Sheet 1. 2 Sheets.

A. Hathaway.
Cordage Mach.

No. 1,228. Patented Jul. 9, 1839.

Fig. 1.

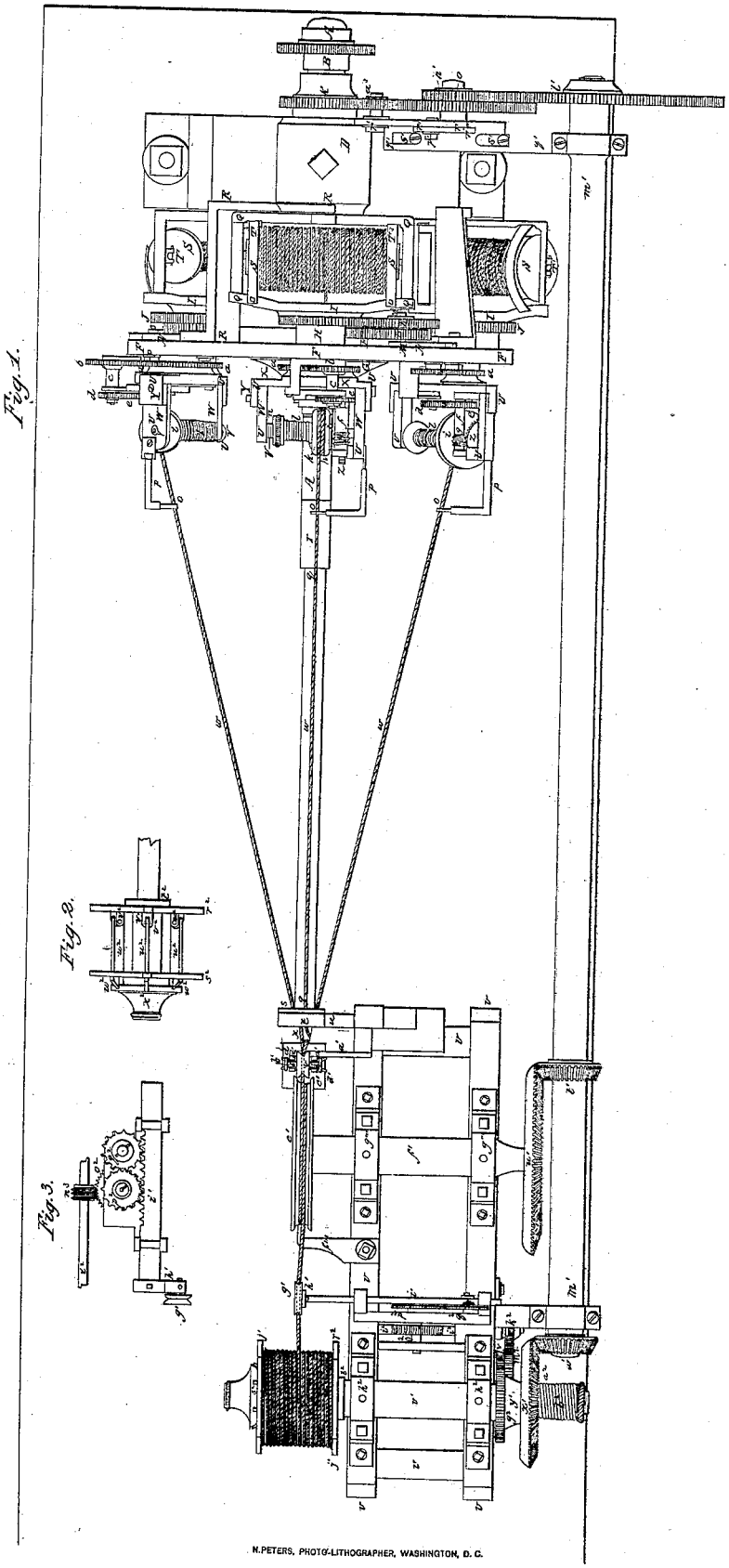

Fig. 2.

Fig. 3.

