2 Sheets—Sheet 1.

C. P. MARSHALL.

Circular Loom.

No. 212,025. Patented Feb. 4, 1879.

Fig. 1.

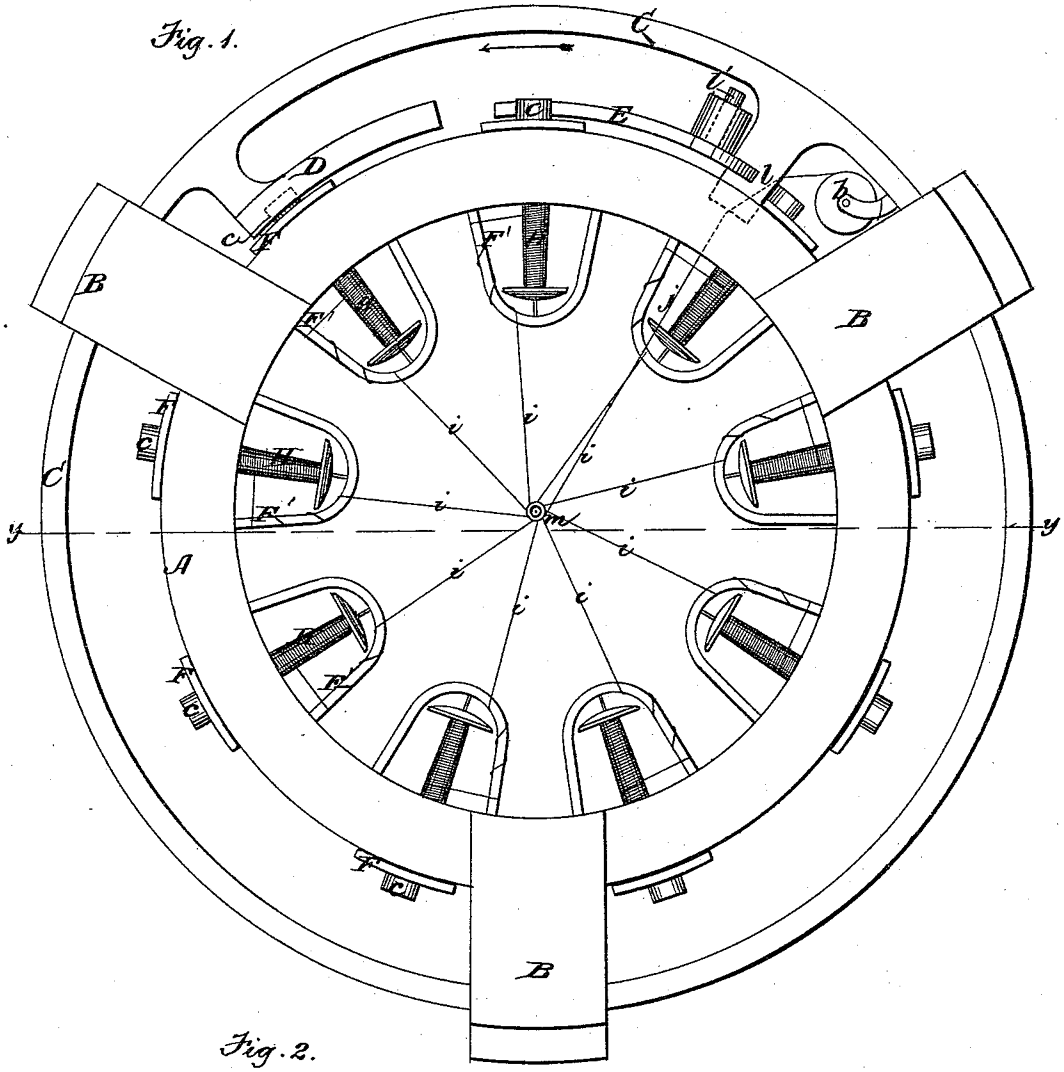
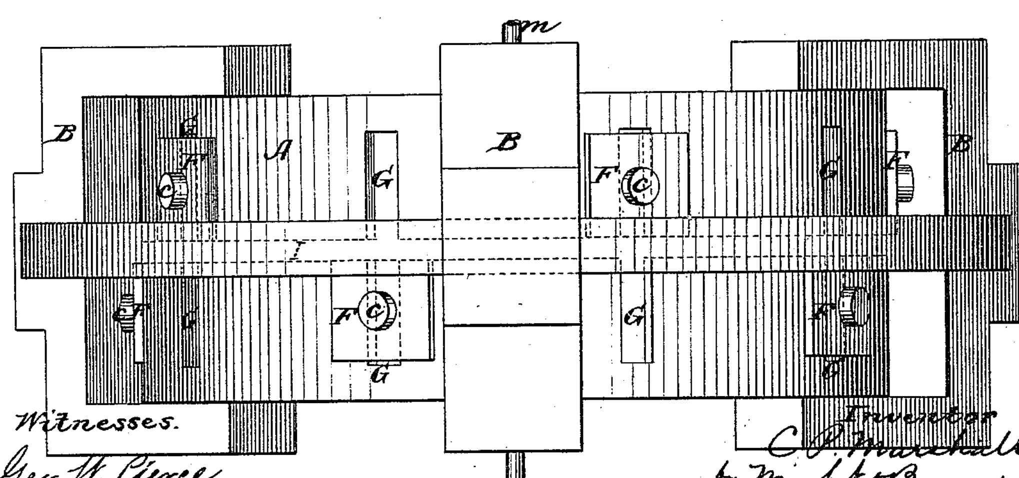


