G. W. Smith.
Wire Weaving.

No. 14,000. Patented Dec. 25, 1855.

Fig. 1.

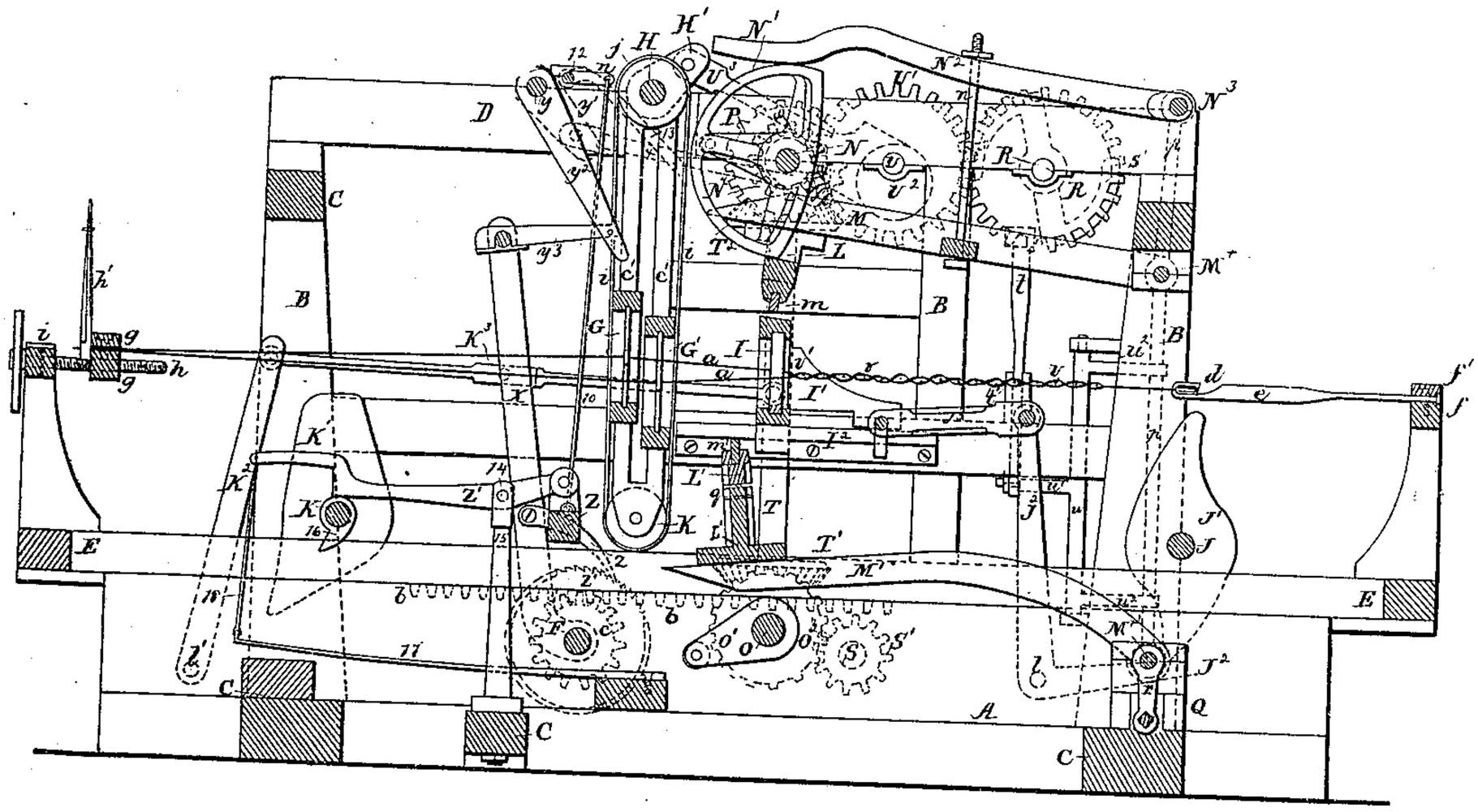


Fig. 2.

