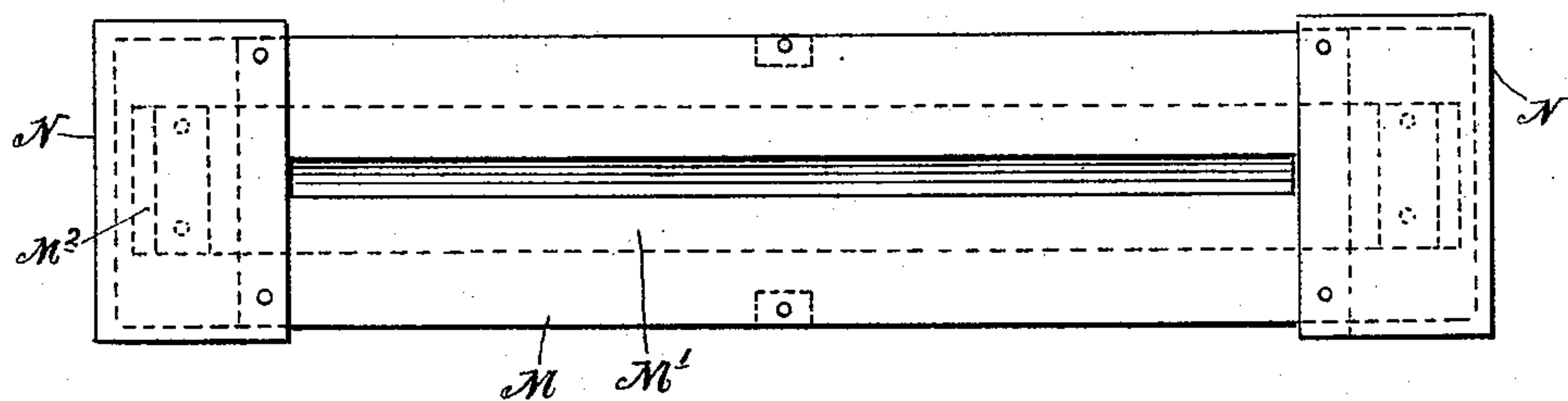


Fig. 3.



