

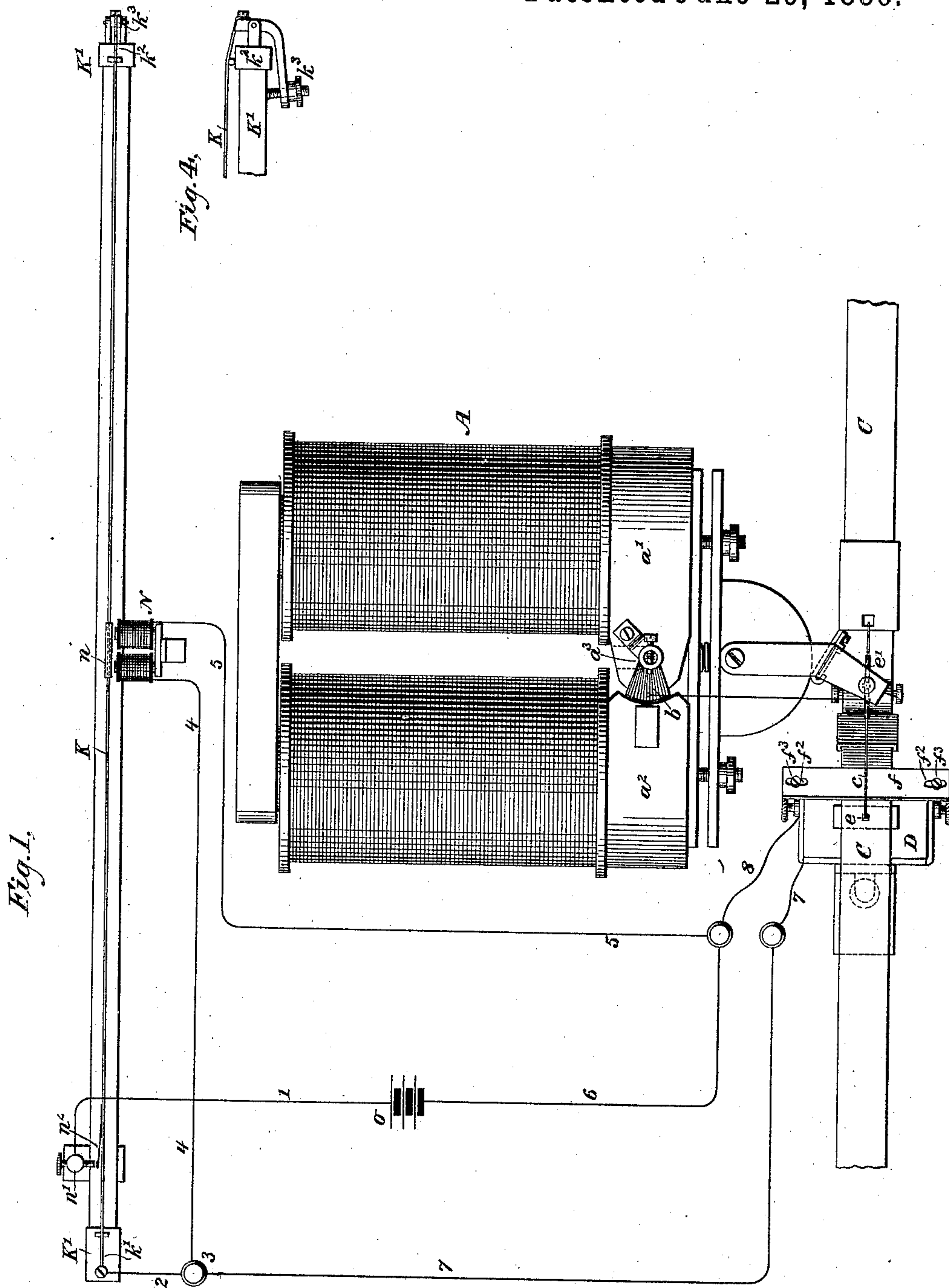
(No Model.)

3 Sheets—Sheet 1.

C. CUTTRISS.
SIPHON RECORDER.

No. 344,772.

Patented June 29, 1886.



