2 Sheets--Sheet 1.

# J. E. GILLESPIE.

## Loom for Weaving Tubular Fabrics.

No. 163,925. Patented June 1, 1875.

Fig. 1.

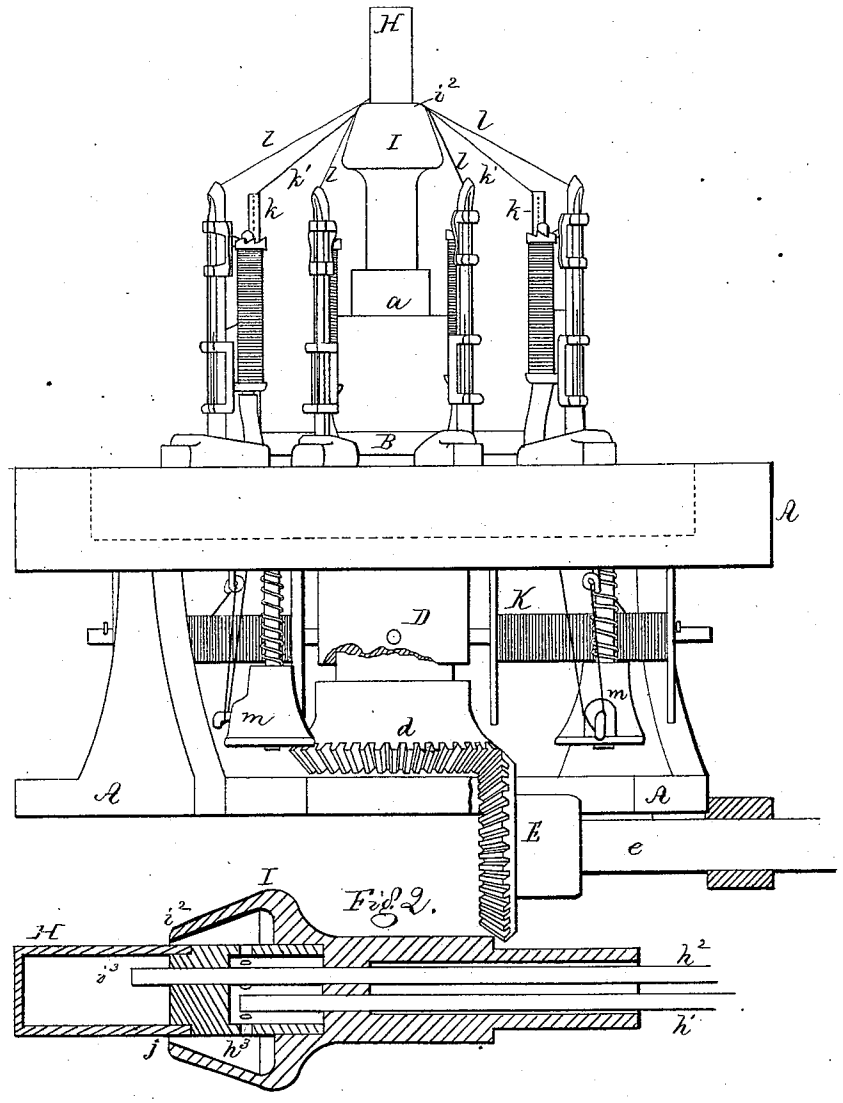


Fig. 2.




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per Crosby & Gregory Atty's.

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2 Sheets--Sheet 2.

# J. E. GILLESPIE.

## Loom for Weaving Tubular Fabrics.

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Fig. 3.

