N. Gavitt. Sheet 1. 3. Sheets.

Paper Cutter.

No. 10889. Patented May 9. 1854.

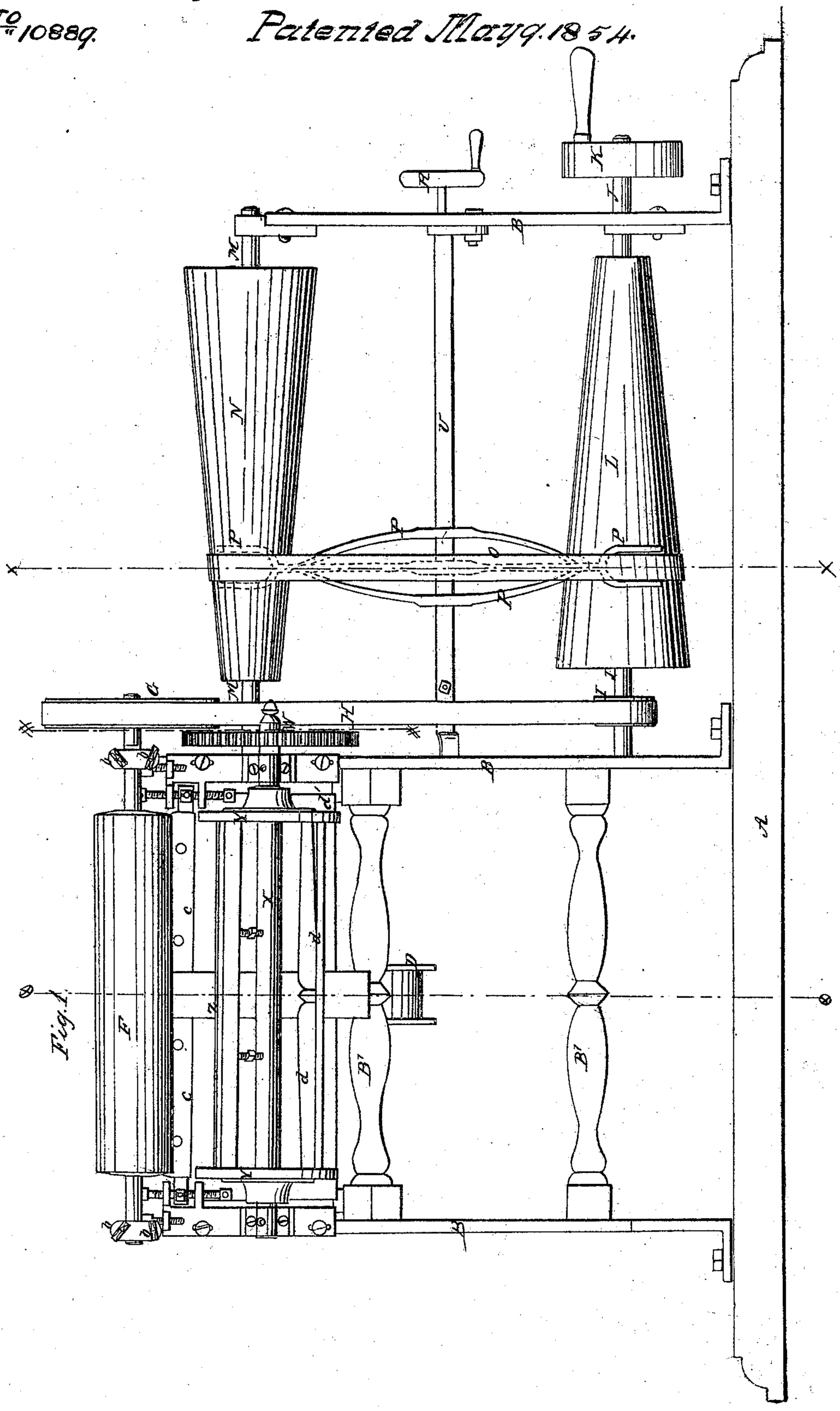

Fig. 1.

N. Gavitt. Sheet 2 Sheets.

Paper Cutter.

No. 10889. Patented May 9. 1854.

