No. 812,042. PATENTED FEB. 6, 1906.

B. S. HUDSON.

# DEVICE FOR MEASURING THE THICKNESS OF PAPER.

APPLICATION FILED OCT. 17, 1902.

2 SHEETS—SHEET 1.

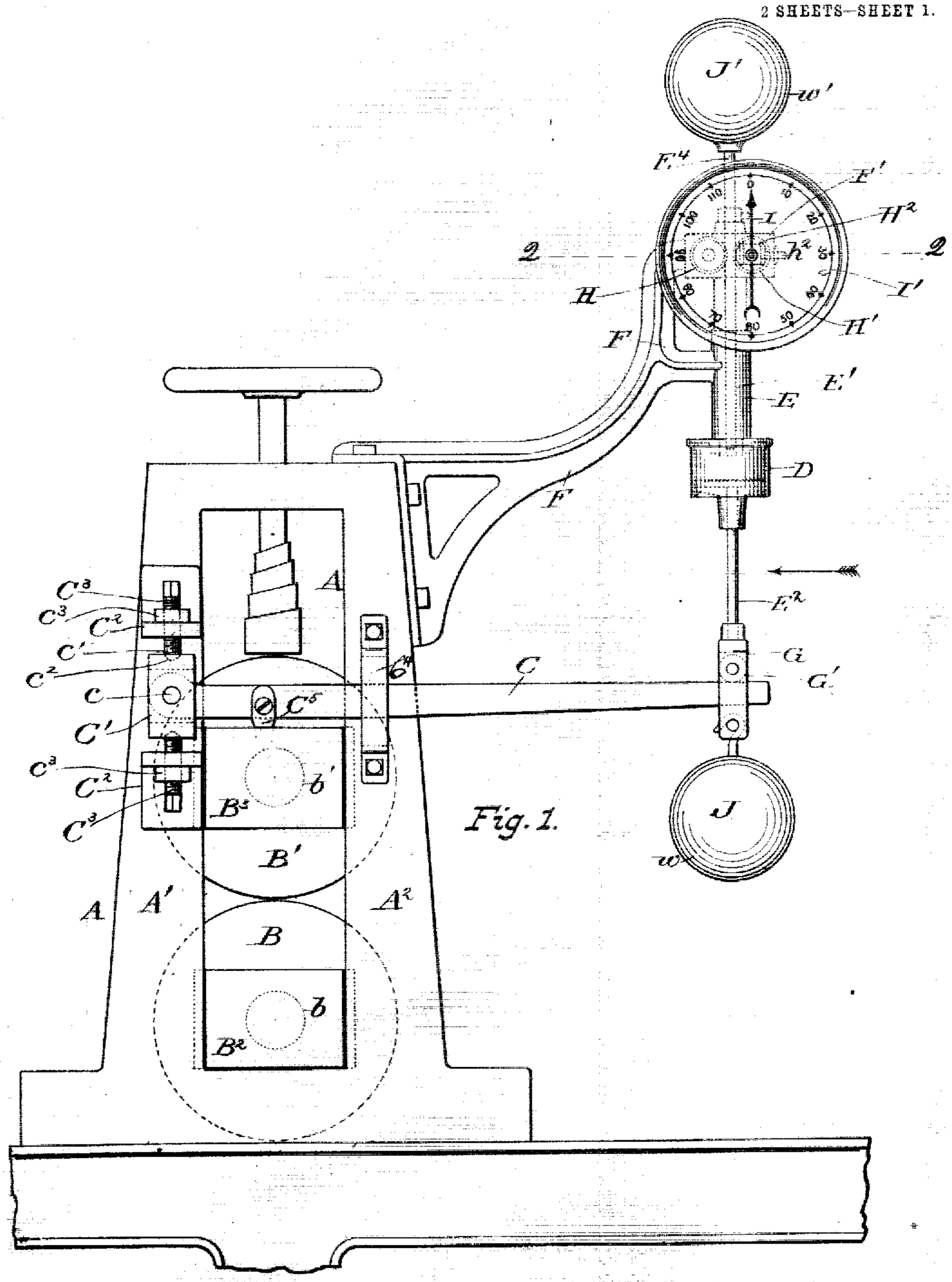


Fig. 1.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

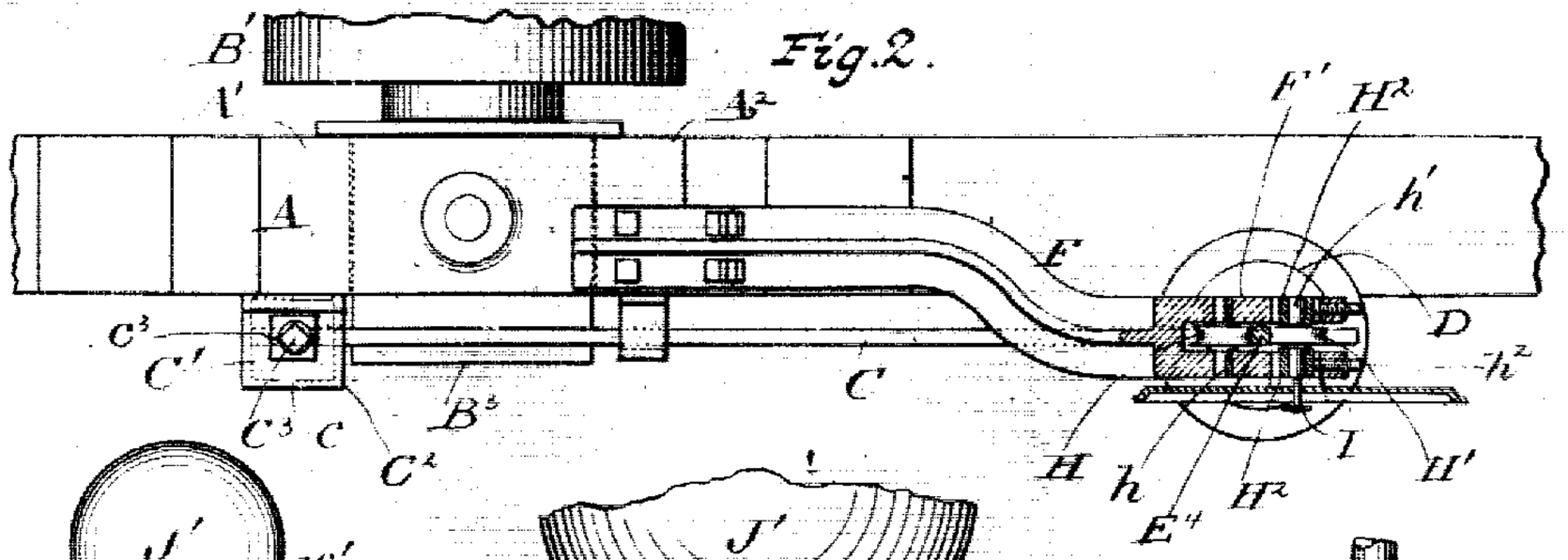



Fig. 3.

