

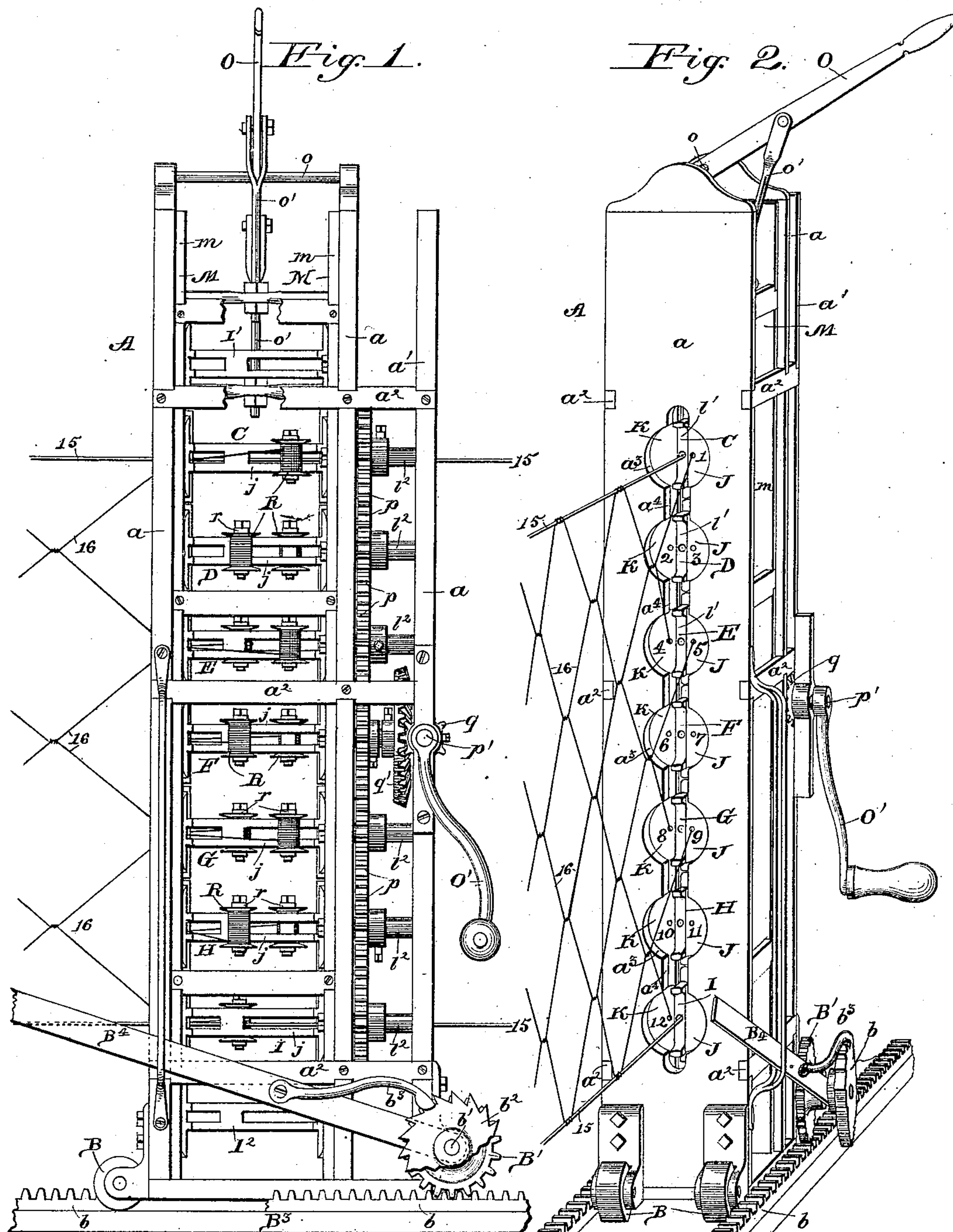
(No Model.)

8 Sheets—Sheet 1.

A. L. KITSELMAN.
WIRE FABRIC MACHINE.

No. 356,322.

Patented Jan. 18, 1887.



Witnesses

Wm. C. Bowen,
H. J. Bauhoff.

Inventor,

Alva L. Kitzelman.

By his Attorneys

C. A. Snow & Co.

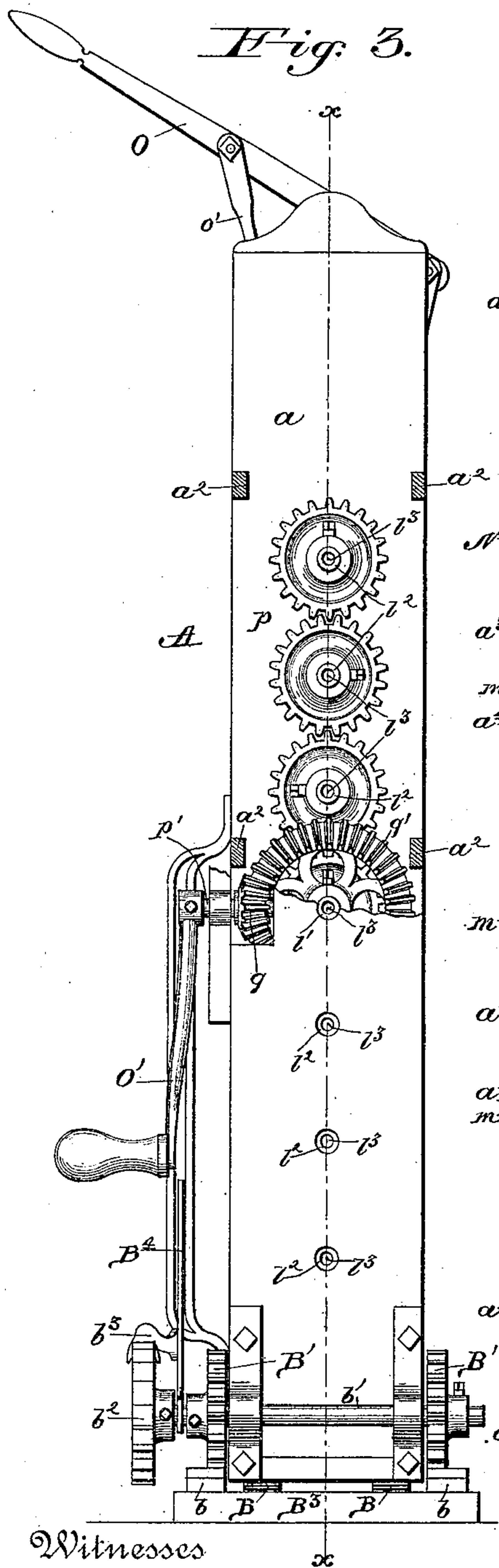
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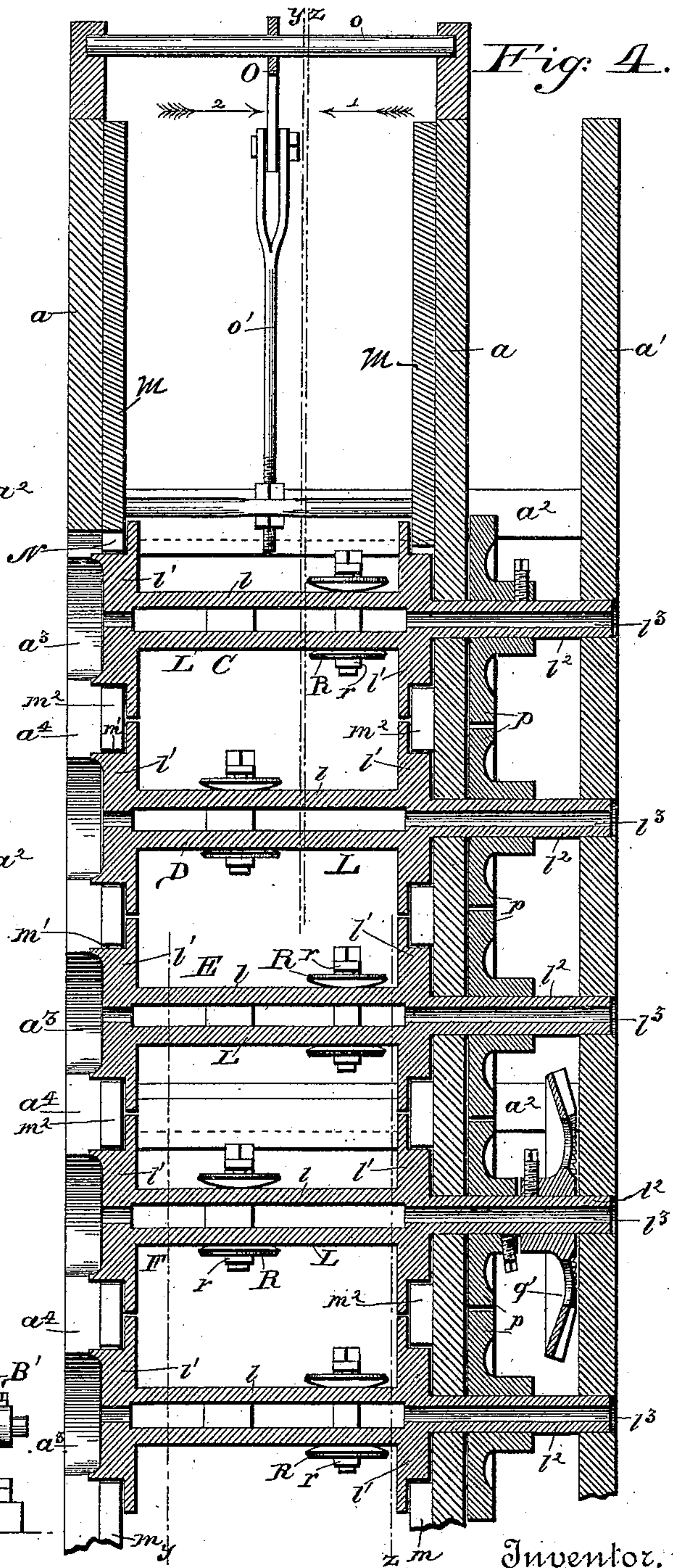
A. L. KITSELMAN.
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Wm. C. Brown.
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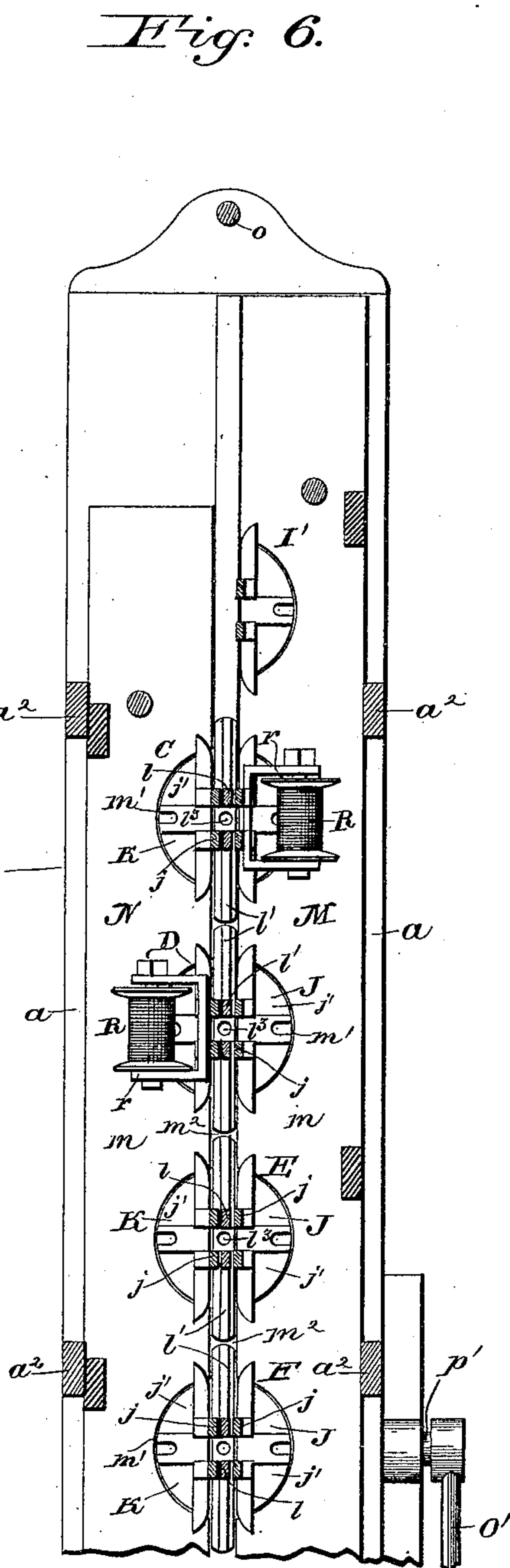
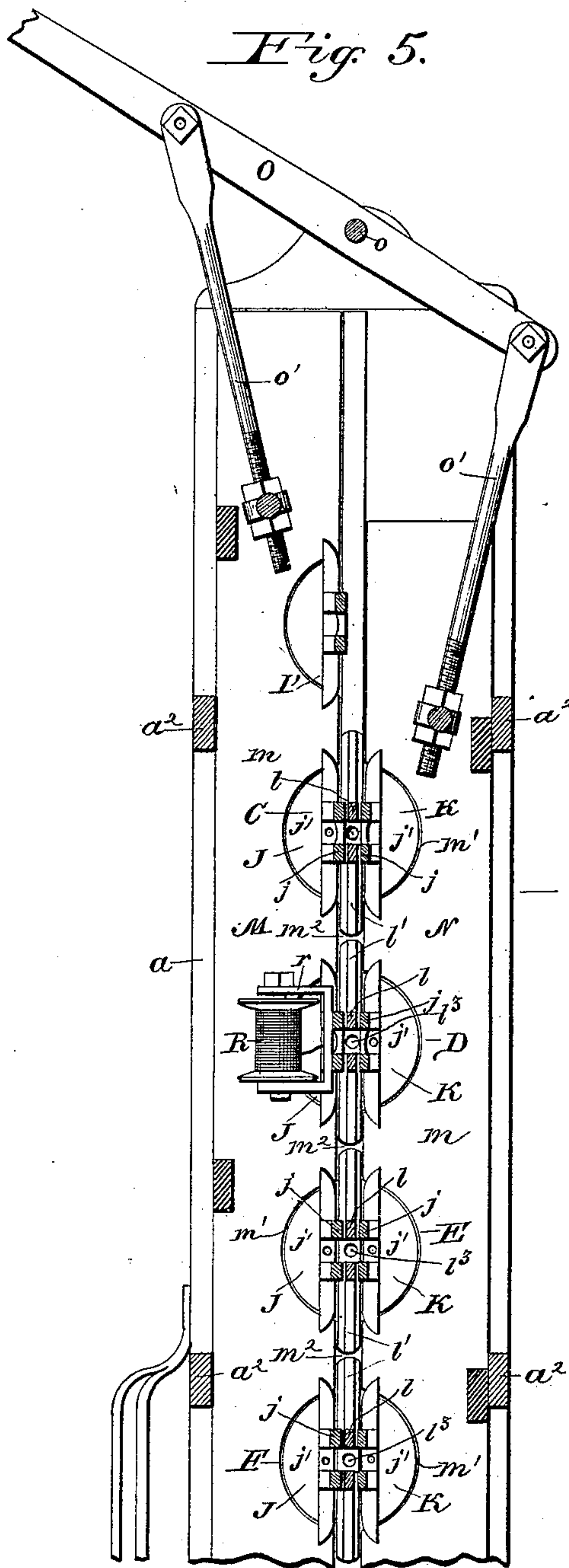
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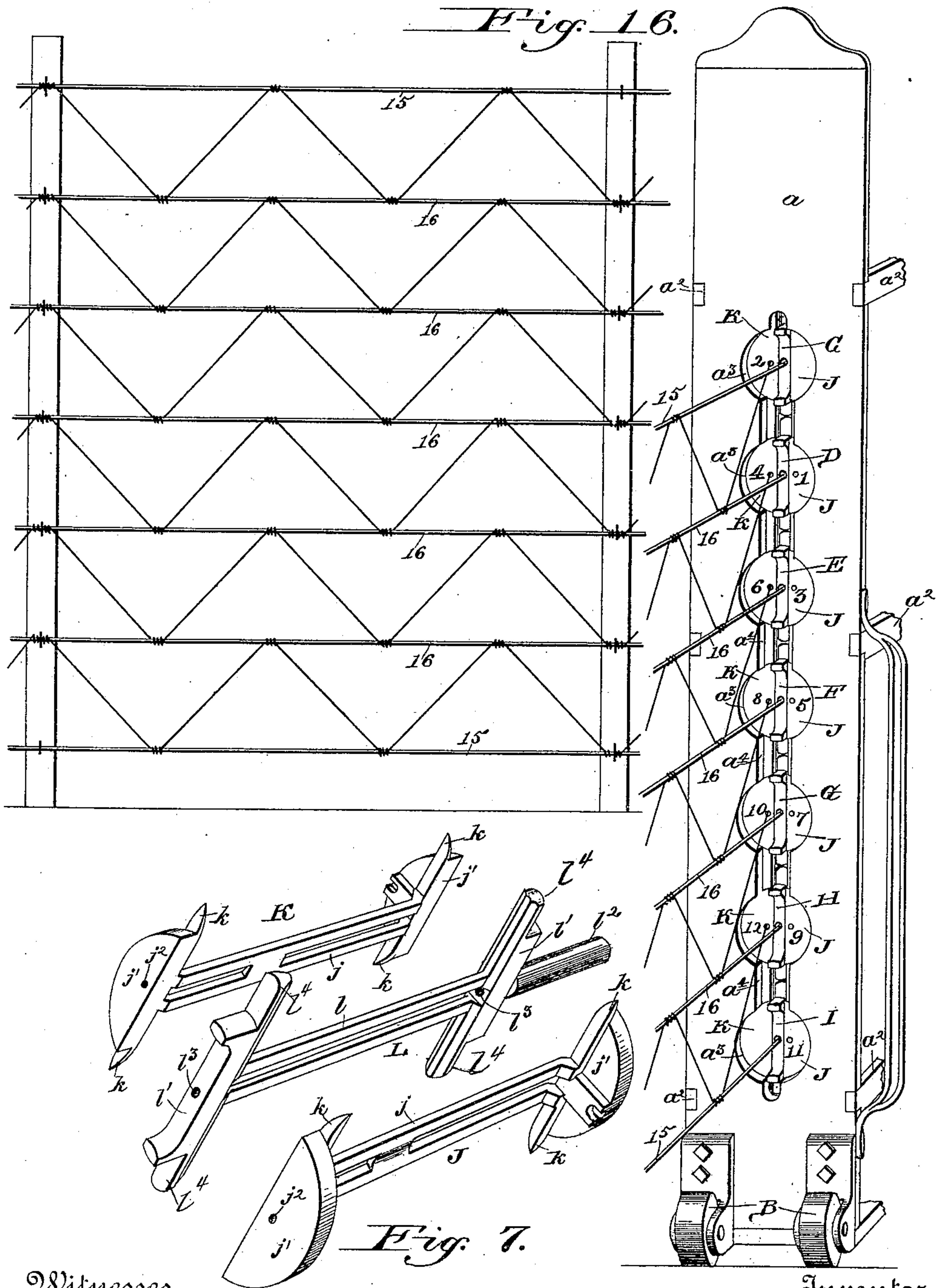
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8 Sheets—Sheet 4.

