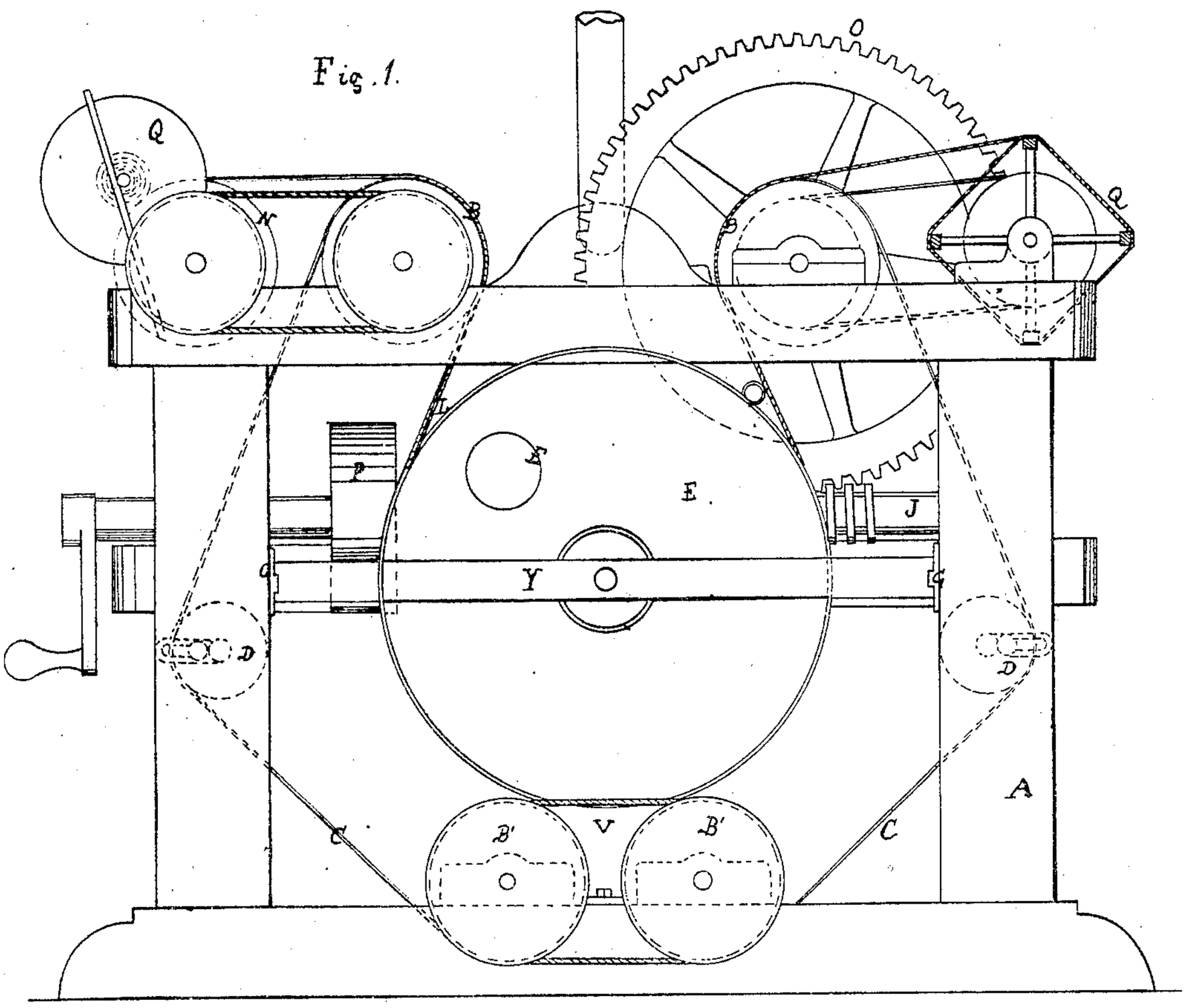
Sheet-1_4 Sheets.

Bloodgood & Johnson.

Felling Machine.

No. 45017 Patented Nov. 15, 1864.

Fig. 1.



Witnesses;

James P. Hall.
Henry Mann

Inventor.

Bloodgood & Johnson
Per. Munn & Co
Attorneys.