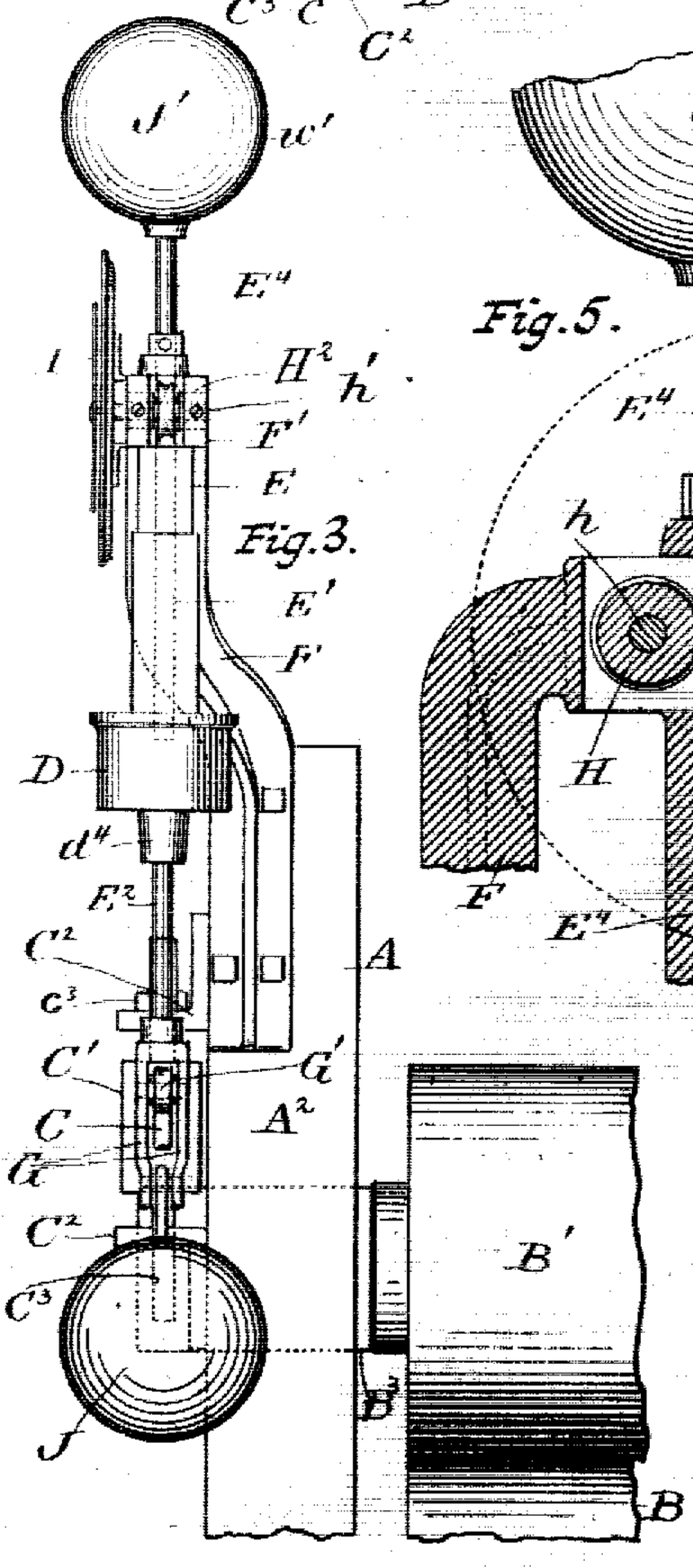



Fig. 5.