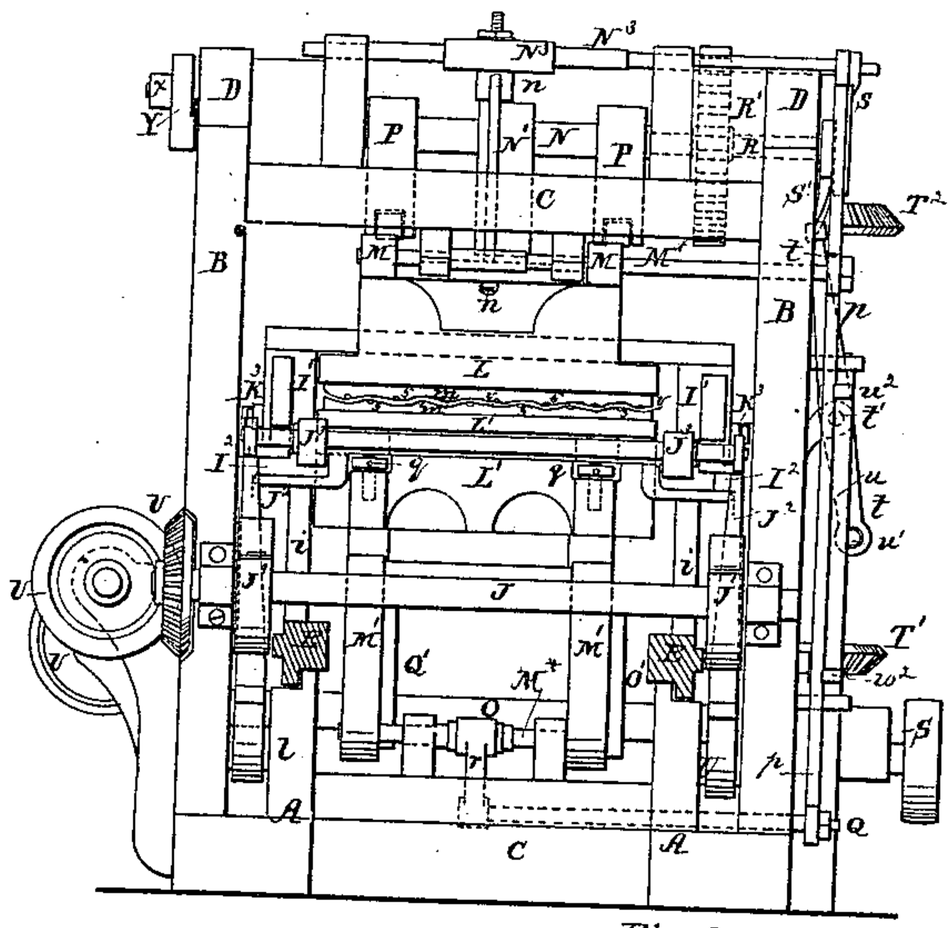
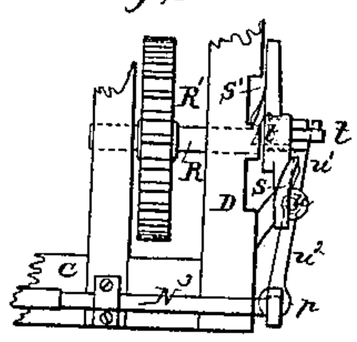


Fig. 3.



UNITED STATES PATENT OFFICE.

GEO. W. SMITH, OF MAUCH CHUNK, PENNSYLVANIA.

LOOM FOR WEAVING WIRE.

Specification of Letters Patent No. 14,000, dated December 25, 1855.

To all whom it may concern:

Be it known that I, GEORGE W. SMITH, of Mauch Chunk, in the county of Carbon and State of Pennsylvania, have invented certain new and useful Improvements in Looms for Weaving Wire; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a longitudinal section of a loom with my improvements. Fig. 2, is a front view of the same with the warp carriage in section. Fig. 3, is a top view of one portion of the loom.

