3 Sheets--Sheet 1.

E. D. AVERELL.

Paper Ruling-Machines.

No. 135,751. Patented Feb. 11, 1873.

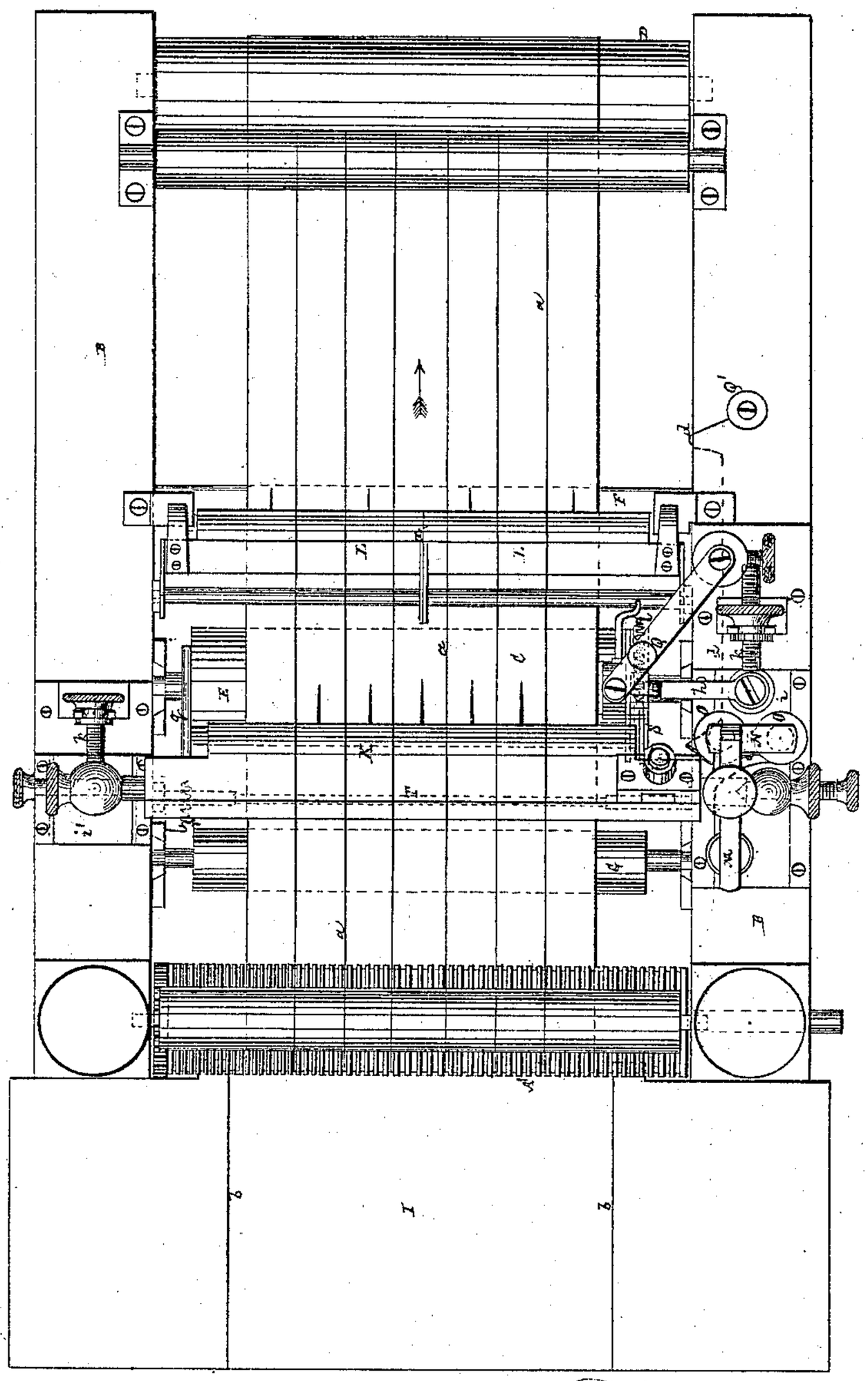

Fig. 1

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Fig. 4

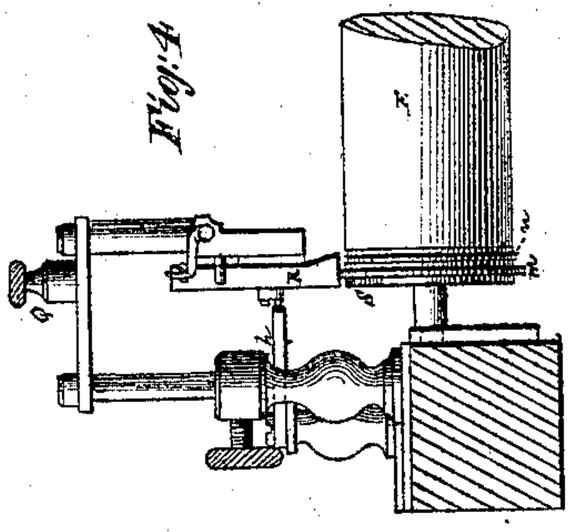

Fig. 3

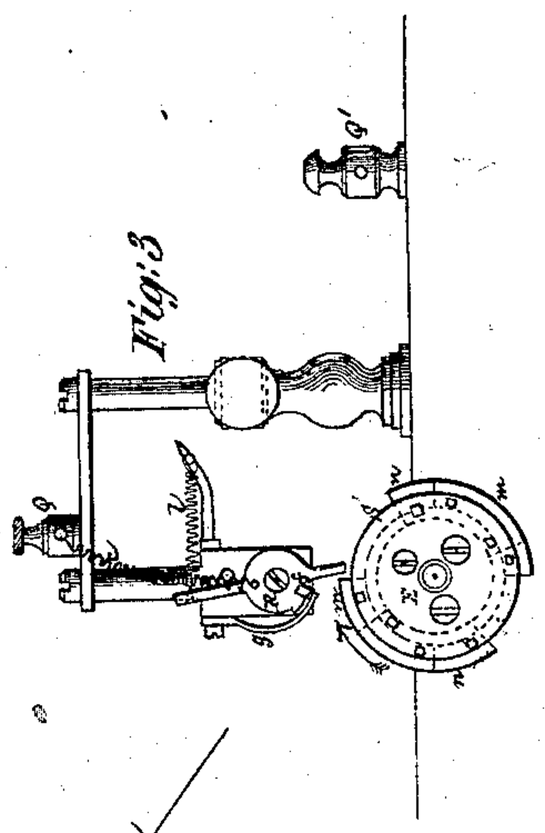

Fig. 2

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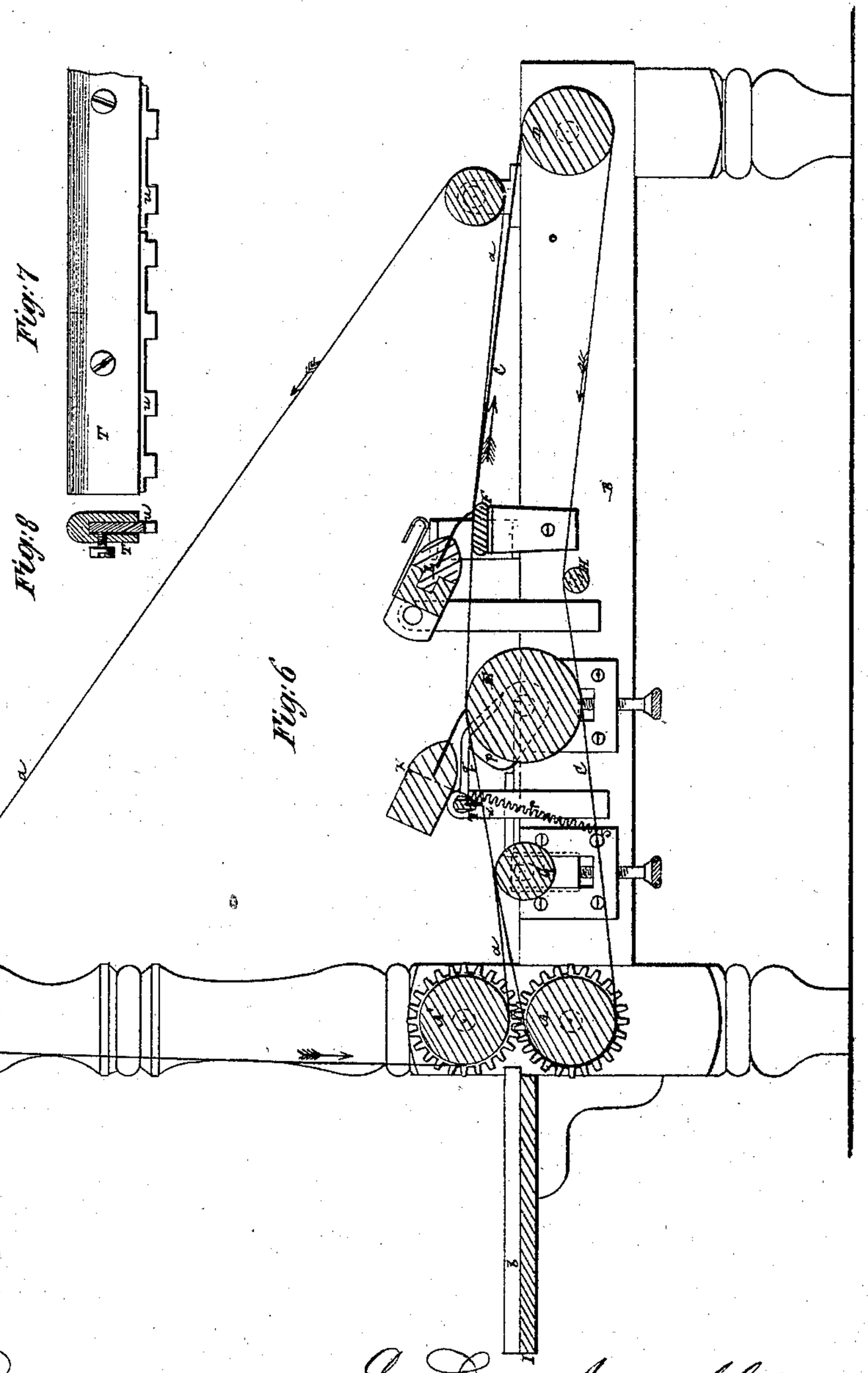

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UNITED STATES PATENT OFFICE.

ELLICOTT DAVID AVERELL, OF NEW YORK, N. Y.

IMPROVEMENT IN PAPER-RULING MACHINES.

Specification forming part of Letters Patent No. **135,751**, dated February 11, 1873.

To all whom it may concern:

Be it known that I, ELLICOTT DAVID AVERELL, of the city, county, and State of New York, have invented certain Improvements in Paper-Ruling Machines, of which the following is a specification:

One part of this invention relates to electro-magnetic striking attachments to ruling-machines, operating to cause the pens to strike the paper on a head-line or head-lines at any distance from the head of the sheet of paper to rule "down-lines" of any desired length from one or from any number of head-lines. This part of the invention consists in a combination, with an electro-magnet or magnets and pen-beam actuated thereby, of a cam circuit breaker and closer operating device, composed of two or more sets of adjustable cams, set in motion by the drum-cylinder or revolving ruling-beam, and a stop-gate operating in a mechanical manner to determine the feed of the paper to the rulers, whereby, while every facility is afforded for adjusting in a simple and practicable manner the timely lifting and lowering of the pens, a quick and lively but soft or easy action is obtained for the striker pen-beam, and a positive means for opening and closing the circuit is used, instead of, as in a former invention of mine, using the paper, which is apt to slip, for such purpose. The invention likewise consists in a pen-beam, which may be the rear one where two are used, divided transversely intermediately of its length to admit of its operating by independent sections, or (by locking the sections) of operating throughout its entire length to suit narrow or broad sheets; and when the paper is fed by double guides in two sheets beneath two pen-beams, the one arranged in advance of the other, the divided or sectionally-constructed beam may only have so much of it in action as is necessary to rule the one sheet with continuous or faint lines, while the other sheet is being ruled with down-lines by the striker-beam, and with double guides for feeding in the paper in independent sheets to a single apron or carrier.