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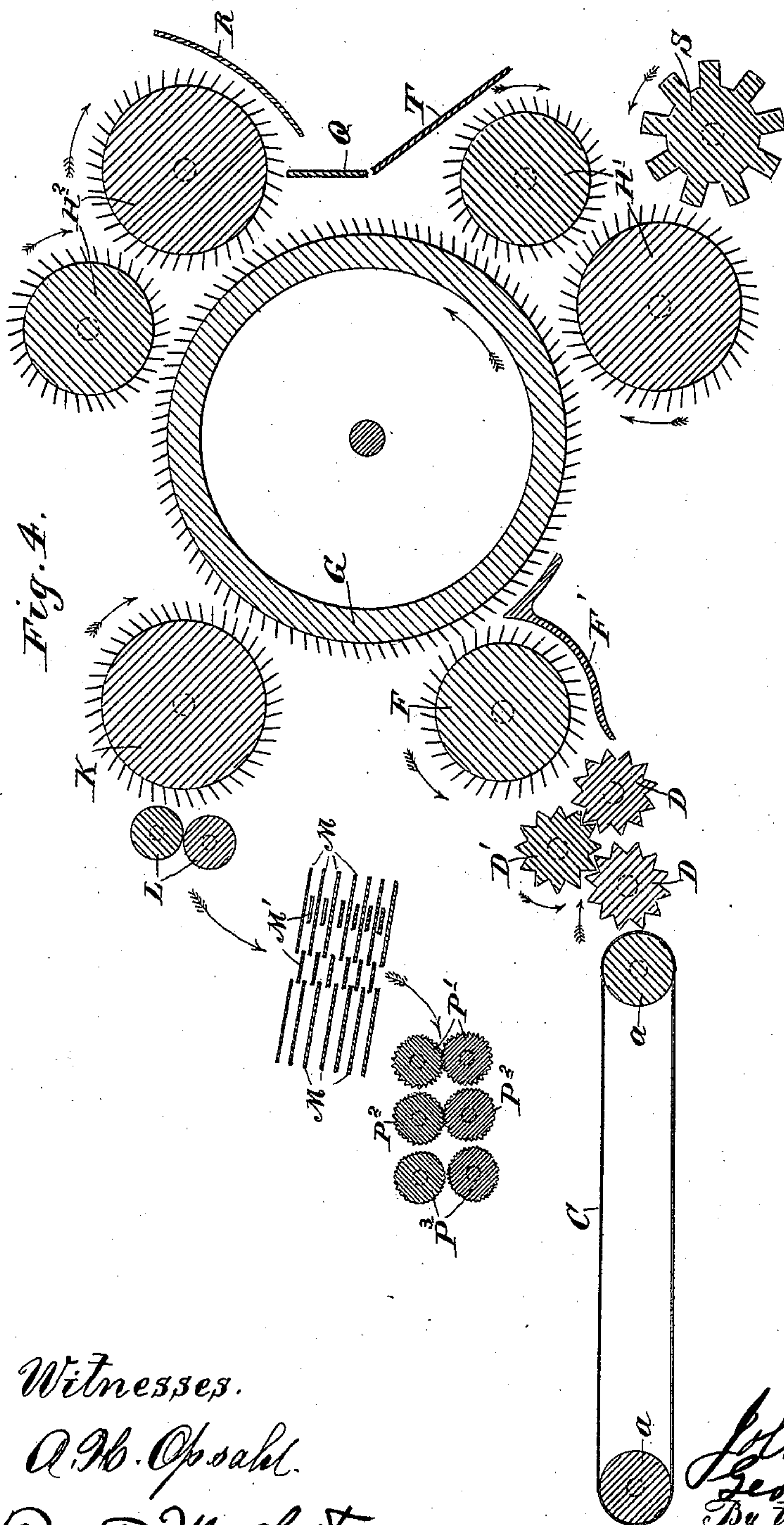
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UNITED STATES PATENT OFFICE.

JOHN McGRATH AND GEORGE Y. SMITH, OF MINNEAPOLIS, MINNESOTA,
ASSIGNORS TO GEORGE N. LYMAN, SR., OF SAME PLACE.

METHOD OF SEPARATING FIBER AND APPARATUS THEREFOR.

SPECIFICATION forming part of Letters Patent No. 456,155, dated July 21, 1891.

Application filed February 19, 1891. Serial No. 382,088. (No model.)

To all whom it may concern:

Be it known that we, JOHN McGRATH, a citizen of Great Britain, and GEORGE Y. SMITH, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Methods of Separating Fiber; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the treatment of fibrous stock, and comprises certain improvements in the method and in the mechanism for manipulating the same, whereby a more effective and rapid separation may be made of the fiber from the shive or woody matter.

The invention was especially designed for the separation of flax fiber, but is also applicable to hemp, sisal, and other fibrous plants. The method of treatment is first to reduce the stock into sheet-like form comparatively clear of shive by breaking and carding actions, and then to subject the sheet of fibrous matter to crimping and rubbing actions, and, finally, for the highest grade fiber, in subjecting the comparatively finished sheet of fibrous matter to a succession of crushing actions of gradually-shortening nips for reducing the same into its finished condition.

The mechanism for applying this method of manipulation is illustrated in the accompanying drawings, wherein like letters refer to like parts throughout.

Figure 1 is a right-side elevation of the entire machine. Fig. 2 is a front elevation, and Fig. 3, a plan of the crimping-blades detached; and Fig. 4 is a diagrammatic view representing the actions.

A B is the frame-work of the machine, of which A is the main casting, and B a forwardly-projecting bracket for supporting the feed-table.

