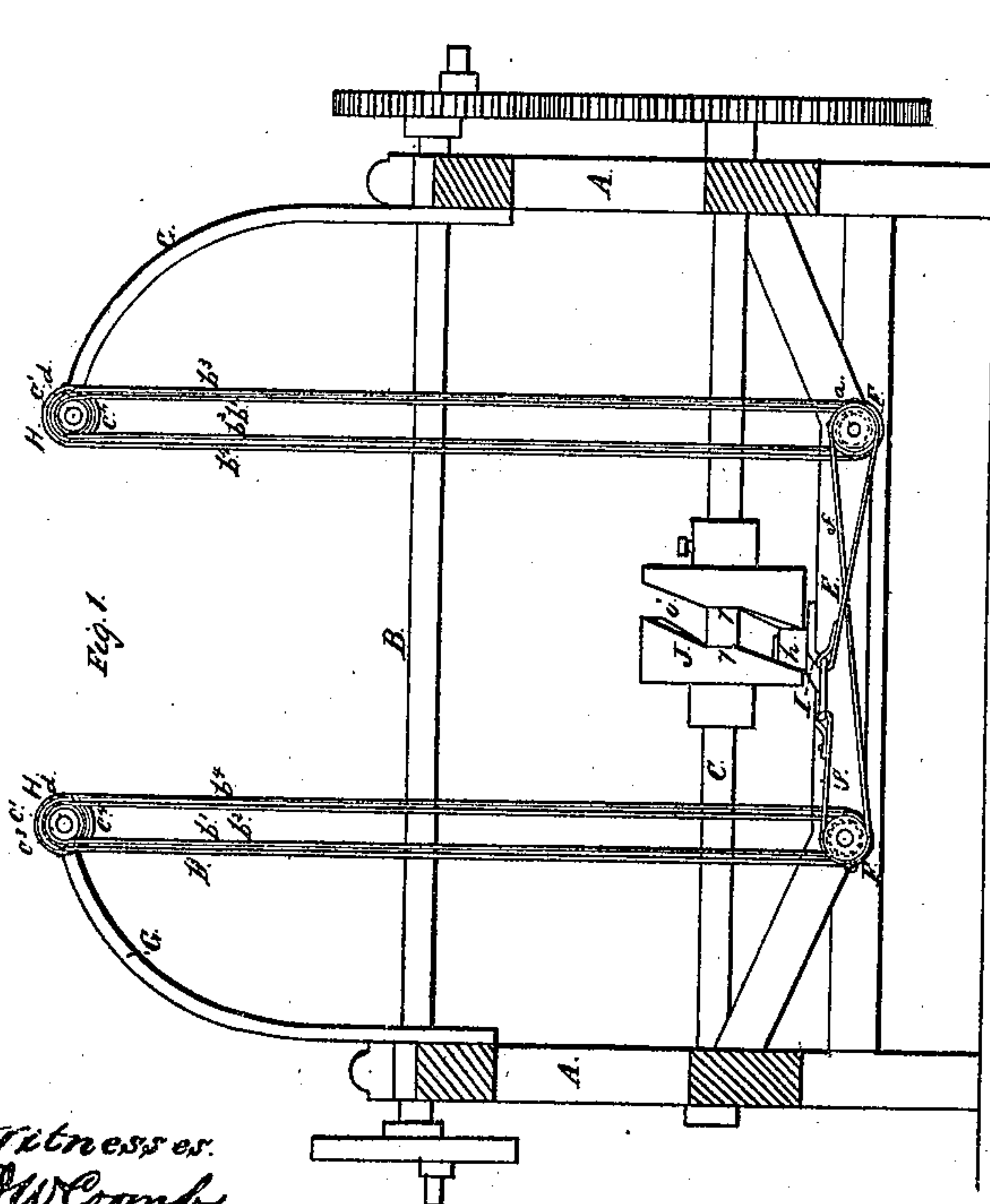
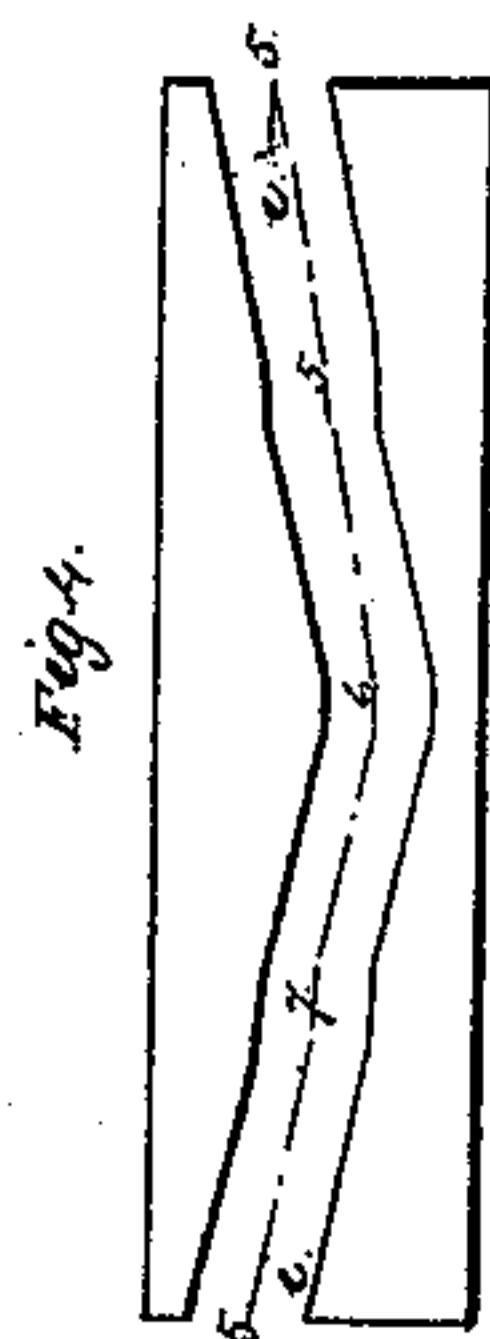