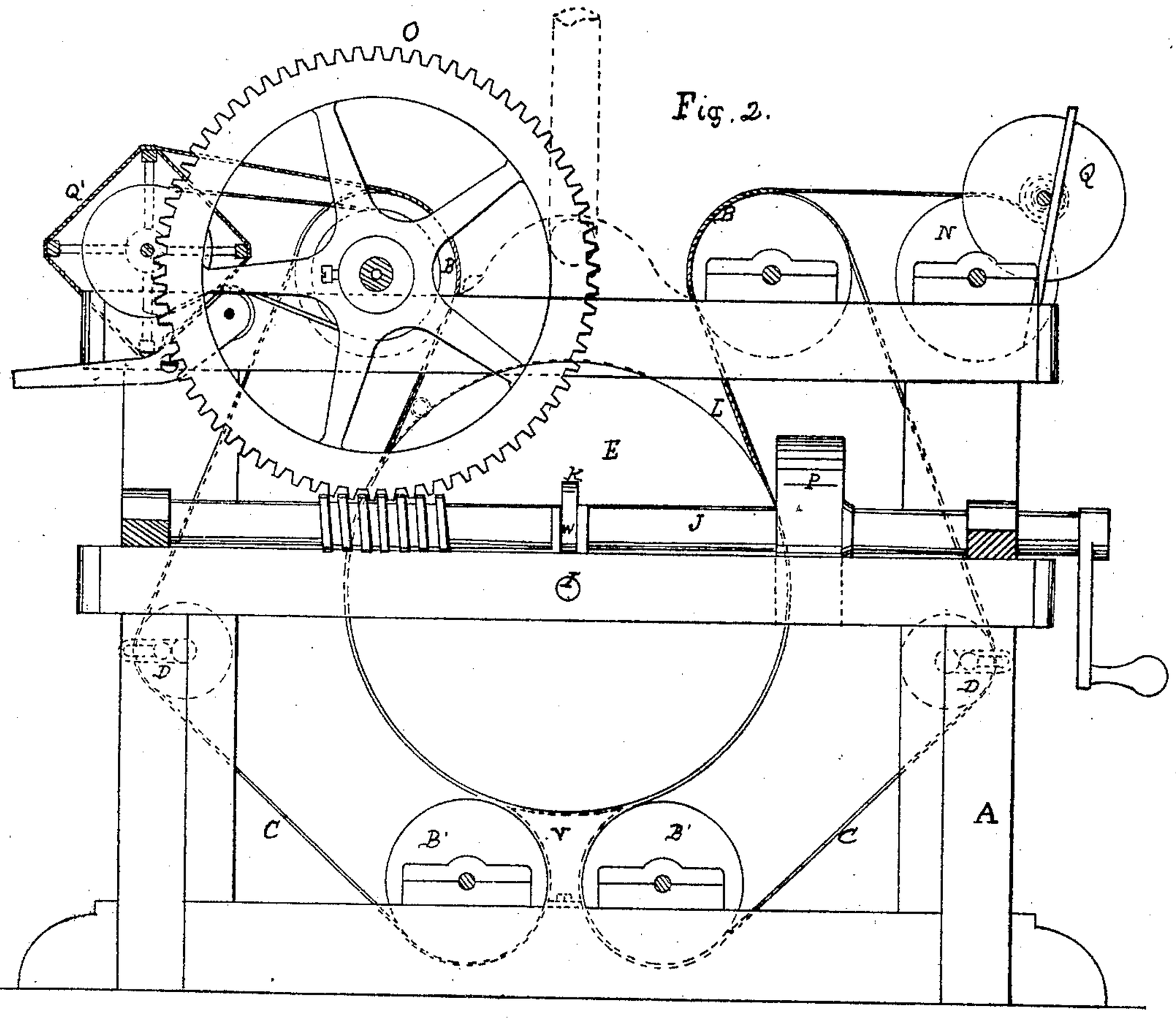
Sheet 2 - 4 Sheets.

Bloodgood & Johnson.

Felting Machine.

No. 45017 Patented Nov. 15, 1864.

Fig. 2.



Witnesses;
James P. Hall
Henry Morris

Inventor.
Jas. Bloodgood
M. A. Johnson
Per Munn & Co
Attorneys

Sheet 3 - 4 Sheets

Bloodgood & Johnson.

Felting Machine.