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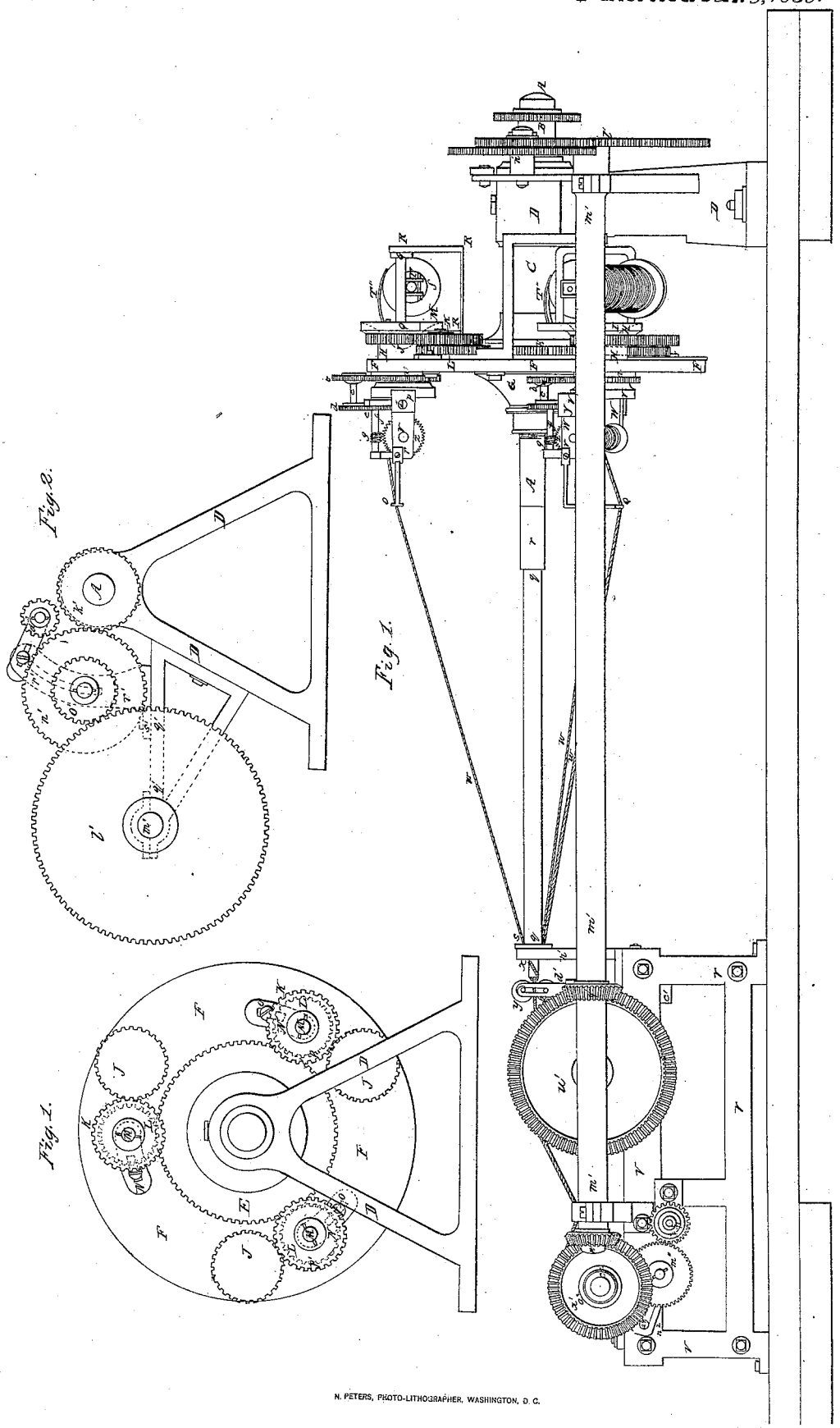

Fig. 2.

Fig. 1.

Fig. 3.

UNITED STATES PATENT OFFICE.

ALFRED HATHAWAY, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR MANUFACTURING CORDAGE.

Specification forming part of Letters Patent No. **1,228**, dated July 9, 1839.

To all whom it may concern:

Be it known that I, ALFRED HATHAWAY, of Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Machinery Used for Manufacturing Cordage of Various Kinds, and for such other purposes connected with the twisting and laying up of strands to which the same may be successfully applied, of which the following is a specification.

These improvements, the principles thereof, and manner in which I have contemplated their application, by which they may be distinguished from other inventions, together with such parts, improvements, and combinations, I claim as my invention and hold to be original and new, I have hereinafter described, which description, taken in connection with the accompanying drawings herein referred to, compose my specification.