A. L. KITSELMAN.
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Witnesses

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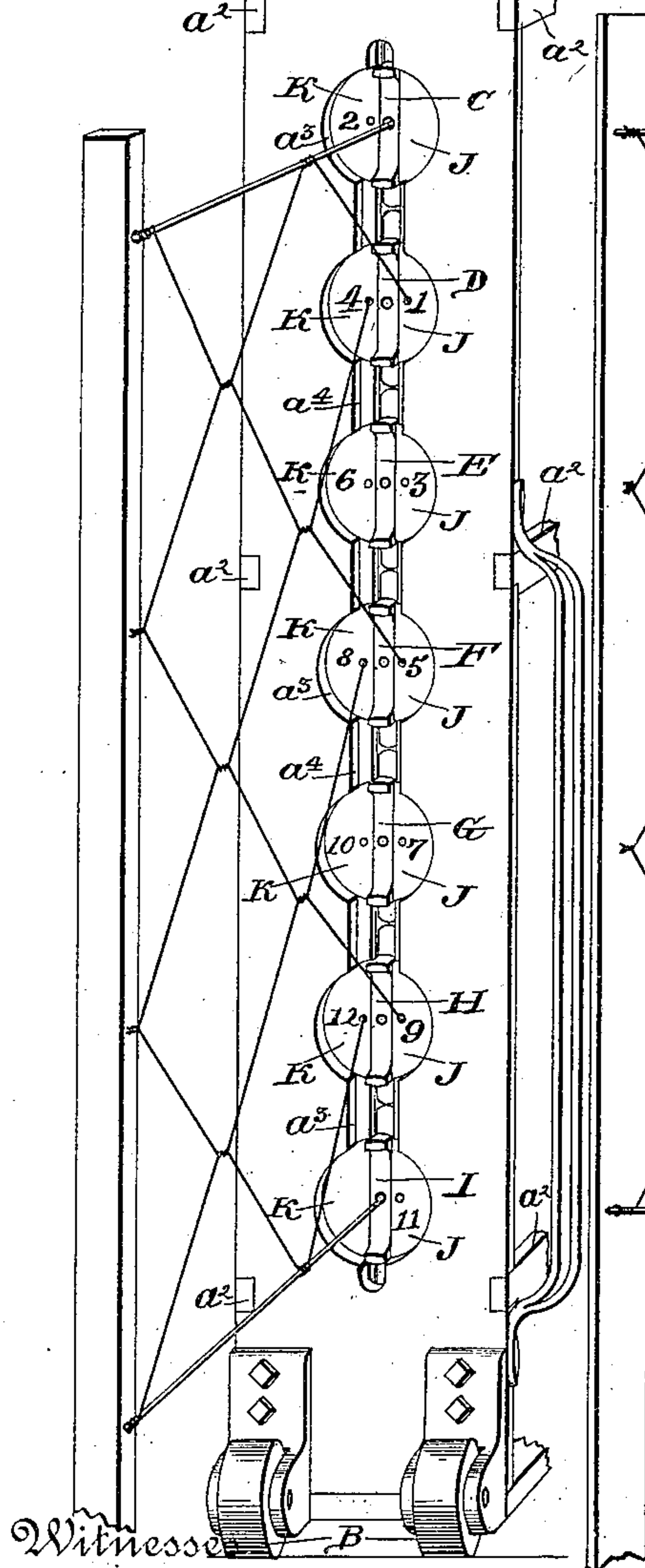
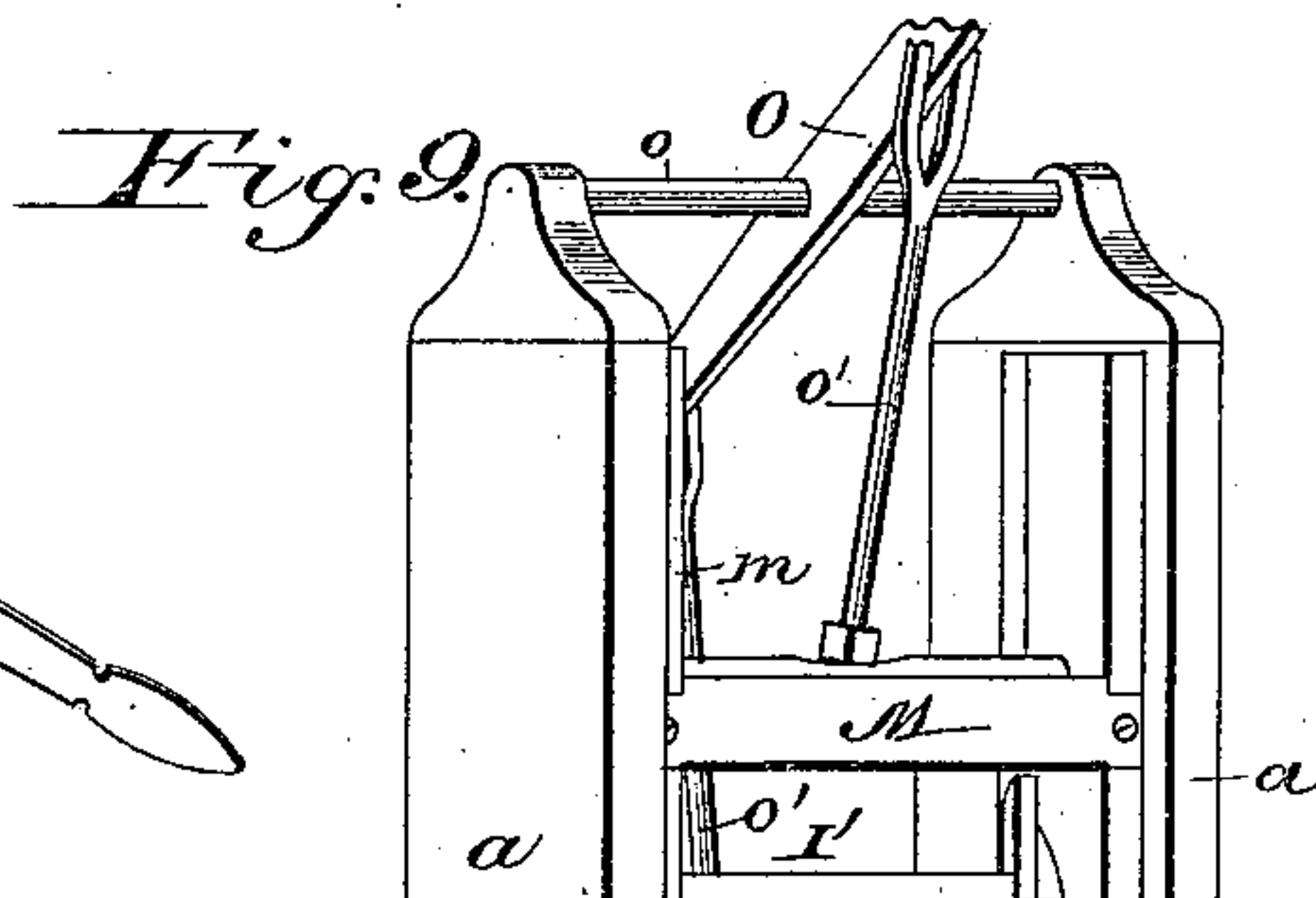
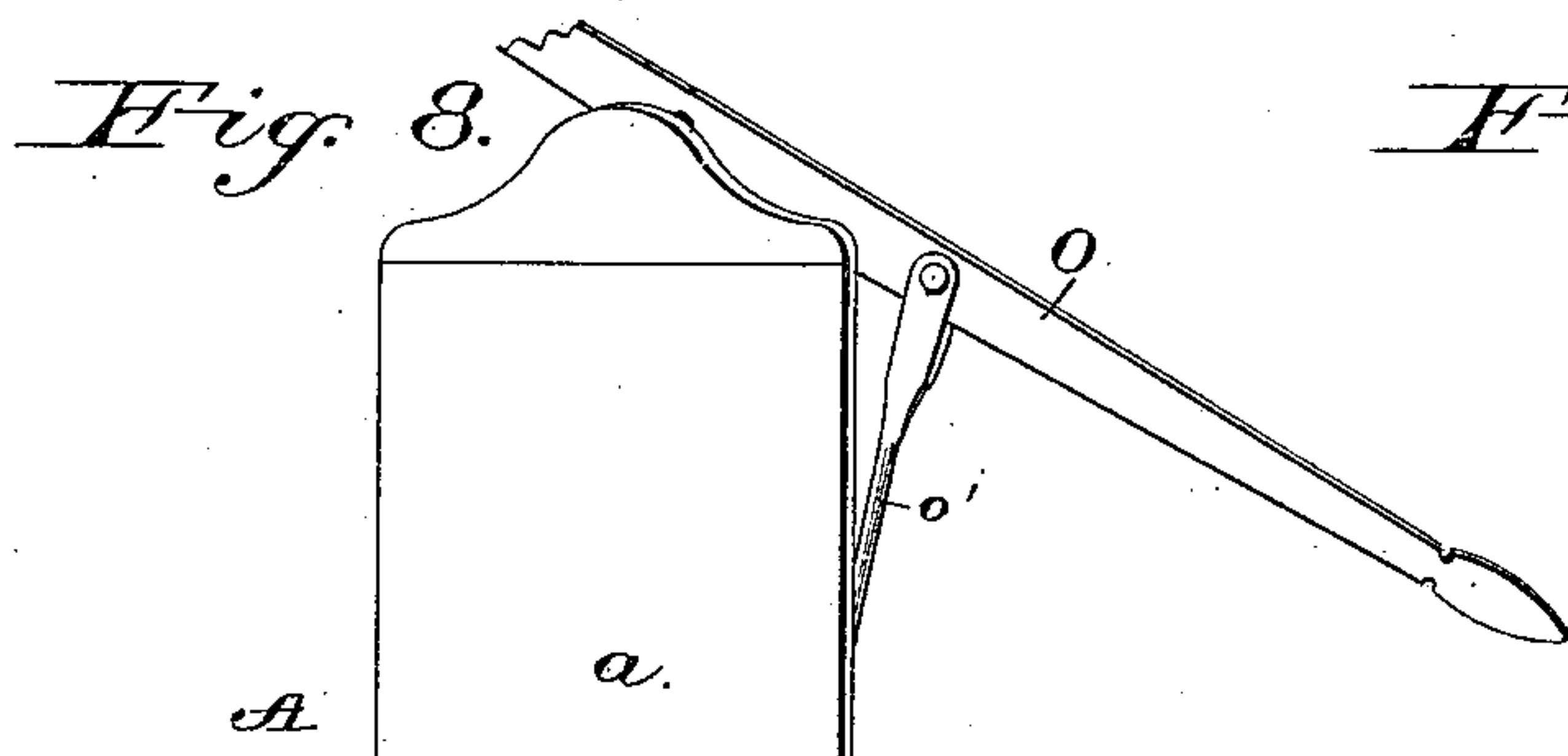
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8 Sheets—Sheet 5.

