(No Model.)

6 Sheets—Sheet 1.

E. A. LEIGH.

CARDING ENGINE.

No. 335,760. Patented Feb. 9, 1886.

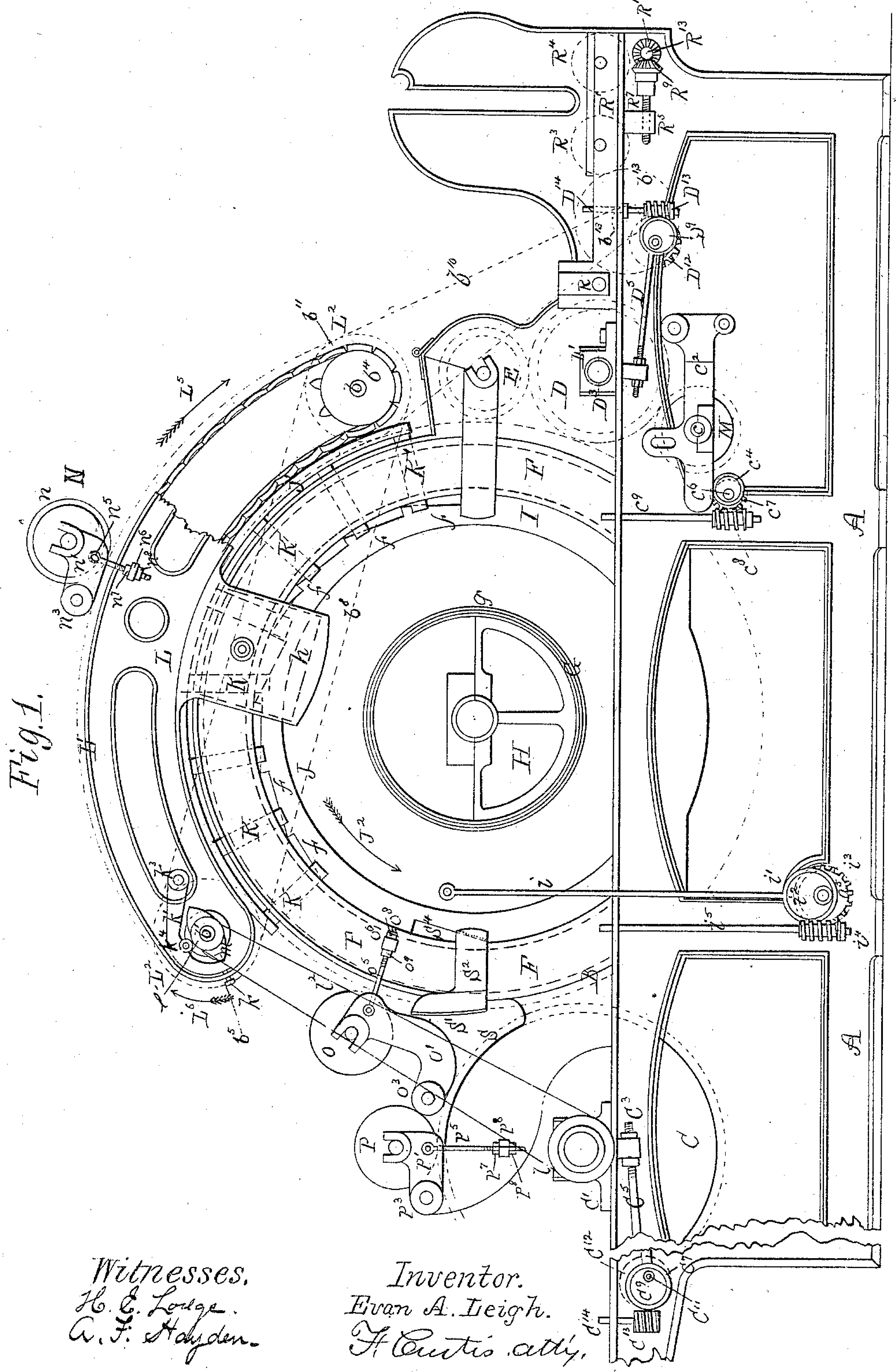


Fig. 1.

Witnesses.
H. E. Lodge.
A. F. Hayden.

Inventor.
Evan A. Leigh.
F. Curtis atty.

(No Model.)

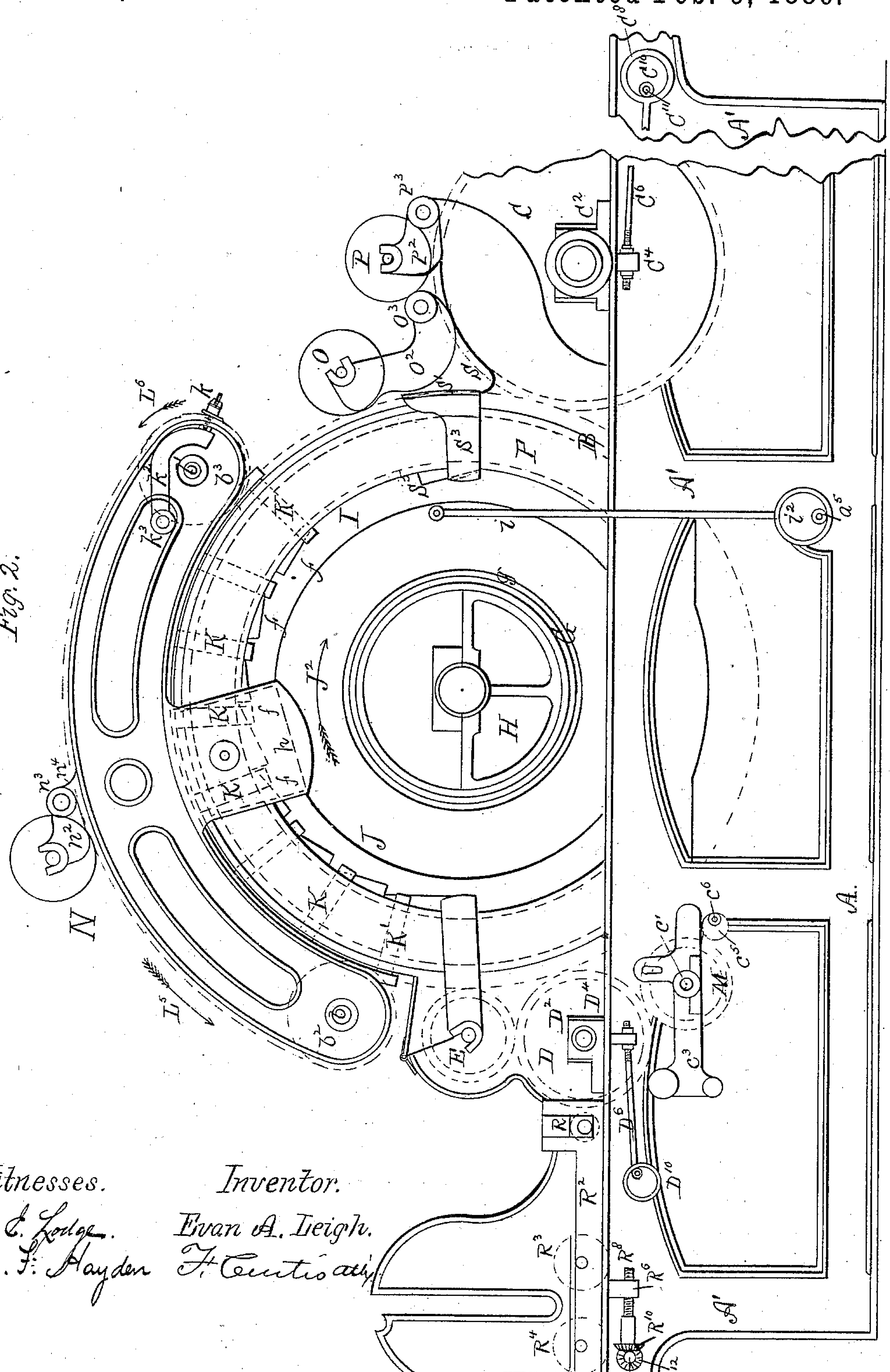
6 Sheets—Sheet 2.