Figure 1, Plate 1, represents a top view or plan of my improvements. Figs. 2 and 3 are detailed views of some of the parts which I shall hereinafter mention and describe. Fig. 1, Plate 2, exhibits a side elevation of the machinery.

It being customary, generally speaking, to lay up or twist ropes and cordage of different kinds in very large or extensive buildings, usually denominated "rope-walks," the intention of my improvements is to render these buildings unnecessary to a considerable extent, if not entirely, and at the same time that the rope is laid in a small or ordinary building it shall be twisted together or manufactured in a much more perfect manner in many respects than can be effected by any of the modes formerly practiced.

I am aware that the object of my improvements has heretofore been the cause of the invention of many machines, which have been patented both in this and other countries. As most of these machines were not capable of performing the work of laying up cordage in a satisfactory manner, owing to faults in the construction and operation, none have as yet, to my knowledge, been successfully introduced.

To remedy the faults observable in the different machines with which I am acquainted, and to invent a machine which shall be capable of performing the laying up of cordage in as perfect a manner as can be desired, has been my object, which machine it is my intention now to describe.

A A, Fig. 1, Plates 1 and 2, represent the main shaft, constructed of iron or other suitable material.

The power which gives motion to the machinery is to be properly applied to a cog-wheel B, Plate 2, Fig. 1, on the extremity of the shaft A A; or the shaft A A may be turned in any other convenient and effective manner. The shaft A A passes through a hollow shaft C, Fig. 1, Plate 2, projecting from and strongly attached to and supported in any suitable manner by the standard or upright post D D, constructed of cast-iron, wood, or other suitable material. A large cogged wheel E, Fig. 1, Plate 3, is attached to the opposite end of the stationary and hollow shaft C, and in the interior and near each end of the hollow shaft C are suitable bearings or boxes, in which the shaft A A is supported and revolves. A large circular plate or framed wheel F F F, Fig. 1, Plate 3, is attached by a neck G to the shaft A A, and thus revolves with said shaft while in motion. The necks H, of any proper number of fliers I I I, are sustained and revolved in bearings connected with the plate F F. (See Fig. 1, Plates 1 and 2.) Each neck has a gear or spur wheel J, the teeth of which engage with another gear-wheel K′, attached to the side of a third gear-wheel L, both combined, playing loosely upon one axis M, which axis projects from and is attached to or near the extremity of a piece of metal N of suitable shape and held firmly to the face of the circular plate F by a bolt or bolts with screws and nuts, as seen in Fig. 1, Plates 1 and 3, at O and P. The latter cogged wheel L engages with the stationary cogged wheel E on the hollow shaft C, and it will easily be seen by inspection of the drawings that as the circular plate F on the main shaft revolves with the said shaft the gear L will move over the fixed or stationary cogged circumference of the gear E, by which motion the gear L, with the gear K attached thereto, will be caused to revolve on the short shaft M M, thus communicating motion to the cogged wheel J on the neck H of the flier I, and of course causing the revolution of the flier. The pieces of metal N, to which the gear-wheels K L are attached, should be so connected to the face of the circular plate F as

to be readily and easily removed whenever it may be necessary to substitute gears of larger or smaller dimensions to change the speed of the fliers; and it will be seen that the gears K L are only intervening wheels between the great stationary gear E on the extremity of the hollow shaft C and the gear J on the neck H of the flier I, and are for the purpose of giving a rotary motion to the fliers to twist the strand. By varying the dimensions of the combined wheels K and L the amount of twist of the strand may be changed whenever necessary.

Q Q Q Q, Fig. 1, Plate 1, is a bent rod formed as seen in the drawings, or otherwise properly shaped. The bent ends of this rod are fastened to the extremities of the body of the flier I. A knee or strut R R R, firmly attached to the face of the circular plate F, supports at its other extremity and serves as a bearing for the central part of the bent piece Q Q Q Q, while the flier revolves. The object of the bent piece Q Q Q Q is to sustain the ends of the axis of the bobbin S S, as seen at T T, in Fig. 1, Plates 1 and 2, which represents small boxes properly formed, into which the ends of the axis of the bobbin are inserted and in which the axis revolves. The bobbins or spools S S revolve endwise with the flier and parallel to the face of the plate or framed wheel F, the spool working sufficiently hard in the bearings to impart to the strand a proper degree of tension or prevent it from running off loose. This may be regulated by a spring T^3 T^3, (see Fig. 1, Plates 1 and 2,) bearing against the circumference of the heads of the bobbin or spool, or by friction otherwise properly and conveniently applied thereto.