Having thus specified the object or objects and nature of the invention, its description will be proceeded with in reference to the accompanying drawing.

Figure 1 represents a plan of a ruling-machine having my invention applied; Fig. 2, a side elevation of the same; Fig. 3, a side view in illustration of the circuit breaker and closer; and Fig. 4, a view at right angles to Fig. 5 of the same. Fig. 6 is a longitudinal vertical section of the machine; Fig. 7, a longitudinal or face view of the stop-gate detached; and Fig. 8, a transverse section thereof.

Similar letters of reference indicate corresponding parts.

As this invention in many of its features is similar to others for a like purpose, the description here will, for the most part, be confined to so much of it as is necessary to illustrate my improvements.

A is a roller at the front end of the framing B for carrying the endless traveling cloth or apron C, which passes round an opposite or back-end roller, D, and over and under a ruling cylinder or bed, E, over a second ruling-bed, F, a guide or supporting roller, G, and a tension-roller, H. The apron C is of a width to admit of two sheets of paper of average size passing side by side, and with the one sheet arranged crosswise and the other lengthwise of the apron, simultaneously through the machine; and the pen-beams and other parts are made to correspond. I is the feed-board, from which the sheets of paper are fed over the roller A and under a roller, A′, to the apron C. This feed-board is provided with guides *b*, which may be adjustable on either side of it, to direct the feed of the sheets in straight courses to the apron, which travels, as indicated by arrows, in concert with the usual sheet-holding-down tapes or cords *a a*. The ruling-cylinder E is revolved by friction of the apron C on and under it. K is the striking pen-beam for making the down-lines on the paper, said beam being fitted with pens, and made to rock, as usual, for the purpose of bringing the pens down on the sheet and lifting them therefrom, as required. The pens of this beam, as also the pens of a second beam, L, are supplied with ink from fountains in the usual or any suitable manner. M is a lever secured to the rock-shaft of the beam K, and having attached to its rear end an armature, N, of an electro-magnet, O, and to its opposite end a spring, P, which connects it with the main frame, said spring exerting a constant tendency