E. A. LEIGH.

CARDING ENGINE.

No. 335,760. Patented Feb. 9, 1886.

Fig. 2.



Witnesses.
H. E. Lodge.
A. F. Hayden

Inventor.
Evan A. Leigh.
F. Curtis atty

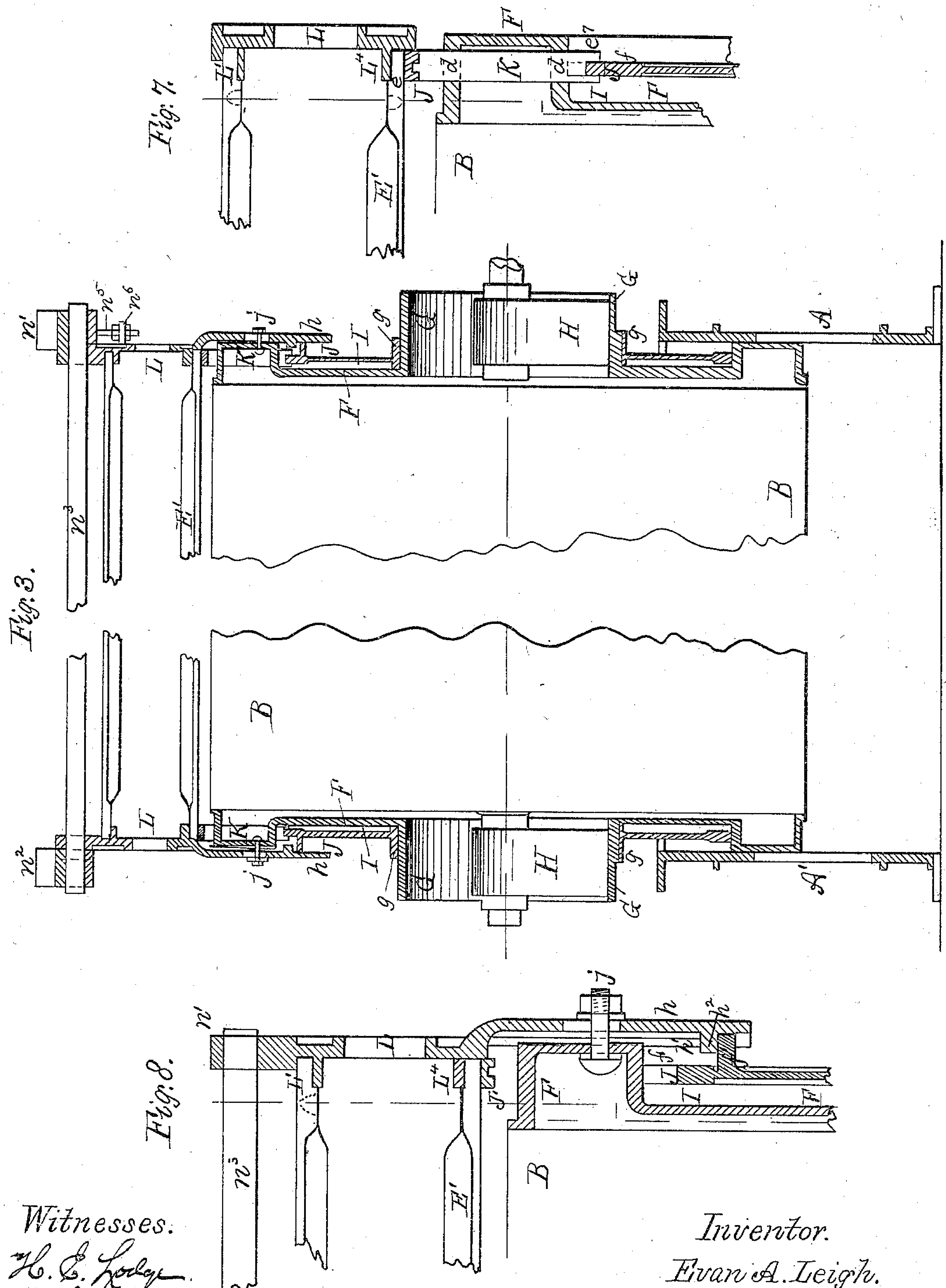
(No Model.)

6 Sheets—Sheet 3.

E. A. LEIGH.

CARDING ENGINE.

No. 335,760. Patented Feb. 9, 1886.



Witnesses.
H. E. Lodge.
A. F. Hayden.