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

This invention consists chiefly in certain means of crimping the wire while in the loom and during the process of weaving whereby I am enabled to weave wire of any size without previous preparation.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The working parts of the loom are all carried by a strong frame which is represented as consisting of longitudinal bed pieces A, A, uprights B, B, crosspieces C, C, and top pieces D, D, all of timber, but it may be of cast iron or constructed of timber in any other suitable manner. The warp wires *a*, *a*, shown in red color are secured in a traveling carriage E, E, which rests on the longitudinal timbers of the frame and is provided on each side with a toothed rack *b*, shown dotted in Fig. 1, to gear with a toothed pinion *c*, on a transverse shaft F, which works in suitable bearings on the frame and by means of these racks and pinions is moved in the direction indicated by the arrow shown in Fig. 1, after every filling wire is put in. The warp wires may be of unlimited length. At the commencement of the weaving their front ends are attached to a transverse bar *d*, which is held by two hooks *e*, which are secured in a screw clamp *f*, *f*, at the front end of the carrriage E, E. The warp wires are also secured at the rear end of the carriage all in a screw clamp *g*, *g*, and each is further secured by a separate pair of tongs *h*, which grasp it close behind the clamp *g*, *g*. The lower portion of the clamp *g*, *g*, contains two female screws to receive two male screws *h*, which fit to turn easily without moving longitudinally, in a standard *i*, attached to the carriage E, E. These screws serve to keep the warp at a proper tension and also to let out sufficient wire, by moving the clamp *g*, *g*, after every crimping and filling operation, to be taken up by the next crimping operation. The screws may be operated for the latter purpose by suitable gearing or by the hand of an attendant.

The shed is opened by two sets of heddles G, G′, which are attached to endless bands *i* passing over rollers *j*, on a rack shaft H, at the top of the loom and under rollers *k*, below. These heddles work on guides *c′*, *c′*, on the framing.

The reed I, of the loom is substantially like that of other looms but instead of being attached to a vibrating lay it is secured in a carriage I′, which works on horizontal fixed guides I²; and instead of having a direct movement back and forth to beat up the filling wires *v*, *v*, which are shown in red color it has two distinct movements, first advancing a short distance after the filling wire is put in to lay the latter square with the warp, and to bring it to a proper position for crimping, then retreating while the crimping machanism operates on the filling wire, after which operation it advances again far enough to beat the filling wire up to its place and finally retreating all the way back at one movement. The forward movements of the reed carriage or lay I², are produced by two cams J′, J′, of similar shape, on a shaft J, near the front of the loom, acting upon two elbow levers J², J², which work on fixed pins *l*, *l*, and are connected by rods J³, J³, with the lay, and the backward movements are effected by two other cams K′, on a shaft K, near the other end of the loom acting on two levers K², which work on fixed fulcra *l′*, and are connected by rods K³, with the lay. The cams K′, are of such form that when they draw back the lay after its first advance they hold it back long enough for the crimpers to operate before it makes its second advance to beat up the filling. The filling wires, if heavy wire is used, are all previously cut to the proper length in which state they may be inserted into the open shed in front

of the reed either by the hand of an attendant or by suitable mechanical means, the insertion always being made after every second retreat of the lay, that is to say after it returns from beating up the filling. In Fig. 1, the lay and reed are shown in the position they occupy on their first advance to square the filling and bring it into the position to be operated upon by the crimpers. If light wire is used the filling may be put in by a flying shuttle.

The crimpers whose form is best shown in Fig. 2, consist of two bars or plates *m*, *m'*, of steel one having a face of the form the upper sides of the filling wires are required to have after the weaving, and the other a face to correspond with the form required for the lower sides; and having recesses 5, 5, therein of sufficient size to receive the warp wires at their points of intersection with the filling. They are secured by screwing keying or otherwise in cast iron stocks L, L', the former above and the latter below the warp, the former stock being attached to a pair of long arms M, M attached to a rock shaft M* and the latter to a pair of arms M', M', attached to a rock-shaft M*'. The above arms have a proper movement to open the crimpers to allow the reed to pass between or through them, and to close the crimpers upon the wires to crimp them. The opening movement of the lower arms M', being in a downward direction is produced by gravitation but the corresponding movement of the upper arms M, being in an upward direction is produced by a cam N', on a rotating shaft N, acting on a lever N^2, attached to a rock shaft N^3, the said lever connecting with the arms M, by a rod *n*. The closing movement of the lower arms M', is produced by roller cams O', O', or revolving arms carrying rollers, secured on a rotary shaft O; and the corresponding movement of the upper arms M, is produced by similar roller cams P, P, on the shaft N, the said roller cams also producing the necessary pressure for the crimping operation. The necessary crimped form of the warp is produced by the filling wires during the act of crimping the latter.