No 45017 Patented Nov. 15, 1864.

Fig. 7.

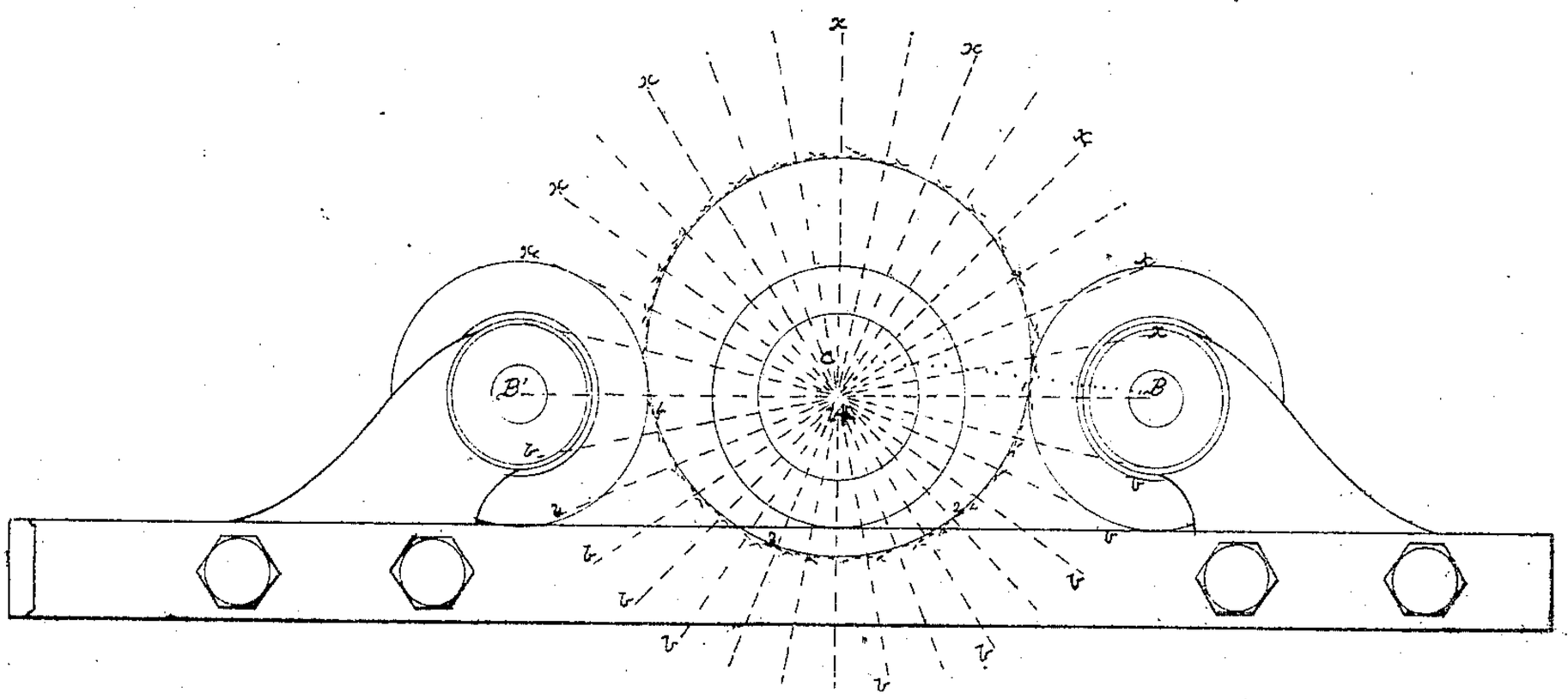
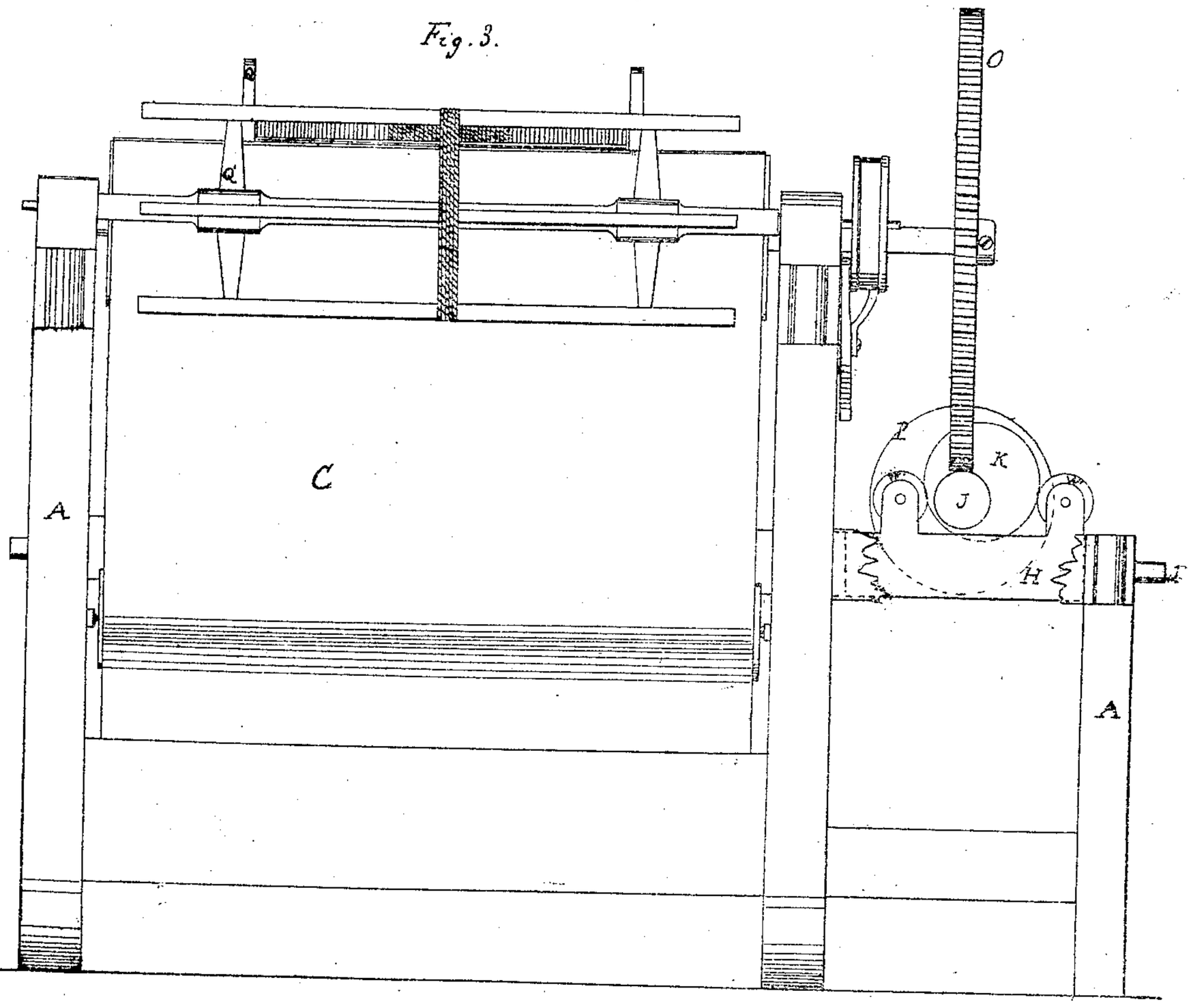


