No. 654,584. Patented July 31, 1900.

J. C. ANDERSON.

WINDING MACHINE.

(Application filed Feb. 17, 1900.)

(No Model.)

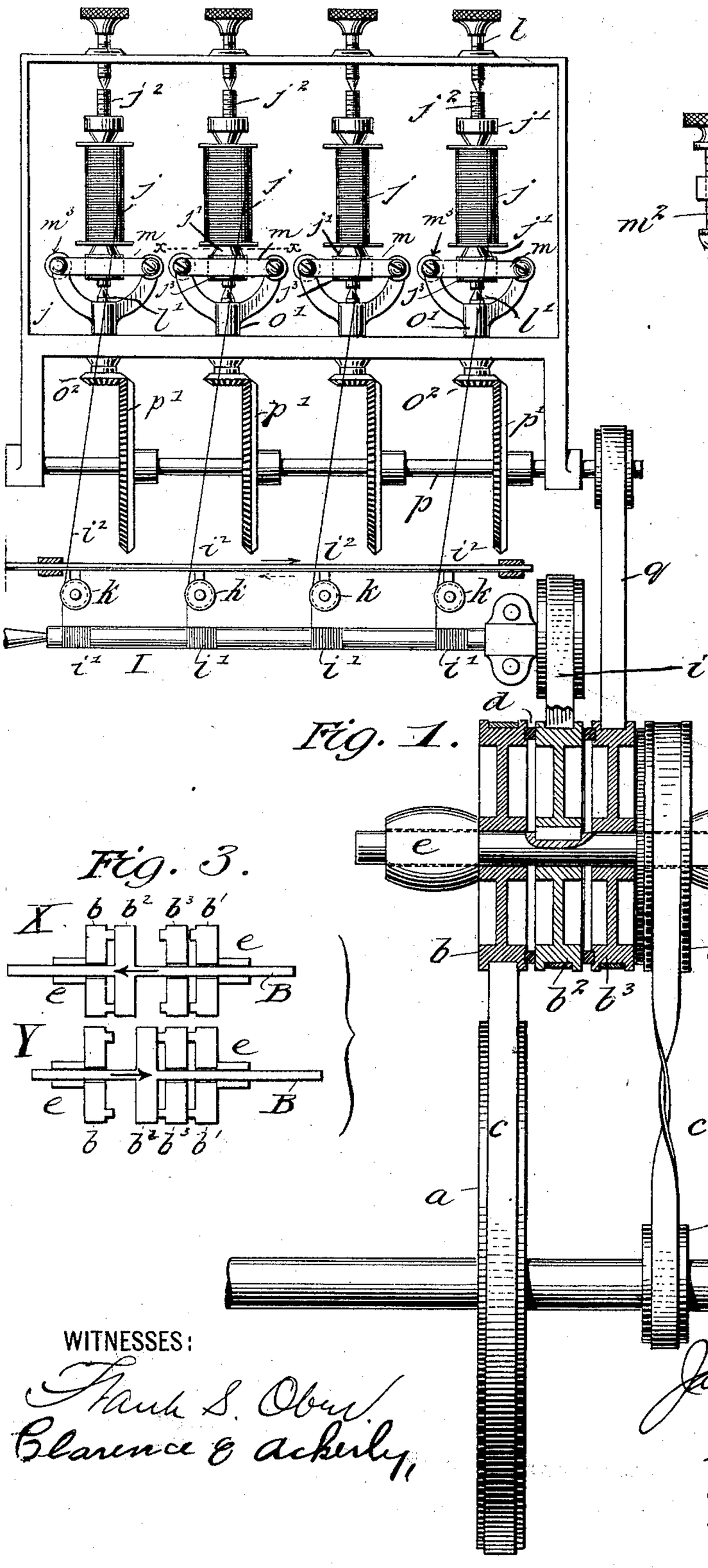

Fig. 1.

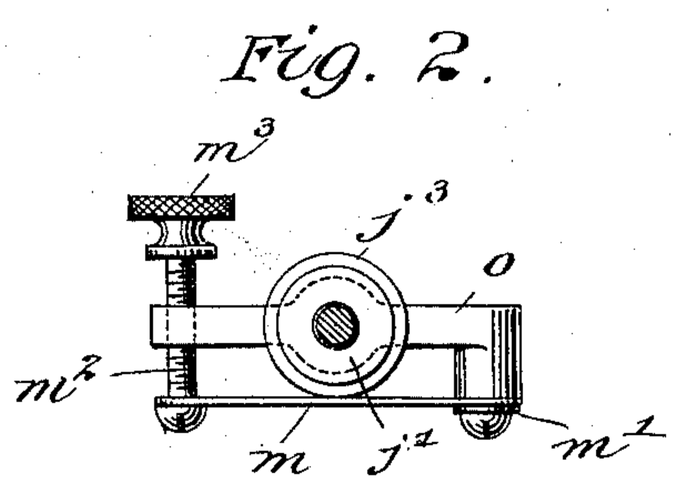

Fig. 2.