Fig. 2.



Witnesses.

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E.B. Fairchild

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2 Sheets—Sheet 2.

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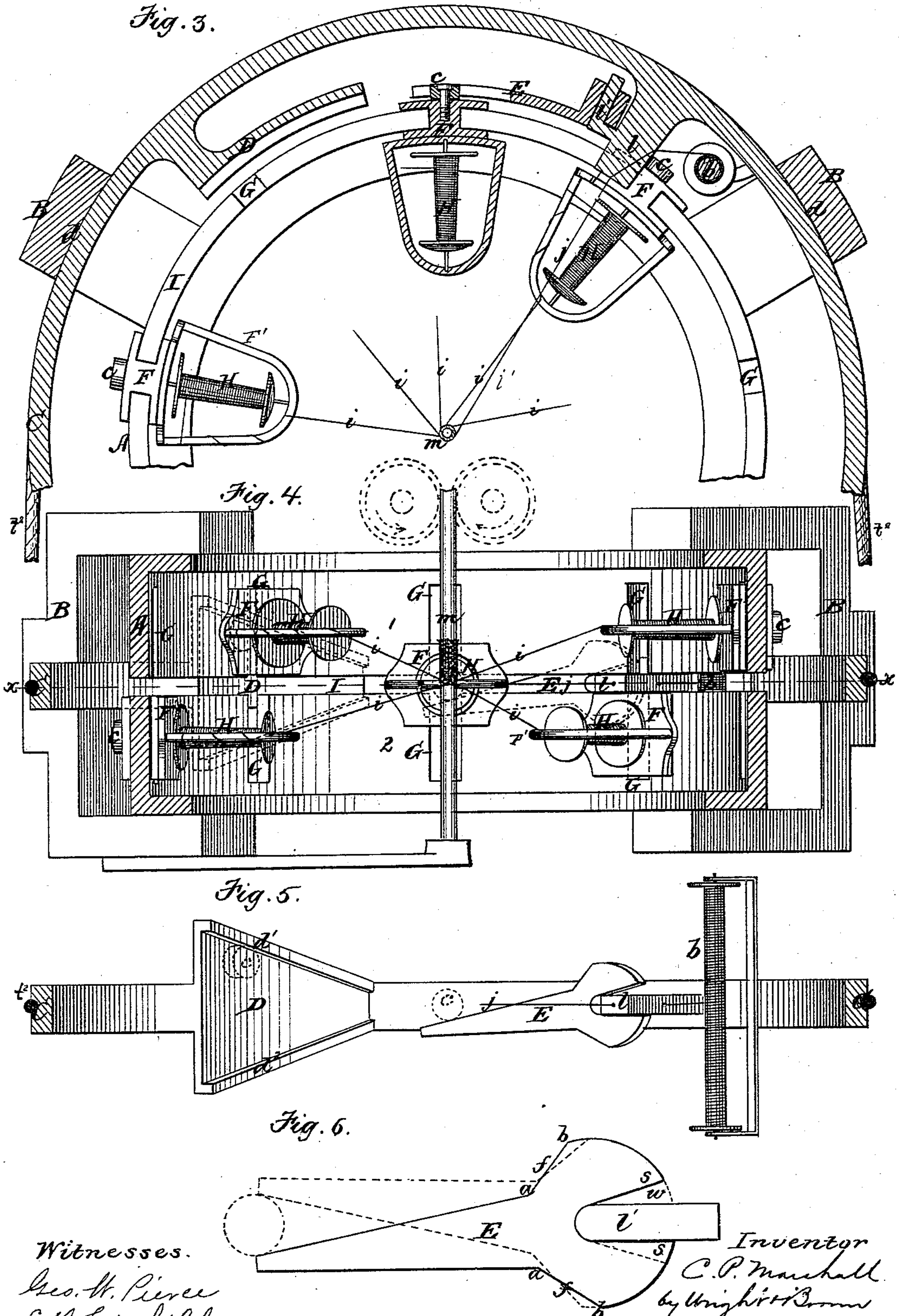