Fig. 3.



Witnesses;
J. P. Hall
Henry Morris

Inventor.
A. N. Bloodgood
W. A. Johnson
Per Munn & Co
attorneys

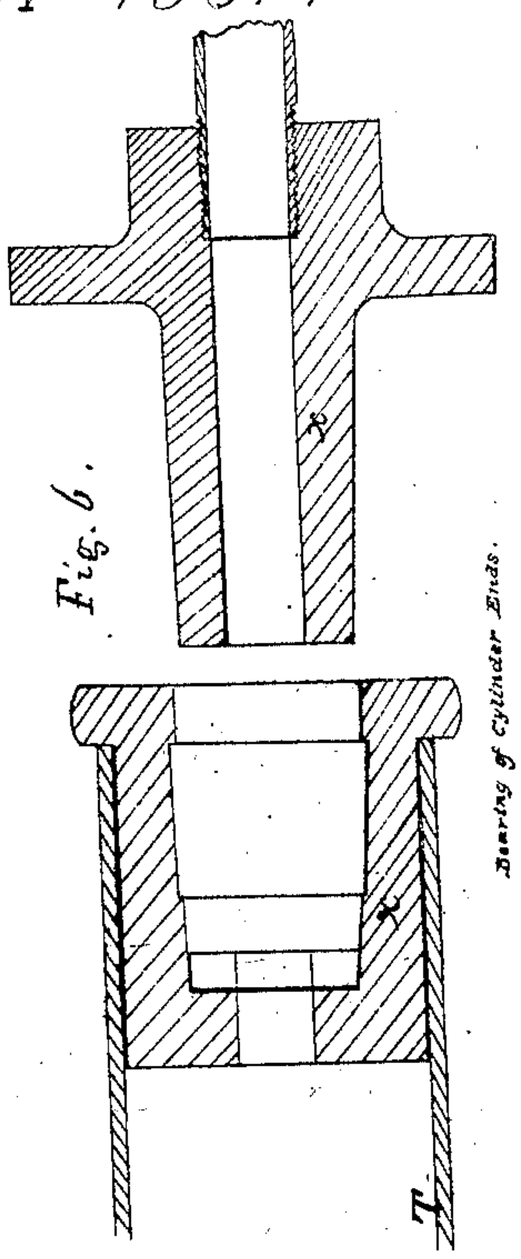
Sheet 4 4 Sheets

Bloodgood & Johnson.