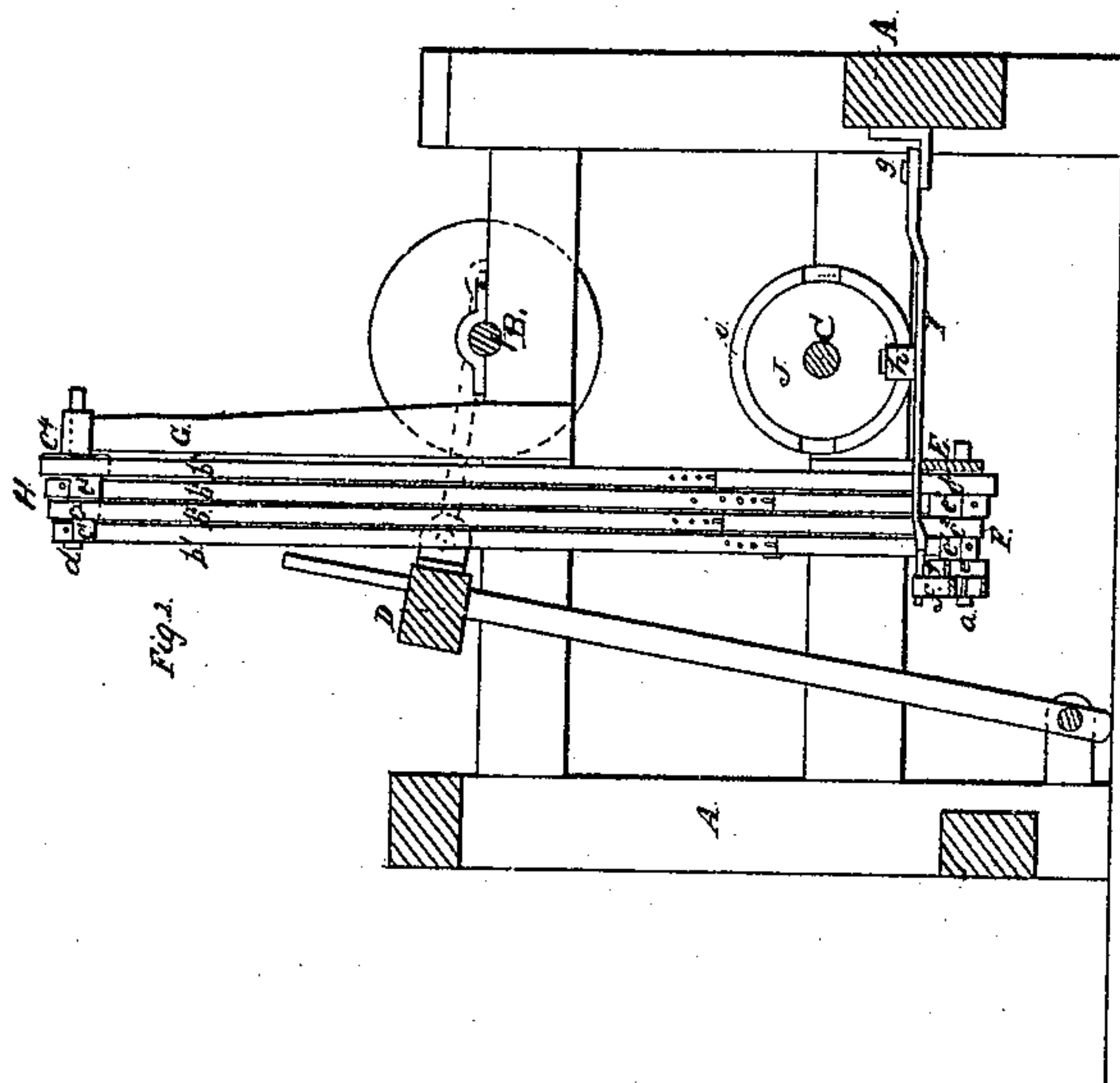