Inventor.
Evan A. Leigh.
F. Curtis, Atty.

(No Model.)

6 Sheets—Sheet 4.

E. A. LEIGH.

CARDING ENGINE.

No. 335,760. Patented Feb. 9, 1886.

Fig. 4.

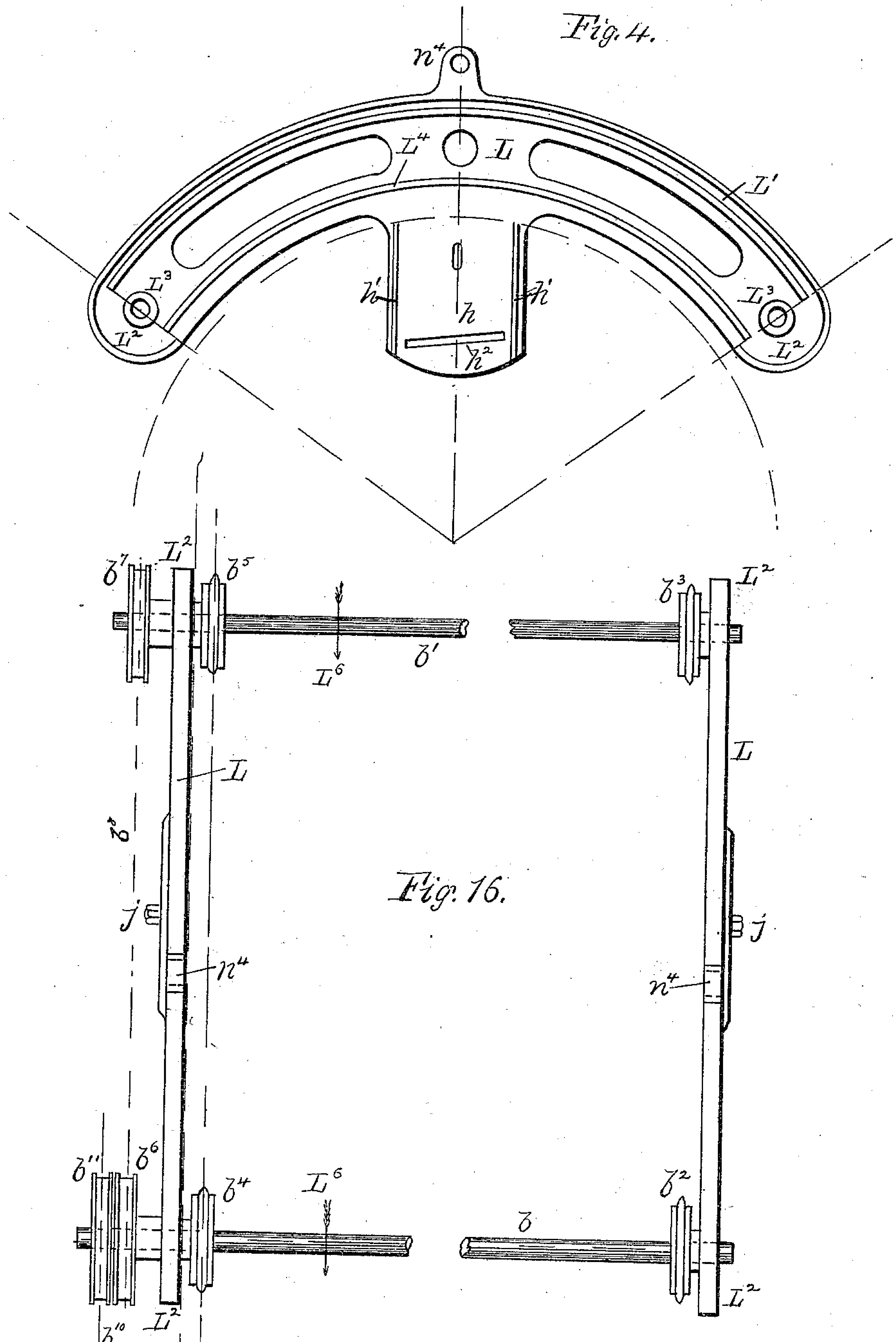


Fig. 16.

Witnesses.
A. F. Hayden.
H. E. Lodge

Inventor.
Evan A. Leigh.
F. Curtis atty.

(No Model.)

6 Sheets—Sheet 5.

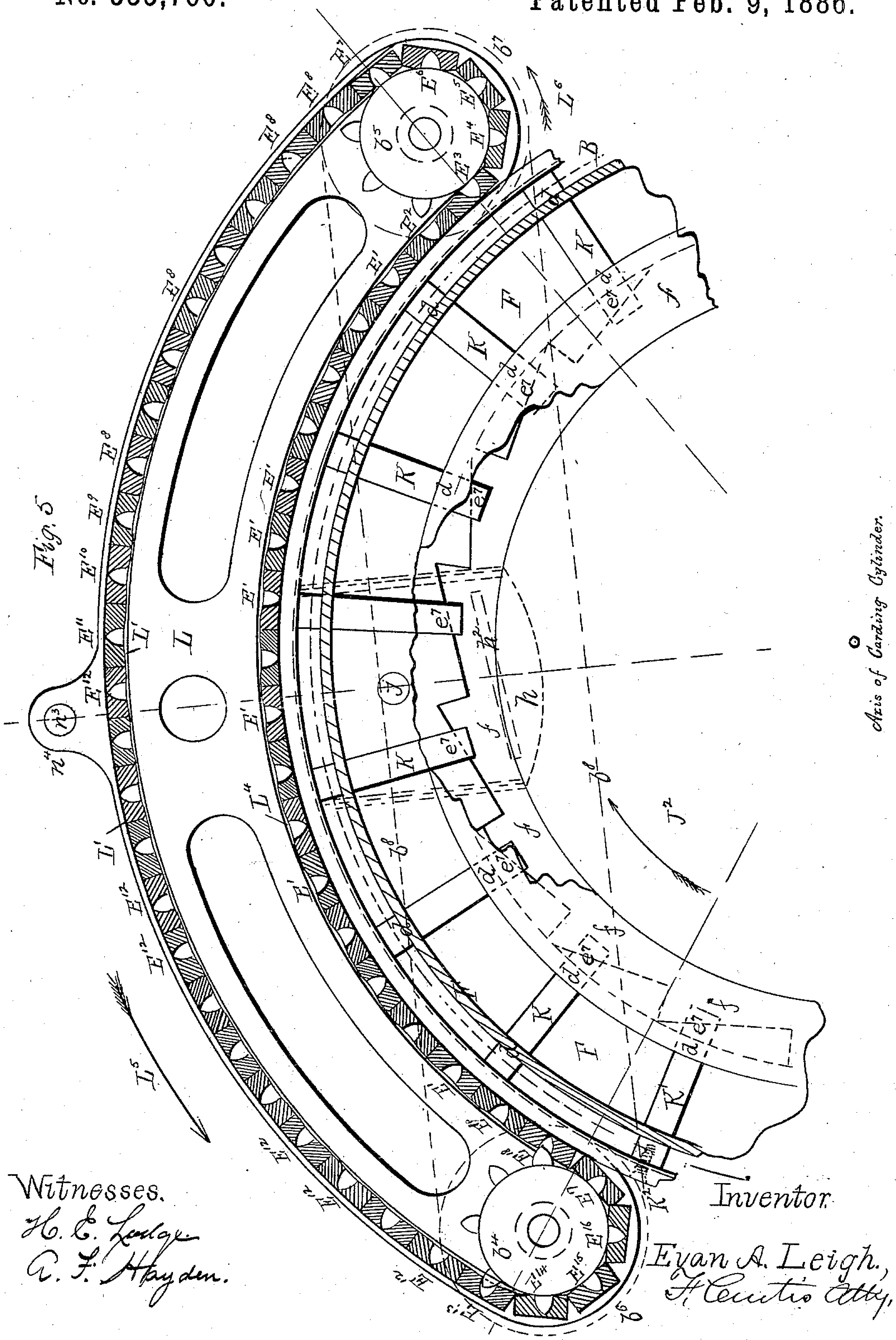
E. A. LEIGH.

