R. S. Newall.
Rope Mach.

No. 4,714. Patented Aug. 26, 1846.

Fig. 3.

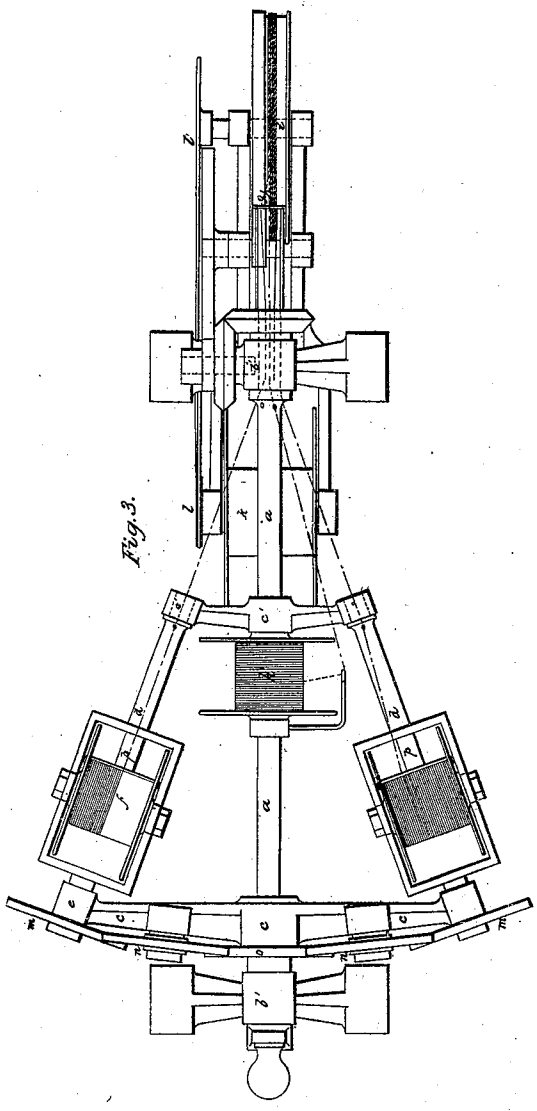

Fig. 6.

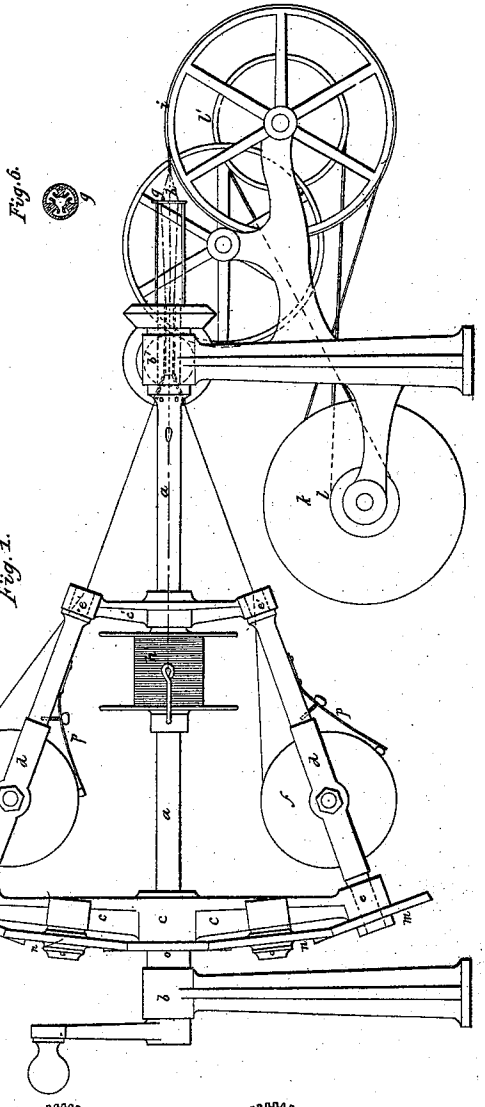

Fig. 1.

Fig. 2.

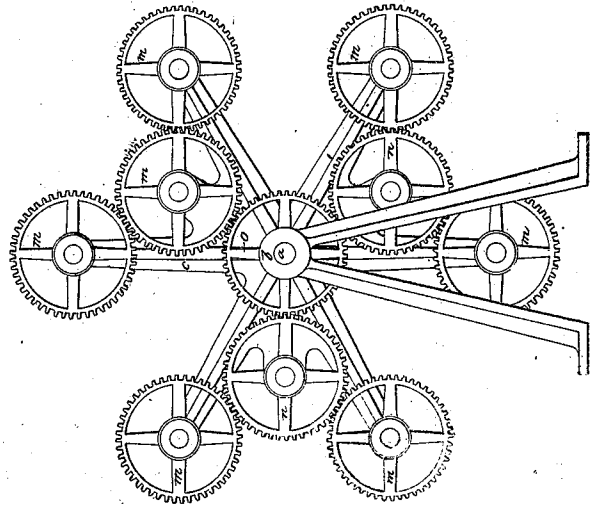

Fig. 5.

Fig. 4.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ROBERT S. NEWALL, OF GATESHEAD-UPON-TYNE, ENGLAND.

IMPROVEMENT IN METALLIC ROPES.

Specification forming part of Letters Patent No. **4,714**, dated August 26, 1846.

To all whom it may concern:

Be it known that I, ROBERT STIRLING NEWALL, of Gateshead, in the county of Durham, England, have invented certain new and useful Improvements in the Manufacture of Wire Ropes; and I do hereby declare that the following is a full and exact description thereof.