Witnesses

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Inventor

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Robert Edgecomb

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

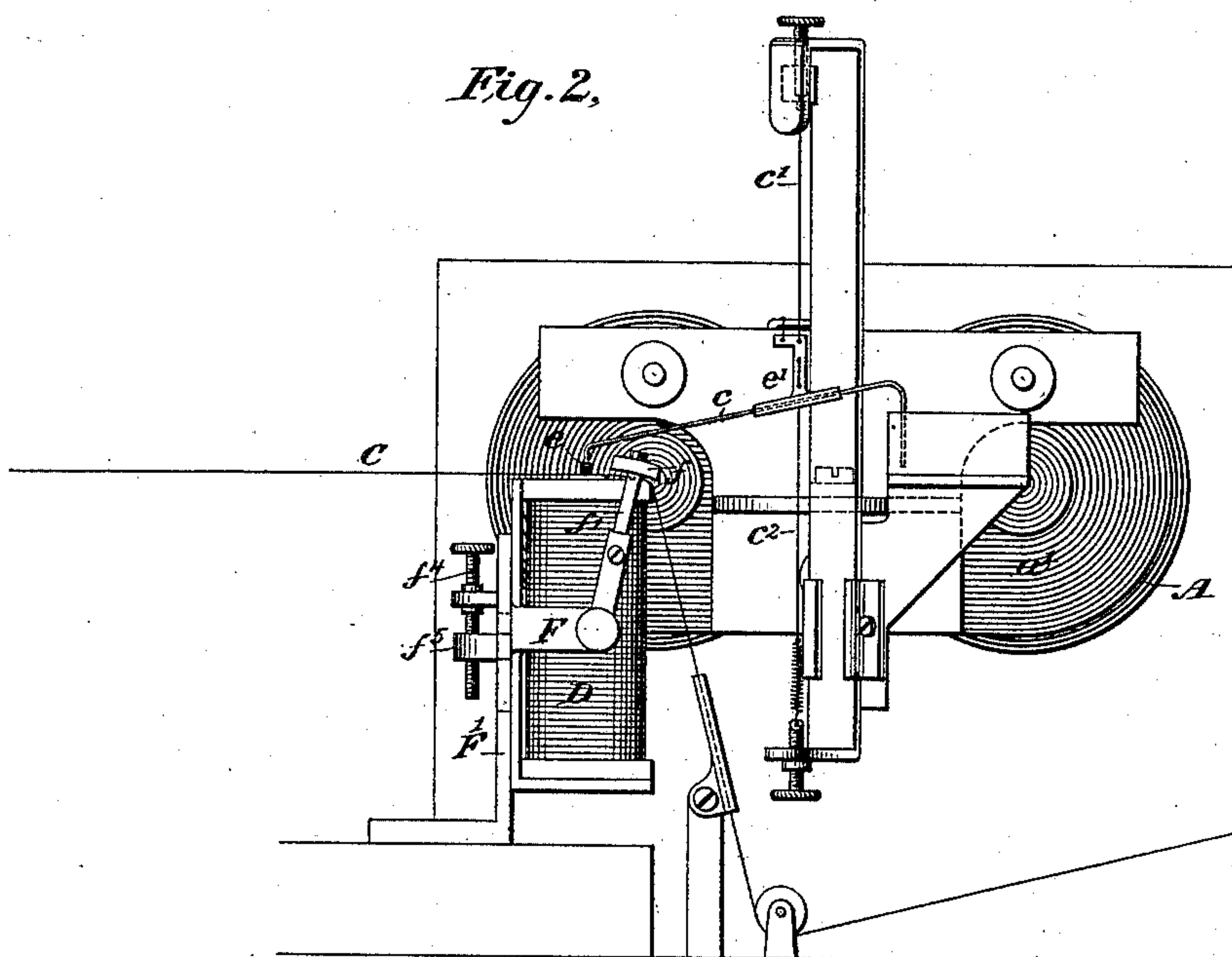
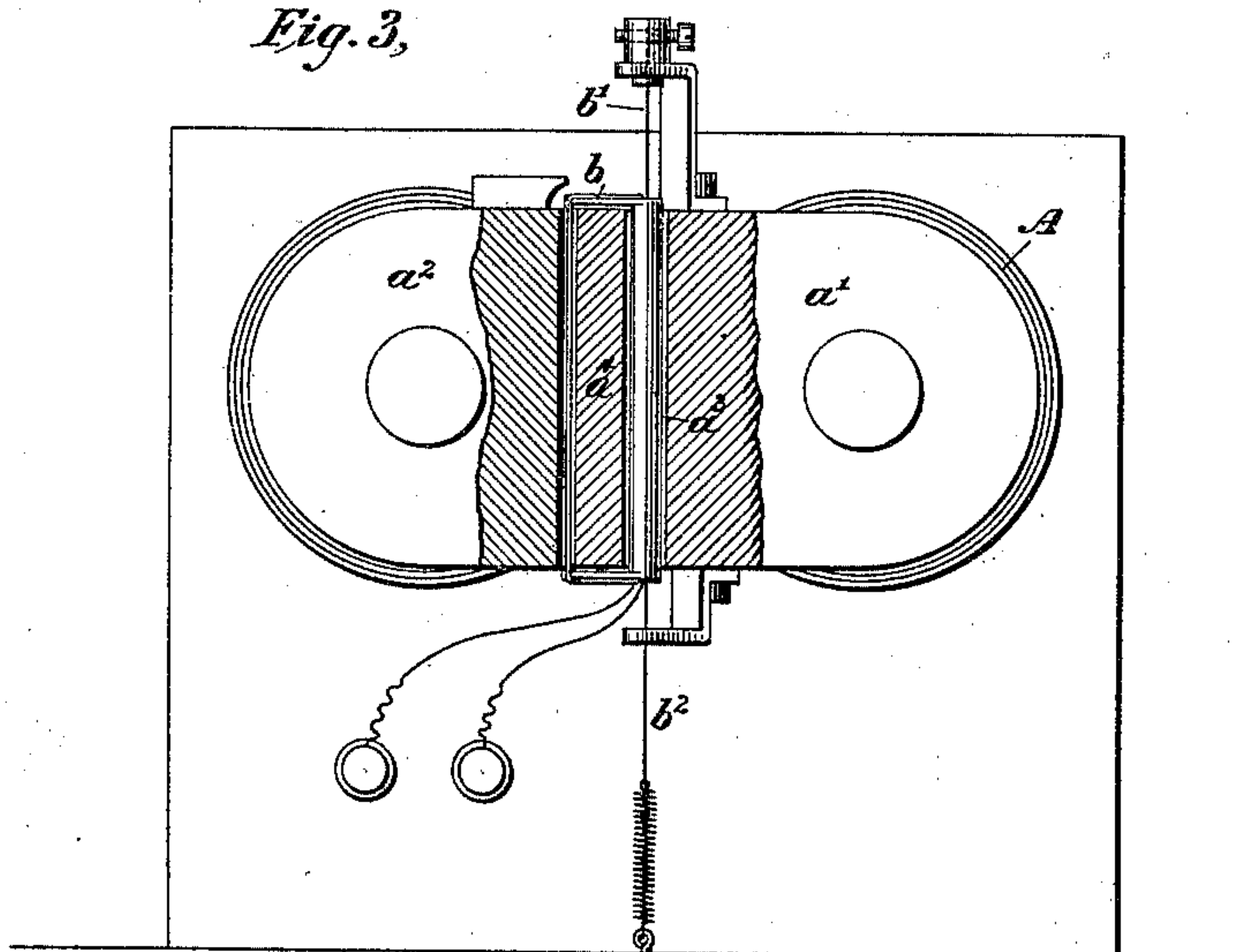