Felling Machine.

No 45017 Patented Nov. 15, 1864.

Fig. 6.



Bearing of Cylinder Ends.

Fig. 4.

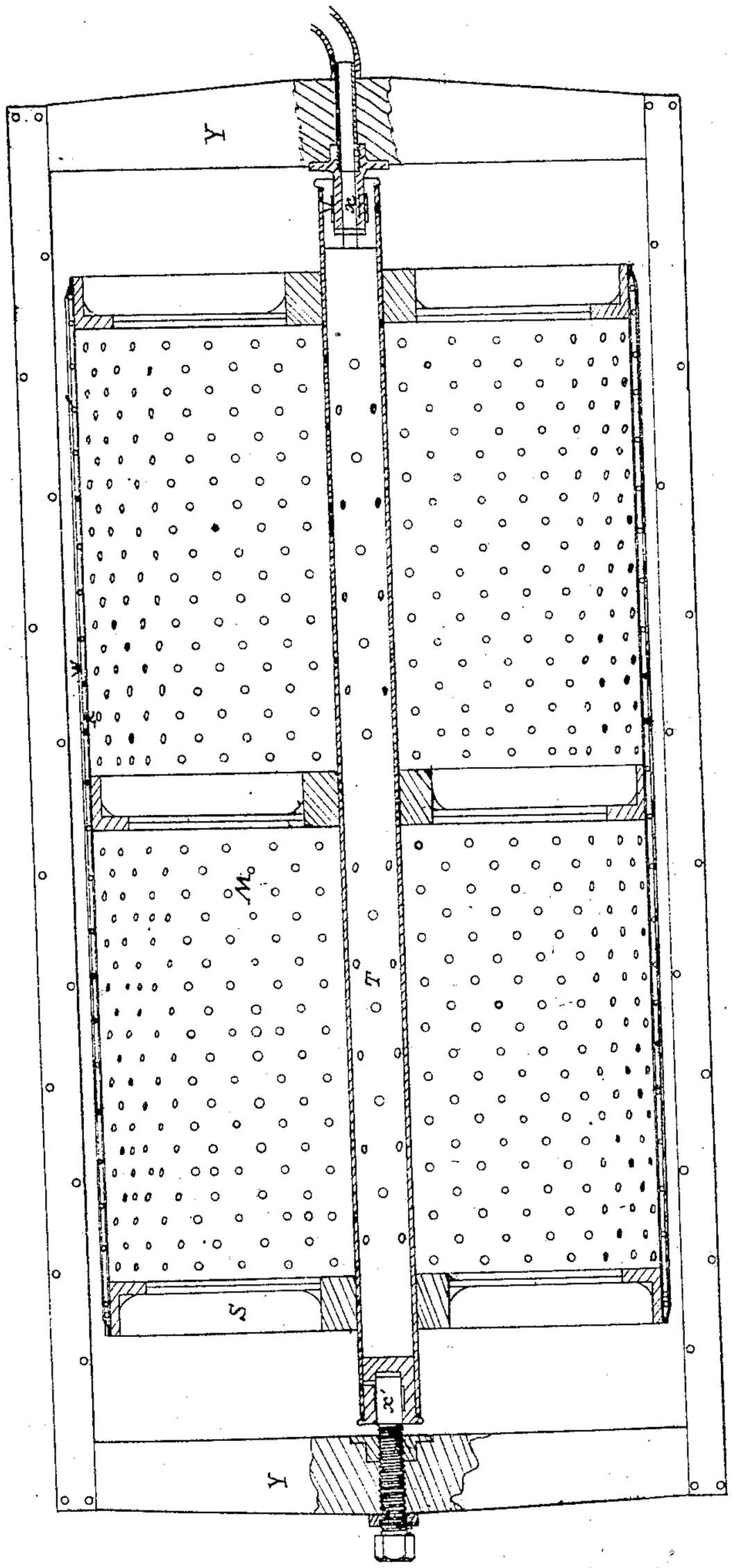
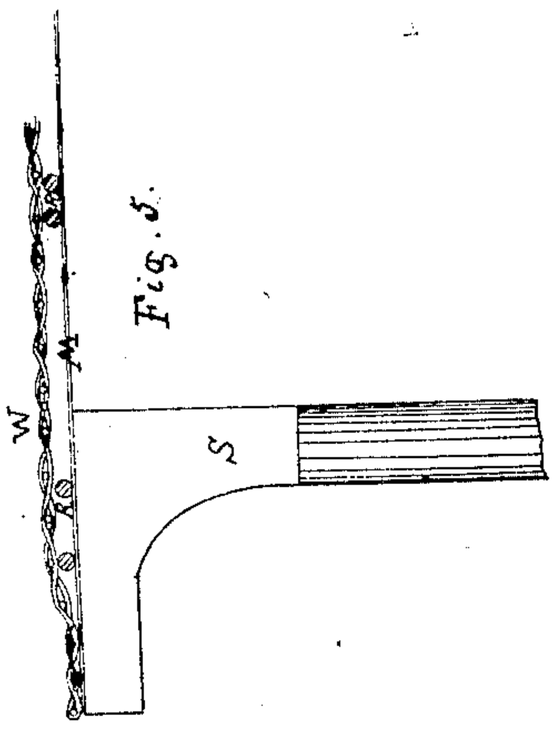