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UNITED STATES PATENT OFFICE.

CHESTER P. MARSHALL, OF WORCESTER, ASSIGNOR TO E. B. WELCH, OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN CIRCULAR-LOOMS.

Specification forming part of Letters Patent No. **212,025**, dated February 4, 1879; application filed May 22, 1878.

To all whom it may concern:

Be it known that I, CHESTER P. MARSHALL, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain Improvements in Circular-Looms, of which the following is a specification:

This invention has for its object to provide a simple and effective circular-loom adapted to weave cylindrical or tubular fabrics over an arbor or mandrel, thereby enabling the fabric to be woven over or upon a lining of rubber supported on said mandrel, the invention being intended particularly for the production of woven hose for conducting water.

My invention consists in the several improvements which I will now describe and claim.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a top view of a loom embodying my invention. Fig. 2 represents a side elevation of the same. Fig. 3 represents a horizontal section on line *x x*, Fig. 4. Fig. 4 represents a transverse vertical section on line *y y*, Fig. 1. Fig. 5 represents a section of the ring-carrier, shifting device, and a woof-bobbin; and Fig. 6 is an enlarged view of the shifting-lever detached.

Similar letters of reference indicate corresponding parts.

The loom is composed of three general parts—viz., first, a stationary circular horizontal frame or annulus, A; second, a revolving horizontal frame or annulus, C, concentric with the frame A, and of larger diameter; third, a stationary vertical arbor or mandrel, *m*, at the center of frames A C, and supported at the lower end by the frame in any suitable manner. The stationary frame A is made in two parts or sections, 1 2, which are attached to brackets B, and are separated from each other by a narrow horizontal space, I, which I term the "woof-race," and is provided with any desired number of vertical spaces or slots, G G, extending equally above and below the woof-race and opening into the latter, and these slots G, I term the "warp-races," each warp-race being composed of two slots, G, one above and the other below the woof-race. In the warp-races are located the shuttles or bobbin-carriers F, which are adapted to slide vertically in the races G and form bearings for the inwardly-projecting warp-bobbins H. The carriers F project on each side of the frame A, and each is provided at its inner face with a yoke, F, inclosing a warp-bobbin, H, and at its outer portion with a friction-roller, *c*, which co-operates with certain hereinafter-described attachments on the ring C to raise and lower the carriers F. The ring C is supported in guides *d* in the brackets B at such a height that its horizontal center will be on the same plane as the horizontal center of the woof-race I. The ring C is adapted to rotate around the stationary frame A, preferably by a band, t^2, which is driven by power suitably applied. The ring C is provided with a suitable number of woof-bobbins, *b*, which move with the ring, the number of these bobbins depending upon the number of warp-shuttles. I prefer to employ one woof-bobbin to every ten warp-shuttles. In advance of each woof-bobbin is a lug, *l*, which projects from the ring into and nearly or quite through the woof-race I, and this lug is provided with an aperture for the passage of the woof-thread from the bobbin *b* to and through the woof-race I, as shown in Fig. 3. As the ring C revolves, the lug *l* moves freely through the woof-race. In advance of each lug *l* the ring C is provided with devices for shifting or moving the warp-shuttles F alternately up and down to form the shed for the woof-thread. These devices consist, first, of a centering-guide, D, rigidly attached to the ring C, and, second, a shifting cam or lever, E, pivoted to the ring C, and arranged to be tilted up and down. The centering-guide D is composed of a plate which is curved lengthwise, so as to be concentric with the frame A, and is provided with two flanges, d^1 d^2, which converge or incline toward each other from the front to the rear end of the guide D. The shifting cam or lever E is pivoted to an arm, l', attached to the lug *l* or ring C, and is also curved lengthwise, so as to be concentric with the frame A.