C is an endless carrier, preferably composed of cloth, mounted on the rollers *a*, journaled in the bracket B, and constitutes the feed-table upon which the flax or other stock to be treated is spread by the operator.

D D D' are a set of breaking-rollers jour-

naled in the frame directly to the rear of the feed-table, and having fluted surfaces preferably of about one inch pitch. These rollers are arranged in sets of three, the angle-seated member of which D' is journaled in sliding bearings *d* and is under pressure. The pressure-delivering device may be of any suitable kind, as the weight E on pivoted lever E', connected to the ends of the roller D' by the links E''. The series or sets of breaking-rollers may be increased to five or fifteen, or any intermediate odd number, the advantage being that two breaks or nips are obtained by every set of three rollers, or every two rollers added to the primary set.

F F' are respectively a pin feed-roller and shell for receiving the stock from the breaking-rollers and delivering the same to the centrally-located carding-cylinder G. The pins on the feed-roller F are preferably set at about one-half inch pitch. The shell F' is carried upward and terminates in a knife-like or sharp angle between the pin-roller and the card, for a purpose which will hereinafter appear.

H' H² are sets of pinned working and stripping rollers co-operating with the carding-cylinders and each other in pairs, the larger member of each set being the stripper and the smaller the worker. As many sets of these working and stripping rollers may be located about the carding-cylinder as may be required.

K is the doffer-roller.

L are a pair of drawing and pressing rollers which receive the stock from the doffer and delivers it in a sheet of uniform thickness.

M M' are a set of crimping-blades located below and slightly to the front of the drawing and pressing rollers L. Of these blades the set M are stationary and are arranged in two tiers on the opposite sides of a common central space and are secured at their ends to angle-blocks N, projecting from the main frame. These blades are held in their retaining-heads spaced apart from each other, and between the same, alternating therewith, work the set of movable blades M', which are also arranged in two tiers spaced apart from each other and on the opposite sides of a central

opening which may be made to register with the central opening between the tiers of the fixed blades through which the stock is made to pass. The movable blades are secured at their ends to pivoted sword-heads or rocking levers M^2 , to which a reciprocating motion is imparted from an eccentric M^3 on a counter-shaft M^4 , mounted in the frame, through the connecting-link or eccentric-rod M^5 . The movable blades increase in width in the direction of the travel of the stock, the increased crimp thus afforded serving by its drawing action to give a positive feed on the stock.

P^1 , P^2 , and P^3 are sets of crushing-rollers arranged together in pairs and having fluted surfaces, the first of which are of about three-eighths inch pitch, each succeeding set being finer in the direction of the travel of the stock. As many of these crushing-rollers may be employed as is necessary to give to the stock the requisite finish.

Q is a whisking-board set edgewise under the upper set of working and stripping rollers H^2 .

R is a shell facing the stripping member of said rollers.

S is a barred roller or trundle-wheel located adjacent to the lower set of workers and strippers H^1 .

T is a guide board or chute set at an angle under the whisking-board Q .

The devices Q , R , S , and T are supplementary in character or function and may or may not be used, according as required. The rollers are all journaled either directly in the frame or in brackets projecting therefrom. The workers and strippers, as well as the feed-wheel and doffer, are all pinned, as is also the carding-cylinder, and are driven in the direction shown by the arrows. When the whisking-board Q is employed, the stripping-roller of the upper set is driven from twenty to thirty per cent. faster than normal. The parts are driven by power preferably applied to a pulley (not shown) on the left end of the carding-cylinder of the shaft. As a convenient means for throwing the crimping-blades out of action at will without stopping the other parts the eccentric shaft M^4 is driven by a belt V , passing over the pulleys g and m , located, respectively, on the right-hand ends of the card-shaft and eccentric shaft. This belt V is normally slack and is subject to the action of a tightener W on the outer end of an arm W' , which is pivoted at its upper end to the shaft of the upper stripping-roller. The belt X for driving the stripping-rollers passes around the pulleys h^1 and h^2 , the tightener W , and the rear face of the pulley g . Hence the belt X will continue in action when the tightener W is lifted out of contact with the belt V . The belt V , then being slackened, will slide on the pulley m , leaving the crimping-blades idle. The other rollers are driven from pulleys and belts on the left end of the machine (Not shown.)