Fig. 5.



Witnesses;
S. P. Hall
Henry Mennis

Inventor.
J. H. Bloodgood
W. A. Johnson
per Munn & Co
attorneys

UNITED STATES PATENT OFFICE.

JOHN H. BLOODGOOD, OF NEW YORK, N. Y., AND MOSES A. JOHNSON, OF LOWELL, MASSACHUSETTS.

IMPROVEMENT IN FELTING-MACHINES.

Specification forming part of Letters Patent No. **45,017**, dated November 15, 1864.

To all whom it may concern:

Be it known that we, JOHN H. BLOODGOOD, of the city, county, and State of New York, and MOSES A. JOHNSON, of Lowell, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Felting-Machines; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents an end elevation of a machine upon which we have chosen, to illustrate our invention, the cylinder E being shown as having a perforation, E′, in its head; but this perforation is made only in the model filed in the case, to enable the Commissioner to inspect the interior of the cylinder, and not in the working-machines. Fig. 2 is an elevation of the same as seen from the other end of the machine. Fig. 3 is a front elevation of the same. Fig. 2 is a plan view of a vertical section of the felting-cylinder taken through the center of its shaft. Fig. 5 is a sectional detailed view (enlarged above the scale of the other figures) of a portion of the periphery of the felting-cylinder to show a mode of constructing it. Fig. 6 is an enlarged sectional view of the hollow bearing of the cylinder, through which steam or hot air is admitted to it. Fig. 7 is a diagram of the eccentric vibrating bar and its rolls, showing how the form of a cam is laid out.

Similar letters of reference indicate like parts.

A is the framing of the machine, strongly built and bolted together.

B B B′ B′ are the drums or rollers, which may be made hollow, and arranged to be heated by steam or air, and which carry the endless aprons C, of canvas or other suitable material.