The lever E is quite narrow at its outer or forward end, and increases gradually in width, its upper and lower sides being plane surfaces to points *a a*, where the sides are more abruptly inclined, as shown at *f f*, these inclines *f* terminating in the points *b b*, above and below the center or fulcrum of the lever, and giving the lever a considerably increased width. From the points b b the lever is curved or inclined inwardly to the rear end, and this end is provided with a wedge-shaped slot, w, into which the lug l projects. This slot is wider than the thickness of the lug l, and its edges form stops s s, which abut against the lug l, and thus limit the turning or working of the lever E on its fulcrum in both directions.

The operation of my improved loom is as follows: The warp-threads i are conducted from the bobbins H and made fast to the arbor or mandrel m, and the woof-thread j is conducted from the bobbin through the lug l, and also made fast to the arbor or mandrel. The ring C is then set in motion, and as it revolves the parts D E alternately raise and lower the warp-shuttles immediately in advance of the woof-thread, and thus form a shed for the latter.

The manner in which the parts D E operate is as follows: Suppose the alternate warp-shuttles to be at the upper ends of their races, and the others at the lower ends of their races, this being the manner in which the shuttles are always arranged. The centering-guide D is of such width at its forward or wider end, and is located in such proximity to the frame A, that one of its flanges d^1 d^2 will bear upon the friction-roll c of the shuttle F, immediately preceding the guide D, and thus move the shuttle toward the horizontal center of the frame A. Suppose the warp-shuttle immediately preceding the guide D to be at the upper end of the race, the rotation of the ring C will bring the upper flange, d^1, of the guide to bear upon the upper side of the friction-roll c of said shuttle. The downward pressure thus produced on the shuttle causes it to descend to the level of the lower or rear end of the flange d^1, which brings the shuttle to the level of the horizontal center of the frame A and ring C, at which point the guide D leaves the friction-roll c, the space between the rear ends of the flanges d^1 d^2 being slightly in excess of the diameter of said roll. Each shuttle is thus centered, and while the centering operation is being performed the shifting-lever E is continuing the movement of the shuttle last centered, by sliding said shuttle from the center to the end of its race opposite the end from which it was moved by the centering-guide, and the lever E is adapted to move the shuttles alternately up and down from the center, its inclination and location with reference to the frame A and centered friction-roll c being such that its outer end will project either under or over the friction-roll of the shuttle immediately preceding it, and move said roll and its shuttle up or down, as the case may be, and the lever is held by its stops s in the positions required to effect these movements of the shuttles.

Suppose the lever E to be inclined downward, as shown in Figs. 5 and 6, its forward end will project under the roll c of the last centered shuttle, and cause the shuttle to move upwardly. When the movement of the ring C brings the abrupt incline f to bear upon the roll c, the latter is raised more rapidly, and at the same time the increased resistance or pressure produced causes the lever to tilt in the opposite direction, as shown in dotted lines in Fig. 6. When the lever has passed by the roll c, the shuttle thereof is lifted to the upper end of its race, and the lever is left in position to lower the next shuttle, and thus the operation is continued, every other shuttle being raised and the others lowered.

It will be borne in mind that the rotation of the ring C carries the woof thread or threads (only one, j, being shown for convenience) around and winds it upon the arbor m in the shed formed by the described movement of the shuttles, and thus a tubular fabric is woven upon the mandrel, and the fabric is moved up the mandrel as fast as woven by any suitable automatic mechanism. The mandrel is suitably supported below the loom, and is unobstructed from the point where the weaving occurs to its upper end, which is preferably about three feet above.

The chief advantages of my improved loom, in addition to its simplicity, are, first, it is adapted to weave the tubular fabric onto a rubber or other lining, which is meanwhile rigidly supported and backed by the arbor; and, second, it is adapted to weave any desired number of plies successively one upon another, thus making a tubular fabric of any desired thickness.

I claim as my invention—

The frame A, having vertical warp-races and horizontal woof-race, in combination with the shuttle-carriers F, provided with external friction-rollers c, and the ring C, carrying the centering-guide D and shifting-guide E, substantially as specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 7th day of May, 1878.

CHESTER P. MARSHALL.

Witnesses:

E. B. WELCH,

C. F. BROWN.