to raise the armature N, and to pull on the beam K in a direction to raise its pins. This spring, however, is not strong enough to overcome the attraction of the magnet upon the armature when the electric circuit through the magnet is closed, such attraction being sufficient to overcome the force of the spring, and also to draw down the pens upon the paper carried by the apron C. Q is the one cup, and Q′ the other cup, with which the wires *c d* of the battery connect. The current from the one pole of the battery passes by the wire *c* to a circuit breaker and closer, R, which may be of a lever form, of disk shape at its center, having a piece of ivory or other non-conducting material, *f*, in its periphery, against which, when the circuit is broken, a spring, *g*, presses, said spring resting on the metallic portion of the hub of said lever to close the circuit. The current flowing through the wire *c* and circuit breaker and closer R passes to a conductor, *h*, and from thence through a slide, *i*, to the one coil of the electro-magnet O. This slide *i* and a corresponding slide, *i′*, on the opposite side of the main frame, serve to carry the rocking pen-beam K, and are adjustable by screws *k k* to regulate the position of said pen-beam, and which may also be used to permanently break the circuit when the striking pen-beam K is not required to be used; but only the second pen-beam L is needed for ruling the faint or continuous lines. Any other means may be used for permanently breaking the circuit. The other wire, *d*, connects with the other coil of the magnet O to complete the circuit, and the several connections and insulations are arranged so that, when the circuit is closed by the spring *g* bearing on the metallic portion of the circuit breaker and closer R, the armature N is attracted by the magnet O, and the pens of the beam K are made to strike the paper; but when the circuit is broken by the spring *g* resting on the ivory *f*, then the spring P releases or throws back the armature and lifts the pen-beam K, so that its pens are out of contact with the paper. It accordingly is only necessary to slightly move and hold in its changed position the lever or circuit breaker and closer R to open and close the circuit. A spring, *l*, serves to draw said lever back, so that its ivory *f* is in contact with the spring *g*, which breaks the circuit. To operate the lever R to close the circuit by bringing the metal portion of its disk or hub in contact with the spring *g*, there is arranged on the one end of the revolving ruling-cylinder E an adjustable cam device, S, which is in the shape of a cylinder or succession of cylindrical plates, forming annular grooves between them to receive two or more sets of adjustable and removable cam sections, *m n*, that act alternately, or according as they may be arranged, to move and hold in its changed position the circuit breaking and closing lever R, so that the ivory *f* is out of contact and the metal of the lever R in contact with the spring *g* till the cam section *m* or *n*, in action, passes the lever R, when the spring *l* draws back the lever and breaks the circuit by putting the ivory *f* again into contact with the spring *g*. By these means the striking and rising actions of the pen-beam K may be adjusted with the greatest nicety to suit different required changes in the ruling of the paper by the pens of said beam; but the mechanical or cam action is only used to operate the circuit breaker and closer; and the beam K is actuated by electricity, which gives a quick and lively but easy action of the pens on and off the paper. T is the rocking stop-gate, arranged beneath or in vicinity to the pen-beam K, and serving to hold the sheet or sheets in place till the cam sections *m n* act; or, in other words, to determine the feed of the paper to the pens of said beam by the advance edge of the sheet coming in contact with the gate, which is raised mechanically, to allow the sheet or sheets of paper to pass under it, by a cam, *p*, on the end of the ruling-cylinder E acting against a lifter, *g*, attached to the gate, a spring, *r*, serving to hold the gate down or closed when the cam *p* is not operating to lift it. This gate T is of a clamp-like construction to hold within its lower edge a serrated bar, *u*, built in sections, against which the paper strikes. These sections are adjustable and removable at pleasure to adapt the stop-gate to the paper, and so that when desired only the one half or portion of it may be in action by removing certain sections of the bar to allow of one of a pair of sheets arranged side by side on the apron passing uninterruptedly under the gate and pen-beam K to the second or faint-line pen-beam L, as in cases when the pens of the beam K are only arranged to rule red or down lines on the one sheet. Furthermore, the whole of the sections of the bar *u* may be removed when it is not necessary to do any "striking," but only required to rule continuous or faint lines by the pen-beam L. In such case the circuit operating the pen-beam K may be permanently broken, and said beam be held or packed with its pens in a raised position, so as to have no action upon the paper passing under them. The second pen-beam L may be arranged at any suitable distance from the pen-beam K, and is supported so as to be capable of rocking, but it has no mechanical action to give it a positive movement, so that its pens are always in position to make continuous lines across the sheet, as necessary in faint-lining paper. This beam L is divided midway or thereabout of its length, at *x*, to make of it two independent sections, either or both of which may be in action accordingly as a large or small sheet is required to be ruled by the pens of the beam L—that is to say, a sheet extending across the whole width of the apron C, or one of two sheets arranged to receive faint lines and suitably fed for the purpose along the one guide *b* of the feed-board I, while the other guide *b* serves to direct the other sheet to be ruled by the pens

of the striking-beam K. In such case the one section or half of the beam L is held up or back by any suitable means. When, however, it is necessary to have both sections of the beam L in action at the same time the two sections are made to lock one with the other by any suitable means — as, for instance, by constructing the pen-holding portions of such sections to slide longitudinally in the main or body portions thereof, so that by sliding the pen-holding portion of the one section a little to one side and the pen-holding portion of the other section to enter the body part of the first section the sections are locked to work in common.

When no work is required of the pen-beam L it may be raised and held in its inoperative position.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination, with an electro-magnet or magnets, O, armature N, and striking pen-beam K, actuated by the magnet, of the revolving cam S carrying adjustable sections *m n*, which operate the circuit breaker and closer R, substantially as and for the purpose herein set forth.

2. The pen-beam L, divided transversely at or near the middle of its length to form independent sections for separate or joint action, substantially as specified.

3. The transversely-divided or sectionally-constructed pen-beam L, in combination with the striking pen-beam K, essentially as described.

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