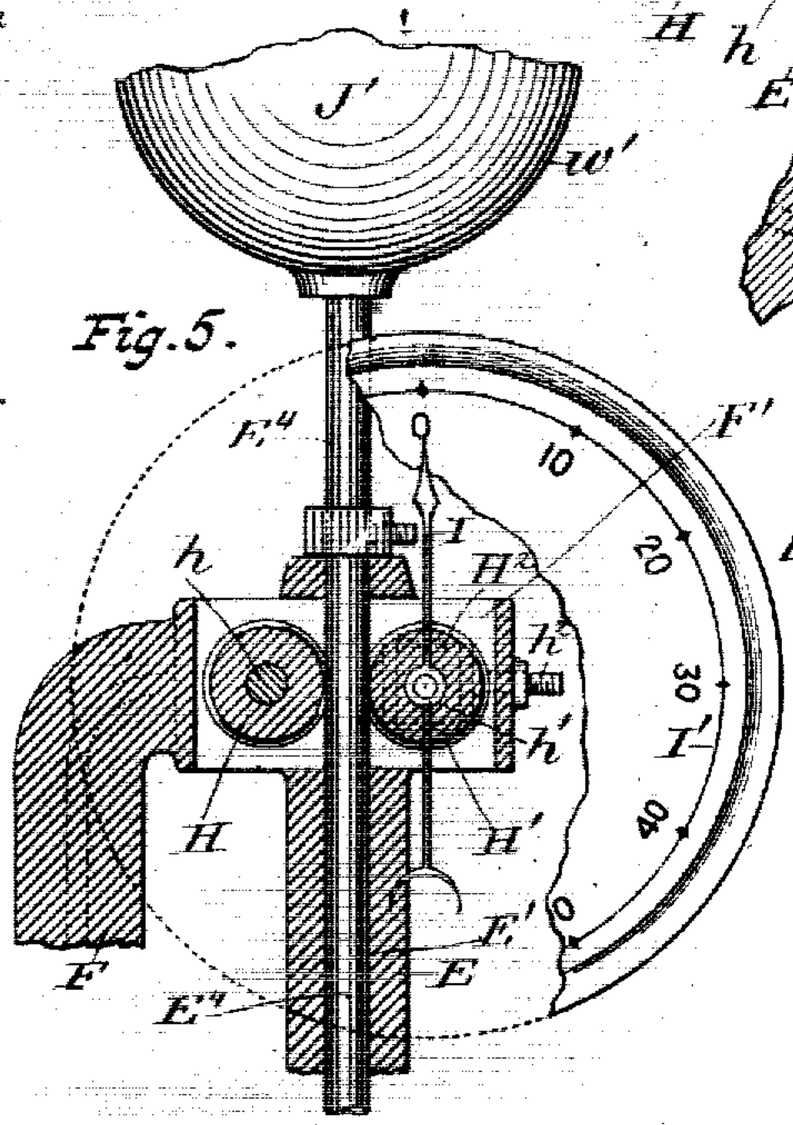
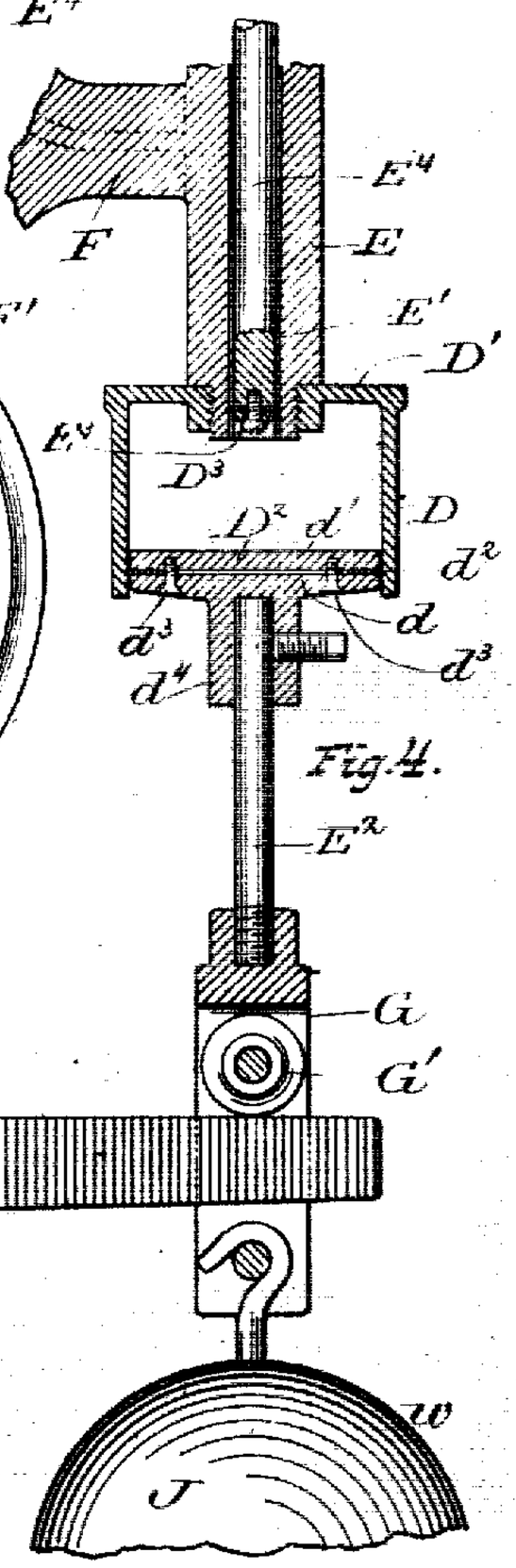



Fig. 4.




Witnesses.

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# UNITED STATES PATENT OFFICE.