D D are the rolls for tightening the apron, and they are arranged so that they not only can be drawn back to tighten it, but also so that one end can be elevated or depressed, in order to guide the apron and prevent it from running to one side on the other.

E is the felting-cylinder, represented in detail in Figs. 4, 5, and 6.

Fig. 4 represents a horizontal section through the diameter of the felting-cylinder and yoke, in which T is a tube, perforated at intervals, as shown, and serving both for the shaft upon which the cylinder turns and for introducing steam or hot air into its interior. Upon this shaft or tube are keyed a suitable number of spiders, S, made as light as is consistent with the requisite strength. Secured to the outside surface or rims of these spiders is the perforated cylindrical metallic case M, made as light as is consistent with the requisite stiffness, this case being intended to allow the steam or air admitted within it to escape freely through it, that it may come in direct contact with the material to be felted. The ends of the cylinder are of course closed up tightly, to prevent the steam or hot air from passing out, except through the case, as described. Outside of the perforated case, a series of rings, R, of flat or round wire, or its equivalent, are secured in those machines which are designed for felting yarn.

In some cases it may be desirable to have the interior case steam-tight, and to introduce the steam or hot air between this and the wire-cloth from some point outside the cylinder. When this is desired to be done, the rings R, Figs. 4 and 5, must be larger, to afford sufficient space for the penetration of steam or hot air to all parts of the surface of the cylinder. Steam or hot air may be introduced in this way by a perforated pipe below the cylinder at the gap V. A casing of some kind is needed to cover the exposed parts of the cylinder at top and at the gap V. One form of such casing is shown in Figs. 1 and 2 in red lines, and is designed to prevent the excessive escape of steam. The form of casing may be varied to suit the wishes of the manufacturer and the form of parts, or it may be omitted where no necessity for it exists. Outside of these wires is a second covering of wire-cloth, W, or its equivalent, firmly secured by soldering or other suitable methods, which covering is designed for the rubbing or friction surface.

The wire-cloth covering W will form slight channels or grooves between the wire rings upon which it is laid, and the object of these is to provide a channel for each yarn, and thus give them a tendency to pass through the machine each in its own path or channel.

Y is the frame or yoke which encompasses

the cylinder, and to which its bearings are attached at *x x'*. One of the bearings, *x*, is made hollow and connected with the steam-pipe for the admission of steam or air within the cylinder. The other bearing is tight, and so arranged by screw and nut as to admit of adjustment to prevent play endwise. This yoke is of wood, well braced, and secured at the corners, and moving freely endwise in the guides G. At the driving end this yoke has connected to it the driving-bar H, to which are secured the small rolls W W', rigidly fastened to the bar, which is kept in a direct horizontal position by the yoke at one end and by the guide I at the other.