In order to adapt the crimpers exactly to the thickness of the wire the stock L', is made in two parts the upper part to which the crimper is secured being adjustable relatively to the other by screws *q*, *q*. For different sized meshes different crimpers are used, and any number of pairs of crimpers can be provided for every loom.

In the woven fabric where any one of the filling wires passes under a wire of the warp, the next filling wire on either side must pass under the same wire of the warp, this brings the elevations in the crimping of one filling wire opposite the depressions in the crimping of the next and consequently the pair of crimpers when in position for crimping one wire are not in position to crimp the next. To correct this the crimpers receive a movement laterally to the warp, between every two successive filling and crimping operations, the extent of such movement being equal to the distances between the warp wires. To effect this lateral movement, the shafts N^3, M*, and M*', are all fitted so as to be capable of sliding in their respective bearings and the shafts N^3, and M*, are connected to an upright rod *p*, outside the framing of the loom, and the shaft M*', is connected by an arm *r*, with a parallel shaft Q below it, the said parallel shaft being connected with the aforesaid rod *p*, so that by a movement of the said rod *p*, all the above named shafts will move longitudinally simultaneously, and with them the arms carrying the crimpers. The movement of the rod *r*, for the above purpose is produced by a cam on a shaft R, which makes one revolution for every two filling operations. The said cam consisting of two segments S, S', curved in opposite directions from the plane of rotation as shown best in Fig. 3. These segments act alternately upon the upper end of a lever *t*, which works laterally to the loom on a fixed fulcrum *t'*, and has its lower end connected with the arm *u'*, of an upright shaft *u*, on the opposite side of which are forked arms u^2, u^2, which take hold of the rod *p*. The segment S, of the cam drives the upper end of the lever *t*, out from the loom throwing the lower end of the same and the arm *u'*, of the upright shaft, in toward the loom, throwing out the arms u^2, u^2, and the rod *p*, and moving the crimpers toward the right hand of Fig. 2. The other segment S^2, acts precisely the reverse and moves the crimpers to the left.

The power to drive the several parts of the loom is received by a short driving shaft S, shown partly in Fig. 1, and dotted in Fig. 2. This shaft carries a small spur wheel S', which gears with a spur wheel (not shown) on the shaft O, by which the lower crimper is operated. The shaft O, also carries a bevel wheel O^3, which gears with a bevel wheel T', of similar size on an upright shaft T, which is geared by a pair of bevel wheels T^2, N^4, of equal size with the shaft N, by which the upper crimper is operated. The shaft O, is also geared by bevel gearing which is partly shown at U, U, in Fig. 2, with both the shafts J, and K, which drive the lay, the said shafts both making the same number of revolutions as the shaft O. The shaft N, carries a small spur wheel *w*, which gears with and drives a spur wheel U', on a shaft U, and this wheel U' gears with a wheel R', of the same size on the shaft R, and this drives the mechanism by which the lateral movement of the crimpers is pro-

duced. The shaft U, carries an eccentric U^2, which is shown by dotted circle in Fig. 1, which eccentric is for the purpose of operating the heddles G, G′; the rod U^3, of the said eccentric being connected with an arm H′, on the rock shaft H, and thus produces the necessary movement.