BERTRAM SCOTT HUDSON, OF CASTLETON, NEW YORK.

## DEVICE FOR MEASURING THE THICKNESS OF PAPER.

No. 812,042. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed October 17, 1902. Serial No. 127,754.

*To all whom it may concern:*

Be it known that I, BERTRAM SCOTT HUDSON, a citizen of the United States, residing at Castleton, in the county of Rensselaer and State of New York, have invented new and useful Improvements in Devices for Measuring the Thickness of Paper, of which the following is a specification.

My invention relates to improvements in devices for measuring the thickness of paper when emerging from between the last pair of calender-cylinders of a paper-machine as dried, hard-pressed, and finished product; and it consists of the novel features of construction and arrangements and combinations of parts and devices hereinafter described, and set forth in the claims.

The objects and advantages of this invention will be fully understood by the following specification when taken in connection with the accompanying drawings (in two sheets,) forming a part thereof, in which—

Figure 1 is a side elevation of a pair of calender-cylinders of a paper-machine from between which the web of paper passes out as a finished product and a paper-measuring device embodying my invention in place for operation. Fig. 2 is a horizontal view taken at line 2 in Fig. 1. Fig. 3 is a view taken in direction of arrow in Fig. 1. Fig. 4 is a sectional side elevation, on an enlarged scale, of mechanism employed between the lever and the dial of the device; and Fig. 5 is an elevation, part in section, on the same scale, of the mechanism operating the index-hand of the device with portions of the dial broken away.

Similar letters of reference refer to similar parts throughout the several views.

In the drawings, A represents a framework of a calendering-machine of a paper-machine. (Not shown.)

B is the lower calender-cylinder, which is stationary.

B′ is the upper calender-cylinder, which is adapted to be moved vertically in direction upward from the lower calender B by the web of paper passing between said two cylinders. The zero-point between these two cylinders is the point of contact of the circumferential surfaces of said two cylinders when a paper web does not intervene. The rise of the vertically-movable cylinder B′ above zero-point will be in all cases in correspondence with the thickness of the web passing between cylinders B B′, whether it be a web of thinnest tissue-paper or a web of paper of thickness between tissue-paper and thickest webs made. These cylinders B and B′ are provided with suitable journals *b b′*, on which they revolve in bearing-blocks $B^2$ $B^3$, preferably supported in ways provided in the standards $A' A^2$ of the framework of the calendering-machine. The construction of these calendering-machines is so well known to the trade that a particular description of the same is unnecessary, as the parts thereof form no part of this invention.

In this invention C is a suitable lever, made with any suitable length and pivoted at one end on pivot *c*, secured to an adjustable pivot-block C′, which is, in fact, a stationary pivot-block which is adapted to be raised or lowered at will in relation to brackets $C^2$, suitably secured to one of the standards, as $A^7$, as shown in Fig. 1, and then be secured from moving. My preferred means for adjusting said block consists of adjusting-screws $C^3$ $C^3$, screwing through the brackets $C^2$ $C^2$, one from above and the other from below, with their inner ends *c′* respectively seated in seats $c^2$ in the opposite ends of said pivot-block C′, as shown in said Fig. 1. These adjusting-screws are held from turning by means of jam-nuts $c^3$ $c^3$. $c^4$ is a keeper secured suitably to the opposite standard $A^2$ and loosely receiving between it and said standard the body of said lever C, so as to retain it from shifting laterally and yet allow it to freely move in vertical directions. $C^5$ is a presser-foot secured to said lever at a suitable point between the pivot *c*, serving as the fulcrum, and the outer end of the lever. This presser-foot is shown to have bearing on the upper side of the bearing-block $B^3$ of the upper or movable cylinder B′, and it may be at bearing-point on the same at a distance from pivot *c* equal to one-quarter, one-fifth, or a tenth of the distance said presser-foot is from the outer or free end of said lever.