CARDING ENGINE.

No. 335,760.

Patented Feb. 9, 1886.

Fig. 5



Witnesses.
H. E. Lodge.
A. F. Hayden.

Inventor.
Evan A. Leigh.
F. Curtis Atty.

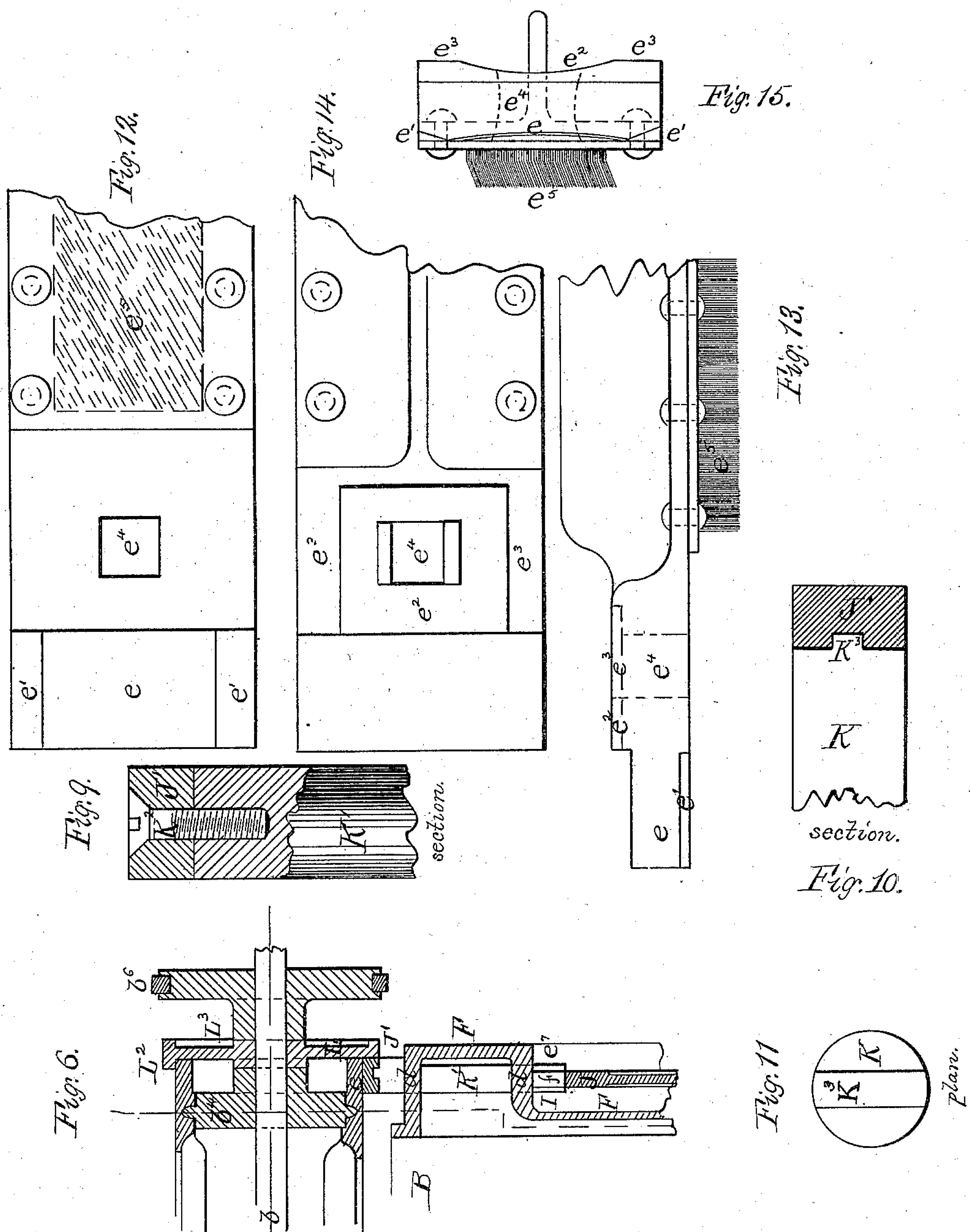
N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 6 Sheets—Sheet 6.

E. A. LEIGH.

CARDING ENGINE.

No. 335,760. Patented Feb. 9, 1886.



Witnesses.

H. E. Lodge

A. F. Hayden

Inventor

Evan A. Leigh.

F. Curtis Atty.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

EVAN ARTHUR LEIGH, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

CARDING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 335,760, dated February 9, 1886.