On the opposite end of the flier-neck H a frame U U U U, shaped as seen in the drawings, (or otherwise properly formed,) is attached. This frame supports the journals or extremities of a revolving shaft V V.

a, Fig. 1, Plates 1 and 2, is a stationary spur-gear attached to the face of the wheel or plate F, the neck of the flier revolving in and passing through the same. A gear-wheel *b* on a shaft *c* engages with the fixed gear *a*. On the opposite end of the shaft *c* is a small pinion *d*, which engages with and turns a geared wheel *e* on the shaft *f*.

The frame-work attached to the frame U U, or that which supports the gear-wheels *b d*, should be so connected to the frame U U as to readily admit of a change of the gear *d* for others of different diameters, as the rendering up of the strands may require. This may be accomplished in various ways, and will be readily understood by mechanics generally. The gear-wheel *d* is to be so attached to the end of the shaft *c* as to be easily detached when it is necessary to substitute another. The shaft *f* has an endless screw *g*, which turns a gear-wheel *z* on the shaft V. A loose pulley *h* runs on the shaft V. This pulley is fitted or rests against a proper shoulder *i* on the shaft V and should be grooved out on its circumference, as represented in Fig. 1, Plate 1, so as to admit of one or more turns of the strand, as may be deemed necessary to prevent the same from slipping. A loose collar *k* presses against the loose pulley *h* on the opposite side to that which rests against the shoulder *i*, and should be prevented from revolving on the shaft by means of a small key in the pulley resting in a longitudinal groove of the shaft V or in any other convenient or proper manner. A wound circular spring *l* encircles the shaft V, one end of this spring resting against the shoulder *k* and the other against a nut *m*, which works on a screw *n*, formed on the shaft V. By turning up the nut *n* any required degree of pressure of the spring against the collar *k* may be applied to said collar, so as to pinch the pulley *h* between it and the shoulder *i* and produce friction on the pulley, so as to regulate the strain or tension of the strand.

In order to impart to the strands a suitable degree of twist, it is necessary that they should be strained endwise as much as may be required, not only to prevent them from becoming loose, but to keep them drawn sufficiently tight, so that the strand-layer may effectually accomplish its office. Therefore it will be seen that the above is the object of the pulley *h* and other machinery attached to the frame U U U U. The pulley *h* by the operation of the machinery which causes it to revolve renders up or delivers the strand very nearly as fast as may be necessary; but if by any cause more strand is required than the gears of the above machinery will allow the pulley to furnish, the pulley will slip a little on its axis or overcome the friction produced by the collar *k* and spring *l*, and thus yield the desired quantity. It will be seen, therefore, that the loose pulley will always preserve an equal tension on the strand.

The neck H of the flier is formed hollow and bell-mouthed, as represented by the dotted lines in Fig. 1, Plate 2. The strand after leaving the bobbin is passed through the hollow part of the neck to and around the draft or regulating pulley *h*. From thence it is carried through small eyes *o* (in the extremity of bent arms *p*, attached to the leg W of the frame U U) to the strand-layer on the extremity of the long spindle *q q*. The object of the eye *o* is to support the strand in the direction parallel to the axis of the flier during the revolutions of the said flier, by which means the strand is kept on the circumference of the pulley *h*.

At the end of the main shaft A A the spindle *q q* is coupled by a proper box of the usual construction. On the other end of the spindle *q q* is a collar *s*, the spindle being supported at this extremity during its revolutions by a bearing on the top of a metallic post *u*, (see Fig. 1, Plates 1 and 2,) connected to a frame *v v v*.

Holes corresponding in number with the fliers in use are formed through the revolving collar, through which holes the strands *w w w*

from the bobbin or spools are passed and continued through the grooves of the strand-layer X on the extremity of the spindle $q\ q$. The strand-layer is formed by tapering or giving to the extremity of the spindle the shape of a frustum of a cone and cutting grooves or scores in the surface either straight or diagonally around the surface of the frustum. Into these grooves the strands are received, and as they leave the same are laid or twisted together by the revolutions of the spindle $q\ q$.