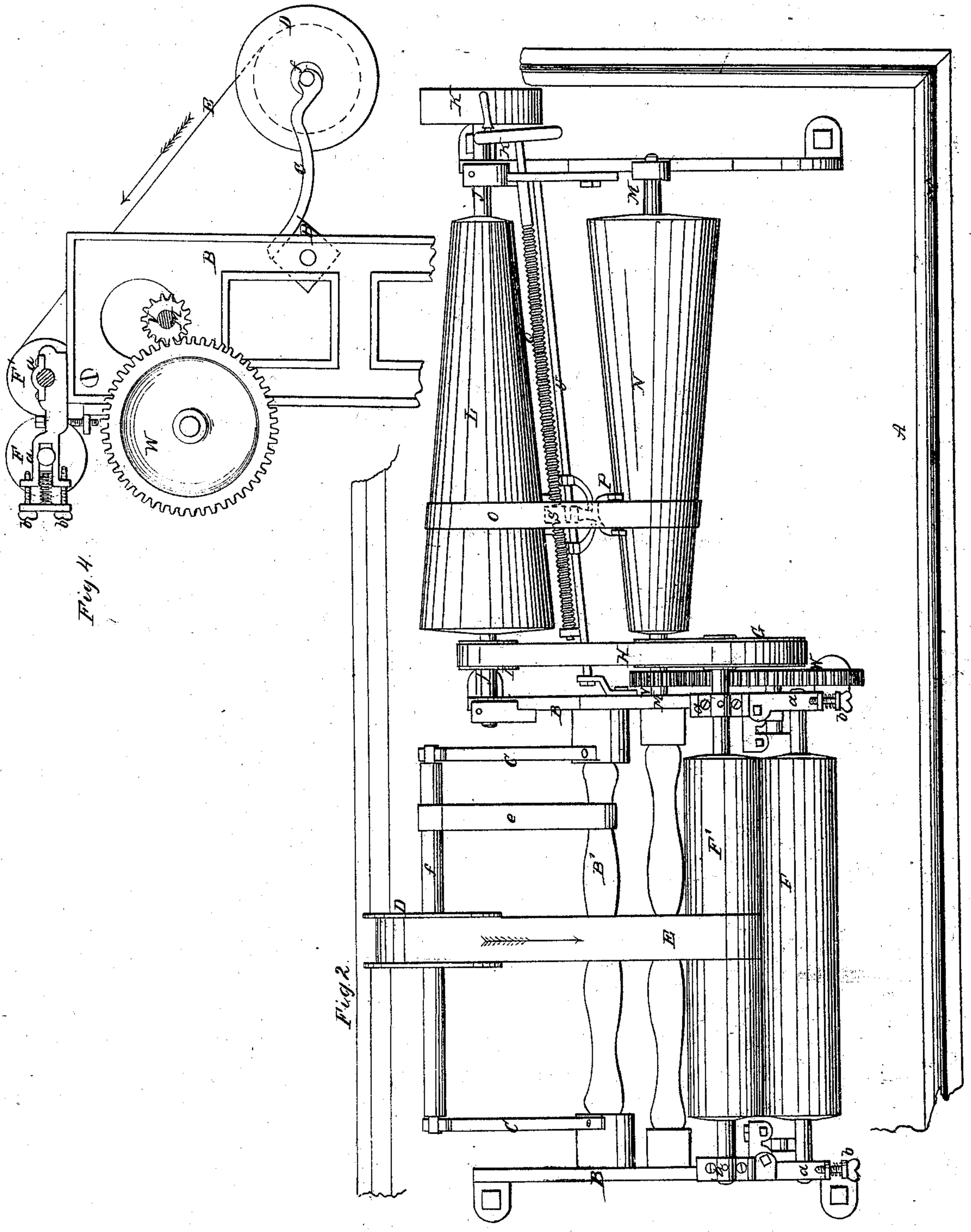

Fig. 1.

Fig. 2.

Sheet 3.3 Sheets.