The operation is as follows: The flax or

other material is spread on the endless carrier C , by which it is delivered to the breaking-rollers $D D D'$, by which it is broken up and passed by the pinned wheel and shell $F F'$ to the carding-cylinder G . In changing its direction over the knife-edge or angular point of the shell F' the stock is subjected to a breaking action, the fiber giving sufficiently in the direction of the movement of the card to avoid any injury thereto. By the card the stock is carried forward and delivered in succession to the successive sets of working and stripping rollers H^1 and H^2 , by the actions of which most of the shive or woody matter will be removed and the fiber again given to the card, whence it is taken off by the doffer-roller K and delivered, through the drawing and pressing rollers L , in a thin sheet of uniform thickness to the crimping-blades M and M' . These blades subject this sheet of comparatively clean fiber to a crimping and rubbing action, which is very effective to further break up and remove the remaining shive or woody matter. From the crimping-blades the stock passes to the graduated crushing-rollers $P^1 P^2$, &c., by which it is subjected to crushing actions of gradually-shortening nips and from which it is delivered in its finished condition. When the whisking-board Q and the shell R are employed, the upper stripper being driven at a comparatively high rate of speed, the fibrous matter projecting therefrom, beard-like, under the action of the centrifugal force will be whisked against the upper edge of the board, and thereby subjected to a scraping action, which is effective both for breaking and removing the woody matter and knocking out the dust from the fiber. The short fiber or tow, which may be whisked off from the upper stripper, may either be directed to the floor by the chute T or permitted to fall onto the barred licking-in roller S , upon the bars of which it will be caught and delivered to the lower stripping-roller. The barred roller S , in addition to this function of catching the tow from the whisking-board, also serves to catch hold of and lick in the fibrous matter projecting from the lower working-roller and to deliver the same earlier to its co-operative stripper. The fibers are caught on the bars of the roller, while the dust falls into the spaces or crotches between the same and is delivered therefrom to the floor.

This method and mechanism is very efficient both in the quantity and quality of the work. Although the best results are obtained by bringing the actions in the order above specified more or less satisfactory results might be obtained with the parts differently located. The crimping-blades, for example, will do the best work after most of the woody matter has been removed and the remaining stock is in a sheet-like form. They could, however, be made to act as a break at or near the head of the machine, but, on account of the bulk of the stock at that stage

of the process, would not be able to work so well.

This machine was especially designed for and is particularly well adapted to the treatment of comparatively short stock, such as the ordinary machine-cut flax as harvested in the United States.

It should be noted that the crimping-blades may be increased or decreased to any desired number, according to the requirements of the work.

It will be understood, of course, that the different moving parts will be speeded so as to work to the best advantage.

What is claimed, and desired to be secured by Letters Patent, is as follows:

1. The method of treating fibrous stock to separate the fiber from the shive or woody matter, which consists in first breaking and carding the stock to reduce the fibrous matter into sheet-like form comparatively free from shive, and then subjecting the sheet of fibrous matter to crimping and rubbing actions for effecting a further separation, substantially as described.

2. The method of treating fibrous stock to separate the fiber from the shive or woody matter, which consists in first breaking and carding the stock to reduce the fibrous matter into sheet-like form comparatively free from shive; second, subjecting the sheet of fibrous matter to a crimping or rubbing action for effecting a further separation, and then subjecting the fibrous matter to a succession of crushing actions for reducing the fiber into its finished condition, substantially as described.