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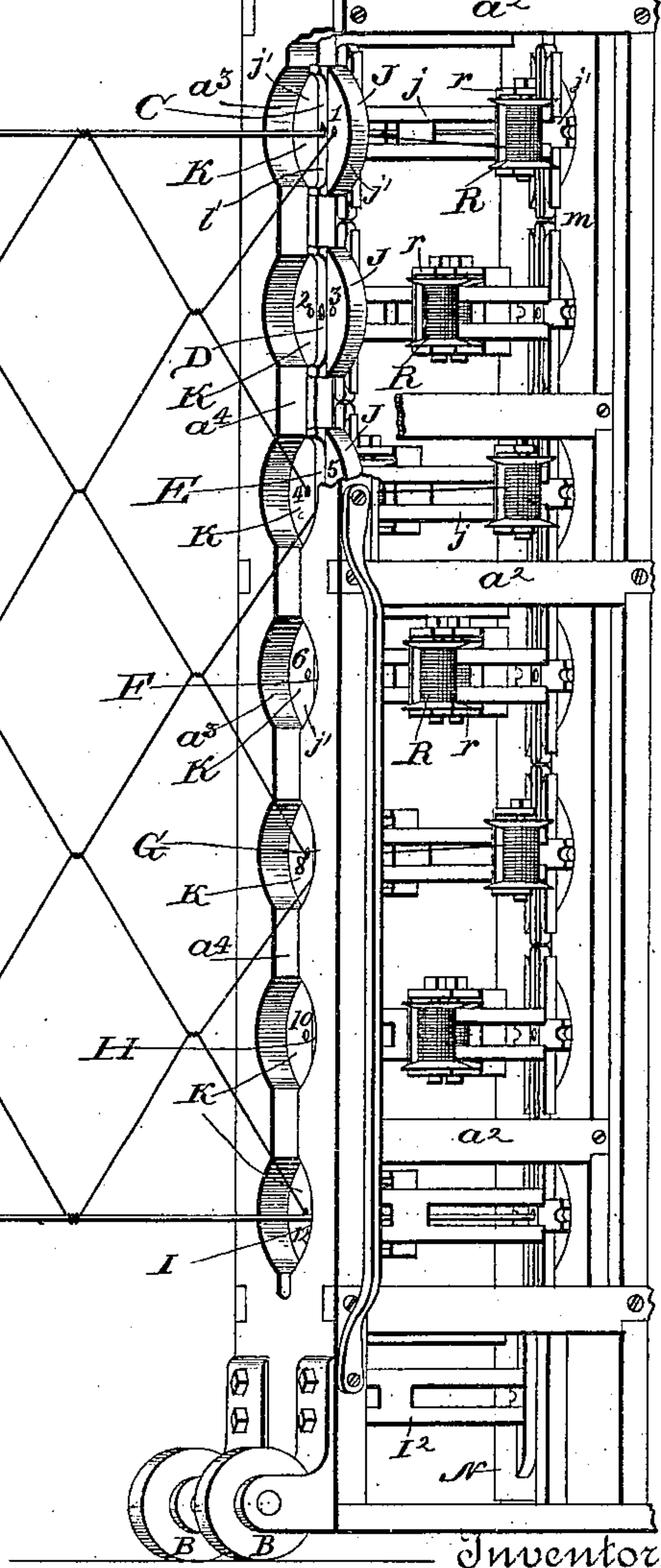
No. 356,322.

Patented Jan. 18, 1887.



Witnesses

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(No Model.)

8 Sheets—Sheet 6.

A. L. KITSELMAN.
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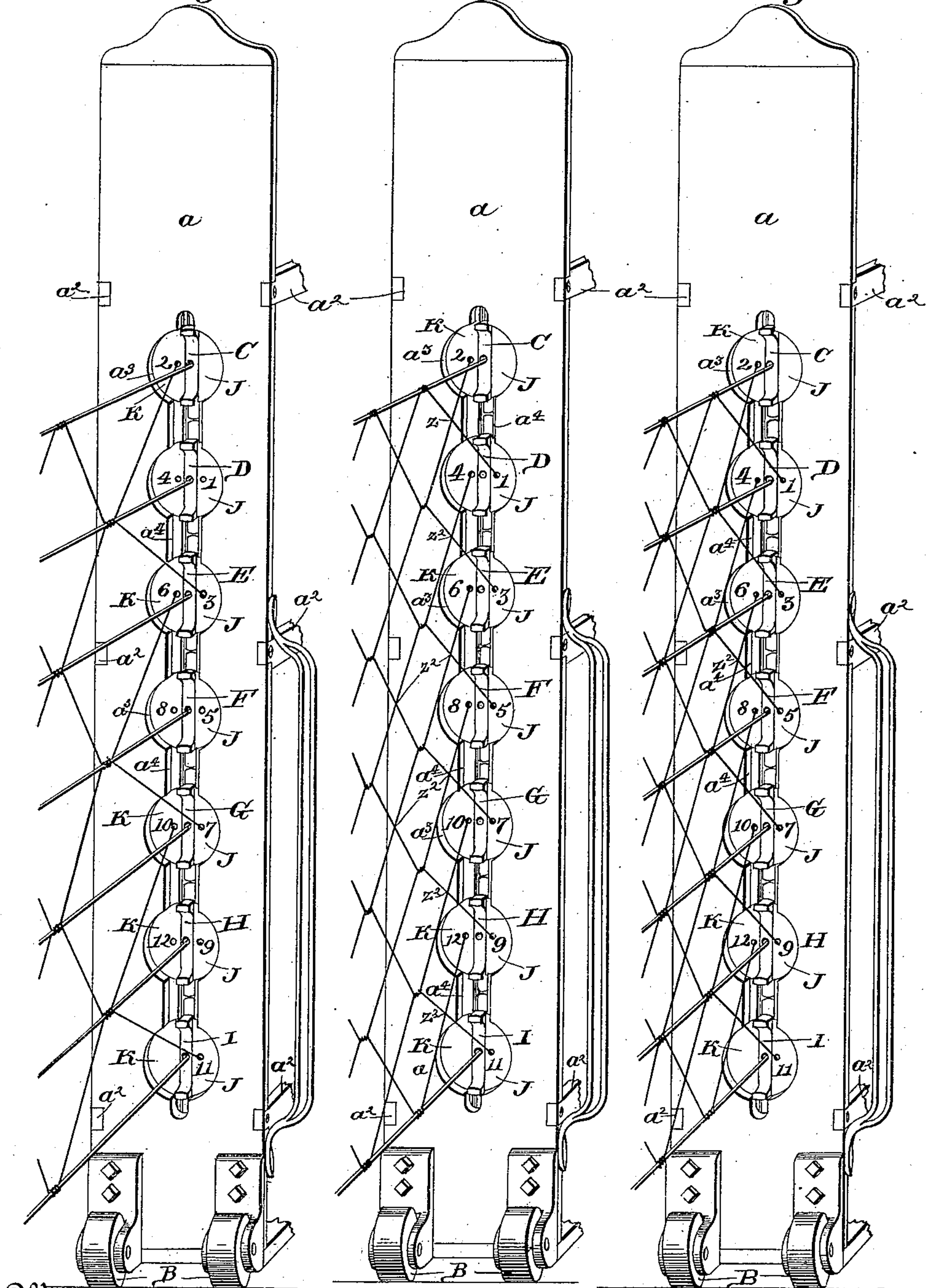
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Patented Jan. 18, 1887.

Fig. 10.

Fig. 12.

Fig. 14.



Witnesses

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(No Model.)