Fig. 3.



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Fig. 5.

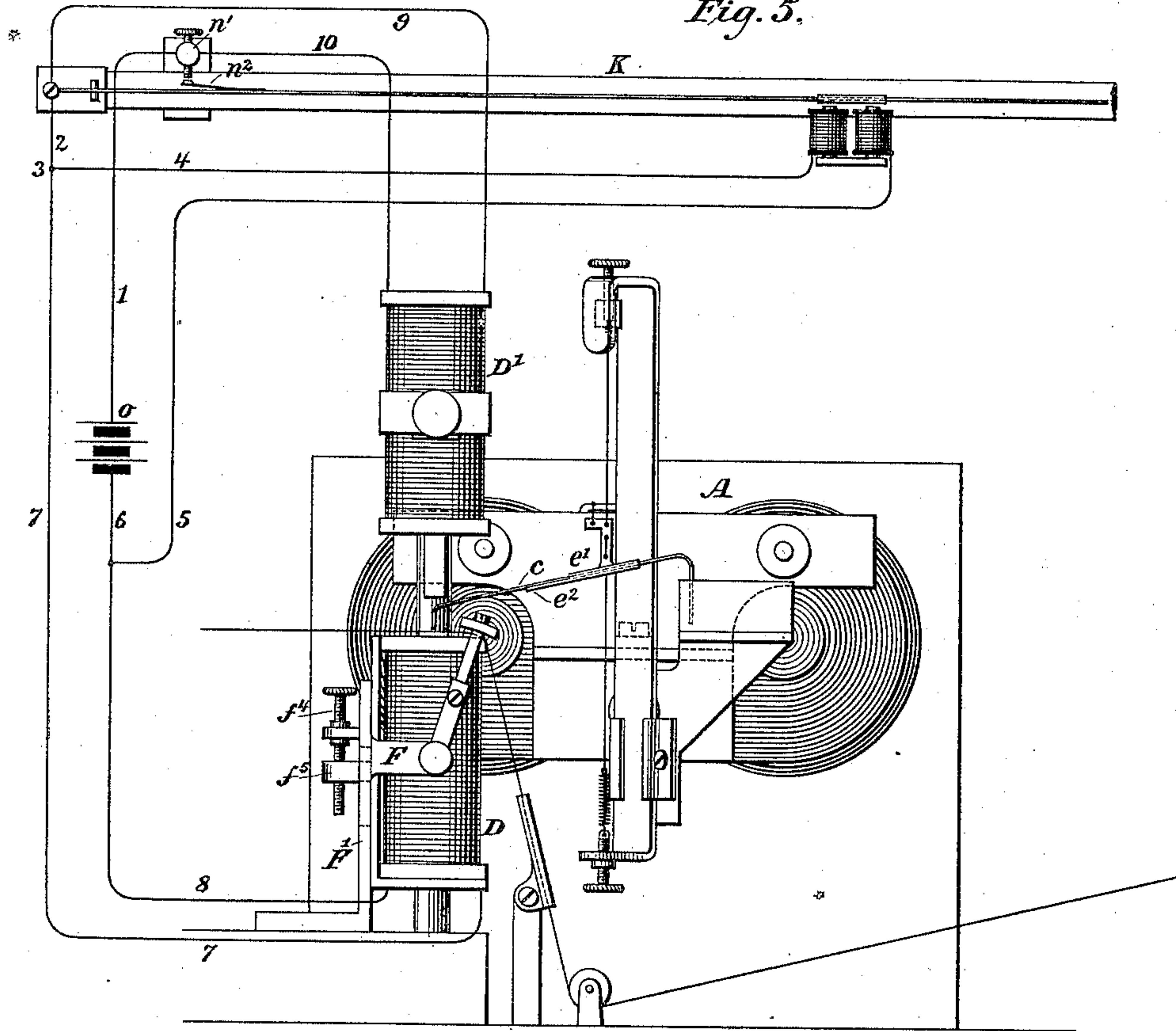
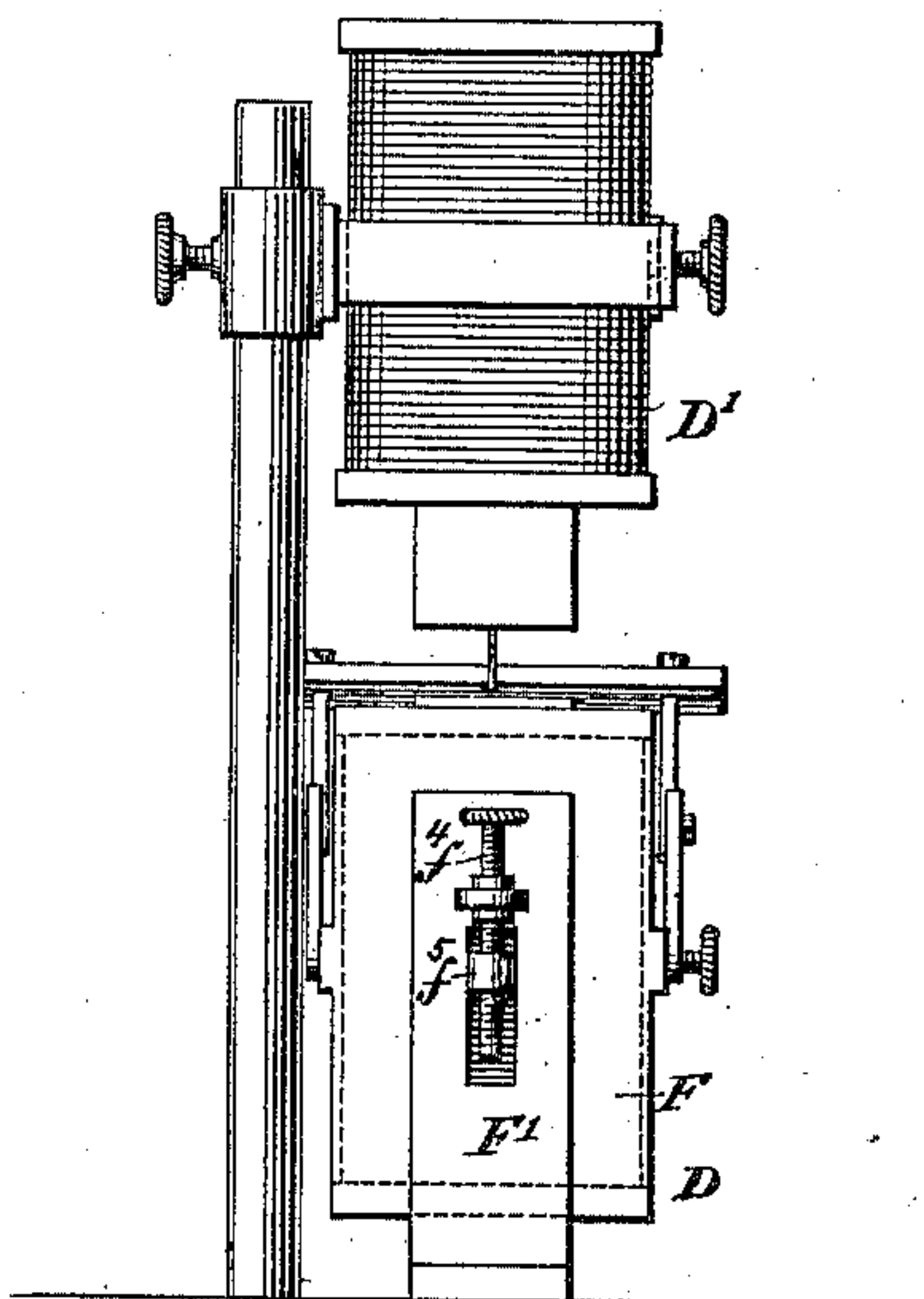