D is a stationary cylinder, made of metal, alloy, glass, or other suitable substance not liable to corrode. The upper end of this cylinder is closed by wall D′, and its lower end is open for admission of piston-head $D^2$. This cylinder has connected with it by its end-closing wall D′ vertical cylinder E, which is shown to be supported by bracket F from standard $A^2$. This cylinder E has in it bore E′ of a suitable smaller diameter than the diameter of the chamber $D^2$ of said stationary cylinder, so that the cross areas of said bore and chamber may be in proportion of one of

the former to fifty, one hundred, or five hundred like diameters in the latter or in any other suitable proportion preferred or that may be found to be advantageous. Piston-head $D^2$ may be made of any suitable metal or alloy or other suitable substance, so as to nicely fit the walls of the chamber $D'$ and yet be allowed to freely move in the said cylinder without leaking. My preferred form of construction of the piston-head $D^2$ is shown in Fig. 4, in which is employed the lower section *d* and upper section *d'* and thin packing-disk $d^2$, of a suitable pliable substance, preferably rubber, *d* and *d'* being of diameter slightly less than the inside diameter of the walls of the cylinder D, while that of the packing-disk $d^2$ is of suitable diameter for making a water-tight joint adapted to prevent escape of liquid from the said chamber under small pressure. These two sections *d* and *d'* are preferably secured together by means of binding-screws $d^3$ passing up through the lower section *d* and screwing into the upper section and adapted to be tightened or loosened from below, so as to allow the said binding-screws to be operated in either direction for tightening or loosening the same, as may be required for slightly expanding the outer margin of the rubber packing-disk $d^2$ or allowing it to contract, as may be found to be necessary to produce a water-tight joint without excessive pressure of the rubber on the wall of the cylinder. From the lower side of section *d* of this piston-head is projected the hollow stem $d^4$, which connects the piston-rod $E^2$ with the rider-piece G, which rides on the outer or free end of the lever C. Between this rider-piece G and lever C is preferably arranged roller G', which is designed to relieve the said rider of liability of binding on said lever.

The smaller cylinder E communicates with the larger cylinder D and has working in its bore E' piston-head $E^3$, suitably packed, (preferably same as piston-head D',) so as to have a water-tight joint between it and the cylinder-walls. This piston-head is connected with the lower end of the piston-rod $E^4$ and extends upward through the bore E' and out from the same to between rollers H H'. Roller H revolves on pintle *h*, which may be fixed stationary in the head F' of bracket F, and roller H' revolves with pintle *h'*, which is preferably revolved in an adjustable block $H^2$, suitably supported and guided in the said head F' and adapted to be relatively moved toward and from the cylinder E, so as to carry roller H in a corresponding direction. Any suitable means may be employed for moving said block, yet I prefer to employ adjusting-screw $h^2$ for that purpose. By these described devices the said two rollers H and H' may be made to have a suitable pressure on the opposite sides of the piston-rod $E^2$, so that they may be revolved by the action of the latter when moved vertically in either direction. One of these rollers, preferably the adjustable roller H', carries the index-hand I, mounted on an outer end of the revolving pintle *h'* of said roller H', so as to be moved to registration with the thickness-indicating points on the scale I' accordingly as the thickness of the said web may, through the several mechanisms employed between the vertical moving revolving cylinder and said revolving wheel, be respectively moved.

J is a device adapted to react against the force operating the lever for elevating its free outer end for return of the latter toward its zero position as the said lifting force is lessened in its elevation because of a web of less thickness. J' is a device employed for reacting against the lifting force of the piston-rod working in the smaller fluid-cylinder. Although these devices J and J' may each consist of a suitable reacting-spring, (not shown,) yet I at present prefer to employ weights (marked, respectively, *w w'*) as reacting devices.

The index or pointer I (shown to be movable in relation to the scale of thickness-marks) may be made to be stationary, while the said scale may be fixed on said pintle *h*, so as to revolve with the same, so as to effect a proper registration of scale-marks or thickness-marks with said index or pointer.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a device for measuring the thickness of a running web of paper while moving between the finishing-cylinders of a calendering-machine, the combination with a movable part of a calendering-machine, a scale comprising marks of divisions and subdivisions, a pointer adapted to be brought to marks or points on said scale which arbitrarily indicate thickness, a pivoted lever connected to the movable part of the calendering-machine, a reservoir containing fluid, means intermediate the lever and the reservoir for forcing the fluid against a piston and a piston operatively connected with the pointer, the movement of the lever forcing the fluid against the piston to bring the pointer and a thickness-mark on the scale into correspondence when the lever is moved.