Application filed April 10, 1884. Serial No. 127,287. (No model.) Patented in England February 28, 1873, No. 738.

To all whom it may concern:

Be it known that I, EVAN ARTHUR LEIGH, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Carding-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My present invention is an improvement on British Letters Patent No. 738 of 1873; and it consists in, first, certain details of construction for effecting the adjustment or setting of the top cards or flats of carding-engines, whether stationary or traveling top cards or flats, with respect to the face of the main cylinder, whereby the entire assembly of such top cards or flats may be changed in position simultaneously and to a uniform extent on both sides of said engine; second, in details of mechanism whereby the doffer is adjusted in position relative to the main cylinder on both sides of the engine simultaneously; third, in details of mechanism whereby the taker-in is adjusted in position relative to the main cylinder on both sides of the engine simultaneously; fourth, in details of mechanism in which the coupling-chains, which heretofore have been universally employed to connect the top cards or flats together, are dispensed with.

The drawings accompanying this specification represent, in Figures 1 and 2, two side elevations, and Fig. 3 a vertical cross-section, of a carding-engine to which my improvements are applied, Fig. 1 showing the side on which the carding-engine is driven, and which it is usual to call the "driving" side, Fig. 2 showing the opposite side. Fig. 4 is a side view of the flat segmental plate on which the top cards or flats travel. Fig. 5 is a section, on a larger scale than Figs. 1, 2, 3, and 4, of the top cards or flats. Figs. 6, 7, and 8 are sections through the main bend, being also on a larger scale than Figs. 1, 2, 3, and 4. Figs. 9 and 10 are sections through the flexible bends. Fig. 11 is a plan of one of the setting-pillars. Figs. 12, 13, 14, and 15 are four views of one end of a top card or flat constructed according to the present invention. Fig. 16 is a diagram or plan of the plate L and its connecting mechanism.

Reference being had to the above-named drawings, it will be seen that A A′ represent the side housings or standards of the frame of the engine, the same being united by suitable horizontal rails; B, the carding-cylinder; C, the doffer; D, the licker-in, and E a carding-roller stripped by the licker-in, while F F represent two flat annular plates, which are termed the "main bends." These rings or heads are of about equal diameter with the heads of the main cylinder, and preferably made in one piece and securely bolted to the inside of the housings A A′. These rings F F are each formed with an axial tubular hub, G, within which is secured one of the standards H, that upholds the journal of the carding-cylinder B, and in addition to this axial hub G each plate F has an annular concentric recess, I, to receive a circular wheel or disk, J, the hub *g* of this wheel or disk surrounding and being supported in position by the hub G, before named, in such manner as to be free to rotate upon the latter. Each circular wheel or disk J has formed upon its upper part a series of peripheral tangential steps, *f f*, &c., which are exactly alike.

A series of pillars or standards, K K K K′, are arranged in lines radiating to the axis of the carding-cylinder. These pillars are preferably straight cylindrical rods, all of a length, and fit loosely in openings *d d*, &c., in the upper parts of the circular annular plates on main bends F F. Each pillar or standard K has a groove in its lower end, e^7, to embrace and rest upon one of the peripheral tangential steps *f*. A flexible bend or elastic segmental disk or plate, J′, is located at the upper part of each side of the carding-engine, and is supported upon the tops of the standards or pillars K K. Each flexible bend or segmental plate J′ is secured at one of its ends to the outmost pillar or standard, K′, by a screw, K^2, and rests loosely upon the other pillars or standards, K K, &c.

To prevent the flexible bends or elastic segmental plates from being moved sidewise, a small groove is formed in their under side, into which fits a projection, K^3, from the pillars or standards K K, &c. (See Figs. 9, 10, and 11.)

Screwed adjustably to the outer upper parts of each circular annular plate or main bend F is a flat segmental plate, L. Each flat segmental plate L has in its upper inner side a groove, L′, Figs. 4, 5, 7, and 8, concentric to the carding-cylinder and of a radius somewhat larger than that of the carding-cylinder. Formed upon its outer ends are half-circular flanges or half-rings, L^2 L^2, Figs. 4, 5, and 6, about a hub, L^3, which is formed in the center of each half-circle, which forms a bearing or support for one end of the horizontal shafts *b* *b*′, which span the carding-cylinder at the front and rear parts of the carding-engine. Each shaft has at each end a sprocket-wheel and one of a series of disks, b^2 b^3 b^4 b^5. The flat segmental plates L L are also provided with pendent legs *h* *h*, on the inner side of which are formed two **V**-beads, *h*′ *h*′, (see Figs. 5 and 8,) which fit into two **V**-recesses formed in the circular annular plates or main bands F F, the **V** beads and recesses being formed in lines parallel to a vertical line radiating from the axis of the carding-cylinder, thus causing the plate L when set therein to slide toward the axis of the carding-cylinder, while the ends L^2 remain parallel thereto.

At the bottom of the leg *h* is formed an inclined plane, h^2, which rests upon a tangential step, *f*′, formed upon the circular wheel or disk J. The flat segmental plate L is clamped to the circular annular plate or main bend F by a bolt, *j*. A circular flange, L^4, concentric to the carding-cylinder, is also formed on the lower inner side of each plate L, and has a radius a little larger than the carding-cylinder. The ends of the revolving top cards or flats E′ E^2 E^3 E^4, &c., are supported by the flexible bends or segmental plates J′, the semicircular flanges L^2, and disks b^2 b^3 b^4 b^5, and the groove L′ in the plate L, and as said flats touch each other at their edges they form an endless band or apron, which travels, by preference, in the direction of the arrow L^5, each top card or flat E′, &c., thus traveling on the flexible bend J′ over the carding-cylinder, round the half-circular flange, round the disks b^2 b^4, over the plate L in the groove L′, thence round the semicircular flange and disks b^3 b^5, and returns to the flexible bend J′. (See Fig. 5.)

To each of the circular wheels or disks J is pivoted one end of a rod, *i*, the other end of the rod *i*′ forming a clip for an eccentric, i^2, which it embraces. The two eccentrics i^2 i^2 are secured to opposite ends of a horizontal shaft, a^5, which is mounted in bearings in the lower part of the housings A A′, the said shaft a^5 being rotated by a worm-gear, i^3, secured to one end of it, which engages and is driven by a worm, i^4, secured to a vertical shaft, i^5, mounted in bearings secured to the housing A. This latter shaft, i^5, is fitted at the top to receive a set key or wrench by which it may be rotated in its bearing.