8 Sheets—Sheet 7.

A. L. KITSELMAN.
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Fig. 13.

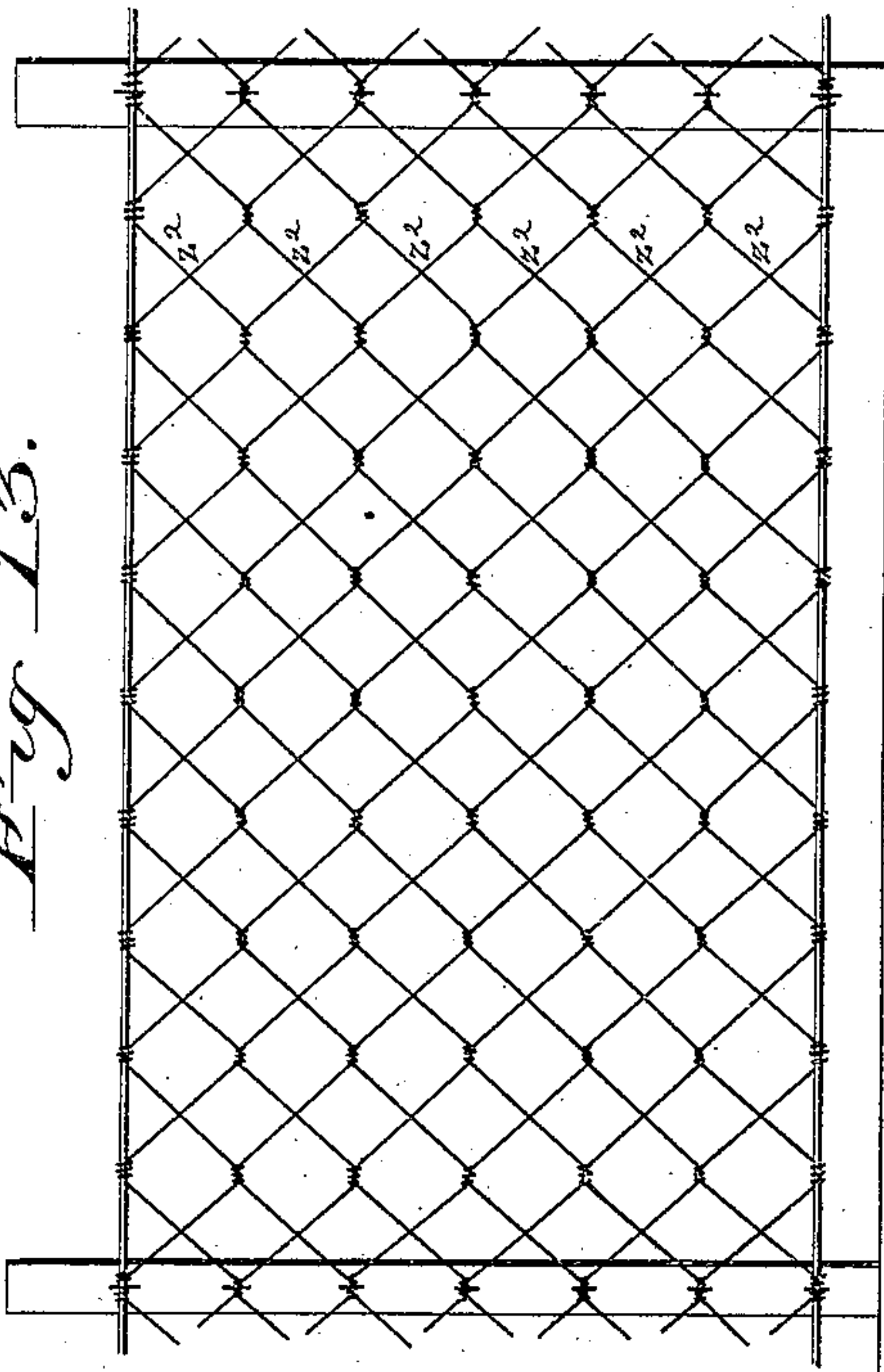


Fig. 21.

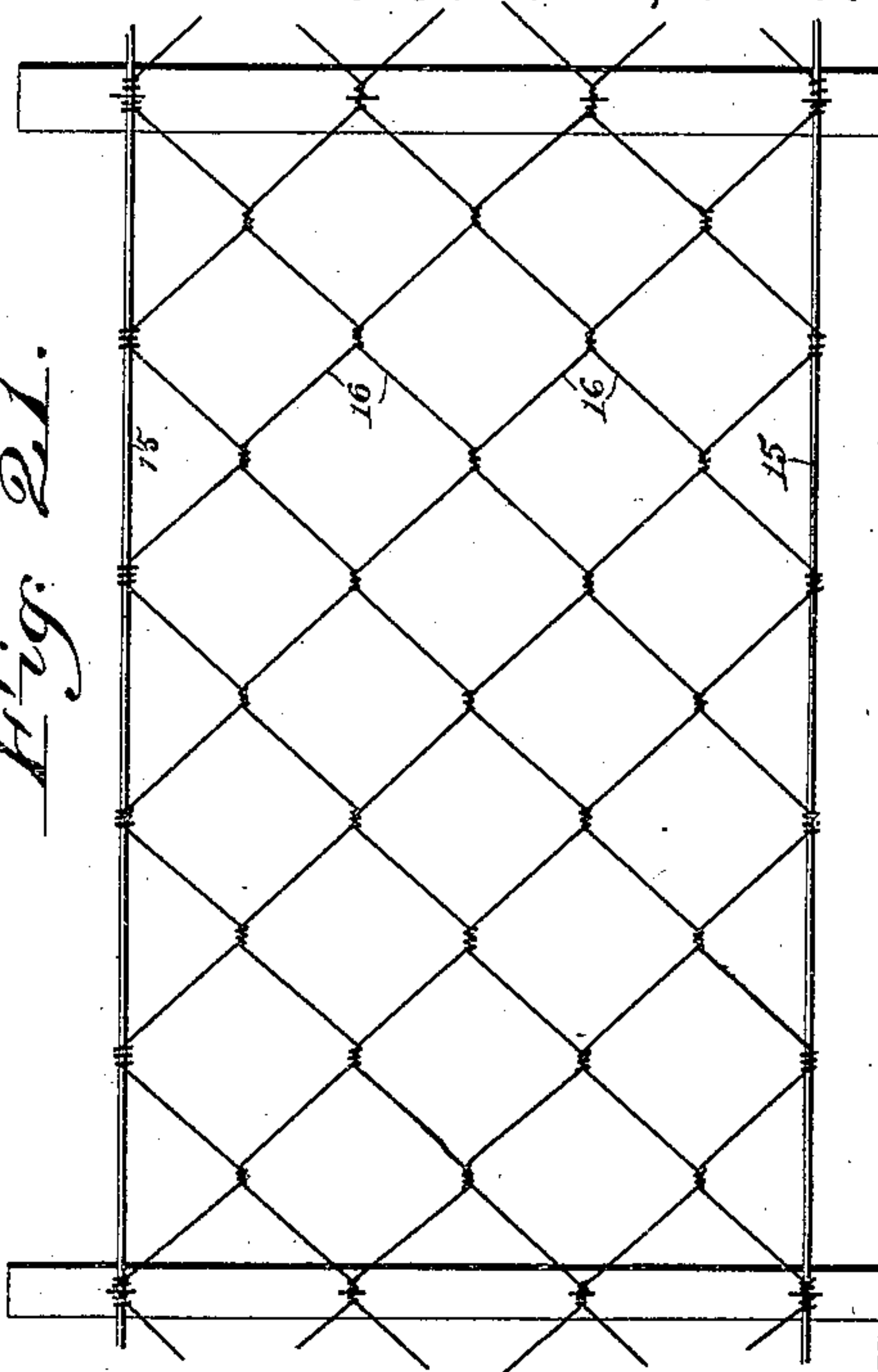


Fig. 11.

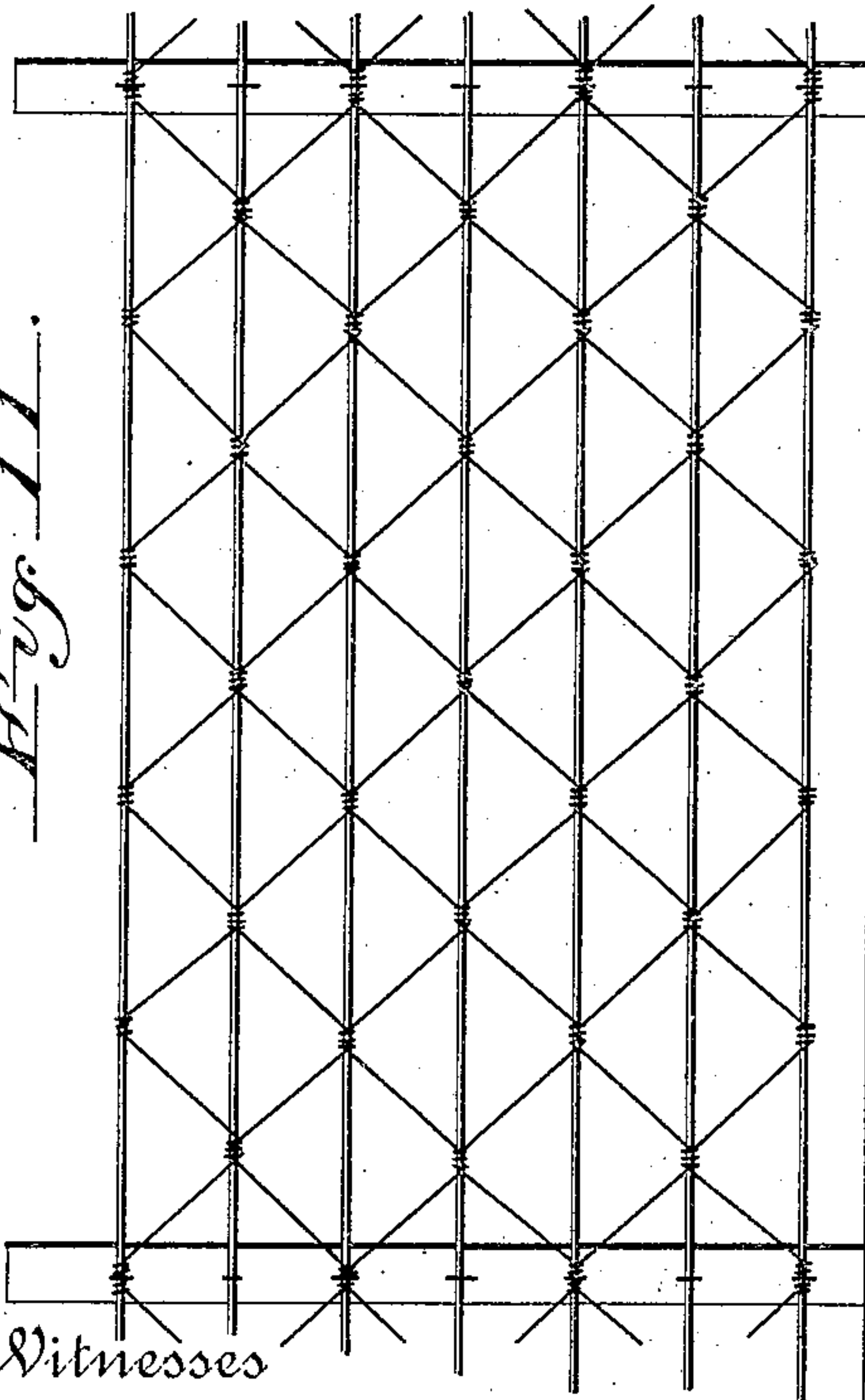
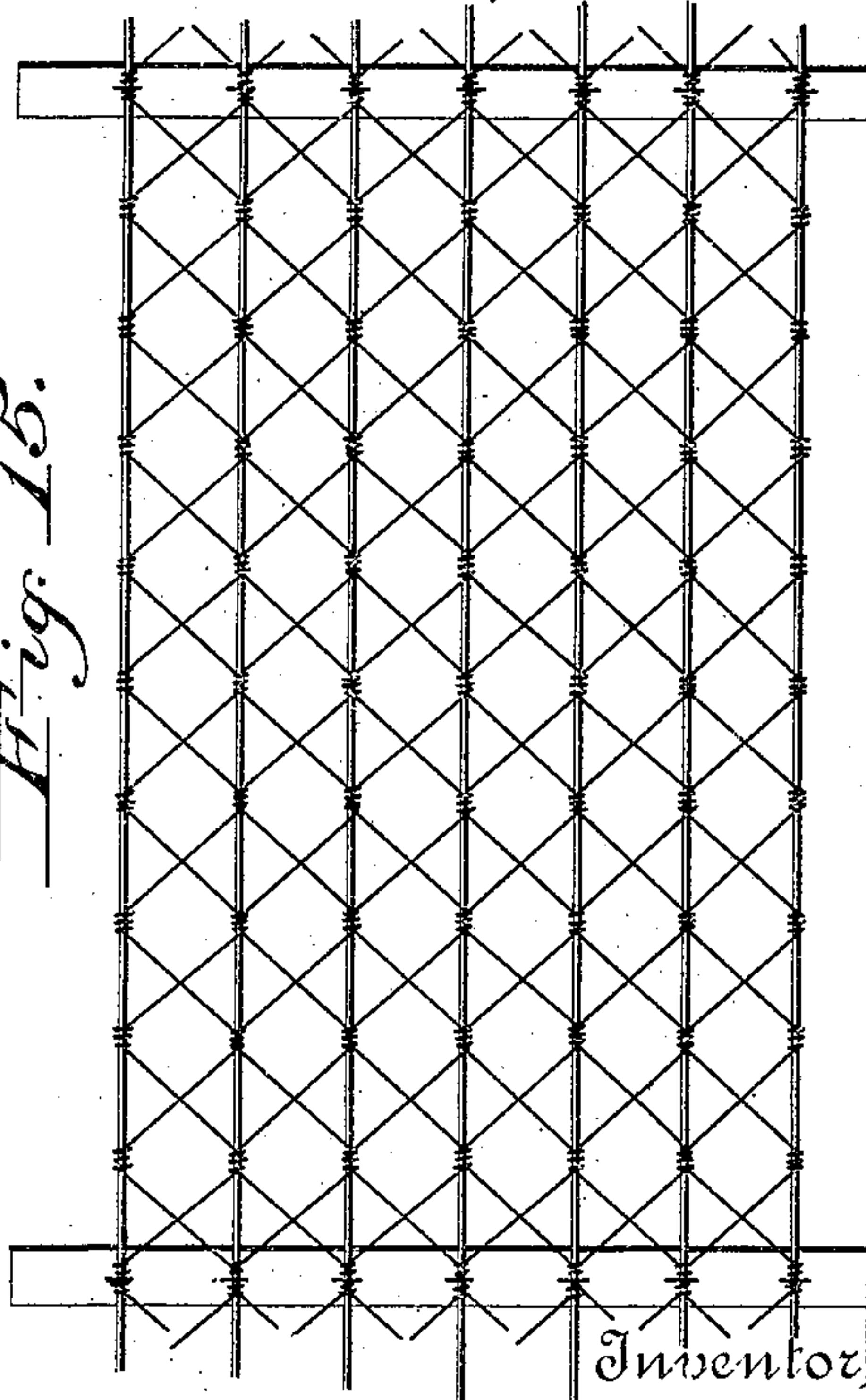