At a sufficient operating distance from the end of the strand-layer X two grooved rollers $y\ z$ (see Fig. 1, Plates 1 and 2) are situated, between which the cordage passes as it is laid or twisted. The lower roller z is supported in bearings near the top of the standard a'. The upper roller y rests on the lower roller z and is lifted from it by the cordage intervening between them, and which during the operation of the machinery gives motion to both rollers. Each extremity $b'\ b'$ of the axis of the upper roller extends past the sides of the standard a', so that a weight c' may be suspended thereon by straps $d'\ d'$, proceeding upward from the same. While the cordage is being laid it is held firm by means of the above rollers, the upper of which is weighted, as above described, or in any other convenient or proper manner. The cordage is drawn from the strand-layer X by a grooved wheel or pulley e' (see Fig. 1, Plate 1) on the extremity of a shaft f', revolving in suitable boxes or bearings $g'''\ g'''$, attached to the upper beams of the frame $v\ v$. The cordage enters on the highest part of the grooved wheel or pulley e', taking one or more turns around the same, as may be necessary, to prevent it from slipping on the circumference of the wheel, and works down by the assistance of a guide f'''. The guide f''' is simply a piece of metal suitably shaped and attached to the frame v in any proper manner, and having a bent and wedge-shaped end, which rests against the side of the cordage merely to give it a proper direction toward the opposite side of the wheel or pulley to which it entered, thus assisting the cordage to run free to the loose pulley g'. The pulley g' runs on a stud supported by a standard n'. (See Figs. 1 and 3, Plate 1.) The standard h' is attached to the end of the rack i' of the traverse motion, which regulates the winding of the cordage on the reel j'.

Having thus described the machinery which twists and lays the strand, or traced the strand from the bobbin to the reel, on which the rope is wound as it is formed, I shall now proceed to describe other parts of the machinery, which are for the purpose of aiding some of the operations before mentioned, and first I shall mention that which causes the shaft f' to revolve. A gear-wheel k' of suitable proportions is fixed on the shaft A A, and also another gear l' is attached to the extremity of a shaft $m'\ m'$. (See Fig. 1, Plates 1 and 2, and Fig. 2, Plate 3.) Between these gear-wheels above mentioned a sufficient number of gear-wheels are interposed to convey a due degree of motion to the shaft $m'\ m'$. These wheels, as represented in the drawings, are two in number—viz., $n'\ o'$. The wheel k', imparting motion to the wheel n', gives motion to the wheel o', which is fixed on the same axis, and the wheel o', working into the large gear l', gives the required motion to the shaft $m'\ m'$. The frame-work $r'\ r'$ should be so arranged as to admit a change of the gear-wheels $n'\ o'$ for others of different dimensions for the purpose of regulating the draft of the cordage by the pulley e', according to the size of the cordage to be manufactured or to other circumstances. This is effected by means of a slot in the frame-work $r'\ r'$, which allows the axes of the wheels $n'\ o'$ to move up and down in the same, the nut p' serving to clamp it in any desired position. The frame $r'\ r'$ is attached to the frame $q'\ q'$, (which likewise supports one end of the shaft $m'\ m'$,) and the position of the frame $r'\ r'$ on the frame $q'\ q'$ may be varied at pleasure by means of the slots and clamps shown at S' S'.

The wheel e', which regulates the draft of the cordage, is turned in the following manner: On the shaft $m'\ m'$ is affixed the beveled pinion t', which works into and turns the large beveled gear n' on the axis f', on which the wheel e' is also situated.

The rotation of the shaft v', on which the reel is situated, is effected as follows: Another beveled pinion w' is affixed to the extremity of the shaft $m'\ m'$, which engages with and turns the beveled gear x'. This wheel is loose on the axis v' and bears against a shoulder y' on said axis. It also has a collar a^2, spring b^2, and nut c^2, similar in arrangement and construction to those before described and denoted by $k\ l\ m$, so that by turning the nut c' forward or back the wheel x' may be made to bear with a greater or less degree of friction on the shoulder y' of the shaft v'. This arrangement is for the purpose of regulating the operation of winding the cordage upon the reel, for as the reel increases in size it will be obvious that a less number of revolutions will be requisite to take up the same length of cordage. As cordage is not always twisted or laid up in the same direction, it may be necessary to reverse the motion of the machinery which performs this part of the operation, while it is absolutely essential that the winding apparatus should move in the same direction. This latter object is effected by the interposition of the small gear-wheel a^3 between the wheels $k'\ n'$, the operation of which will be readily understood.

