Sheet 1-2 Sheets.

J. J. Greenough.

Circular Weaving.

No. 51,040. Patented Nov. 21, 1865.

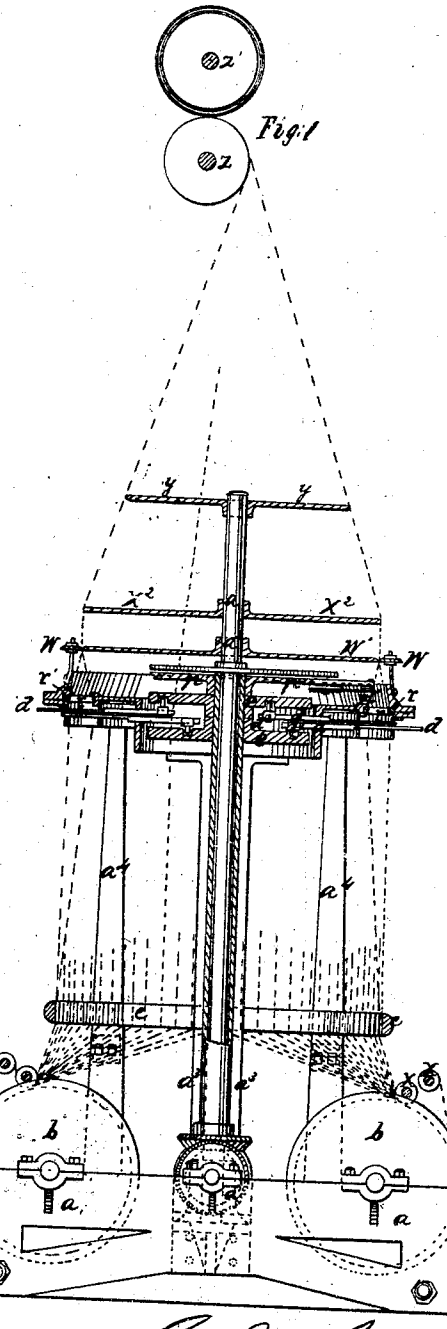

Fig. 1

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Sheet 2-2 Sheets.