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES CUTTRISS, OF NEW YORK, N. Y.

SIPHON-RECORDER.

SPECIFICATION forming part of Letters Patent No. 344,772, dated June 29, 1886.

Application filed December 17, 1885. Serial No. 185,951. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CUTTRISS, a subject of the Queen of Great Britain, residing in the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Siphon-Recorders, of which the following is a specification.

My invention relates to the class of apparatus employed for recording signals transmitted over telegraphic circuits of great lengths, especially ocean cables, by means of electricity.

The object of the invention is to provide convenient and efficient means for producing a record of the movements of the receiving apparatus, which is capable of ready adjustment and is free from many of the objections incident to the organizations heretofore employed.

The invention has for its further object to simplify the construction of the receiving-instrument and to render it more sensitive.

It has been customary to secure a movement of the recording pen or siphon of cable instruments through the instrumentality of a coil of wire placed in a magnetic field, the precise position of said coil being dependent upon the direction and strength of the currents traversing it. The amount of wire usually employed in such coils I have found to be greater than is necessary, by reason of the fact that heretofore it has been caused to encircle a soft-iron core, thus making two comparatively weak fields of magnetic force. By extending one of the poles into close proximity to the other and cutting a slot or opening into the same I am enabled to apply the coil directly to one pole and cause its convolutions to pass through the slot and through the narrow space which separates the two poles. In this manner a closer proximity of the wires to the poles is secured, as well as a much stronger field of force, and a more advantageous disposition of the convolutions is permitted. A fine glass siphon-tube of the usual character employed for conducting the ink from the reservoir to a strip of paper is connected with the coil by a fine fiber of silk or other material in the usual manner.