In the manufacture of wire ropes hitherto it has been the custom to lay the wires together to form a strand and the strands together to form a rope in such a manner that the individual wires were twisted—that is, were subjected to torsion round their own axes—and their strength was thereby materially impaired. The wires were also laid together in such a manner that they were not at equal distances from the center of the strand. They were therefore of unequal lengths and subjected to unequal strains. The strands also were at unequal distances from the center of the rope, and were therefore defective for the same reason.

The nature of my invention consists in manufacturing wire ropes in such a manner as to carry out the following two new principles, namely: the preventing the wires from being twisted in themselves and the keeping them equidistant from the center of the strand and the strands equidistant from the center of the rope.

My invention also consists in a new method of inserting fresh wires or strands when laying the wires into a strand or the strands into a rope.

To enable others skilled in the art to make and use my invention, I will proceed to describe an arrangement of machinery for carrying the above principles into effect, reference being had to the annexed drawings, making part of this specification.

Figure 1 is a sectional side view of a machine for making a strand of six wires or a rope of six strands. Fig. 2 is an end view showing the arrangement of the wheels *m n o* reduced to a plane. Fig. 3 is a plan.

NOTE: In the drawings some of the wheels are represented without teeth.

The machine consists of a shaft *a*, supported in bearings *b b'*. It carries two sets of arms *c c'*. The spindles *d d* are supported in bearings *e e'* in the ends of the arms *c c'* and carry the bobbins *f*, each of which contains one wire. The bobbins turn on center pins having a screw and nut at one end. An equal tension is given to each bobbin by means of a spring *p* with a regulating-screw.

For the purpose of preventing the wires from being twisted a motion must be given to each in the reverse direction of the lay of the strand. This is done by fixing a toothed wheel *m* onto the end of each spindle *d*. These wheels *m* and the center wheel *o* are all of the same size. The center wheel *o* is fixed to the bearing *b*, the shaft *a* passing through it. The intermediate wheels *n* work into the wheels *m* and *o*, and as the machine revolves the spindles *d* will therefore revolve once in the reverse direction for each revolution of the machine, and thus prevent the wires from being twisted in laying the wires into a strand, which are afterward laid into a rope by a similar but larger machine.

In order to keep the wires equidistant from the center of the strand and the strands equidistant from the center of the rope when the number exceeds three, they are laid round a core (which may be of hemp or other suitable material) of sufficient size to fill up the space formed by the wires and strands when arranged in a circle and touching one another. This is shown in Figs. 4 and 5, which are sections of a strand of six wires round a core and of a rope of six strands round a core. This number I prefer to any other, but do not confine myself to it. The wires pass from the bobbins *f* through holes in the end of the spindles *d* and in the end of the shaft *a*, and meet beyond the laying-plate *g*, (hereinafter described,) where they are laid into a strand round the core *h*, which is wound on the bobbin *h'* and passes through a hole in the shaft *a* and through the center of the laying-plate *g*. The strand is drawn by the drum *i*, round which it passes several times to obtain sufficient friction to prevent its slipping. It is then wound on the drum *k*, to which motion is given by the pulleys and belt *l l'*. The requisite motion is given to the drum *i* by means of wheels and pinions, as shown by the drawings. An index being employed to count the number of revolutions of the drum *i*, the length of the strand or rope may be easily ascertained.

I recommend that wire ropes should not be so hard laid as hemp ropes. I find that a

very good proportion is as follows: diameter of rope, one-half, five-eighths, three-fourths, seven-eighths, one, and one and one-eighth inches one revolution in six, seven, eight, nine, ten, and eleven inches—that is, in making a half-inch rope the machine shall revolve once while the rope is drawn a length of six inches, and so on; and I recommend that the strand should have double the lay of the rope—that is, in making a strand of a size necessary to make a six-strand rope of half an inch diameter the machine shall revolve once while the strand is drawn a length of three inches, and so on.

The laying-plate *g*, Fig. 6, is of use chiefly in inserting a fresh wire. The plate is fixed by means of rods at a distance (three feet for larger ropes) from the end of the shaft *a*, so that it revolves with the shaft, and is so made that the holes or slits through which the wires pass are at equal distances from each other and from the center, which is essential to be attended to in laying the wires regularly. The fresh wire or strand is inserted in the following manner: Suppose the wires are laid till an end is within three feet (for a rope of one inch diameter and less for smaller ropes) of the laying-plate. The empty bobbin is replaced by a full one. The core is cut close to the apex of the cone formed by the wires at *g*. The end of the fresh wire is passed through the hole in the spindle *d* and shaft *a*, and passing through the center of the laying-plate *g* takes the place of the core. The machine revolves and lays half the length of the remaining end, which is then taken out of its place and put in the center, while the new wire is brought from the center and put in the place occupied by the old one, which now forms the core. The remaining half is then laid and the core is again inserted and the laying of the strand continued. Thus the two ends of the wires cross one another and are firmly held in their place by friction. I prefer this mode of joining to brazing or twisting the ends together.

Having now described a means of carrying my invention into effect, I wish it to be understood that I do not claim the machinery above described as my invention, although it was invented by me, because many other methods of arranging machinery for making wire ropes on the principles I have discovered may be invented; but

I claim as my invention and desire to secure by Letters Patent—

1. Forming each strand by winding wires spirally around a flexible core without twisting the wires and forming the rope by the winding of such strands in the same manner around a similar core, the core of the strand being about equal in size to the wires, so that every wire in the spiral of each strand shall be laid equidistant from the center of such strand and every strand equidistant from the center of the rope.

2. A method of inserting a fresh wire or wires or a fresh strand or strands in laying the wires into the strand or the strands into the rope made as above when six wires are used in making the strand or six strands used in making the rope.

R. S. NEWALL.

Witnesses:

HENRY INGLEDEW,
Public Notary, Newcastle-upon-Tyne.
WM. SWEET,
His Clerk