Fig. 3.

WITNESSES:

Frank S. Obrien

Clarence E. Ackerly

INVENTOR

James C. Anderson

BY

Wm. C. Rosenbaum

ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES CHRIS ANDERSON, OF JERSEY CITY, NEW JERSEY.

WINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 654,584, dated July 31, 1900.

Application filed February 17, 1900. Serial No. 5,624. (No model.)

To all whom it may concern:

Be it known that I, JAMES CHRIS ANDERSON, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Winding-Machines, of which the following is a full, clear, and exact description.

This invention relates to machinery for winding fibers, filaments, or strands into coils, bobbins, or helices, and has special reference to a machine in which spools upon which such material is stored are placed in the machine and the fibers, filaments, or strands led, respectively, therefrom to a single winding-spindle, upon which a plurality of the coils, bobbins, or helices are simultaneously wound. In the operation of such a machine my experience has shown that occasions often arise when it is desirable to partially unwind the coils, bobbins, or helices from the winding-spindle and back-wind the material upon the spools on which they were originally stored. There are various reasons for the necessity of this back-winding, and as one instance I may mention the fact that in winding copper wire for electrical helices it is necessary that all of the helices which are simultaneously wound upon the spindle shall when finished contain the same number of turns of wire. If in the winding operation the wire leading to one helix terminates, as is often the case, the machine cannot be stopped to splice the wire until a number of turns of the perfect wire have been wound into their respective coils, so that it is necessary to unwind these extra turns to the point where the wire terminated in the defective helix. The difficulty of this back-winding arises from the fact that the coils, bobbins, or helices on the spindle are all of the same diameter and must give back or pay off the strands equally, whereas the spools upon which the bulk of the material is stored are likely to be of various diameters, owing to the different quantities of material contained, respectively, thereon, and if they are positively driven to back-wind the strands unequal tensions will be created in the strands, causing some of them to break and others to become slack.

It is the object of my invention, therefore, to provide means for back-winding strands on their respective spools from a plurality of coils, bobbins, or helices of the same diameter and all wound upon the same spindle or its equivalent. I accomplish this back-winding operation without breaking or tangling the strands by positively driving the winding-spindle in a backward direction and simultaneously rotating the spools at a variable speed controlled by the tension of their respective strands. The specific devices for accomplishing this are illustrated in the accompanying drawings, in which—

Figure 1 represents somewhat conventionally the spools, the winding-spindle, the power devices, and the gearing all arrranged in accordance with my invention. Fig. 2 is a section on line $x\,x$ of Fig. 1. Fig. 3 is a conventional representation of the two conditions under which the shifting-pulleys act.

A indicates a power-shaft, and B a counter-shaft carrying two pulleys b and b', loose on said counter-shaft and driven in opposite directions from shaft A by the belts c and c', which pass around pulleys a and a', respectively, belt c' being crossed to obtain the reverse direction. Between the two pulleys b and b' are the two pulleys b^2 and b^3, the former of which is keyed to the shaft and the latter loose thereon. Between the adjacent faces of the pulleys frictional surfaces are formed, by which when the pulleys are pressed together motion will be imparted from one to the other. The outer pulleys b and b' are adapted to abut against the bearings $e\,e$, respectively.

f is a lever pivoted at f' and having a fork engaging with a groove in the end of the counter-shaft B, by means of which said shaft may be moved longitudinally in either direction. The spring s acts to pull the lever f in one direction, while power, either manual or of other nature, is used to move the lever in the opposite direction, where it may be locked by the latch-lever g. With the understanding that b^2 is the only pulley positively connected with the shaft it will be seen that when the shaft B is forced over to the left pulley b^3 will be carried into contact with pulley b and will receive motion from said pulley, while the pulley b' will run idle in the opposite direction and pulley b^3 will not be driven at all; also, when lever f is thrown to the right the

connection between pulleys b and b^2 will be broken, leaving pulley b to run idle, while pulley b^2 will make frictional connection with pulley b^3 and the latter will make frictional connection with pulley b', thus driving pulley b^2 in the reverse direction, and with it pulleys b^3 and b'. This reverse movement will, however, be slower than the former movement on account of pulley a' having smaller diameter than pulley a.

I indicates a winding-spindle positively driven by means of a belt i from the pulley b^2 whenever the shaft B is rotated in either direction. Upon this spindle the machine winds a plurality of coils, bobbins, or helices i', the material in the form of strands, fibers, or filaments i^2 being drawn off from spools j and being guided to feed upon the spindle in layers by relatively-traveling guides k. As a substitute for this single winding-spindle I, I may use a number of spindles, all driven by pulley b^2, and still carry out the idea of my invention. The spools j are mounted rigidly between cones j' on the spool-shafts j^2, and these shafts are mounted to rotate freely between the centering-pins l and l'. The lower cone j' is provided with a cylindrical surface j^3, which forms one member of a frictional clutch and brake. The other member of this clutch and brake is a flat spring m, bearing against the cylindrical surface and supported across the arms of a yoke formed on a hub o', surrounding and secured to the pin l'. The spring is positively fixed at one end by a screw m' and at the other end is adjustable, so that it may be made to press with greater or lesser force against the cylindrical surface j^3 by the screw m^2, carrying the thumb-nut m^3. The pin l' has a bearing in the frame of the machine and carries a bevel-pinion o^2, which engages with bevel-gear p' on shaft p. This shaft is driven by a belt q from pulley b^3. It will be understood that the mountings of the spools j are all alike, and all are flexibly connected with the shaft p, in the manner described.