It has been customary to secure a flow of ink from the siphon-pen to the paper by means

of electrical attraction, and it has been proposed to connect the siphon by a fine thread with the armature of an electro-magnet included in a circuit which is rapidly made and interrupted. By the present invention a continuous and rapid vibration is imparted to the siphon or ink-duct through the agency of magnetic attractions exerted upon a very small piece of soft iron attached to the siphon near its recording end. The vibrations are maintained at the proper rate by means of a vibrating reed capable of being adjusted to such a pitch as will coincide with the natural vibration of the siphon. The successive attractions exerted by this magnet upon the minute armature upon the siphon will cause a continuous vibration of the latter, and thus insure a uniform delivery of the ink without necessitating that the pen should constantly rest upon the paper. A record consisting of a continuous trace or dotted line will thus be made without friction between the recording-point and the paper upon which the record is made. Another important feature is that the movement is not retarded by any resultant lateral strain, as is the case when the siphon is vibrated through a string or cord leading to a vibrating point, for the upward and downward pull is essentially direct whether the siphon be at the center or at one of its limits of vibration; whereas when the siphon is attached to a fixed point then the further it is vibrated laterally the greater will be the resultant force tending to draw it back toward the center, and because of this the movement of the siphon in making a record is hindered or hampered.

In practice it is found that each siphon has an inherent rate of vibration which it tends to maintain when set in motion, and in practice if the reed is vibrating at a rate slightly more or less rapid, then an irregular or imperfect discharge of the ink will be produced.

For the purpose of readily securing the proper rapidity of impulses through the vibrating magnet, there is employed a long reed or metallic string capable of being adjusted to a greater or less tension for the purpose of modifying its rate of vibration or note. Near one end of this string there is attached a contact-spring connected with one pole of the bat-

tery, and this is carried by its movement into and out of contact with a corresponding point. The spring and point constitute the terminals of the circuit of the battery, and the motion of the reed serves to make and break the connections of the vibrating magnet of the siphon. The reed itself is maintained in vibration by means of an electro-magnet the circuit through which is automatically made and interrupted by its contact-spring and point.

In the accompanying drawings, which illustrate the invention, Figure 1 is a plan view of the apparatus, and Fig. 2 is a side elevation of the same. Fig. 3 is a front elevation of a receiving-magnet and suspended coil. Fig. 4 is a side view of one end of the adjustable reed. Figs. 5 and 6 illustrate a modification.

Referring to the drawings, A represents a permanent or an electro magnet designed to maintain a strong magnetic field between the pole-pieces a' and a^2 . The pole-pieces a' and a^2 of this magnet are extended toward each other. The pole-piece a' is curved outward upon its end, and the pole-piece a^2 is cut away or hollowed out to correspond. A narrow space is left between the two poles. An opening or slot, a^3 , is cut into the pole-piece a' to the central line, as shown. It is designed that a coil of fine insulated wire, b , should be suspended by means of delicate threads or wires b' and b^2 , and through this coil there extends the portion a^4 at the end of the pole-piece a' . The coil b is preferably so wound that the portion between the poles is in the form of an arc of a circle coinciding with the space between the pole-pieces, while the inner portion or that entering the slot a^3 is gathered together more closely, as shown. The manner in which the coil is wound permits the portion between the pole-pieces to be wider than that within the slot a^3 . In this manner a less amount of wire than has been heretofore employed is sufficient for the purpose. Moreover, the curved portion of the coil is brought into close relation with the confronting polar extensions.