N. Gavitt

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Fig 5

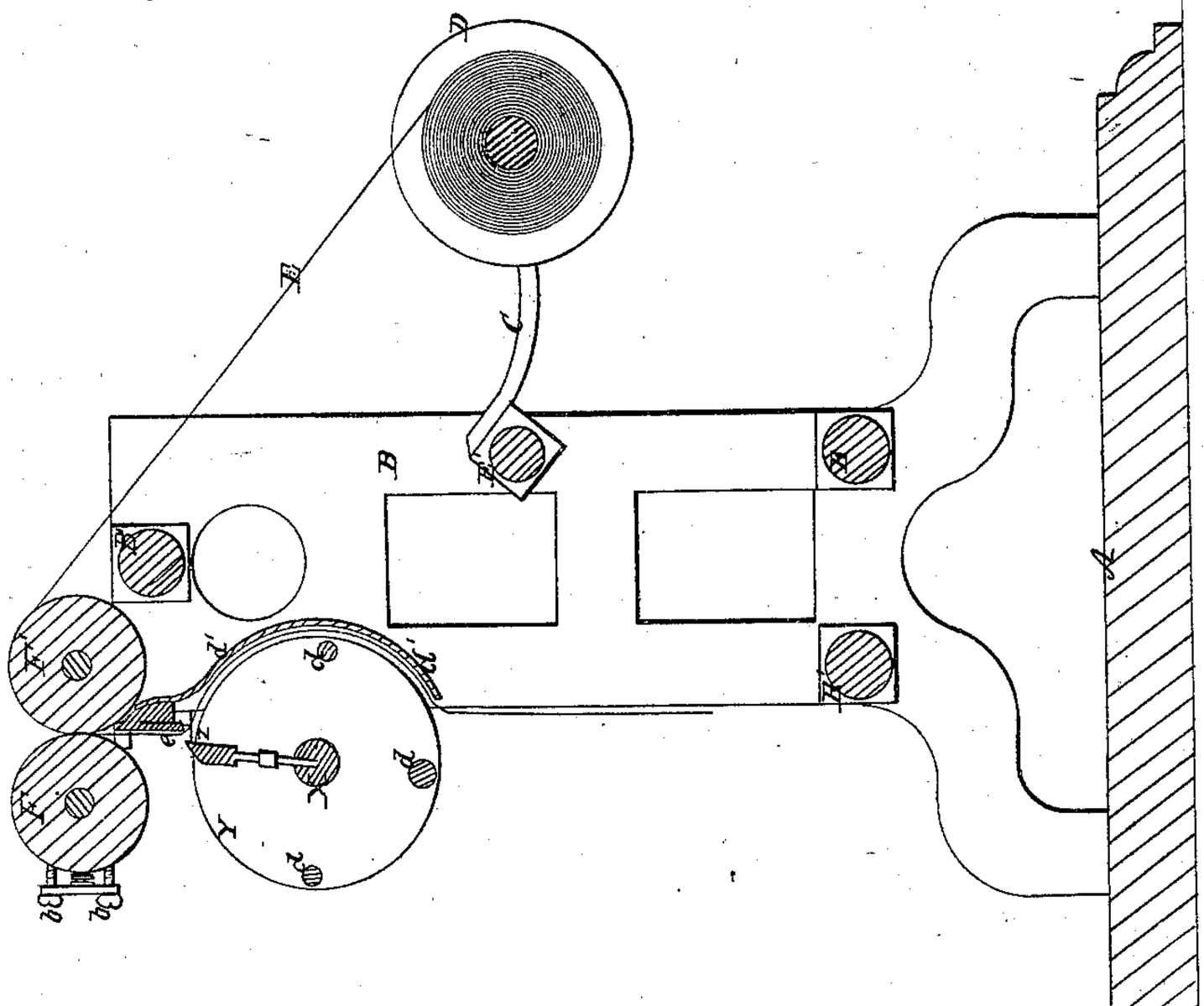
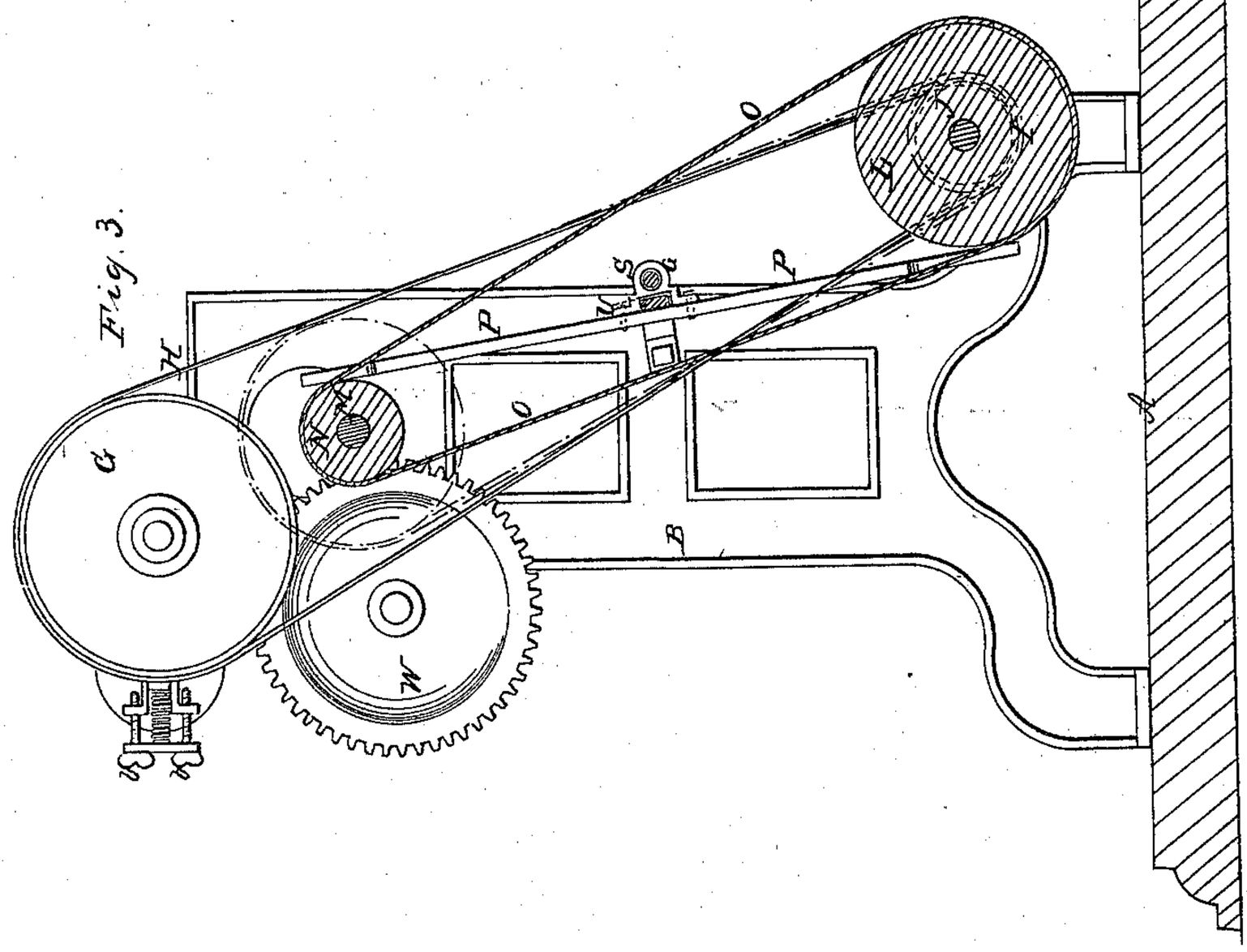