3. In a fiber-separating machine, the combination, with breaking and carding devices adapted to reduce the stock to sheet-like form comparatively free from shive, of a set of crimping-blades for treating said comparatively finished stock, adapted to subject the same to a crimping or rubbing action, the said breaking and carding devices and the crimping-blades being arranged in a series and delivering successively from the one to the other of the series, substantially as described.

4. In a fiber-separating machine, the combination, with breaking and carding devices for removing the coarser shive and reducing the fibrous stock to sheet-like form, of crimping-blades adapted to subject the said sheet to a crimping and rubbing action, and one or more sets of fluted crushing-rollers for reducing the fibrous matter to its finished condition, the said breaking and carding devices, the crimping-blades, and the fluted crushing-rollers being arranged in a series and delivering successively from the one to the other of the series, substantially as described.

5. The combination, with breaking and carding devices, of a set of crimping-blades and a graduated series of two or more sets of fluted crushing-rollers, the said breaking and carding devices, crimping-blades, and fluted crush-

ing-rollers being arranged in a series and delivering successively from the one to the other of the series, substantially as described.

6. In a fiber-separating machine, the combination, with a carding-cylinder, of a set of working and stripping rollers, the latter of which is driven at a comparatively high rate of speed, and a whisking-board, against the edge of which the fibrous matter projecting tangentially from the working-roller under the action of the centrifugal force is made to strike and is subjected to a scraping action, substantially as described.

7. The combination, with the carding-cylinder, of a set of working and stripping rollers, the latter of which is driven at a comparatively high speed, the whisking-board, and the shell facing the stripping-roller, substantially as and for the purpose set forth.

8. The combination, with a carding-cylinder and a set of working and stripping rollers, of a barred licking-in roller between the working and stripping rollers, the bars of which are adapted to catch the ends of the fibrous matter projecting from the adjacent worker or dropped onto the same from higher sets of working and stripping rollers and to present the same to the adjacent stripper, while permitting the dust and shive to pass to the floor, substantially as described.

9. A fiber-separating machine comprising the combination, with a suitable frame, of an endless feeding-carrier, a series of fluted breaking-rollers, a carding-cylinder and sets of working and stripping rollers co-operating therewith, a pinned feed-wheel and a shell for receiving the stock from the breaking-rollers and conducting the same to the card, a doffing-roller, a set of pressing and drawing rollers for acting upon the sheet of fiber as it comes from the doffing-roller, a set of crimping or rubbing blades, and a graduated series of crushing-rollers, the said crimping-blades and crushing-rollers being arranged to receive and act upon the sheet of fiber in succession as it comes from the drawing and pressing rollers, substantially as described.

10. The fiber-separating machine, substantially as described, consisting of the endless-carrier feed-table, the series of breaking-rollers arranged in sets of three, the angle-seated member being automatically adjustable and under pressure, the pinned feed-roller and pointed shell, the carding-cylinder, the sets of working and stripping rollers, the stripping member of one set being run at a relatively high speed, the shell and whisking-board in co-operation therewith, the barred licking-in roller in co-operation with the members of another set, the doffing-roller, the set of pressing and drawing rollers, the crimping-blades, and the graduated series of crushing-rollers, to the action of which devices the stock is subjected in the order named, substantially as and for the purpose set forth.

11. In the fiber-separating machine, substantially as described, the combination, with

the reciprocating crimping-blades, of the eccentric rod and shaft for driving the said blades of the slack belt for driving the said shaft from the carding-cylinder, and a pivoted
5 belt-tightener for the said slack belt, provided with a pulley, over which the main belt driving the other parts of the machine passes, whereby the crimping-blades may be stopped by lifting the tightener out of contact with

the eccentric shaft-belt without stopping the ro other parts of the machine.

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

JOHN McGRATH.

GEORGE Y. SMITH.

Witnesses:

JAS. F. WILLIAMSON,

EMMA F. ELMORE.