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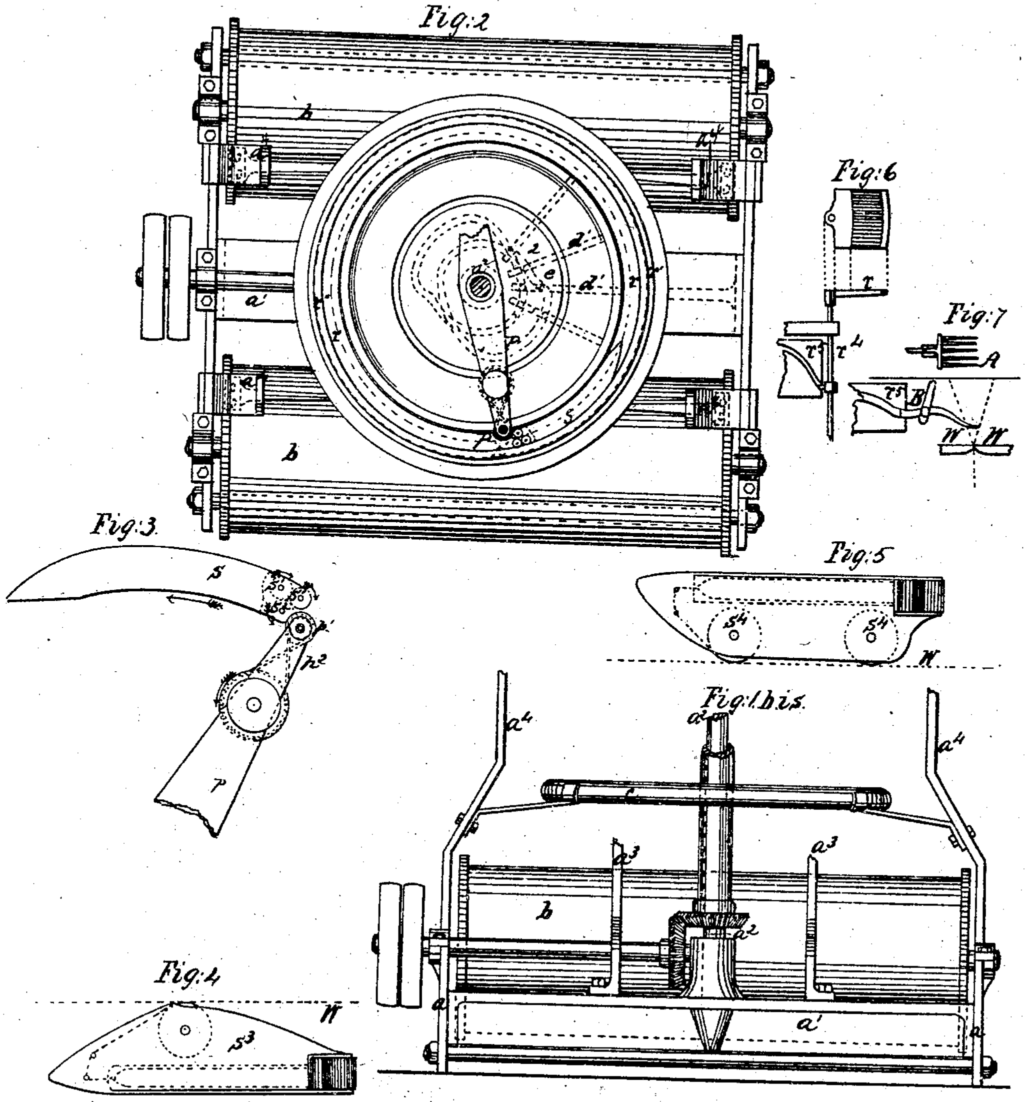

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UNITED STATES PATENT OFFICE.

JOHN J. GREENOUGH, OF NEW YORK, N. Y.

IMPROVEMENT IN CIRCULAR LOOMS.

Specification forming part of Letters Patent No. **51,040**, dated November 21, 1865.

To all whom it may concern:

Be it known that I, JOHN JAMES GREENOUGH, of the city, county, and State of New York, have invented certain new and useful Machinery for Weaving Cloth, which I denominate the "Circular Loom;" and I do hereby declare and ascertain said invention, referring to the accompanying drawings, forming the illustration of the description, in which—

Figure 1 is a vertical section of the loom, (base not in section.) Fig. 1^{bis} base of loom at right angles to Fig. 1; Fig. 2, a plan; Fig. 3 the plan of a shuttle; Fig. 4, modified shuttle elevation; Fig. 5, reversed shuttle; Fig. 6, mechanism for raising the reed, with modifications; Fig. 7, fork for supporting the shuttle.

My invention consists in forming a loom with a circular or endless race in which one or more shuttles are made to run continuously in one direction to perform the process of laying the weft-thread or filling properly into the warp, and also in adapting the various movements of the warp and other necessary mechanism of the loom to this main feature.

Several parts of my loom are susceptible of modified construction, and throughout the description I shall name some of the most prominent of these modifications to illustrate the same, and as types of the changes which I deem equivalents of the devices shown in the drawings.

It is obvious that the frame of the machine may be made in any convenient way that will sustain the working parts.

In the drawings, *a* represents an oblong base of metal, consisting of two side castings connected through the center by a cross-piece, *a'*, and by other braces at the ends. From the center of the cross-piece *a'* a standard, a^2, rises. This standard forms the axis of the revolving parts about to be named, and also supports above them certain stationary parts. Standards a^3, in the drawings, sustain the stationary parts of the loom below the race within the web. The standards a^4 sustain the outer stationary parts.

The "take-up" movement can be supported by other proper standards from the base, or by hangers from the ceiling of the room; but all these standards, as well as the other frame-work of the loom, may be varied or omitted, and substitutes therefor supplied in any efficient way to suit the taste or wishes of the builder and properly sustain the working parts of the loom.