Fig. 15.



Witnesses

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(No Model.)

8 Sheets—Sheet 8.

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Fig. 18.

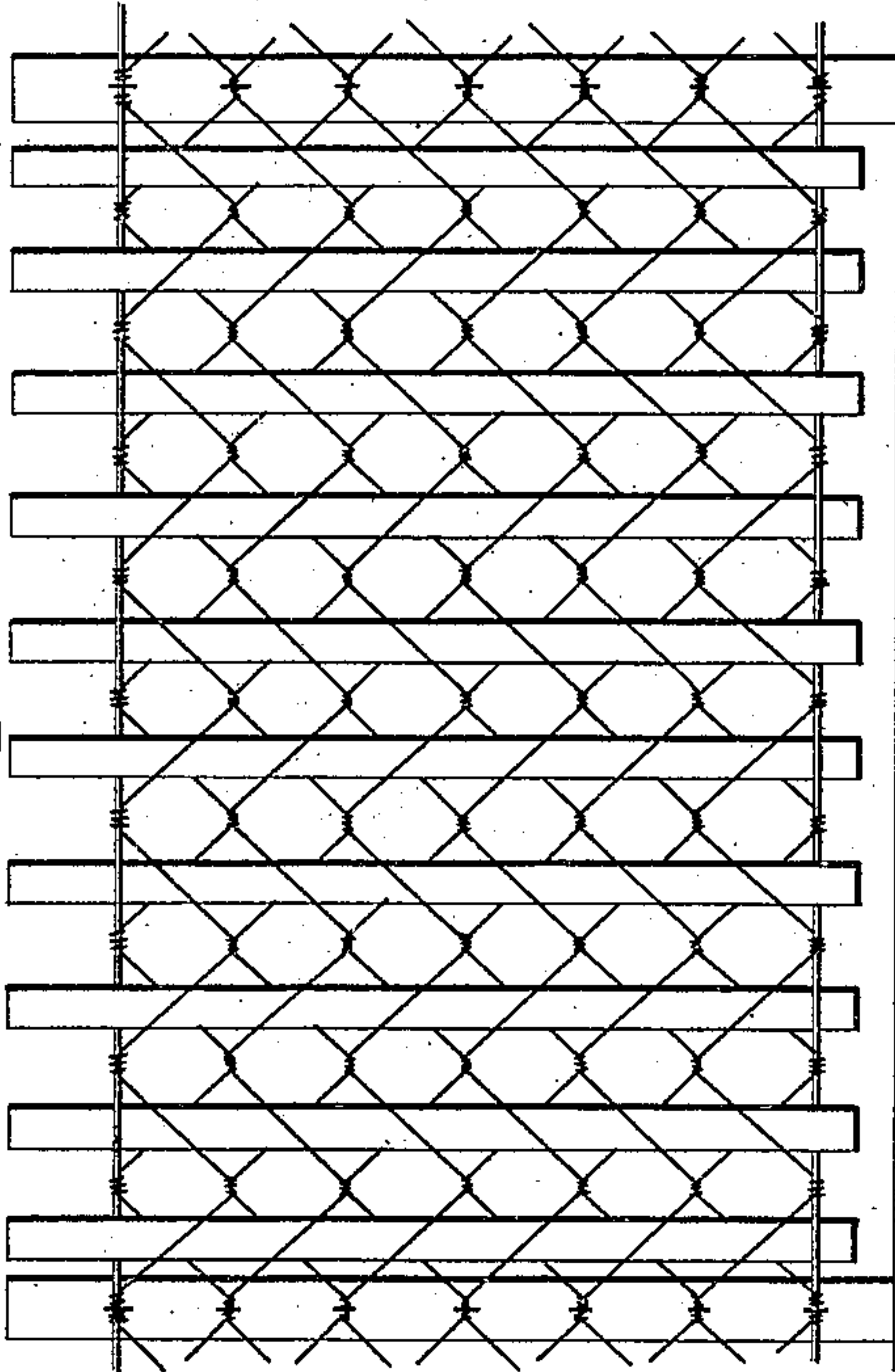
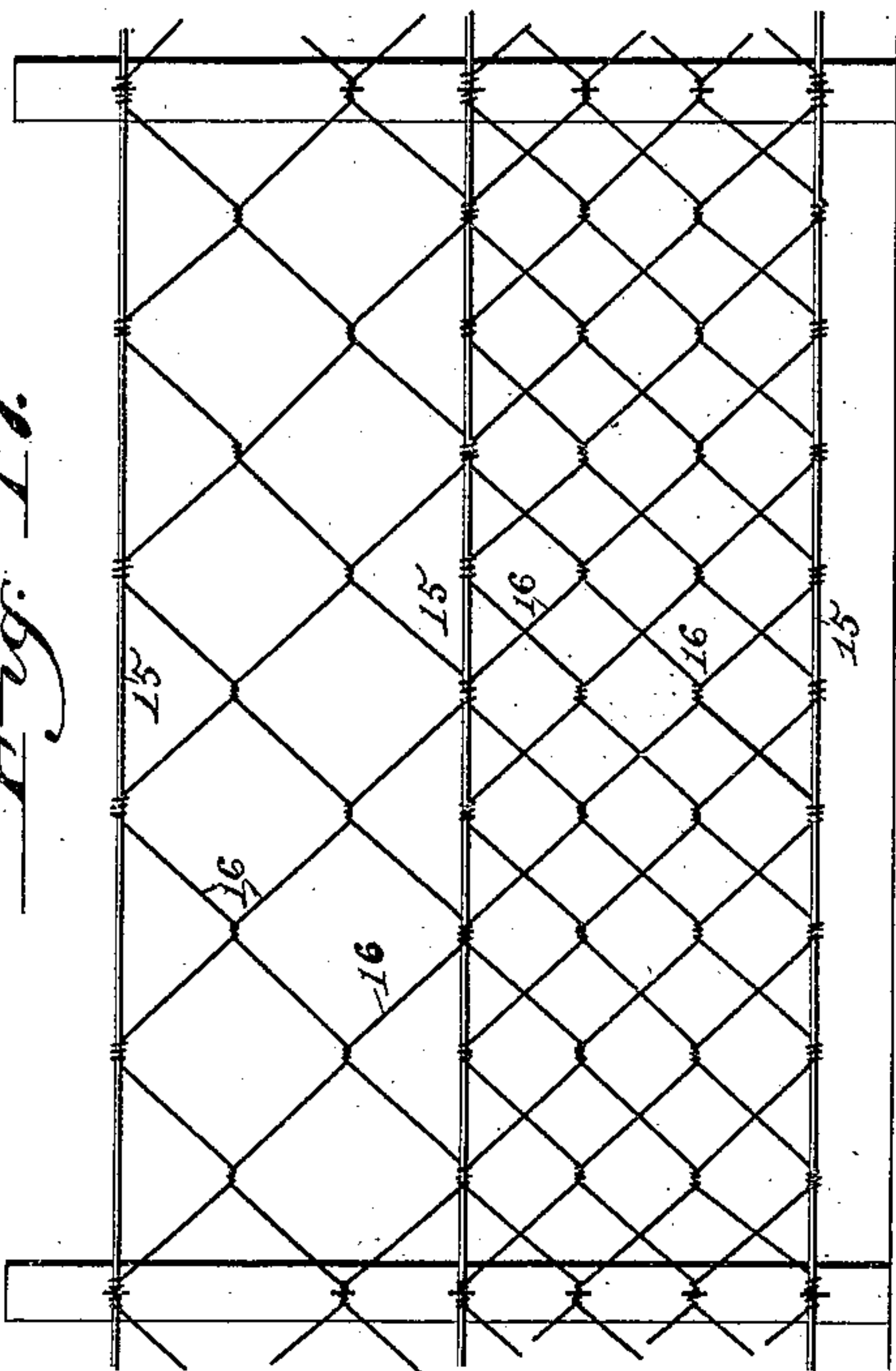


Fig. 17.



Witnesses

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W. Peruchas

Fig. 20.