2. In combination, a calendering mechanism having actuating mechanism, an indicator, indicator-actuating mechanism, a fluid-reservoir of larger area than the end of the actuating mechanism and coöperating therewith, a piston in said reservoir which is disconnected from the end of the actuating mechanism, a rod connected therewith, and a pivoted lever connected with the rod and actuated by the actuating mechanism on the calendering mechanism, the indicator registering the thickness of the paper.

3. In combination, a calendering mechan-

ism, an indicator, mechanism for operating the indicator, a fluid-reservoir of larger area than the end of the mechanism which operates the indicator and operatively connected therewith, a piston in said reservoir which is disconnected from the end of the latter actuating mechanism, a rod connected with the piston, and a pivoted lever connected with the rod and actuated by the calendering mechanism, the indicator registering the thickness of the paper.

4. In combination, a calendering mechanism having a movable part, an indicator, a roller connected to the pointer of the indicator, a rod contacting with said roller, a piston at the end of the rod, a fluid-reservoir of larger area than the piston and coöperating therewith, a piston in the reservoir, a piston-rod connected therewith, and a pivoted lever actuated by the movable part of the calender mechanism as the paper passes through the same, the movement of the lever indicating at the indicator the thickness of the paper.

5. In combination, a calender mechanism, an indicator, a roller connected to the pointer of the indicator, a rod contacting with said roller, a weight on the upper end of the rod, a piston at the opposite end of the rod, a cylinder in which the piston operates, a fluid-reservoir of larger area than the piston, a piston in the reservoir, a rod connected to said latter piston, a weight at the end of the rod, a pivoted lever actuated by the calendering mechanism, the movement of the lever indicating at the indicator the thickness of the paper.

6. A device for measuring the thickness of paper comprising a frame, an indicator bearing scale-marks, a pointer coöperating with the scale-marks, a roller secured to the pointer, a rod engaging the periphery of the roller, a cylinder in which the end of the rod operates, a reservoir containing fluid and communicating with the cylinder, a piston in the reservoir and means for connecting the piston with a paper-treating machine, whereby the thickness of the paper being treated will cause the piston to force the fluid against the rod and actuate the pointer.

7. A device for measuring the thickness of paper comprising a frame, an indicator bearing scale-marks, a pointer coöperating with the scale-marks, a roller secured to the pointer, a second roller spaced from the pointer-roller, a rod passing between the rollers and in contact therewith, a cylinder in which the end of the rod operates, a reservoir containing fluid and communicating with the cylinder, a piston in the reservoir, and means for connecting the piston with a paper-treating machine, whereby the thickness of the paper being treated will cause the piston to force the fluid against the rod and actuate the pointer.

8. A device for measuring the thickness of paper, comprising a frame, an indicator bearing scale-marks, a pointer coöperating with the scale-marks, a roller connected to the pointer, a rod for operating the roller, means for adjusting the roller in relation to the rod, and mechanism between the roller and a calendering-machine for imparting motion to said roller when paper is being treated.

9. A device for measuring the thickness of paper, comprising a frame, an indicator bearing scale-marks, a pointer coöperating with the scale-marks, a rod actuating the pointer, a weight carried by one end of the rod, a piston formed on the other end of the rod, a cylinder in which the piston operates, a reservoir containing liquid and communicating with the cylinder, a piston in the reservoir and spaced from the piston on the rod, a rod connected to the reservoir-piston, a yoke on the end of said rod, a weight connected to the yoke, and a pivoted lever fitting in the yoke.

10. A device for measuring the thickness of paper, comprising a frame, an indicator bearing scale-marks, a pointer coöperating with the scale-marks, a piston actuating the pointer, a cylinder in which the piston operates, a reservoir of larger area than the cylinder and containing fluid and communicating with the cylinder, a piston in the reservoir spaced from the cylinder, and means for connecting the piston to a paper-treating machine.

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