The shaft N, also carries a crank Y, which would not be seen in Fig. 1, as it is on that side of the loom which is removed by the section, but in order to illustrate its action and at the same time prevent confusion with the other parts I have shown it together with its connections, in blue outline in that figure. This crank Y, drives the shaft F, from which the warp carriage E, E, receives motion. It is connected by a rod *x*, shown in blue outline in Fig. 1, with an arm *y′*, also shown in blue outline in Fig. 1, on a shaft *y*, which carries two other arms y^2, connecting by rods y^3, with two long levers X, which work on the shaft F, as a fulcrum, and carry each a pawl *z*, which engages with one of two ratchet wheels *z′*, which are fast on the shaft F. Every revolution of the shaft N, acting through the above mechanism causes the shaft F, to receive a movement sufficient for the pinions *c*, and racks *b*, to move the carriage E, E, a distance equal to the desired distance between the filling wires. In order to enable the warp carriage to be run back, when desirable or necessary, the pawls *z*, are connected by rods 10, with arms 11, on a shaft 12, at the top of the loom, and the shaft is furnished with a lever handle 13, represented in blue color, for the purpose of raising the pawls from the ratchet wheels.

The warp carriage is held firm in its place during the operation of beating up the filling wires, by means of a clamp Z, which reaches all across the carriage and presses it down on its bed. This clamp Z, is attached to one end of a lever Z′, which works on a stationary fulcrum 14, in a standard 15; the other end of the said lever being raised by a cam 16, on the shaft K, and by that means being caused to force down the clamp. The clamp is raised after the cam passes the lever by means of a spring 17, connected with the lever by a rod 18.

Having described the several parts of the machine and their duties and individual operations I will briefly describe the weaving process.

The warp wire having been secured in the carriage as hereinbefore described, the pawls *z*, are thrown in gear and motion is communicated to the driving shaft to start again. When the lay is thrown back ready for its preparatory and least forward advance the shed is open and filling wire is put in. The preparatory advance of the lay brings this wire to the position shown at *v′*, in Fig. 1, ready to be operated upon by the crimpers, at the same time laying it parallel with the face of the reed or square with the warp. As the lay retreats, the crimpers commence closing and after its retreat has terminated the lay remains stationary long enough for the crimpers to finish their operation and commence their opening. The final and most forward advance of the lay then takes place, the lay passing right through the open crimpers and beating the crimped wire up to its proper place. The forward movement of the warp carriage takes place during the final retreat of the lay or the early part of its next preparatory advance. The slacking of the warp wires by the screws *h*, *h*, takes place during the final retreat or at an early stage of the preparatory advance of the lay. The lateral movement of the crimpers takes place during the final advance and retreat of the lay, so that when the crimpers close upon the next filling wire which is inserted and brought to the position of *v′*, they crimp it to a form precisely the reverse of the last that is to say with its depressions opposite the elevations of the former one and vice-versa.

The operation proceeds as above till the carriage has been driven up as far as convenient, when the loom is stopped and the clamps *f*, *f*, and the tongs *h′*, are unfastened and the whole of the warp is pulled forward in the carriage E, E, by the attendants or by suitable mechanism the clamps *g*, *g*, admitting of this drawing forward as they only grasp it just tight enough to keep the wires properly extended and straight. The work is then again secured, the front part being secured this time by clamping it directly between the clamps *f*, *f*, the hooks *e*, *e*, being no longer necessary, and the rear part being secured by the tongs *h′*, *h′*, as before. When all is secure the pawls *z*, are thrown out of gear and the carriage E, pushed back by the attendants to such a position as to bring the last filling wire at a proper distance from the lay, after which the pawls may be thrown in gear again and the loom started, when all will proceed as before till the warp carriage has again run up as far as it can and the warp requires to be moved and the carriage run back. The fabric may be cut after being drawn past the clamp *f*, *f*, or if required to be of great length, it may be wound up into a roll. There is no limit to the length that may be woven as the warp wires may be joined.

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

1. Giving the reed two movements substantially as described the first for squaring the filling with the warp and bringing it to

a suitable position to be operated upon by the crimpers and the second to beat it up to its place.

2. Giving the crimpers a movement laterally to the warp in opposite directions alternately after the crimping operations for the purpose of making them adapt themselves to the varying intersections of the successive wires of the filling and the warp.

G. W. SMITH.

Witnesses:
JOSHA. BULLOCK,
S. L. KELLAM.