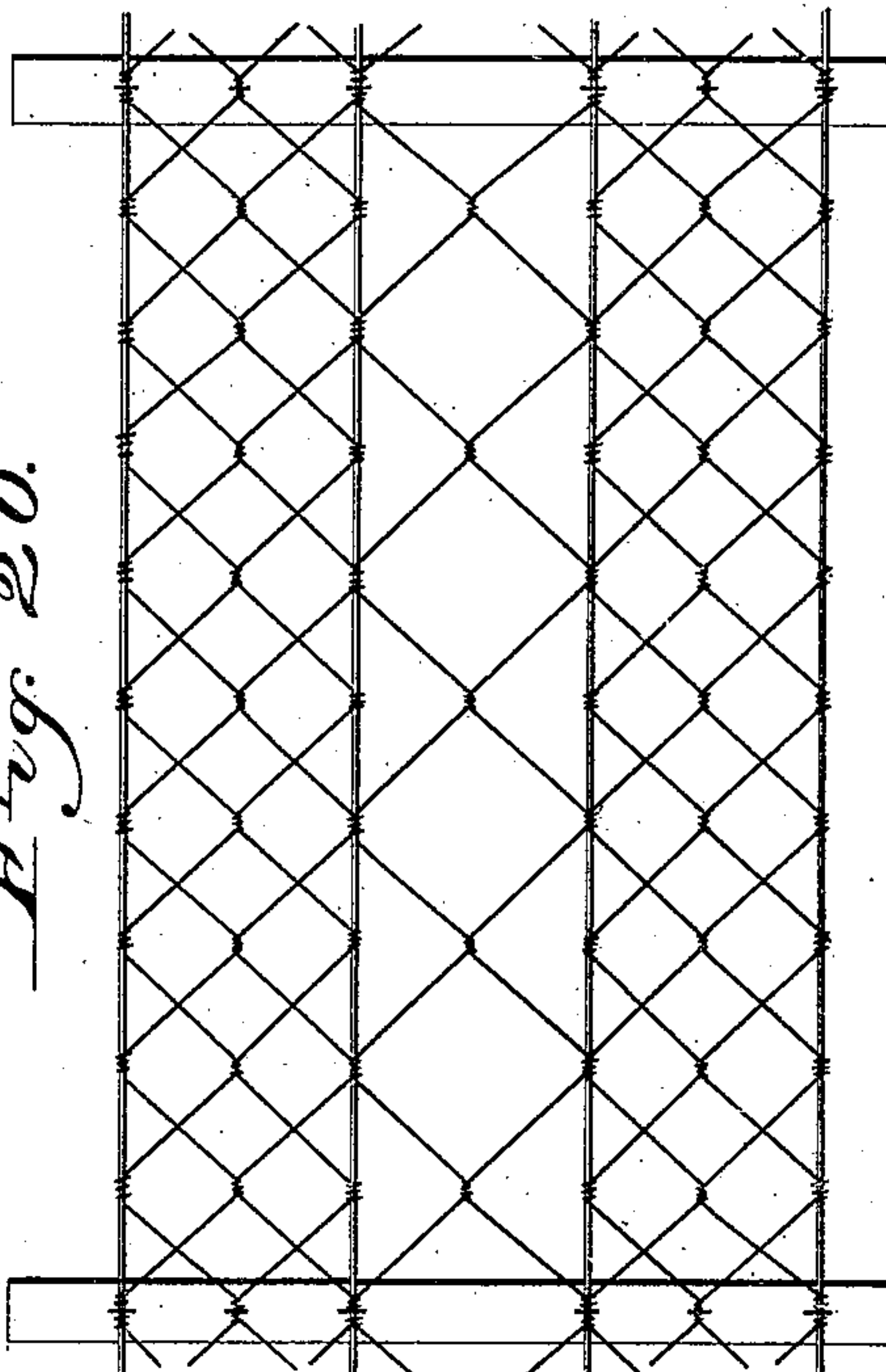
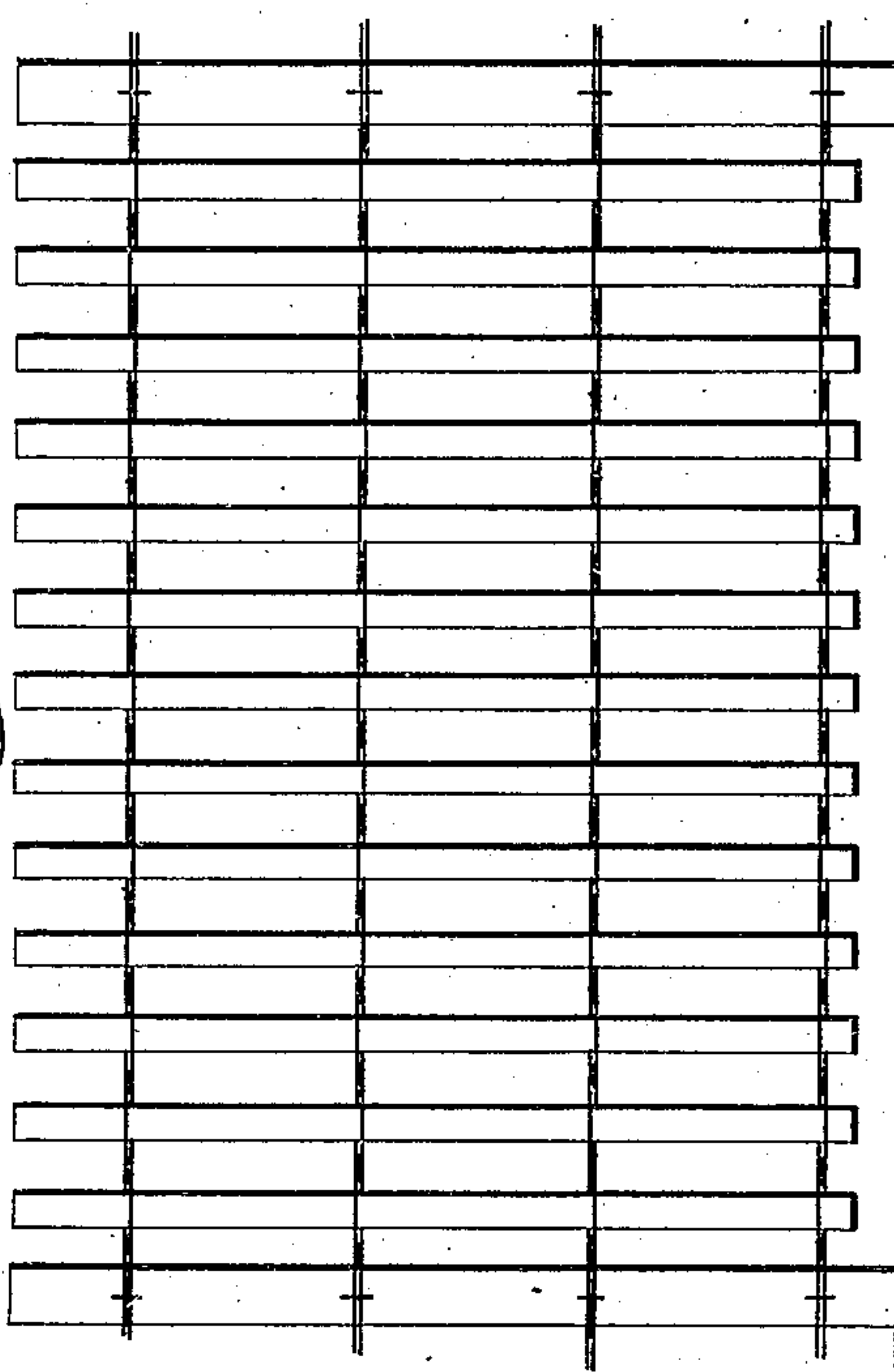


Fig. 19.



Inventor,

Alva L. Kitzelman,

By his Attorneys

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

ALVA L. KITSELMAN, OF RIDGEVILLE, INDIANA, ASSIGNOR OF ONE-THIRD
TO DAVIS M. KITSELMAN, OF SAME PLACE.

WIRE-FABRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 356,322, dated January 18, 1887.

Application filed August 13, 1886. Serial No. 210,818. (No model.)

To all whom it may concern:

Be it known that I, ALVA L. KITSELMAN, a citizen of the United States, residing at Ridgeville, in the county of Randolph and State of Indiana, have invented a new and useful Improvement in Wire-Fabric Machines, of which the following is a specification.

My invention relates to machines for making twisted wire fabric for use as fencing and analogous purposes; and it consists of the peculiar combination and novel construction and arrangement of the various parts for service, substantially as hereinafter fully set forth, and particularly pointed out in the claims.

The primary object I have in view in my invention is to provide a simple and easily-operated machine of the class named which can be adapted for use in the open field or other place for the construction of fences, as well as a stationary or fixed machine for the manufacture of wire fabric.

A further object of my invention is to provide a machine of the class specified which can be adapted for the manufacture of different classes or designs of wire fabric and fences, when used as either a portable or stationary apparatus, without requiring any adjustment or interchange of its parts.

In the drawings hereto annexed, which illustrate a wire-fabric machine embodying my invention, Figure 1 is a side elevation of the machine in its portable form, the same being mounted on wheels and running or traversing on a track which is placed in the open field or road, so that it is adapted for making or constructing the fence as it is moved or fed along. Fig. 2 is a front elevation with the twist-ers threaded to form the style of fence illustrated in Fig. 21. Fig. 3 is a rear elevation with a portion of the casing or main frame broken away to show details of construction. Fig. 4 is a vertical longitudinal sectional view on the line *x x* of Fig. 3. Fig. 5 is a vertical transverse sectional view on the line *y y* of Fig. 4, looking in the direction of the arrow 1. Fig. 6 is a similar sectional view corresponding to Fig. 5 on the line *z z* of Fig. 4, looking in the direction of the arrow 2. Fig. 7 is a detail perspective view of one of the sectional twist-ers with the parts or sections

thereof separated from one another. Fig. 8 is a partial front elevation differing from Fig. 2 in showing the position of the twist-ers after the vertically-movable frames or slides have been operated. Fig. 9 is a partial side elevation illustrating the position of the slides or vertically-movable frames after they have been adjusted. Fig. 10 is a partial front elevation showing a different manner of threading the twist-ers. Fig. 11 is an elevation taken from one side of the fence that is made by the machine when it is threaded as shown in Fig. 10. Fig. 12 is a partial front elevation showing another method of threading the twist-ers. Fig. 13 is an elevation of the plan of fence made when the machine is threaded as shown in Fig. 12. Fig. 14 illustrates another plan of threading the twist-ers. Fig. 15 is a view of the style of fence made by the machine when it is threaded as shown in Fig. 14. Fig. 16 is a view of another style of fence with the corresponding plan of threading the disks or twist-ers. Figs. 17, 18, 19, and 20 are views of additional styles of fencing which may be made with my machine. Fig. 21 is an elevation of the style of fence made when the machine is threaded as shown in Fig. 2.

Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures, A designates the main frame or casing of my improved wire-fabric machine.

When the apparatus is to be constructed in portable form, so that it is adapted for use in the open field, road, or other place for putting up or constructing fences as the fabric is turned out or manufactured by the same, the carrying-frame A comprises the vertical standards or uprights *a a* and *a'*, which are arranged parallel with each other and connected and braced by suitable cross or transverse pieces, *a''*; but the shape of this frame is immaterial, and I would have it understood that I hold myself at liberty to vary and change the same as may be desired.

When the machine is to be transported and used in the open field, it is mounted upon supporting rollers or wheels B and B', which are arranged in pairs at the front and rear ends thereof, respectively. The front rollers or wheels, B, are provided with smooth or plane

peripheries and travel on the smooth surface of a board or other suitable track, B³, that is placed on the ground or other place, and the rollers B' are provided with teeth on their peripheries, as clearly shown in the drawings, the said toothed wheels meshing with the racks b, that are arranged at the sides of the board or track B³ and rigidly affixed or secured thereto in any suitable manner. The toothed wheels mesh with the toothed surface of the track, so that when they are rotated by the means which I will presently describe the main frame and the various parts of the operating mechanisms will be drawn along and thus fed at the required or proper rate, and the wheels B, with the smooth peripheries, are arranged comparatively close together, so that they will bear on the track between the racks or toothed surfaces at the sides of the latter, whereby the frame is rendered very steady in its movement.

The toothed supporting wheels are rigidly affixed in any suitable manner to a common shaft, b', so as to rotate or turn therewith, and this shaft is journaled in suitable bearings on the main frame at the lower rear side thereof. One of the ends of this shaft b' is extended beyond the sides of the vertical main frame, and to this extended end is rigidly affixed a ratchet-wheel, b², with the teeth of which engages the pointed or free end of a pawl, b³, that is pivoted on and carried by a hand or operating lever, B⁴, which is provided with an eye or opening at one end, through which the shaft is passed, so that the lever is supported on the shaft and free to move thereon independently of the same. This ratchet mechanism is designed to be operated by hand to feed the frame and other parts of the mechanism along to any required distance; but I do not intend to restrict myself to the peculiar construction and arrangement of the parts of the same, as they can be varied without departing from the spirit of my invention.

The distance which the main frame can be moved can be easily and readily regulated or varied by the operator by causing the pawl of the hand-lever to slip over two, three, or more teeth of the ratchet-wheel, so that the mesh of the wire fabric or fence can be made of uniform size or varied as may be necessary, according to the design of fabric selected, as will be very readily understood.

The main frame A carries a series of devices for twisting the wire into open spaces or loops, and, for the sake of clearness and convenience, in describing or referring to these devices hereinafter I will term them as "twisters." Any preferred or desired number of these twisting devices may be employed that may be deemed desirable or necessary, and in the accompanying drawings I have shown a series of seven, and will confine my description of the operation of the machine to this number of these devices; but I would have it understood that I hold myself at liberty to vary and change the number thereof to adapt the machine to

manufacturing wire fabric of any desired width, or to constructing fences of varying or different heights.

In order to render the operation of my machine more clear and explicit, I have lettered these twisters C D E F G H I. The twisters from C to I, inclusive, form the active twisters, and at the top and bottom I provide two inactive twisters, I' I²; and in describing the process of manufacturing the different classes or kinds of fabric I will describe the method or manner of threading the twisters, and also in which the fabric is formed. Each of these active twisters consists, essentially, of two oppositely-movable sections, J and K, and a stationary section, L, these terms being used for the purpose of distinguishing the parts of the twisters. In Fig. 7 of the drawings I have shown one of these active twisters with the parts detached from each other, and will now describe the said parts separately from each other. The oppositely-movable sections J K of each of the active twisters are made precisely or substantially alike, and they each consist of a tie or connecting bar, j, and two segmental heads, j', which are formed integral with the tie-bar and at the extremities of the latter. These segmental heads of the movable sections of the twisters are placed on opposite sides of the stationary sections of the twisters, so that the flat sides of the said segmental heads of the movable sections impinge or bear against the stationary section on their flat or straight sides, and their outer curved edges form a complete circle, whereby the stationary and movable sections of the twisters are adapted to impinge upon each other and to revolve together, so as to form the twist in the loop during the process of manufacturing the fabric.