The siphon or recording-tube c is suspended in the usual manner by means of fine threads c' and c^2 , and one end of the siphon extends into close proximity to the paper strip C, upon which the record is to be made. A continued vibration is imparted to the tube by means of an electro-magnet, D, which is preferably placed with its poles beneath the recording-table, over which the paper passes. Either pole of the magnet may itself constitute such a table. Upon or near the end of the siphon there is carried a very small piece of magnetic material, such as soft iron, as shown at e . This is acted upon by the electro-magnet D, and the successive vitalizations and demagnetizations of the latter cause the siphon in this manner to vibrate rapidly toward and from the magnet.

For the purpose of removing, in so far as is necessary the magnetic effects which might

otherwise be received from the magnet A, a bar of soft iron, f , is supported in close proximity to the poles of the magnet D. Preferably the bar f is carried upon adjustable supports f' , which permit the bar to be removed toward and from the poles of the magnet D, and also toward and from the armature e . The bar f is secured to its supports f' by screws f^2 , passing through slots f^3 , formed therein, which permit the bar to be adjusted toward and from the magnet A.

The bar f , together with the support F, upon which the arms or supports f' are carried, may be carried by an upright frame, F' , and turning in a nut formed in a projection, f^5 . The latter extends from the support F through a slot in the frame F' . By means of the bar f the field of magnetic force to which the armature e is subjected is rendered uniform, and the only active attraction exerted upon the armature is that due to the magnet D.

The manner in which the electro-magnet D is vitalized and demagnetized is as follows: A reed or metallic vibrating string, K, is supported in a frame, K' . One end, k' , is securely attached to the frame, while the other end, k^2 , is attached to an adjustable tension device, k^3 . By means of the latter the tension of the cord may be increased or decreased accordingly as it is desired to increase or decrease its rate of vibration. Upon the metallic spring or reed there is carried an armature, n , applied to an electro-magnet, N. A battery, o , has one pole connected by a conductor, 1, with a contact-point, n' , which is applied to a contact-spring, n^2 , carried upon the reed near the end k' , and in metallic connection therewith. The reed or string is connected by a conductor, 2, with a binding-post, 3, and from this point the connections are continued through the conductor 4 to the electro-magnet N, and thus through conductors 5 and 6 to the other pole of the battery o . It will be understood, therefore, that if the point n' be properly adjusted the circuit through the electro-magnet N will be made and interrupted by means of the reed itself, which will in this manner act as a rheotome. By adjusting the tension of the string or reed the rate of its vibration may be modified as desired. The circuit which is thus made and broken through the electro-magnet N is a branch of another circuit, which extends through the electro-magnet D as follows: From one pole of the battery o to the binding-post 3 in the manner already described; thence through a conductor, 7, to the electro-magnet D; thence by way of the conductor 8 to the conductor 6, and thence to the remaining pole of the battery. In this manner the electro-magnet D will be vitalized and demagnetized in unison with the movements of the reed K.

It is well known that each siphon has its own natural period of vibration, and that it is practically impossible to make it conform to any other period. For this reason it is necessary to so adjust the vibration of the reed K

as to conform to the natural vibration of the siphon. This may be readily accomplished by setting the apparatus in operation and adjusting the tension of the reed by the adjusting-screw k^3 , the proper adjustment being determined by noticing the line which is formed by the siphon upon the recording-paper, for when a continuous succession of regular dots is received then it is known that the siphon is vibrating in its proper period.

In Figs. 5 and 6 a modification is illustrated in which two electro-magnets, D and D', are employed for vibrating the siphon. The construction and circuit-connections of the magnet D are the same as already described. The magnet D' is included in conductors 9 and 10, respectively, leading from the contact-point n' and the string K. It is thus in a circuit around the points n' and n^2 , and is therefore shunted when the points are closed. The magnet D will, however, always be in circuit, its connections being either through the points n' and n^2 or through the coils of the magnet D'. The siphon will thus be drawn down at times by the electro-magnet D with a given force and then by a less force because of the resistance of the circuit being increased by the insertion of the coil of the magnet D', and the effective force of the magnet D will at the same time be diminished by the vitalization of the electro-magnet D', which tends to draw the siphon upward.

It is evident that the circuit-connections of the two magnets may be variously modified without departing from the spirit of the invention.

Instead of applying the armature e to the siphon, it may be attached to the support which carries the siphon. In this case the support should be prolonged toward the recording end of the siphon, as indicated at e^2 in Fig. 5. Normally, however, it is preferred to apply the armature to the end of the siphon, and it is then unnecessary to prolong the support e^2 .