The warp can be wound on a straight beam, as in ordinary weaving; and I prefer to use two or more beams, *b*, as seen in the drawings, especially when wide cloth is woven. (It is obvious creels could be here substituted.) From the yarn beam or beams the warp-threads are led up into a circle formed by a ring at *c*, after passing a tension apparatus, *x*, and thence up through the reed above. This tension apparatus may be an elastic weight, or other suitable device, bearing on the warp to keep it properly strained and allow it to rise freely without additional strain, to open the shed for the passage of the shuttles.

Just below the reed, and as close thereto as it can be conveniently placed to work properly, there is the harness or heddles, or, instead thereof, a series of needles, as seen in the drawings at *d*. The needles, or other warp-shifter, are connected with a series of short head-pieces or sectional pieces that compose an annular band, *d'*, that are attached to cam slides d^2, working into revolving cams *e* on the center shaft. The needles are in radial lines, and are connected with the band *d'*, which is made in sections, and to each end of each section there is jointed a radial sliding piece, d^2, that connects the sectional band with the cam *e*, by which the needles are moved to open and close the warp properly. (A plan of this is shown in Fig. 2.) These cams *e* are so formed as to open the shed gradually from the heel of one shuttle to the point of the next, so that when the loom is in very rapid motion the shed opens comparatively slowly.

To make the loom in the most simple form the shuttles should be in pairs, or in twills, equal the number of leaves of harness, in which case the cam and the shuttles revolve at exactly the same velocity; but if there is but one shuttle, or an odd number to the twill, it requires a shift of cams for each revolution, by any well-known means.

For plain cloth a double cam or two cams are required, which may be increased for any number of heddles, and for complex figures I contemplate sometimes using a jacquard or its equivalent.

The sole of the race *r* is of circular form and endless. The sole is formed by the reed *r*,

and curb r' forms the outside thereof and guides the shuttle in its course. The shuttle s is curved in its outline to conform to the curve of the race. At its heel it has three rollers, as clearly seen in Fig. 3, two of which, s' s', bear against the curb r. The roller s^2, with its periphery resting upon the surface of those first named, lies just within the space between them, as clearly seen in the figure.

On the end of an arm, p, that extends out radially from the axis a^4, there is a roller, p', that comes in contact with the roller s^2, in rear of its axis, so as to drive the shuttle around the race as the arm revolves. The roller p' turns on its axis in a direction the reverse of its advance movement, as indicated by the arrow in Fig. 3, by means of a band, p^2, or other suitable device, which may be broad enough to cover the face of the roller, or otherwise, so that the warp-thread between it and the shuttle will not be displaced by the action of driving the shuttle. Motion is given to these parts by a stationary pulley on the center standard, a^2, just above the arm p, (clearly seen in Fig. 1,) and connected by band, or otherwise, with the roller p', either by an intermediate roller or not, as shall be desired, and proportioned so that as the arm p revolves around under the stationary pulley the roller p' shall be properly turned.

If I use the shuttle alone to beat up the filling it is formed as shown in Fig. 4, with a fin, s^3, projecting from it, either with or without a friction-wheel, as seen at the apex. If the loom is reversed, as hereinafter described, I form the shuttle as in Fig. 5. If the web is to be beaten up closer than can be done with the shuttle, I propose to form the reed in convenient sections, and beat up just behind the shuttle by any well-known mechanism for raising the reed. One modification of this is shown at Fig. 6, where r is the reed, r^4 is the slide-rod by which it is held and raised, r^5 is the cam which in such case I propose to use for lifting it, consisting of a groove in the periphery or face of a cylinder that revolves on the central axis. I also propose, as a device for this purpose, a revolving or vibrating beat-up, so made as to readily enter the web and force the filling up to its place, if any device is necessary, or a revolving brush may be used for the purpose in some descriptions of goods.