B. F. Knowles.
Weaving.

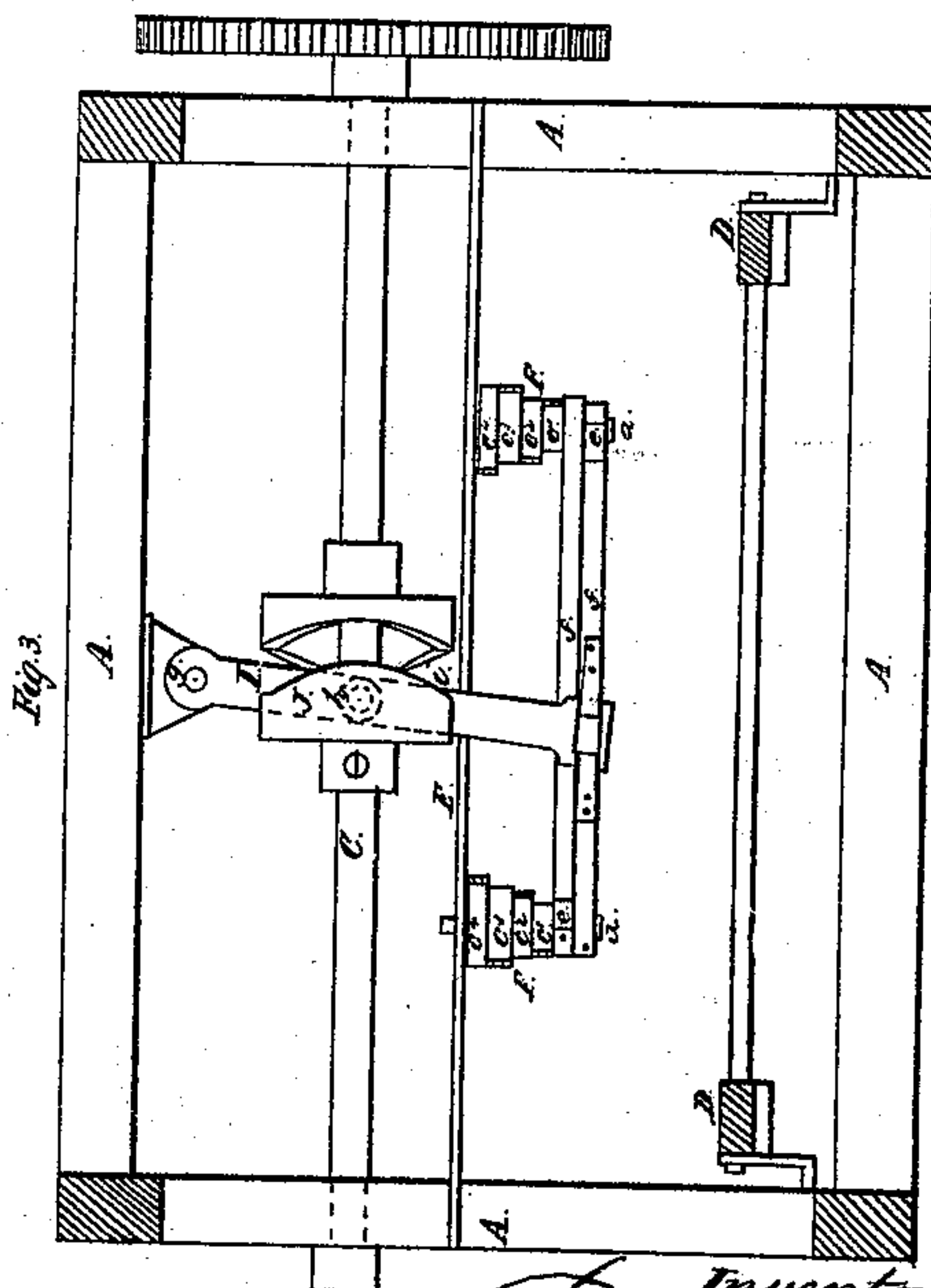
No 142.