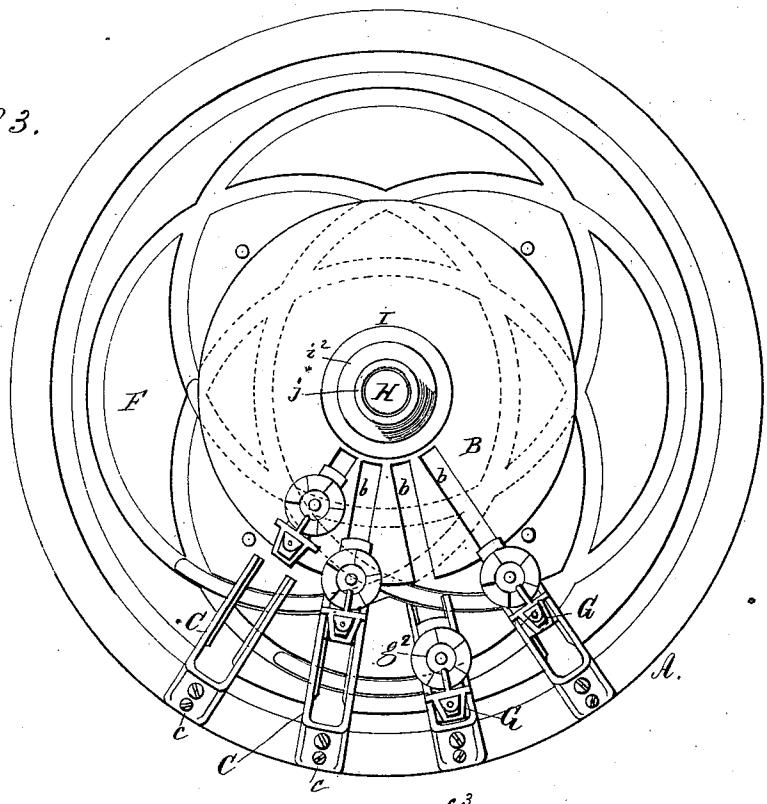



Fig. 5.

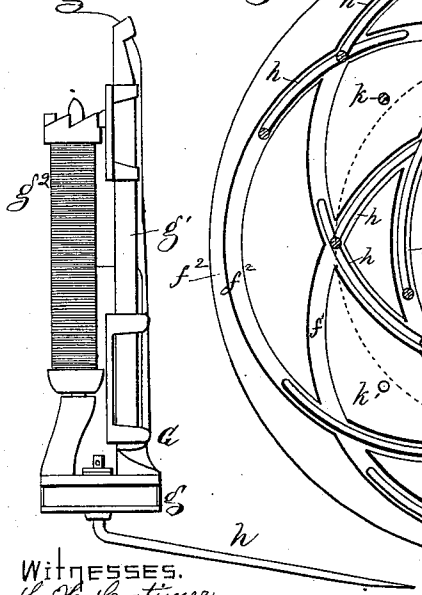
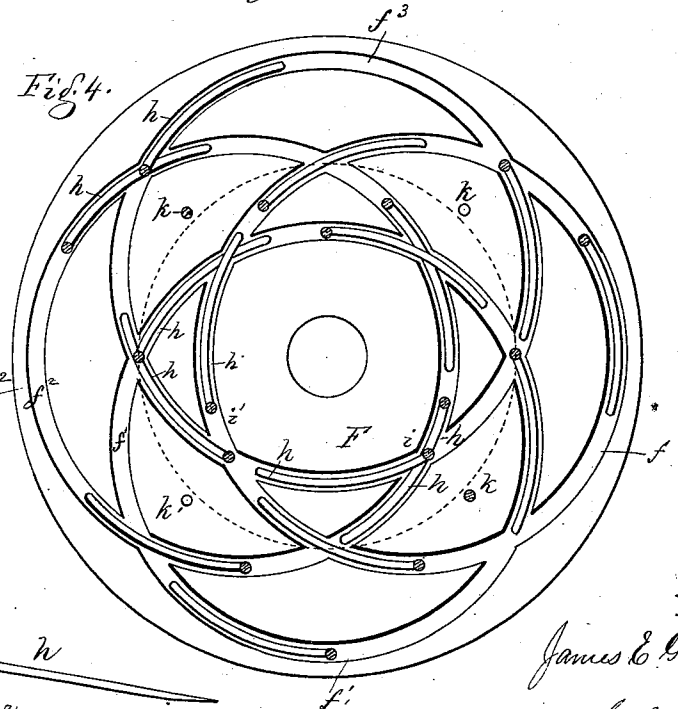



Fig. 4.

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# UNITED STATES PATENT OFFICE.

JAMES E. GILLESPIE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THEODORE A. DODGE, TRUSTEE, OF SAME PLACE.