At the line where the cloth is formed I place a ring, w, of the size the woven cloth is to be made, which rests against the outside of the tube of woven cloth and determines its diameter. It has the warp-thread delivered just at or above its lower edge or bearing on the cloth. This ring w should be somewhat smaller than the circle of warp-threads at the ring c below, and the greater the difference between the size of these two circles the more room will there be for the play of the harness and the spread of the warp-thread or size of the shuttle, which should be varied according to circumstances that will readily be suggested to the practical manufacturer. A disk, w', or inner circle, is also shown in the drawings placed at this point, and held by center stationary standard, a^2, between which and the outer ring, w, there is a narrow opening for the woven cloth to pass. If this circle w' is furnished with an elastic edge, such as india-rubber or other proper material, which bears against the outer ring, it will produce an elastic pressure upon the cloth between them, holding the warp and weft properly in place as the cloth is formed. By means of the ring and circle the strain upon the warp-thread is greatly relieved in beating up with the shuttle. The cloth, as it is formed, is carried up to a circular disk, x^2, above, and thence to an oval one, y, from whence it is flattened and passes over the take-up roller z to the cloth-beam z'.

I do not propose to change the "let-off" or "take-up" movements materially from the best forms now in use, the principal difference being the substitution of a continuous motion for the intermittent one. All the requisites for letting off the yarn and taking up the cloth being so well known to the loom-builder and weaver, I have shown no device for the purpose on my drawings.

It is obvious that by reversing the position of the parts, by placing the yarn-beams above and the cloth beam or beams below, there might be some additional device required to traverse the shuttle. I propose, in case of necessity, to use a fork or "grid," as seen in Fig. 7, which apparatus might also be used with the beat-up. In this figure A is the plan; B, an elevation, showing its position relative to the reed and warp. As such a fork has been essayed in straight looms, it needs no particular description. When used it enters the warp in advance of the shuttle, and after the shuttle passes over it it is withdrawn, the motion being given by a cam; but I prefer, in weaving goods that can be beaten up by the shuttle, to employ one substantially like that shown at Fig. 5, from the under side of which a fin projects downward in a wedge form, having two thin rollers or wheels, s'' s'', that run along the line where the warp passes through between the ring w and circle w', at the point where the cloth is formed, the shuttle being thus supported by said stationary parts.

It is obvious that the shuttle can be driven from the outside of the race instead of the inside, and elastic or flexible bands can be placed on the outside and inside of the race, and forced in behind the shuttle to drive it, but I do not recommend this plan.

Where the force required to drive the shuttle is within the limits of magnetic attraction the shuttle may be made of steel, and a magnet or electro-magnet may be affixed to the driver to cause it to revolve. These devices are suggested as equivalents, where they can be advantageously used, of the device shown, but I do not recommend them as superior thereto.

The cloth can be split in one or more places around the circle, cutting the cloth in the loom into desirable widths that can be wound on

separate cloth-beams, or it can be delivered in the form of a woven tube, as shown in the drawings.

Any desired number of shuttles can be used at the same time by constructing the loom-race of sufficient diameter to have each shuttle follow its predecessor at a proper distance to allow for the shifting of the warp and beating-up between the shuttles. I prefer to use an even number of shuttles for simplicity of mechanism in plain cloth. If the warp is flared much, by making the ring *c* larger than the ring *w*, the sole of the race will have to be inclined so as to have the reed or sole of the race at right angles to a strright line drawn from one of said rings to the other.

Having thus fully described my improved machinery for weaving, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of two or more shuttles, constructed as herein described, in a circular race, the sole of which is formed as described, and following each other continuously in one direction and weaving, substantially as and for the purposes set forth.

2. In combination with the ring *w*, the flaring or expanding of the warp, substantially as and for the purposes set forth.

3. The employment of the ring *w* and the disk *w'* at the line where the cloth is formed, substantially as and for the purposes herein set forth.

4. Beating up the filling by means of the shuttle, when combined with a circular race and ring *w*, substantially as herein set forth.

J. JAMES GREENOUGH.

Witnesses:

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E. B. SMITH.