It is not always essential to employ the bar f when a second electro-magnet, D', is employed.

In some instances it may be desirable to polarize the core of the second magnet D', as, for instance, by applying to it coils connected in a special circuit, which may be that employed for polarizing the magnet A.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, with a receiving electro-magnet, of extended pole-pieces for the same, a coil of insulated wire having one side of its convolutions between said pole-pieces, and the other entering a slot formed within one of the pole-pieces, and a recording-siphon connected therewith, substantially as described.

2. In a siphon-recorder, the combination, substantially as hereinbefore set forth, of a magnet having confronting poles or polar extensions, between which there is left a curved opening in the form of the arc of a circle, one of said poles or polar projections having a

lateral opening, leaving a partially-detached portion, a coil of insulated wire surrounding such portion and extending through the opening, a recording-stylus, and a connection between said stylus and said coil.

3. In a siphon-recording instrument, a magnetic armature carried upon the siphon, an electro-magnet applied thereto and located beneath the recording-point of said siphon, and means for rapidly vitalizing and demagnetizing the same, and thereby moving said siphon toward and from the record-paper.

4. In a siphon-recording instrument, a siphon, the threads c' and c^2 , supporting the same, an electro-magnet and an armature secured directly to the siphon and inductively acted upon by said electro-magnet.

5. The combination, substantially as hereinbefore set forth, in a siphon-recorder, of a rheotome, a marking-point, an electro-magnet, an armature fixed to the marking-point and inductively acted upon by said electro-magnet and imparting a vertical movement to the point, and a second magnet imparting a lateral movement thereto.

6. The combination, substantially as hereinbefore set forth, with the marking-point of a recording-instrument, a coil responding to the currents transmitted upon a main line, and a connection between said coil and marking-point, of a rheotome, an electro-magnet included in a circuit controlled by the rheotome, and an armature for said electro-magnet carried upon said marking-point.

7. The combination, substantially as hereinbefore set forth, with the marking-point of a siphon recorder and an armature attached thereto, of an electro-magnet applied thereto, and adjustable soft-iron bar adapted to be placed in proximity to the poles of said electro-magnet.

8. The combination, substantially as hereinbefore set forth, with a siphon-recorder, of an electro-magnet for imparting a rapid vibration to the marking-point, a battery for vitalizing said electro-magnet, and a rheotome for controlling the connections of said battery, consisting of a string attached at both ends, a contact-spring carried upon said spring, and a contact-point applied to said spring.

9. The combination, substantially as hereinbefore set forth, with the marking-point of a recording-instrument, of an electro-magnet for securing a rapid vibration of the same, a battery for vitalizing said electro-magnet, and a rheotome for controlling the connections of said battery, consisting of a vibrating spring supported at both ends under tension, and means for modifying the tension of said spring.

10. The combination, substantially as hereinbefore set forth, with a siphon-recorder, of the battery o , electro-magnet D, the armature f , the electro-magnet N, included in a branch circuit of the battery, the adjustable reed K, and the circuit-connections, substantially as described.

11. In a telegraphic receiving-instrument,

the combination, substantially as hereinbefore set forth, of a vibrating reed or string, a contact-spring carried thereby, a contact-point for the same, and an adjustable support, to
5 which one end of said string is attached.

12. The combination, substantially as hereinbefore set forth, with the marking-point of a siphon-recorder and an armature therewith, of an electro-magnet applied to the armature,
10 a bar of magnetic material placed in proximity to the poles of the magnet, and means for adjusting the position of said bar vertically and laterally with reference to the poles, substantially as described.

13. The combination, substantially as hereinbefore set forth, with the marking-point of a siphon-recorder, of an electro-magnet and its

armature for vibrating the same, and a second electro-magnet applied to said armature and acting counter to the first electro-magnet. 20

14. The combination, substantially as hereinbefore set forth, with the marking-point of a recording-instrument, of an armature rigidly attached thereto, and two electro-magnets acting upon the armature, substantially as described. 25

In testimony whereof I have hereunto subscribed my name this 12th day of December, A. D. 1885.

CHAS. CUTTRISS.

Witnesses:

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CHARLES A. TERRY.