31,176.

Patented Jan. 22, 1861.



Witnesses:
J. W. Comby
R. A. Spencer



Inventor
B. F. Knowles
by
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UNITED STATES PATENT OFFICE.

BENJ. F. KNOWLES, OF PROVIDENCE, RHODE ISLAND.

HARNESS-MOTION FOR LOOMS.

Specification of Letters Patent No. 31,176, dated January 22, 1861.

To all whom it may concern:

Be it known that I, BENJAMIN F. KNOWLES, of Providence, in the county of Providence and State of Rhode Island, have
5 invented a new and useful Improvement in the Harness-Motion of Power-Looms; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompany-
10 ing drawings, forming part of this specification, in which—

Figures 1, and 2, are vertical sections at right angles to each other of a power loom for plain weaving having my improvement
15 applied. Fig. 3, is a horizontal section of the same. Fig. 4 exhibits a projection of the harness cam in a plane form.

Similar letters of reference indicate corresponding parts in the several figures.

20 My invention consists in a novel system of cones of pulleys for supporting and operating the harness whereby several important advantages are obtained as will be hereinafter specified.

25 It also consists in certain means of producing a slower movement of the harness at the time of crossing the sheds, as compared with the greater portion of its movement whereby I am enabled to drive the loom at a
30 higher velocity that is to say to make a greater number of picks per minute without increased liability of doing injury to the warp at the time of crossing the shed.

To enable others to make and use my invention I will proceed to describe its construction and operation.

35 A, is the main framing of the loom; B, is the crank shaft; C, the cam shaft, and D, the lay all constructed and arranged in the
40 usual manner.

E, is a fixed rail extending across the lower part of the framing for the purpose of carrying the axles a, a , of two cones of pulleys F, F.

45 G, G, are two harness stands erected upon the side frames of the loom for the purpose of carrying the axles d, d , of two cones of pulleys H, H, which are similar to F, F, each cone consisting of four pulleys $c^1, c^2, c^3,$
50 c^4 , one for each of the four leaves of harness. The axles a, a , and d, d , are horizontal and parallel with the warp and with the planes of vibration of the lay and the smallest pulleys c^1, c^1 , are next the front of the loom
55 and the larger ones nearer to the back of the loom according to their size, the largest

c^4, c^4 , being nearest to the back. The two lower cones of pulleys F, F, are at equal distances from the center of the loom and the two upper ones H, H, are situated one
60 directly over each of F, F.