As before stated, each of the movable sections of each twister is cast or formed in a single piece of metal, and the segmental heads j' of the twister-sections are each provided with a transverse aperture or opening, j², except one of the movable sections of the upper and lower twisters, C I, respectively, for the free passage of the wire, as more fully described presently, and said heads are further provided with radial or outwardly-projecting arms or ribs k, which impinge or bear against the sliding frames to prevent longitudinal play of the same. These arms are also formed or cast with the twister-sections, and they are arranged to project beyond the periphery of the segmental heads, and at or near the straight inner side thereof, for the purpose described.

The stationary or immovable section L of each twister consists of a tie or connecting bar, l, and the flat heads or ends l', formed or cast in a single piece therewith at opposite extremities of the tie or connecting bar, the heads or ends of the tie-bar being made of the same thickness or width as the bar itself, so that the sides of the tie-bar and heads thereof are in line with each other. The extremities of the heads l' of the central stationary section of each

twister are extended beyond the upper and lower sides of the tie or connecting bar, as at l^4 , so that when the said central section is rotated with the side sections of the twister to form the twist in the loop the extended ends l^4 will impinge upon the inner sides of the main carrying-frame, and thereby prevent the central section from longitudinal movement. The stationary section of each twister has a cylindrical shaft or bearing-piece, l^2 , cast in a single piece therewith, and this shaft is arranged at the rear end of the section and projects outwardly beyond one of the heads thereof, as shown, the shaft and the heads of the tie-bar being provided with passages or openings l^3 , which are in line with each other, so that the warp-wires of the fabric or fence can pass through the said openings very freely without hinderance or danger of becoming entangled with other parts of the apparatus.

The inactive twisters I and I' are arranged at the upper and lower ends of the main frame and on opposite sides of the central sections of the active twisters, and said inactive twisters are merely fitted in and carried by the sliding frames to coincide with the central sections of the active twisters C I; but they do not affect the operation of the machine.

M and N designate the sliding frames, which are arranged within the uprights a of the main frame A and on opposite sides of the twisters. These sliding frames each consist of two vertical pieces, m , which are connected by suitable transverse pieces to render the frame rigid and strong, and which bear against the inner sides of the uprights a of the main frame. The upright a at the front of the main frame and the uprights m of each of the sliding frames are each provided with an opening or aperture, a^3 and m' , respectively, the opening a^3 of the main frame being circular, and the openings m' of the sliding frames are formed on the inner edges of the sliding frames and semicircular, so that when the sliding frames coincide the said openings or recesses m' register to form a complete circle, and these openings a^3 in the front uprights, a , of the main frame are connected by vertical slots or passages a^4 , and a space, m^2 , is left between the contiguous edges of the sliding frames for the stationary sections L, as will be very readily understood. The openings a^3 and m' of the main and sliding frames are adapted to register or coincide, and they are equal in diameter to the diameter of the circle formed by the semicircular heads or disks at the ends of the movable sections of the twisters. It will thus be seen that I provide one of the uprights of the main frame and both uprights of the sliding frames with a series of circular openings, which are connected by intermediate spaces or slots, and that these openings and slots or spaces are arranged one above the other in vertical lines. The circular openings in the said main and sliding frames correspond in number with the number of twisters employed.

The twisters are arranged in series one

above the other, and the stationary section of each of the twisters is fitted between the contiguous edges of the sliding frames and located between the movable sections of the twisters, which are thus disposed on opposite sides of the stationary section. The central stationary sections of all of the twisters are arranged in a vertical line, and they are fitted or so arranged that the heads at the extremities thereof are fitted in the straight slots or spaces m^2 intermediate of the semicircular openings in the contiguous edges of the vertically-sliding frames, the shaft of the stationary section of the twister being passed through and suitably journaled in the rear uprights, a and a' , of the main frame, so that the stationary section of the twister is prevented from movement or play in a vertical line. The segmental heads at the extremities of the movable section of each twister are fitted so as to rotate very freely in the opening m' in the sliding frame, and the straight faces of the heads of the movable sections and the tie or connecting bars thereof are normally in contact with the head and tie-bar, respectively, of the corresponding stationary or central section of the twister, whereby all three of the sections of each of the twisters are adapted to be rotated in vertical planes together or simultaneously for the purpose of forming the twist in one of the loops of the fabric, all of the said series of twisters being geared together to adapt them to be rotated at one operation in order to twist the wires in the series of loops simultaneously.

From the foregoing description, taken in connection with the drawings, it will be seen that the heads of each section of each twister are fitted in the opening or recess in one of the sliding frames M or N, and when these frames are moved vertically these movable sections of the twisters are carried or moved with their respective frames, so that they are caused to coincide or register with a stationary central section of a twister above or beneath the section from which the movable section started before the sliding frame was shifted. Thus, for instance, when the sliding frame N is moved upwardly, the sections K of the twisters E and F are carried with it and caused to register with the stationary sections of the twisters D E, respectively, as will be very readily understood. The object of thus shifting or moving the sections J K of the twisters is to cause the wires that are fed therethrough to cross or incline, in order to prepare the wires for the subsequent operation of twisting them, which is accomplished by rotating the twisters one or more times, as may be desired, all as herein-after more fully described.

The sliding frames M N and the movable sections of the twisters carried thereby are operated or shifted vertically in opposite directions by a single movement of a single hand-lever, O—that is, when the frame M is moved upwardly, the frame N will be forced downwardly, and vice versa. This hand-lever O is journaled or fitted near one end on a central

pin or shaft, *o*, that is rigidly supported in the upper end of the main frame A, and the said lever is connected with the shifting or sliding frames by intermediate links, *o'*, which are
 5 pivotally connected with the lever and the frames, as is obvious.

Each of the shafts of the central section, L, of each twister is provided with a spur-gear wheel, *p*, which is rigidly secured thereto, so
 10 as to rotate therewith, and these gear-wheels are all of the same diameter and have the same number and proportion of teeth, so that all of the twist-ers are rotated at the same rate of speed and describe a complete circle or revolution in the same space of time. The gear-
 15 wheels mesh with each other, so that all of the twist-ers are rotated simultaneously, and these gear-wheels are operated at one time by a single crank, *O'*, that is arranged at one side of the machine, and is secured on a shaft, *p'*, which is
 20 journaled in suitable bearings affixed to the upright *a'* of the main frame, the said shaft having a small bevel gear-wheel or pinion, *q*, which meshes with a larger bevel gear-wheel, *q'*, on one of the shafts of one of the stationary sections of one twister. It will be seen that by rotating the crank the motion thereof will be commu-
 25 nicated to the shaft of one of the twist-ers through the bevel gear-wheel and pinion, and as all of these shafts are geared together the twist-ers are rotated simultaneously.

The warp-wires that compose the fabric are passed or threaded through the central section of the twist-ers through the aligned open-
 35 ings therein, and the woof-wires of the wire fabric or fence are passed through the transverse perforations or openings in the semicircular disk or head of the movable sections of the twist-ers.

The warp-wires are wound or coiled in bundles as they leave the factory, and they are unwound in rear of the machine and stretched for a suitable distance—say fifty rods—upon the posts in rear of the machine, and they
 40 serve as stays to aid in keeping the machine vertical, the said warp-wires being passed through suitable openings in the upright *a'*, thence through the shaft of the central stationary section of the twister, then through
 50 the aligned openings therein, and out of the opposite side of the machine through the circular openings in the upright *a* at the front of the main frame. The woof-wires are coiled upon spools or bobbins R, that are loosely
 55 journaled in brackets *r*, which are affixed very rigidly to the outside of the movable side sections of the twist-ers by means of suitable bolts or screws, which are passed through the brackets, and the tie-bar of the movable section,
 60 each of the said movable sections of the twist-ers, except the inactive sections I I' and one of the movable sections of the twist-ers C I, being provided with a spool or bobbin, which is carried thereby and rotates therewith during the
 65 operation of twisting the wire *b* to form the loops. The wire from these spools or bobbins R is passed through the transverse opening

in the head of the movable side sections of the twist-ers, and thence through the circular opening in the front upright, *a*, of the main frame. 70
 One of the movable sections of the twist-ers C and I at the extreme upper and lower ends of the machine, however, is not provided with the bobbins R for the woof-wires, because when the shifting frames M N are moved vertically 75
 one section of one twister C and the section of the twister I on the opposite side of the stationary central sections of all of the twist-ers will be thrown above and beneath the circular openings in the main frame, and hence it is 80
 impossible to pass or feed the woof-wires through the said movable section of the twist-ers therein, and when the frames M N are shifted to one position, as in Fig. 8, the inactive sections I I' are adjusted to register with 85
 the stationary sections L of the twist-ers C I, the inactive twist-ers being provided merely to properly rotate the twist-ers C I. The warp-wires, however, are passed through the central stationary sections of the said twist-ers. 90

In order to attain a clear understanding of the shifting of the movable side sections, J K, of the active twist-ers by the sliding frames M N, I shall designate the central stationary sections by the reference-letters which distinguish 95
 the twist-ers from each other—as, for instance, C D E, &c.—and the movable side sections of the twist-ers by the numerals from 1 to 12, inclusive, as clearly shown in the end eleva-
 100 tions.

To make the style of fence shown in Figs. 1 and 21 of the drawings I proceed to thread the twist-ers as follows: The end twist-ers, C I are threaded with the large wire, which is to form the warp, by passing it through the 105
 aligned openings in the central stationary part or section thereof, and the smaller-sized wires, that form the woof of the fabric, are then passed through the twister-heads 1, 4, 5, 8, 9, and 12, and it will thus be seen that no wires 110
 are passed through the twister-heads 2, 3, 6, 7, 10, and 11, and the inactive twist-ers I I', and the blank sections of twist-ers C I. When using the machine to construct a fence in the field, one end of the large wires from the cen- 115
 tral section of twist-ers C I is attached to the fence-post just beyond the machine. The large wires 15, which pass through the central sections of the upper and lower twist-ers C I, form the warp for the woven-wire netting or fabric, 120
 while the smaller wires, 16, which are inserted through the heads of the side movable sections of the twist-ers, form the weft or woof of the netting. The wires 15 should be stretched taut by means of suitable stretchers located 125
 any desired distance from or in rear of the machine; but I have not deemed it necessary that these stretchers shall be shown, as any device for accomplishing this end can be used. With the warp-wires 15 arranged as shown 130
 and described to form the selvage of the wire netting or fabric, and the weft or woof wires arranged through the twister-heads of the sections J K, to make the style of fence in Figs.

1 and 21, I proceed as follows: The lever O is pressed down to move the slide M downward and by the same movement force the sliding frame N upward, inasmuch as the slides move in opposite directions simultaneously. By moving the sliding frame N upward the side sections of the twist-ers that are located in the sliding frames are forced upward correspond-
 5 ingly, and the side sections J of the twist-ers in the sliding frame M are forced downward with the frame by the same movement of the lever. Thus the section 1 of the upper twister, C, which has one of the weft-wires 16, will be carried down and brought on a line to coin-
 15 cide with the central section of the twister D. By the same vertical movement of the sliding frames M N the twister-heads 5 and 9 are carried down opposite to the central section, L, of the twist-ers F and H, and the twister-heads 4, 8, and 12 are carried up opposite to the cen-
 20 tral sections of the twist-ers D, F, and H, one twister receiving one of the side sections from the adjoining twister and giving one of its own side sections to the said adjoining section. (See Figs. 8 and 9, and compare the same with Figs. 12 and 2.) The blank inactive twist-ers I I' are thus caused to register with the central section, L, of twist-ers C I and the blank sec-
 25 tions of twist-ers C I are reversed, as is ob-vious. In this manner the side sections, J K, which have weft-wires 16 passed through them, coincide with the twist-ers D, F, and H, which originally had the side sections without any weft-wires. While the machine is in this
 30 condition, with its weft-wires all located at the twist-ers D F H, the crank O' is turned, caus-
 35 ing the rotating of all of the twist-ers simul-taneously as they are geared together for in-stantaneous operation. The number of com-
 40 plete turns given to the twist-ers will regulate the number of twists which are made in the wires.

As the twist-ers are geared together, one twister will turn in one direction and the ad-
 45 jacent twister will turn in the opposite or re-verse direction; but at the same time each twister will make the proper twist on the two weft-wires without interfering with each other.