Fig. 3.



UNITED STATES PATENT OFFICE.

NELSON GAVITT, OF PHILADELPHIA, PENNSYLVANIA.

MACHINERY FOR CUTTING PAPER.

Specification of Letters Patent No. 10,889, dated May 9, 1854.

To all whom it may concern:

Be it known that I, NELSON GAVITT, of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Cutting Webs or Sheets of Paper into Variable Lengths, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1, represents a side elevation of a machine for cutting paper with my improvements applied thereto, Fig. 2 represents a top view of the same, Fig. 3 represents a transverse section at the line *x x* of Fig. 1, and Fig. 4 represents a transverse section of a fragment of the machine at the line # # of Fig. 1, and Fig. 5 represents a transverse section through the line ⊗ of Fig. 1.

Various machines have been heretofore constructed for the purpose of cutting webs of paper into lengths or sheets but none of them are capable of cutting sheets of any great number of different lengths or of lengths differing by a slight and variable, or a considerable and variable amount, at the option of the attendant, and in none of them can the length of the sheet be varied—while the machine is in operation.

The object of my invention is to give to the machine the capacity of varying the length of the sheets cut from the web to any degree small or great, within the two extremes of length to which the machine is adapted and to produce such changes, while the machine is at work.

In the manufacture of paper water marks and other devices are imprinted upon the web while in the pulpy state at uniform distances apart and as the paper shrinks or contracts in length very much in the process of drying it follows that if one part of the web drys sooner than another the water-marks will be nearer together in one part than another. Now this is precisely what happens in the process of paper making, a change in the hygrometric state of the atmosphere, or the temperature of the room in which the web is being wound upon a spool, as it comes from the machine, preparatory to cutting it, will affect the regularity of its drying, because the paper is produced at one uniform rate, whether it drys uniformly or not, and as these are causes constantly in action that disturb the regularity of the drying, the water marks are nearer together at one part than another, although sheets cut of varying lengths by dividing the web half way between each water mark, will when uniformly dried have contracted to nearly uniform lengths.

In order to cut the sheets of proper length it is necessary for the attendant of the cutting machine to watch closely its operations and whenever there is observed a tendency to cut the sheets too long, the action of the cutter must be adjusted to cut them shorter, or if the tendency be to cut them too short then the action of the cutter must be adjusted to cut them longer. The principle upon which this nicety of adjustment is effected is very simple. The web of paper being wound upon a spool, which is laid in the cutting machine on bearings that allow it to turn, and the end of the web inserted between a pair of feed rollers, or other feeding apparatus that draw it off the spool at a uniform rate and pass it between the jaws of a pair of shears or beneath a knife that acting at intervals, divides the web into sheets; when the knife passes through the web most frequently the sheets are shortest and when it passes through the slowest the sheets are longest, because the feed in the cases supposed is uniform. By making the knife act at unequal intervals and causing the web to be fed under it at a variable speed would operate to produce sheets of greater or less length, it is only the converse of the first named method. By retarding the motion of the feed and accelerating that of the cutter and vice versa, this differential action will be double that which would take place in either of the other cases supposed, when only one element is made variable.

Instead of a continuous feed an intermittent one might be adapted to the purpose, but I prefer the continuous feed, and have represented a feed of that variety in the cutting machine, shown in the accompanying drawings which illustrate one of the various ways in which my invention may be carried into effect.

The machine as shown in the drawings consists of a base or bed plate (A) to which three upright parallel frames (B) are secured. These frames are joined by side bars (B′). A pair of brackets (C) project from the back of the frame, having suitable bearings on their outer ends to receive the jour-