When it is necessary to set the top cards or flats nearer to the carding-cylinder, in consequence of the wire of the carding-cylinder and flats having been ground away, or if necessary to set the top cards farther away from the carding-cylinder, all the carding top cards or flats can be set on both sides of the carding-engine simultaneously nearer to or farther from the carding-cylinder, as desired, by turning the shaft i^5 with a key in the following manner: The bolt *j* is first loosened, and the shaft i^5 being turned by a key causes the worm i^4 to revolve, which rotates the worm-gear i^3 and the shaft a^5, and when the latter revolves the two eccentrics i^2 revolve simultaneously. These eccentrics pull down the rods *i* *i*—one on each side of the carding-engine—causing both circular wheels or disks J J to revolve to a small extent round the hub G in the direction of the arrow J^2, and the tangential steps *f* *f*, &c., on the disks J J are likewise moved so that the setting pillars or standards K K′ rest on a lower part of the above-mentioned steps by means of the weight of the top cards or flats, which press down the flexible bands J′ J′, which are supported by the setting pillars or standards. At the same time the setting pillars or standards are moved inward, as described, the tangential steps *f*′ *f*′ on the circular wheels or disks J are also moved to the same extent, causing the two flat segmental plates L L, together with the flats or top cards, shafts *b* *b*′, and sprocket wheels and disks b^2 b^3 b^4 b^5, which they support, to be moved inward to the same extent as the flexible bends J′ J′, the weight of the plates L L, together with that of the above-mentioned top cards or flats, shafts, and sprocket wheels and disks, causing the plates L L to press inward on the incline *f*′ *f*′, and the legs *h* *h* to slide downward in the **V**-recesses in the circular annular plates or main bands F F. When the top cards or flats have been thus set, as required, the bolts *j* *j* are tightened again.

To attain greater accuracy in the setting of the revolving top cards or flats than heretofore, I construct each flexible bend J′, Fig. 10, of cast-iron (by preference a segment of a ring in shape) with a small groove on the inside. These segments are perfectly parallel and true, being, and by preference, turned instead of being thicker in the middle and unturned on the under side, as heretofore. One end of each flexible bend J′, Figs. 5 and 9, is secured to the outmost setting pillar or standard, K′, by a screw, K^2, and rests loosely on all the other setting pillars or standards, K K, &c., the weight of the top cards or flats depressing the flexible bends J′ J′ upon the pillars K′ K K, &c., and the elasticity of the said flexible bend under the weight of the top cards or flats resting on them enables the above-mentioned flexible bends to accommodate themselves to the change in the position of the top cards or flats as the wire clothing upon the carding-cylinder is ground away.

Instead of coupling the top cards or flats of revolving flat carding-engines together with the bushed chain, which is now universally employed for that purpose, I dispense with a coupling-chain altogether, and construct each top card or flat (see Figs. 12, 13, 14, and 15) with four different curves, e e' e^2 e^3, on each end of them. The ends of the top cards or flats E' are supported upon the flexible bends J', Figs. 5, 6, 7, 8, 9, and 10, the curves e on the ends of the top cards or flats being in contact with the flexible bends, (see Figs. 5, 6, 7, 8, 12, 13, and 15,) these curves e being of the same radius as the flexible bends when such flexible bends are set down to the smallest diameter required of them. The top cards or flats E^{17} E^{16} E^{15} E^{14} E^6 E^5 E^4 (see Fig. 5) fit at their ends between the semicircular flanges L^2 and the sprocket wheels and disks b^2, b^3, b^4, and b^5 and the curves e' e^2, the curve e' being in contact with the semicircular flanges L^2, and the curves e^2 being in contact with the disks b^2, b^3, b^4, and b^5. The top cards or flats E^7 E^8 E^9 E^{10} E^{12} fit in the grooves L' in the plate L, the curve e^3 being in contact with the bottom of the groove L^6, and the points at the junction of the curves e and e' in contact with the top of the groove L^7. Each top card or flat is provided with an opening or internal tooth, e^4, into which gear the sprocket-wheels b^2, b^3, b^4, and b^5 (see Figs. 5 and 6) on the shafts b and b'. On one side of the carding-engine a chain-wheel, b^6, is secured to the shaft b, and on the same side is another similar chain-wheel, b^7, secured to the shaft b'. A chain, b^8, gears into both chain-wheels, so that when the shaft b is rotated the shaft b' will also revolve, and the sprocket wheels and disks b^3 b^5 revolve together at the same speed. (See Fig. 16.) When the shaft b is rotated, the sprocket wheels and disks b^2 b^4 revolve in the direction of the arrows L^6. The curves e^2 e' on the ends of the top cards or flats E^{14} E^{15} E^{16} E^{17} fit between the disks b^2 b^4 and semicircular flanges L^2, and the teeth of the sprocket-wheels b^2 b^4 are in gear with the internal teeth e^4 of those top cards or flats, thus causing the top cards or flats E^{14} E^{15} E^{16} E^{17} to revolve round the disks b^2 b^4, the top cards or flats being guided to the flexible bends J' by the semicircular flanges on which the curve e' of the flat E^{17} is supported. As the top card or flat E^{17} leaves the semicircular flanges to be supported on the flexible bends, the teeth of the sprocket-wheels b^2 b^4 are disengaged from the internal teeth of the top card or flat E^{17}, and the edges of the top cards or flats E^{18} E^{19} come into contact, thus pressing against each other, and causing the top cards or flats E' E' E' E', &c., to move forward in the direction of the arrow L^6.