It will be understood that the throw or
 50 movement of the sliding frames M N is just sufficient to cause the side sections to align or coincide with the central section of the twist-ers above and beneath the same, according to the direction in which the side sections are moved
 55 by the sliding frames. In turning the twist-ers to make a complete twist, it is necessary to completely revolve the twist-ers—that is, transfer one side section from the sliding frame M to the sliding frame N, and then return it
 60 again to the frame M. This turning of the twist-ers is kept up to correspond with the number of twists to be made at the crossing of the wires. When the twisting is completed at this point, the sliding frames are shifted back
 65 to their original positions by properly ma-nipulating the hand-lever, thus returning the side sections, J K, to their proper central sec-

tions. The weft-wires are now located as fol-
 lows: The single weft-wires at the twist-ers 1 and 12 extend alongside of the warp-wires 15. 70
 The double weft-wires at the twist-ers 4 5 and 8 9 are arranged on each side of their respect-ive central sections, C E, and while in this position the crank is again turned to cause the rotation of the twist-ers and consequent twist-
 75 ing of the wires at the points designated. The single end weft-wires twist around the warp-wires and the double weft-wires twist upon themselves or around each other. Having now reached the point from where the opera-
 80 tion started, it is not necessary to continue further, since by repeating the operation over and over again the wires are inclined and twisted to form additional meshes or loops of the netting, as will be very readily understood. 85
 It will be plain that by the alternate shifting of the sliding frames M N up and down the weft-wires are extended down and up in alter-nate series, and thus woven together to form the mesh when the twist-ers are rotated. 90

I illustrate another style of fence in Fig. 11, and I will proceed to describe the manner of weaving the wires. In this form of fence I use the warp-wires at each of the several cen-
 95 tral sections of the twist-ers, and pass the woof-wires through the side twister-heads, 2, 3, 6, 7, 10, and 11, as shown in Fig. 10; or they may be passed through the heads 1, 4, 5, 8, 9, and 12, which will produce the same result. The manner of threading the twist-ers is shown 100
 in Fig. 10, and it differs from Fig. 2 only in having the warp-wires through all of central and through the side twister section-heads, as in Figs. 1 and 2—i. e., through numbers 2, 3, 6, 7, 10, and 11. It will be understood that 105
 the weft-wires in the style shown in Fig. 11 twist around the warp-wires, which are held straight and tight.

Referring to Fig. 12 will be seen the arrange-
 110 ment of the wires when constructing the style of fence shown in Fig. 13. Warp-wires are used at the top and bottom twist-ers, and the weft-wires are passed through both side sec-tions of all the twist-ers, except the top and bottom ones, which latter have only one weft-
 115 wire. By operating the slides M N of the machine the adjacent weft-wires are caused to cross each other, but not twist, at the points z^2 , the twisting being made at the point on the weft-wires reached when the slides come to 120
 the limit of their movements, as before ex-
 125 plained. The weft-wires cross at the point z^2 when about half of the movement of the slide has been made.

Referring to Fig. 15 will be seen another 125
 style of fence, which is, however, very similar to the plan shown in Fig. 13. The threading of the wires in the twist-ers to form the plan of fence seen in Fig. 15 is shown in Fig. 14. The arrangement of the weft-wires is the same 130
 as in Fig. 13, but the plan of the warp-wire is different, in the fact that in Fig. 14 all of the twist-ers have the warp-wires. It will be seen that the weft-wires cross each other at an in-

intermediate point before twisting around the warp-wires, just as in Fig. 13. At the end of each movement of the slides the twist-ers are rotated to effect the twisting of all the weft-wires around the warp-wires. The plan of fencing shown in Fig. 15 makes a very strong fence, the meshes being close together and the arrangement and connection of the warp and weft threads mutually bracing each other, and thus avoid any liability to sag.

The style of fence shown in Fig. 16 is made by threading the central sections of the twist-ers at the upper and lower side of the machine, C I, with large wire 15, then the central section of the twist-ers D E F G H with either large or small wire 16, and finally the twist-ers heads 2, 4, 6, 8, 10, and 12, as shown in Fig. 16, with small wire from the bobbins R. The sliding frames are now shifted and the twist-ers are rotated, after which the frames are returned to their former position, the same as in the operations hereinbefore referred to.

To make the style of fence shown in Fig. 17 of the drawings, the central sections, L, of the twist-ers C, E, and I, are threaded with the large warp-wires 15, and the heads 1 4 5 6 7 8 9 10 11 12 of the side sections, J K, are threaded with the small weft-wire 16 from the spools R, after which the sliding frames are shifted, the twist-ers rotated, and the frames returned to their normal position, as hereinbefore described. The mesh of the fabric shown in this figure is very wide at the top or upper half, and at the lower half it is very close to prevent small animals from passing through the lower part, as may be desired in some cases, and it also produces a very ornamental and pretty fence.

Fig. 18 shows another plan of fencing made by my machine, in which I employ pickets or slats, as shown. The threading of the twist-ers to make this form of netting shown in this figure, and the operation, are exactly the same as represented in Figs. 12 and 13. The palings or pickets are introduced by hand through the meshes of the wires as each mesh is completed.

Fig. 19 illustrates the common form of wood fence held together by wires. In this instance as many of the twist-ers are threaded with their side sections as will accord with the desired number of strands for the fence; but the central sections, L, have no wires passed through the opening at the front end thereof. It will be seen that the central and side sections of the twister have slots or openings. The wires for the side sections in this instance are passed through the central shaft or spindle of the central section; then they are separated, and one wire is passed through one side section and the other wire through the other side section. In this instance warp or larger wires only are used from the rolls or bundles in rear of the machine, and no woof-wires are fed from the spools R on the movable sections of the twist-ers. In making this style the sliding

frames M N remain inactive. The twist-ers are rotated in first one direction and then the other to twist or weave the wires between the slats or pickets in a straight line, the pickets being introduced by hand, of course.

In Fig. 20 I have shown still another form of fence that my machine is capable of making. In threading the machine for this style each alternate central twister is threaded, C, E, G, and I, with the warp or large wires, and the heads 1, 2, 3, 4, 5, 8, 9, 10, 11, and 12 are threaded with the small or woof wire, after which the slides and levers are operated in the manner hereinbefore described to form the twists and meshes of the fabric.

It will be observed that I provide a simple and strong machine which is capable of doing a variety of work without adjusting or changing any of its parts. The machine has very few parts when the character of the work to be performed thereby is taken into consideration, and the arrangement of the parts is such as to avoid the possibility of the machine getting out of working order.

I may either construct a portable machine, as shown in the accompanying drawings, to work in the open field or other place, or dispose the parts in a horizontal instead of a vertical position and mount the same on suitable bearings and legs to provide a stationary machine for indoor use.

I do not wish to be understood as confining myself to the exact details of construction and form and proportion of parts herein shown and described as an embodiment of my invention, as I am aware that numerous changes therein can be made without departing from the spirit or sacrificing the advantages of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a wire-fabric machine, a series of sectional twist-ers, each of which comprises a central section for carrying a warp-wire, and having rotary movement imparted thereto, and the shifting sections for carrying the weft-wire, and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

2. In a wire-fabric machine, the combination of a series of sectional twist-ers geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

3. In a wire-fabric machine, the combination of a series of sectional twist-ers, comprising the central section having rotary movement imparted thereto to rotate the same on its axis only, the shifting side sections adapted to align with the central sections to be rotated thereby, and mechanism for shifting the said side sections to cause the side section of one twister

to coincide with the central section of the adjacent twister, substantially as described, for the purpose set forth.

4. In a wire-fabric machine, the combination, with the series of sectional twist-
ers, of the shifting frames carrying the movable sections of the twist-
ers being held from longitudinal movement during the shifting of the frames, and the side
sections being carried by the frames to cross the
wires, the side sections being rotated by the
central sections, substantially as described, for
the purpose set forth.

5. In a wire-fabric machine, the combination, with the sectional twist-
ers, comprising the central sections capable of rotating movement on
their axes only, and the side sections having
longitudinal movement and rotated by the cen-
tral sections, of the shifting frames carrying
the said side sections, which are capable of
free rotation therein, substantially as de-
scribed, for the purpose set forth.

6. In a wire-fabric machine, the combination of the sectional twist-
ers, comprising the central
section having the projecting heads, and the
side sections fitted against the central section,
and the sliding frames in which the side sec-
tions are carried and are capable of free rota-
tion, substantially as described, for the pur-
pose set forth.

7. In a wire-fabric machine, the sectional
twisters, comprising the central and side sec-
tions movable with respect to each other,
the sliding frames movable in opposite direc-
tions simultaneously and carrying the side
sections therewith, and means for shifting the
said frames, substantially as described, for the
purpose set forth.

8. In a wire-fabric machine, the sectional
twisters, comprising the central and side sec-
tions, in combination with the sliding frames
having the recesses in which the side sections
of the twist-ers are fitted, and a lever connected
with the slides for moving them in opposite
directions simultaneously, substantially as de-
scribed.

9. In a wire-fabric machine, the series of
sectional twist-ers, comprising the central and
side sections, the central section of each twister
being geared to the twister adjacent thereto
for simultaneous operation, substantially as
described, for the purpose set forth.

10. In a wire-fabric machine, the combina-
tion of a series of twist-ers geared directly to-
gether for simultaneous operation, and each
comprising a central section and the side sec-
tion, each side section carrying a spool or reel
for the wire, substantially as described, for the
purpose set forth.

11. In a wire-fabric machine, a series of
twisters connected for simultaneous operation,
and each consisting of a central section and
the side section, in combination with the
spools carried by the side sections, the central
section of each twister being provided with a
longitudinal opening for the passage there-

through of the warp-wire, substantially as de-
scribed.

12. In a wire-fabric machine, the combina-
tion of a carrying-frame, the sliding frames
therein, the sectional twist-ers having the sta-
tionary central section and the side sections
fitted in the sliding frames, and means for
moving the carrying-frame with a step-by-step
motion, substantially as described, for the pur-
pose set forth.

13. The combination of a series of twist-ers
geared directly together, and each consisting
of a central section capable of rotation on its
axis only, and the side sections, the oppositely-
movable slides in which the side sections are
fitted, the spools carried by the side sections,
and a lever for shifting the slides simultane-
ously, substantially as described.

14. The combination of a series of sectional
twisters, each consisting of a central section
having the projecting heads, and the side sec-
tions in contact with the central section and
having the segmental heads with their flat
sides in contact with the heads of the central
sections, the said heads of the central and side
sections forming a complete circle when the
sections are placed together side by side, sub-
stantially as described, for the purpose set
forth.

15. In a wire-fabric machine, the combina-
tion of a series of rotary twist-ers geared di-
rectly together for simultaneous operation,
each twister having a central section capable
of rotary movement only, and two side sec-
tions which are capable of a shifting move-
ment independently of the central section in
opposite directions simultaneously, whereby
the said shifting sections of one twister are
adjusted to register with the central sections
of twist-ers on opposite sides of the same, sub-
stantially as described, for the purpose set
forth.

16. In a wire-fabric machine, the combina-
tion of a series of rotary twist-ers geared to-
gether for simultaneous operation, each twister
comprising a central section capable of rota-
tion on its axis only, and the shifting sections
arranged on opposite sides of the central sec-
tion, each side section having segmental heads
which impinge upon the central section when
the twister is rotated, substantially as de-
scribed, for the purpose set forth.

17. In a wire-fabric machine, the combina-
tion of a series of rotary twist-ers, each of
which consists of two shifting sections capable
of movement in opposite directions simulta-
neously, and a central section having rotary
movement imparted thereto and interposed
between the shifting sections to impinge upon
the latter when they align therewith and ro-
tate the same, substantially as described.

18. In a wire-fabric machine, the combina-
tion of a series of rotary twist-ers, each of
which consists of a central section held from
endwise movement and capable of rotation on
its axis only, and the side sections capable of

shifting movement in opposite directions simultaneously, the side sections of one twister being arranged on opposite sides of the central section thereof and impinging upon the latter
5 to be rotated on their axes therewith, the twisters being capable of rotary movement only when the shifting side sections thereof are in line with the central section, substantially as described, for the purpose set forth.
10 19. In a wire-fabric machine, the combination of a series of rotary twisters, each twister comprising the shifting side sections provided with the segmental heads, through which the warp-wires are to be passed, and the central
15 section disposed between the side sections and held from shifting movement, the central sections of the series of twisters being geared directly together and impinging upon the side

sections when the latter are in line therewith, to rotate the said side sections, substantially 20 as described, for the purpose set forth.

20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their 25 axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth.

In testimony that I claim the foregoing as 30 my own I have hereto affixed my signature in presence of two witnesses.

ALVA L. KITSELMAN.

Witnesses:

JAMES W. McCAMISH,
HENRY P. KITSELMAN.