Having thus completed the description of the machinery which causes the revolution of the shaft v', it now becomes necessary to explain that by which the rope as fast as laid is regularly wound over the reel. It will be seen that to effect this it is necessary to take into account the winding of the rope sidewise to and fro in regular layers over the surface

of the reel, and also the gradual enlargement of the coil, which takes place by the overlapping of the rope. A cogged wheel k^2 (see Fig. 1, Plate 2) is fitted on the extremity of a horizontal shaft i^2, Figs. 1 and 3, Plate 1, and Fig. 1, Plate 2, more particularly seen in Fig. 3, Plate 1. Between the gears g^2 and k^2 are two combined intervening gears $l^2 m^2$, through which motion is communicated from the wheel g^2 to k^2. The standard n^2, Fig. 1, Plate 2, which supports these combined gears $l^2 m^2$, should be so attached to the frame v v by a screw and nut a^4 that these gears may be changed for others of different dimensions, as the size of the cordage may require. An endless screw n^3 (see Fig. 3, Plate 1) is fixed on the shaft i^2 and operates in the teeth of and turns round a gear-wheel o^2, which operates the traverse motion that regulates the winding of the cordage on the reel. A gear-wheel p^2 on the same shaft with o^2 operates with another gear-wheel q^2. Behind these gear-wheels and attached to them are sectional gear-wheels—that is to say, wheels of the same size of p^2 and q^2, and in which a certain number of the teeth are removed from each. The teeth of these sectional wheels operate in the rack i' and impart to the same a reciprocating rectilinear motion. While the teeth of one semi-circumference of one of the sectional wheels are engaged with the teeth of the rack the teeth of the other are disengaged and the rack is moved in one direction as far as is desirable. As soon as the last tooth of the first sectional wheel leaves the teeth of the rack the first tooth in the arc of the second wheel enters the teeth of the rack, and thus the teeth of the second sectional wheel move the rack backward in an opposite direction. Thus the rope is guided to and fro over the surface of the reel j' by the rack i' and the pulley g'.

The reel j' j' consists of two heads s^2 r^2, (see Figs. 1 and 2, Plate 1,) one of which heads r^2 is stationary or fixed on the hub t^2, and into which four or more bars u^2 are inserted. Each of these bars has a joint at one end, as seen at v^2, Fig. 2, Plate 1, and it extends through the opposite head s^2, resting on the beveled edge w^2 w^2 of a nut x^2. When the nut is unscrewed or removed, the bars fall toward the center and leave the coil loose on the reel.

Having thus described my invention and improvements, I shall claim in the above as follows:

1. The mode of regulating the twist by means of the changeable combined wheels, in combination with the gear-wheel on the neck of the flier and on the end of the fixed hollow shaft, as herein described.

2. The apparatus which draws the strand from the bobbin or spool and regulates the delivery and tension of the strand, which is situated on the opposite side of the circular plate F to that on which the fliers are arranged—that is to say, the combination of the draft-pulley h, spiral spring l, and nut m, and other parts attached to the frame U U, this apparatus thus combined being operated by the fixed gear a, all as herein described.

3. The method of adapting the machine to different-sized cordage by coupling the main shaft and spindle, as herein described.

4. The arrangement, substantially as described, of the machinery intervening between the gear-wheel k' and the reel-shaft V′ for the purpose of giving motion to the reel-shaft for the object of winding the cordage on the reel, in combination with the collar a^2, spring b^2, and nut c^2, and reel, in the manner and for the purpose hereinbefore set forth, and also for regulating the winding of the cordage on the reel as the same increases in size, as above described.

5. The method of distributing the cordage over the reel by combining with the reel the rack i', operated and regulated in the manner herein described.

6. Constructing the reel j' with hinged bars w^2 w^2, operated on by a nut x^2, as I have hereinabove explained.

In testimony that the above is a true description of my said invention and improvements, I have hereto affixed my signature this 21st day of June, in the year 1839.

ALFRED HATHAWAY.

Witnesses:

JOHN R. ADAN,

EZRA LINCOLN, Jr.