nals of the spool or roller (D) on which the web of paper (E) is wound. The end of the paper is passed between a pair of feed rollers (F F′) whose journals rest in boxes (*a*) on the top of the frame, the journal of the back roller passes beyond the box on which it rests on the middle frame and has a belt pulley (G) mounted upon it by which it is driven. The back feed roller turns the front one by friction, the two being pressed together tightly by the set screws (*b*) which press the journals of the front roller toward those of the back roller in the slots in which they are supported, by which means the web can be gripped between the rollers with any desired degree of pressure. The pulley (G) on the shaft of the back roller is encircled by a belt (H) which passes around it and the pulley (I) on the main driving shaft (J) of the machine, which receives motion from a steam engine or other prime mover through the pulley (K) on its outer end, or in any other convenient or suitable manner. The main shaft (J) is mounted in bearings on the lower part of the frames (B) and carries a conical drum (L) which extends nearly its whole length. Another shaft (M) is mounted near the top of the frames (B) in suitable bearings and is parallel to the shaft (J), this shaft also carries a conical drum (N) of the same length and diameter as the drum (L) but in a reversed position; the two drums are encircled by a belt (O) which by means of the shifting forks (P) may be moved from one end of the drums to the other, and as the drum (L) is in all cases the driver, when the belt is around its larger end the drum (N) is caused to rotate as much faster as its small end is less in diameter than the large end of the driving-drum (L), but when the belt is at the opposite end of the drum, the driver runs as much slower as in the former case it ran faster than the driven, when the belt is in the middle of the drums they run with equal speed as they are thus of equal diameter. The shifting forks are moved from end to end of the drums, to shift the belt by means of a screw (Q) which is of equal length with the drums and is mounted on bearings, formed in brackets attached to the frame; the outer end of this screw is fitted with a hand wheel (R) by which it can be turned by the attendant of the machine. A nut formed in a bracket (S) projecting from the stock of the forks, embraces the screw which when turned one way causes the forks to move in one direction and when turned the other way causes the forks to move in the opposite direction. In order that the forks may move smoothly and without binding the stock is fitted to a guide rod (U) parallel to the screw on which it slides. The shaft (M) at its inner end carries a pinion (V) that takes into and drives a wheel (W) of several times its diameter so that the wheel only turns once for several revolutions of the pinion; this is an important part of the arrangement, because in the event of the drums being sprung or irregular, or an occasional slipping of the belt, the irregularity of the revolutions of the wheel will be as many times less in amount than the cause of disturbance as its revolutions are less in number than those of the pinion which drives it, and besides as there is as great probability of undue acceleration as retardation one irregularity will be likely to compensate the other, so that the wheel (W) will be turned a regular proportionate number of times to the revolution of the driving drum (L) under all circumstances.

The wheel (W) is mounted upon the shaft (X) which it turns; this shaft is secured in bearings on the side of the frames (B) and carries at either end a disk (Y) to which a knife (Z) of the usual construction for such machines is attached and is revolved past a fixed knife (*c*) secured to the frame in the usual position with respect to the rotating knife (Z). Bars or rods (*d*) extend at proper intervals between the heads (Y) whose office it is, in connection with a concave shield or guide plate (*d′*) to direct the end of the paper as it is delivered by the feed rollers.

The operation is as follows: The end of the web being introduced between the feed rollers is drawn forward in the direction indicated by the arrows, and to prevent the spool from turning too fast a friction brake, or pawl may be applied to it in any convenient way, an elastic strap (*e*) is shown in the drawing passed around the shaft (*f*) of the spool and the side bar (B′) of the frame, the friction between the surfaces of the strap, bar, and shaft being sufficient to produce the required retardation or drag. The end of the web descends between the rollers (F) across the fixed knife (*c*) which is immediately below. Care must be taken to enter the web between the feed rollers at such a point that when the rotary knife passes the fixed knife and severs the web, the sheet shall be cut off at the required point with respect to the water-mark; if it is not cut exactly at the required point the motion of the cutter must be accelerated or retarded with respect to the feed as may be required, by adjusting the belt (O) on the cone drums by means of the screw (Q). When the cut is thus once properly adjusted it will remain so, so long as the web is of the same dryness, but when that changes the action of the cutter must again be adjusted to suit, and as this adjustment is exceedingly sensitive the required changes can be instantly made. With cone pulleys proportioned as in the drawings, the longest sheet

that could be cut in the machine will be about two and a half times that of the shortest with every degree of variation between that can be appreciated.

I am aware that conical rolls encircled by a shifting belt, as a device for varying the relative velocity of different parts of a machine, has long been known and I do not claim it. But

What I do claim as my invention and desire to secure by Letters Patent is—

The method substantially as herein described of adjusting the cutting of sheets from a web of paper whereby the length of the sheets can be varied by any required proportionate amount of the whole range of variation to which the machine is adapted, however small, or however large the same may be, thus rendering it possible with a continuous feed of the web of paper under an intermittent cutter, to sever the sheets half way or thereabouts between water marks, nearer together at one part of the web than at another.

In testimony whereof I have hereunto subscribed my name.

NELSON GAVIT.

Witnesses:

JOHN THOMPSON,

JOS. PARK.