To prevent the top cards or flats E' E' E' E', &c., from lifting as they travel over the flexible bends J', the circular flanges L^4, as before described, (see Figs. 4, 5, and 6,) formed on the plate L, prevent such tendency and retain them in place. When the top cards or flats have traveled over the flexible bends J' to the position of the top card or flat E^2, Fig. 5, the internal teeth of the flats begin to gear with the teeth of the sprocket-wheels b^3 b^5, which are revolving with the shaft b'. These sprocket-wheels lift the top card or flat E^3 from the flexible bend J' onto the semicircular flange L^2, and the top cards or flats E^3 E^4 E^5 E^6 pass round the disks b^3 b^5. The above-mentioned sprocket-wheels also lift the top card or flat E^6 from the semicircular flanges concentric with the shaft b' into the grooves L' in the plates L. The flats or top cards E^8 E^9 E^{10} E^{11} E^{12}, &c., are supported on the bottom of the groove L' in the plate L on the curve e^3, Figs. 13, 14, and 15. As the top card or flat E^7 is guided into the grooves L' in plate L, the sprocket-wheels b^3 and b^5 are disengaged from the top card or flat E^7, and the top cards or flats E^7 E^8 begin to press against each other at their edges in a manner similar to that in traveling over the flexible bend J'. The top cards or flats E^8 E^8 E^8 E^8 E^9 E^{10} E^{11}, &c., press against and propel each other in the direction of the arrow L^5 until in revolving they pass that part of the groove L' which is situated over the axis of the carding-cylinder, the top card or flat E^{11} being in that position. The top cards or flats, after passing in the groove L' over the axis of the carding-cylinder, cease to be pressed forward by each other by means of the sprocket-wheels b^3 and b^5, but are caused by their own gravity to press in the groove L' toward the shaft b, the teeth of the sprocket-wheels b^2 and b^4 sustaining their weight. As the sprocket-wheels b^2 b^4 revolve, the top cards or flats E^{13} E^{14} are guided from the groove L' into the flexible bend J' by the semicircular flanges L^2, which are concentric to the shaft b, on which they revolve. The sprocket-wheels b^2 b^4 revolving, the top cards or flats E^{14} E^{15} E^{16} E^{17} travel as an endless belt around the disks b^2 and b^4 and between semicircular flanges L^2 over the flexible bands, &c., as before.

It is obvious from the above description that the weight of the top cards or flats ascending and descending on one side of the central shaft n^3 will balance that of the top flats descending and ascending on the other side of said shaft; hence the sprocket-wheels b^2 b^3 b^4 b^5 have to overcome only the friction of the top cards or flats revolving on the flexible bends J', semicircular flanges L^2, and groove L'. The top cards or flats may be driven in the usual manner by the shaft b, which is rotated by a chain, b^{10}, and chain-wheels b^{11} b^{12}, driven from the feeder-carrier wheel b^{13}. The flats or top cards are carding as they travel on the flexible bends J', and as they travel round the circular flanges L^2, which are concentric with the shaft b', are stripped by an oscillating comb, k, attached adjustably to two levers, k' and k^2, said levers being attached to a horizontal shaft, k^3, which spans the carding-cylinder and has its bearings in the plates L. On the lever k' is fixed a stud carrying the bowl k^4, which is free to revolve on it. A band-pulley, l', to which is secured a cam, m, is caused to revolve on the end of the shaft b' by means of a band, l^2, while the latter is driven by another band-pulley, l, secured to one end of the doffer-shaft. The band-pulley l' and cam m thus revolving oscillate the bowl k^4, which being carried by the lever k', and the lever k' attached to the shaft k^3, cause the shaft k^3, the levers k' and k^2, and the comb k to oscillate, thereby stripping the flats or top cards as they travel round.

The roller for grinding the wire clothing of the top cards or flats is shown at N, Figs. 1 and 2. To adjust this roller to or from the said top cards or flats E^{12}, I mount the journals of such roller in the standards n' n^2, which are secured at their lower ends to a rock-shaft, n^3, which is mounted on the standards n^4 upon the plates L. The free end of the standard n' is pivoted to one end of a rod, n^5, the opposite end of which is secured to a boss, n^6, formed on the side of the plate L, Fig. 1, while two nuts, n^7 n^8, secure it in place. When it is desired to adjust the grinding-roller N nearer to the top cards or flats, the nut n^7 is loosened and the nut n^8 tightened, lowering the rod n^5, and with it the standard n', which being attached to the rock-shaft n^3, and the latter attached at its opposite end to the standard n^2, causes both the standards n' n^2 to be lowered simultaneously and to the same extent. When it is desired to brush out the clothing of the top cards or flats, a circular brush can be placed in the standards n' n^2 instead of a grinding-roller.

The roller for grinding the clothing of the carding-cylinder is shown at O, Figs. 1 and 2, and to adjust this roller toward or away from the carding-cylinder I mount the journals of the grinding-roller in the two standards o' o^2, and adjust both together by means of the rod o^5, the rock-shaft o^3, boss o^6, and nuts o^7 and o^8.

The grinding-roller for grinding the clothing of the doffer is shown at P, Figs. 1 and 2, and is mounted in the standards p' p^2, which are also both adjusted simultaneously in a similar manner to that described for adjusting the flat or top card grinding-roller, and also the carding-cylinder grinding-roller. The standards p' and p^2 move together by means of the rod p^5, rock-shaft p^3, boss p^6, and nuts p^7 and p^8. If it is desired to use a "dirt-roller," M, Figs. 1 and 2, so called, underneath the taker-in D, the journal-bearings c c' of such roller are secured to and upheld by horizontal levers c^2 and c^3, which are pivoted at one end to the housings A A', and whose free ends rest upon eccentrics c^4 and c^5, secured to opposite ends of a horizontal shaft, c^6, which extends laterally across such housings, and is put in rotation by a worm-gear, c^7, which is secured to it, the latter engaging and being driven by a worm, c^8, secured to a short vertical shaft, c^9, mounted in bearings secured to the outside of one of the housings, A, and fitted at top to receive a key or wrench by which it may be rotated, thus causing both ends of the dirt-roller M to be adjusted at the same time.

The doffer C is mounted in bearings C' C^2, and to simultaneously adjust both sides of the said doffer to the carding-cylinder I suspend from each doffer box or bearing twin screw-tapped lugs C^3 and C^4, through which the ends of screw-threaded rods pass. The opposite ends of these rods carry straps C^7 and C^8, which inclose eccentrics C^9 C^{10}. These eccentrics are secured to opposite ends of a horizontal shaft, C^{11}, spanning the housings A A' and mounted in bearings in the latter. I secure to this shaft a worm-gear, C^{12}, which engages with a worm, C^{13}, secured to a vertical shaft, C^{14}, mounted in bearings in the housing A, the upper end of such shaft being adapted to receive a key or wrench by which it may be rotated. The rotation of the shaft C^{14} effects, through the agency of the shaft C^{11}, simultaneous rotation of the eccentrics C^9 and C^{10}, which effect lateral movement of the doffer C toward or away from the carding-cylinder, according to the direction in which the said shaft C^{14} is turned.