## IMPROVEMENT IN LOOMS FOR WEAVING TUBULAR FABRICS.

Specification forming part of Letters Patent No. **163,925**, dated June 1, 1875; application filed April 14, 1875.

*To all whom it may concern:*

Be it known that I, JAMES E. GILLESPIE, of Boston, Massachusetts, have invented an Improvement in Looms for Weaving Tubular Fabrics, Hose, &c., of which the following is a specification:

This invention relates to a loom for weaving a tubular fabric for hydraulic hose or other purposes. The warp is carried on bobbins or spools moved from the center to the outside of the machine, and the weft-carriers move in a circular path, and lay their threads into the sheds between the warp-threads.

In this class of looms, as heretofore constructed, it has been impossible to weave tubular fabric of sufficient strength, or with warp and weft sufficiently compacted and accumulated, to form practical hose for hydraulic purposes, because the warp-carriers, as heretofore constructed, could not be brought sufficiently close together without the crescent on the lower portion of one carrier interfering with the crescent on the lower portion of an adjacent carrier at the crossings of the grooves formed in the grooved plate for operating the carriers. These crescents are pivoted to the carriers, their pivotal pins passing through the centers of the crescents. The crescents run in the grooves of their actuating-plates, and are always made long enough to extend entirely across the intersections of the grooves to insure that the crescents or feet continue to move always in their proper grooves.

It will be noticed in such machines that when one crescent is passing a point where two grooves intersect, and has blocked up such intersection, the crescent next to cross such intersection is held back, so as not to interfere, and with such crescents it is apparent that the bobbins carrying the warps cannot be placed close together.

In this invention the feet, to run in the grooves, are connected with the carriers to project only in one way from their pivotal points, and they are inclined to the plane in which the carriers move, so that the feet readily pass one over the other, and permit the warp-carriers to move as close together as is desired, and in radial paths distant from each other only sufficiently far to permit the bobbins to pass without touching. The grooves in the plates are made much deeper than usual, to permit the feet to occupy an angular position, and pass readily under each other.

This invention consists in a loom of the class above described, having carriers with feet projecting as described, and adapted to cross each other. Also, in the combination, with a loom adapted to weave a tubular fabric about a mandrel, of an apparatus to form a lining material or substance, composed in whole or in part of india-rubber, or of other suitable material, about the mandrel where the weaving is taking place, or for forcing said lining material or compound into or within the tubular fabric, or for saturating the fabric with a water-proof or preserving substance at or near the weaving-point.

Figure 1 is a side elevation of a loom provided with this invention. Fig. 2 is a cross-section of the mandrel, and of the apparatus for forming the lining, or for saturating the fabric or material with a water-proof substance, when desired. Fig. 3 is a top view of Fig. 1, a number of the warp-carriers being omitted. Fig. 4 is a top view of the grooved warp-carrier operating-plates, with the feet of the carriers in the grooves; and Fig. 5 shows a carrier in perspective.

The frame A of the loom is of any desired size, and of suitable shape to support and carry the working parts, and rising therefrom is a central post, *a*, to which is attached the hub of a disk, B, slotted at *b b* to allow the heads of the carriers to pass from forked guides C, attached by screws *c c* to the frame A. These guides and the disk are, when in operation, fixed or stationary, the opening in one coinciding with the opening in the other. In some looms the slotted disk will be employed, but for all large looms it is preferred to place forked guides like C on the disk B, or on a flange projecting from the hub of B, or from other suitable fixed base, and in such case it is apparent that the forked carrier-guides may be adjusted as desired, and a greater or less number of guides be employed, according to the number of carriers or warps to be used. Surrounding post *a* is a tubular sleeve, D, having an attached beveled gear, *d*, engaged and operated by a bevel-gear, E,

on a shaft, *e*, driven by power in any suitable or well-known way. At the upper end of this sleeve is the plate F, provided, as shown in this instance, with four grooves, $f f^1 f^2 f^3$, intersecting each other, as shown in Figs. 3 and 4. The warp-carriers G are provided with flanged or grooved heads *g*, to fit the forked guides. Rising from the heads are posts $g^1$, on which are the usual tension-weights and bobbin-stops or let-off devices, and the warp-spools $g^2$ are carried on spindles rising from the heads, as fully represented in Fig. 5. The warp-carriers so far described are of common construction, and instead of the construction shown they may be of any other well-known construction.