J is the driving-shaft, which should be large enough to prevent all spring, and is hung in long bearings, and so situated that its center of motion shall be accurately within the horizontal line, which passes through the centers of the two rolls W' of the driving-bar. Upon this shaft, besides the driving-pulleys P, are the eccentric cams K, one or more, as may be desired, which act directly upon the rolls W W', and are so formed as to remain in perfect contact with the latter and at all points of the revolution, giving at the same time the requisite throw or endwise movement to the yoke and cylinder for the process of felting—say from three-fourths of an inch to one and one-fourth inches, and affording a comparatively frictionless and noiseless means of producing the rapid vibratory movement. This cam is formed upon the following principle: It is first determined what size will be desirable or convenient for the cam and rolls. In this case we have generally selected about six inches for the former and four for the latter. Next we fix the amount of eccentricity required, and, as it is the condition of this arrangement that the centers of the rolls or wheels W' and the center of the shaft of the eccentric shall always be in the same straight line, it follows that if the cam were a true circle when the center of the eccentric is vertically above or below the center of motion, the wheels must be nearer together than when the two centers are upon the same horizontal line by an amount proportionate to the throw. Now, as it is impossible to have the rolls at the same time perfectly rigid and yet adjustable to this variable distance, we change the form of the curve of the cam to one in which the several diameters through the center of motion shall be of such length as to obviate all necessity for such adjustment. This we do by shortening all the diameters except that from which we start when the two centers are vertically above or below each other. For simplicity in the formation and for ease in the construction of the cam we proceed as follows: Having determined the eccentricity, we proceed mathematically to ascertain how much nearer the centers of the wheels would be (if they could move) when the long side of the eccentric is vertical than when horizontal, in order that we may by additional eccentricity compensate for the loss of throw consequent upon the shortening of the several diameters of the eccentric. This is a simple problem, it being only necessary to calculate the difference between the lines forming the base A B, Fig. 7, and the hypotenuse C B of the right-angled triangle formed by connecting the center of motion A and the center of the eccentric C with the center B of one of the wheels, and to add this difference to the original eccentricity, which, although not mathematically a perfect compensation, is practically all that is required. Thus for one and one quarter inches throw we make the eccentric center $\frac{625}{1000} + \frac{40}{1000}$ or .665 of an inch away from the center of motion, and for one and one-half inches throw .827 of an inch instead of .750, &c. From this center of the cam we draw a semicircle, 1 2 3 4, below or above the horizontal line, corresponding with the original design—say in this case with a three-inch radius—then upon said horizontal line we take two points, B B', outside of the circle, as centers for the wheels, (which we have assumed to be four inches,) such that the circumference of the latter shall exactly touch that of the semicircle. Next we proceed to lay off any number of radii *b* from the center of motion, the more the better, and from points outside of the eccentric on each of these draw the curves corresponding with the wheels, so as to come in contact with the semicircle, and from these points, with the distance B B', as established on the horizontal line, lay off on each upper or opposite radius the center points, *x x*, for corresponding circle of wheel, and describe a portion of the latter next the eccentric. The curve shown in red, exactly touching all these sections of circles, will be the form of the upper half of the eccentric cam, and will be such that at all points of the revolution the cam will be in perfect contact with both rolls, thus enabling us to obtain a rapid vibratory motion with but little noise and friction.

The gear O is driven by worm on shaft J, and gives motion to the apron-rolls, and the cylinder itself is turned by the action of the aprons against its surface. N is the spool drum as in ordinary jacks for spinning, which is of course dispensed with in machines for felting cloth; and Q is the spool of roving. The finished yarn is wound upon the reel Q'. Where bands are represented in the drawings gears will be substituted in practice.

The operation of the machine is quite simple. The roving-spool is placed upon the drum as shown, and the ends of roving entered through suitable guides, to be fixed at L, between the first apron and felting-cylinder. The steam or hot air being admitted to the latter and the machine started, the roving is drawn in, and as it passes along is felted by the rapid vibratory or alternate endwise motion of the cylinder, and, passing across the vacancy V at the lower side, made to allow the escape of condensed steam. The yarns come next between the cylinder and the second

apron, where they are still further felted, and finally delivered at the top roll and wound upon a reel; or, if desired, they may be wound directly upon bobbins for the shuttle.

The drums B B′, which carry the aprons C, are in some machines made hollow, and connected by means of hollow journals with the steam-pipe, so as to introduce steam or air within them, and thereby increase and keep up the temperature at which the operation is to be carried on. It is generally sufficient to make the receiving-roll only of each apron of this character.

Where heated air is used instead of steam in the felting process, the required moisture is given by sprinkling or otherwise moistening the aprons over which the roving or yarns pass.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The use, in machines for felting, of a rubbing-cylinder whose surface is so constituted that steam or hot-air may readily pass through the same from within or without and act directly upon the material to be felted, whether said cylinder be used in combination with an endless apron, as herein described, or any other

[illegible]

2. We do not claim in this application heating a cylinder which merely revolves, but we claim, in machines for felting, the use of a vibrating rotating cylinder heated from within by steam, hot air, gas, or other means, substantially as and for the purposes described.

3. Covering the rotating vibrating cylinders of felting-machines with wire-cloth, substantially as and for the purposes above set forth.

4. The combination of the cam herein described with the felting-cylinder, for the purpose of giving the rapid vibratory motion to the latter.

5. The wire guides R R, shown in Figs. 4 and 5, the object of which is to form suitable channels for guiding the yarns, substantially as described.

6. The use of drums heated by steam or hot air, as the carrying-rolls of the endless aprons in felting-machines, substantially as described.

JNO. H. BLOODGOOD.
MOSES A. JOHNSON.

Witnesses:

OCTAVIUS KNIGHT,
CHARLES D. SMITH,
For Bloodgood.
GEORGE W. SHATTUCK,
WM. P. KIMBALL,
For M. A. Johnson.