The journals of the taker-in D' D^2 are mounted in boxes D^3 and D^4, which are caused to have a lateral movement, when the taker-in is set to or from the carding-cylinder, by means of the screw-threaded rods D^5 and D^6, eccentrics D^9 and D^{10}, worm-gear D^{12}, worm D^{13}, and shaft D^{14}, in a similar manner to that of the doffer-boxes, and the taker-in is thus set both sides at the same time and to the same extent by means of rotating the shaft D^{14}.

The feed-roller R, Figs. 1 and 2, of the carding-engine is mounted in movable journals or boxes R' R^2, adapted to slide upon the housings A A'. The lap-rollers R^3 R^4 are also mounted in the same movable boxes. Each feeder-box R' and R^2 has a pendent boss, R^5 and R^6, through which a short horizontal screw-threaded shaft, R^7 and R^8, screws, the shafts R^7 and R^8 being supported in bearings secured to the sides of the housings A A', and being rotated each by a bevel-pinion, R^9 R^{10}, secured to them, which engage with and are driven by two other bevel-gears, R^{11} and R^{12}, these gears R^{11} and R^{12} being secured, respectively, to opposite ends of a horizontal shaft, R^{13}, spanning the housings A A'. One end of the shaft is fitted to receive a key or wrench, and by rotating the shaft R^{13} the screw-shafts R^7 and R^8 are rotated simultaneously and the feed-roller R caused to approach toward or recede from the taker-in and maintain its parallelism with the latter.

I employ in my carding-engine a movable box, S, and straight-edge S', which is supported at each side of the carding-engine in brackets S^2 S^3, disposed upon the main bends or circular annular plates F F; and in order to adapt the straight-edge to the periphery of the carding-cylinder, I create upon the periphery of each circular wheel or disk J an additional oblique step, S^4 S^5, which operates with spurs (indicated by dotted lines) upon the brackets S^2 S^3, to adjust the position of the straight-edge S′ simultaneously with that of the top cards or flats. As this straight-edge is to accommodate itself to the wear of the wire of the carding-cylinder only, the steps S^4 and S^5 are to have an inclination of but half the extent of the steps *f f*, as the latter must adjust the pillars or standards K K K to the wear of both the carding-cylinder wire and wire of the top cards or flats. The circular annular plates or main bends F F with a flange, being made in the form of a ring, is well adapted for fixing an under casing to the carding-engine.

In working my improved carding-engine the grinding-rollers N O P are placed in their respective stands n' n^2, o' o^2, p' p^2, and the adjustment of each such roller takes place by means of the nuts on one side, Fig. 1, of the carding-engine, as before described; and I wish it to be observed that as each grinding-roller is adjusted at both sides—*i. e.*, the side shown in Fig. 1, and the side shown in Fig. 2—simultaneously by means of the rock-shaft to which such roller-stands are secured—the surface of the wire clothing which each of such rollers sharpens is always ground parallel to the axis of the rock-shafts n^3 o^3 p^3, which are themselves always parallel to the axis of the carding-cylinder, and the surfaces of the wire clothing so ground are always true cylindrical surfaces. The wire clothing of the carding-cylinder and that of the top cards or flats e^5, Figs. 12, 13, and 15, being always parallel, the top cards or flats, by means of rotating the shaft i^5 with a key or wrench, through the agency of the mechanism before described, can all be set together parallel on both sides of the carding-engine at the same time, and perfect accuracy maintained in setting them to the varying diameter of the carding-cylinder wire clothing. As such card-clothing is ground away in being sharpened by the grinding-roller O, the wire clothing of the doffer C being always ground parallel, the adjustment of it to the carding-cylinder is always kept parallel by means of the shaft C^{14} being rotated by a key or wrench, as before described. Perfect parallelism is also always maintained in the positions of the taker-in of the feed-roller and of the dirt-roller by reason of their being each set on both sides of the carding-engines, Figs. 1 and 2, at the same time by the mechanism before described.

It will be seen that the various adjustable elements of a carding-engine to which my improvements are applied are readily and quickly changed in position when necessary without disturbing their proper working position, and in practice I prefer that the mechanism for adjusting the top cards or flats E′ E^2, &c., to the carding-cylinder, the doffer C to the carding-cylinder, the taker-in D to the carding-cylinder, the grinding-roller N to the top cards or flats, the grinding-roller O to the carding-cylinder, the grinding-roller P to the doffer, the dirt-roller M to the taker-in, or the feed-roller R to the taker-in, shall be so arranged that by turning the adjusting key or wrench to the right these parts are caused to approach the parts to which they are set, while to the left they are caused to recede from them.

I claim—

1. The shaft a^5, in combination with the worm i^4, worm-gear i^3, eccentric i^2, rod *i*, wheel J, provided with tangential steps *f*, the pillars K K′, &c., the flexible bends supported by said pillars, the flats traveling in said bends, and the carding-cylinder, to or from which the flats are adjusted simultaneously on both sides of the engine, substantially as set forth.

2. The combination, with the carding-cylinder B, of the flexible bends J′, the plates L, having V-grooves *h′*, fitting the main bend F, semicircular flanges L^2, the series of flats moving therein as an endless belt, the actuating sprocket-wheels b^2 b^3 b^4 b^5, the posts K, the wheel J, with its tangential steps *f f*, the actuating-rod *i*, and devices whereby said rod is operated to adjust the entire series of flats toward or from said carding-cylinder, substantially as set forth.

3. The plate L, having a leg, *h*, provided with inclined planes h^2, in combination with wheels or disks J, which are provided with tangential steps *f′*, that turn under said planes to raise or lower said plates L, and the flats traveling in said plates and adjustable by means of said wheels, legs, and plates, substantially as set forth.

4. The wheels J and their tangential steps *f*, in combination with the grooved pillars K, which are raised or lowered by said steps, the flexible bends J′, supported by said pillars, and having tongue-and-groove connection therewith, the flats which travel above said bend, and the plate L, which incloses said flats, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EVAN ARTHUR LEIGH.

Witnesses:
ARTHUR C. HALL,
GEORGE ALLEN HALL,
9 *Mount St., Manchester.*