The feet *h* of the warp-carriers are pivoted at one end to the head *g*, so as to turn freely, are curved to conform to the shape of the grooves in which they move, (see Fig. 4,) and are inclined downward to pass, the one over the other, as is shown fully in Fig. 4, the grooves *f f'*, &c., being deep enough to receive the feet and permit this. At the crossing *i*, Fig. 4, the carriers are very close together, and the feet are shown as partially crossed. At $i^1$, the feet are approaching to cross, and the rear end of each foot there shown is crossing or being crossed by another foot. The warp-threads pass from the upper ends of the carriers to a flange, $i^2$, on the upper end of a cup, I, the edge of the flange serving as a rest for the warps and indicating the weaving-point, and the tube, as woven, is drawn by a suitable take-up along over the mandrel H, which governs the size of the hose. In Fig. 2, the mandrel and cup are shown in section, and constructed so as to form a lining within the inner side of the tube, or to force a water-proof or preserving liquid among the warps at the weaving-point. The lining may be of rubber in whole or in part, or, instead of rubber, any other material suitable to form a lining or water-proof coating, may be employed. Referring to Fig. 2, $h^1$ is a pipe, connected, by means of a pump or otherwise, with the source or supply for the lining or water-proof substance, so that such substance may be delivered under pressure to the cup I, passing through holes $h^3$ into the cup and out at the opening *j*, about the mandrel H, which is shown as hollow to receive steam from a pipe, $h^2$, leading thereto, and connected with a steam supply or chamber, an outlet from the mandrel carrying away the water of condensation. The liquid or semi-liquid substance to form the lining, or to act as a water-proof substance, is forced through the pipe $h^1$ into the cup and through the opening *j*, and between the mandrel and the tubular fabric, at or near the weaving-point, the heated mandrel assisting to dry the same, and the lining or water-proof material is in this way interlocked or embedded into the warps or into the fabric at the weaving-point. The weft is led from spools K, four in this instance being used, to upright weft guides *k*, either hollow, as shown in Fig. 4, in two places by the circles, or as solid rods with eyes, and carried by the grooved plate F. The weft $k^1$ is laid between the warps *l*, as the plate F is rotated, and the warp-carriers are moved out and in to form sheds in the warps, as at *l l*, and this shedding action may be such as to form plain or twilled weaving. The warp-carriers, through the action of the grooved plate on the feet *h*, are thrown from the holders C to the grooved disk B, or into holders on the disk, thus crossing the path in which the weft-carriers move. The weft-threads are kept taut by tension-weights *m*, of any well known or suitable construction.

It is evident that the means for forming the lining or conducting the water-proof substance into the tube might be changed without departing from the invention herein described, and it is not intended to limit this invention to the exact devices shown for forming this lining or introducing water-proof material, as any other equivalent mechanism might be used instead. Any desired number of grooves and carriers may be used, and to remove a carrier for repairs or otherwise, it is only necessary to remove its forked guide or holder C, whereas with other machines in which the heads of the carriers work in grooves cut in the plate fixed over the grooved disk for moving the carriers, it is necessary to remove or elevate the fixed plate in order to remove a carrier. Instead of using a plate, F, with grooves *f*, &c., in its face, I may use a cylinder with grooves.

Having described this invention, I claim—

1. The combination, with the heads of the warp-carriers, of the pivoted inclined feet, adapted to cross each other, substantially as described.

2. The combination of a rotating grooved surface or plate, with warp-carriers having pivoted inclined feet adapted to cross each other at the intersection of the grooves, substantially as described.

3. The combination of the warp-carriers and their pivoted feet, with the grooved plate and the independent removable warp-carrier guides, substantially as described.

4. The combination of the mandrel, about which the tube is formed, with a shoulder, $i^2$, against which the warps rest at the weaving-point, substantially as described.

5. The combination, with a loom for weaving a tubular fabric, and the mandrel, of mechanism adapted to form and introduce a lining or water-proof material within the tube during the process of weaving, substantially as described.

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

JAMES E. GILLESPIE.

Witnesses:
G. W. GREGORY,
S. B. KIDDER.