$b^1, b^1, b^2, b^2, b^3, b^3, b^4, b^4$, are the heddle straps four of which b^1, b^2, b^3, b^4 , connect the pulleys c^1, c^2, c^3, c^4 , of the cone F, with
65 the corresponding pulleys of the other cone H, the said straps being secured to the said pulleys and running on the said pulleys in opposite directions alternately from back to front, that is to say, the straps $b^1, b^1, b^3,$
70 b^3 , running up and down from and to the outer sides of their respective pulleys c^1, c^1, c^3, c^3 , and straps b^2, b^2 , and b^4, b^4 , running up and down from and to the sides of their
75 respective pulleys c^2, c^2 , and c^4, c^4 , so that while b^1, b^1 , and b^3, b^3 , are ascending and carrying up their two respective leaves of
80 heddles b^2, b^2 , and b^4, b^4 , are descending and carrying down their respective leaves of heddles. The heddles are not shown, as their rails are connected with the heddle
straps in substantially the same manner as in other power looms.

Each of the lower cones of pulleys F, F, has secured to it one of two pulleys e, e , which are connected by crossed belts f, f , at-
85 tached securely to their peripheries, and one of these belts is connected with a horizontally vibrating lever I, which works upon a stationary fulcrum g , near the back of the
90 loom. This lever carries an antifriction roller h , which works in the groove i , of a cam J, on the shaft C. Every revolution of this cam produces one vibration back and forth of the lever I, and the said lever act-
95 ing through the bands f, f , produces a rocking or reciprocating rotary motion of the two pulleys e, e , and their attached cones of pulleys F, F, and these latter operate the
100 heddle straps, the upper cones of pulleys H, H, being moved by the straps in a manner corresponding with the lower ones F, F. The advantage of this arrangement of cones and pulleys is that while every leaf of harness has a movement proportioned to its
105 distance from the filling point so that every shed is opened to the same width at the point where the shuttle passes through it, the harness stands are open at the top, permitting the weaver standing in front to at-
110 tend to the back part of the loom without going around. The arrangement is especially advantageous when four leaves of harness

are used in plain weaving as it allows alternate leaves to be raised simultaneously instead of raising the two more forward ones together and the two backward ones, so that the operation is practically equivalent to using only two leaves. Another advantage consists in the facility afforded for the drawing in of the web without any mistake, as the thread can be drawn in from the back to the front leaf of the heddles one after the other, instead of one thread through the first leaf the next through the third, the next through the second and the next through the fourth.

The retardation of the movement of the harness at the time of the crossing of the shed is produced by the peculiar construction of the groove *i*, of the cam J, as illustrated in Fig. 4. In this figure, 5 and 6 indicate the points in the groove where the full throw of the lever, and the full opening of the shed are produced and 7; 7, the points where the roller is at the middle of the stroke of the lever when the crossing of the shed is taking place. It will be observed that for a short distance from either side of the points 7, 7, the inclination of the groove from the plane of rotation of the cam is very slight, compared with the inclination of the parts on either side of it, and consequently the movement of the lever, as this point approaches, passes and leaves the roller, will be very slow, and hence the movement of the harness at the time of crossing the shed will be very slow and the several rising and falling threads of the warp will be enabled to pass each other without interfering or breaking. The retardation at this stage of the

operation of the harness so far from necessitating a slower operation of the loom as might at first sight be supposed, enables the loom to be driven at a much greater velocity, that is to say, at a greater number of picks per minute than when the shed crosses at the same velocity as the earlier and later portions of its opening and closing movements.

I do not claim of itself the suspension of the harness straps from pulleys of uniform size having their axes parallel with the vibrations of the lay, nor do I claim of itself the giving of the several leaves of heddles a greater or less amount of movement according to their distance from the filling point of the cloth; but

What I do claim as my invention and desire to secure by Letters Patent, is—

1. The employment, for supporting and operating the harness, of cones of pulleys arranged with their axes parallel with the vibrations of the lay and the larger pulleys of the cones toward the rear of the loom substantially as herein specified.

2. In combination with a horizontally vibrating lever I, connecting with a belt or belts *f, f*, for driving the harness, a grooved cam J, so constructed as to produce a slower movement of the harness at the time of the crossing of the shed as compared with its movement in the earlier and later stages of the opening and closing of the shed substantially as herein described.

BENJ. F. KNOWLES.

Witnesses:

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