The operation is as follows: The pressure of the spring m upon the cylindrical surface j^3 is adjusted so that a suitable tension will be given to the strands to prevent any accumulation of slack and to insure proper laying of the convolutions in the layers on the winding-spindle. At the same time, since the strands are to be unwound from the spools merely by draft created by the winding-spindle, care must be exercised not to make this friction between spring m and surface j^3 so great as to be the cause of breaking a strand. When the ends of the strands have been properly connected with the winding-spindle, the machine is started by throwing the pulleys b^2 and b into frictional engagement in the manner hereinbefore described, this condition being indicated at X, Fig. 3. This rotates the winding-spindle and allows shaft p to remain stationary. The rotation of the winding-spindle draws the strands from the spools j, and by the action of the guides k one layer is wound upon another until the coils, bobbins, or helices are finished. Now in case one of the strands terminates the operator upon discovering the fact releases the latch g and allows spring s to throw the pulleys into the condition shown at Y, Fig. 3, whereupon immediately the shaft p is driven and the direction of the winding-spindle I is reversed. The latter shaft p communicates its motion through the pinions o^2 to the yoke o and spring m, and by reason of the frictional engagement between said spring and the surface j^3 the spools are driven in the direction opposite to that in which they rotated when paying off the strands. This causes the strands to be wound back upon the spools, in which operation it will be understood that as the winding-spindle pays off the strands uniformly the spools, which are of various diameters, must actually rotate at various speeds to avoid such a strain upon the strands as would break them. Now since the winding-spindle pays off at a constant rate and the friction-clutch between the spool and the shaft is set to yield before the strand will break it is evident that the resultant speed of each spool will be just sufficient to take up its strand as fast as it is given off by the winding-spindle. The winding-spindle must be positively driven in this back-winding operation, because if free it would run at the speed determined by the strand pulling the hardest upon it, and those strands which were not pulling so hard would become slack. With the speed of the spindle predetermined the speed of shaft p should be such that the spool having the least quantity of material on it will rotate fast enough to take up the strand as fast as it is given off by the spindle. Then the other spools will slip to a greater or lesser extent. When the strands have been back-wound sufficiently, the machine is stopped and the broken strand spliced, whereupon the winding-spindle is again started forward by throwing the pulleys into the condition shown at X.

It will be seen that while the frictional device described serves as a differential clutch for the back-winding operation it also acts as a tension for the strands in winding forward, the flat spring m being a mere brake-shoe.

Having described my invention, I claim—

1. In a machine for winding fibers, filaments or strands into coils, bobbins or helices, the combination of a winding-spindle, a plurality of spools upon which the fibers, filaments or strands are stored, means for conducting the fibers, filaments or strands from the spools to the spindle, means for rotating the spindle and spools backward, and a yielding connection between the respective spools and said rotating means, substantially as described.

2. In a machine for winding fibers, filaments or strands into coils, bobbins or helices, the combination of a winding-spindle, a plurality of spools upon which the fibers, filaments or strands are stored, means for conducting the

fibers, filaments or strands from the spools to the spindle, means for rotating the spindle and spools backward, and an adjustable yielding connection between the respective spools and said rotating means, substantially as described.

3. In a machine for winding fibers, filaments or strands into coils, bobbins or helices, the combination of a winding-spindle, means for rotating it, a plurality of spools, means for directing the material stored thereon to the winding-spindle, a shaft, a yielding gearing between the shaft and each spool, and means for rotating said shaft, substantially as described.

4. In a machine for winding fibers, filaments or strands into coils, bobbins or helices, the combination of a winding-spindle, means for rotating it, a plurality of spools, means for directing the material stored thereon to the winding-spindle, a shaft, a yielding gearing between the shaft and each spool, means for reversing the direction of rotation of the winding-spindle and rotating the shaft, substantially as described.

5. In a machine for winding fibers, filaments or strands into coils, bobbins or helices, the combination of a winding-spindle, means for rotating it, a plurality of spools, means for directing the material stored thereon to the winding-spindle, a shaft, a yielding gearing between the shaft and each spool, and means for simultaneously reversing the direction of rotation of the winding-spindle and rotating the shaft, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

JAMES CHRIS ANDERSON.

Witnesses:
WM. A. ROSENBAUM,
FRANK S. OBER.