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AZA ARNOLD, OF NORTH PROVIDENCE, RHODE ISLAND.

## DOUBLE-SPEEDER.

Specification forming part of Letters Patent No. 11, dated January 21, 1823; Reissued August 10, 1836.

*To all whom it may concern:*

Be it known that I, AZA ARNOLD, of North Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Cotton-Roving Machines, called the "Double-Speeder," which improvement consists in applying a certain combination of wheels to produce the proper motion for winding the roving upon the spools.

Said combination is composed of several wheels connected in such a manner (hereinafter described) that the first and second operate immediately on the third without affecting each other, so that if the first be put in motion it moves the third although the second remains still, and if the second be put in motion it moves the third although the first be still, then if the first and second move together it moves the third with the accumulated motion of both; and further, if the first and second move in opposite directions then the third turns on its own axis, which axis moves only by the difference of their two velocities. This may be called a differential or compound motion, for the effect is either to add two motions together or to subtract one from the other as the case may require, and it is equally applicable to the "double speeder" one way as the other. I have applied it both ways.

The "double speeder" is too well known to require any particular description. It may be proper first to state that the "double speeder," is a machine that makes the roving and winds it on the spools; it draws the cotton by a system of rollers similar to that of Arkwright's roving can-frame, but unlike that it has no cans to receive the roving, but has fliers to twist and wind the roving upon the spools: the "double speeder," requires three motions essentially different from each other, one is a uniform motion of the fliers, rollers, &c. Another must be a retarded motion for the vertical movement of the spools, while the third may be an accelerated motion for the rotary movement of the spools, or it may be another retarded motion. Suppose the vertical reciprocating motion of the spools required to be reduced from four vibrations per minute by degrees to one vibration per minute; the reason of this change will appear from the nature of the operation required, for the rising and falling of the spool causes the roving to be wound from top to bottom and vice versa; then as the diameter of the spool is enlarged by each successive layer of roving the motion should be reduced in the same proportion, otherwise the roving would not be wound equally close, and while the flier revolves with uniform velocity, say twenty revolutions per given time the spool should vary (during the time of being filled) from sixteen to nineteen turns; so that when the roving is winding on the bare spool the flier turning twenty and the spool sixteen times gives the roving four turns around the spool; but when the spool is near full and is four times as big in diameter it will require four times as much length of roving to reach around it, therefore it is proper that it should turn nineteen times while the flier turns twenty, giving one turn of roving around the spool only. Since the same cause that requires one variation requires the other also, it appears that their differentials should correspond; the enlargement of the spool requires that one motion should be reduced lest the roving should not be wound equally close, and requires that the other should be accelerated lest the roving should be broken. Now if this retarded motion be added in just proportion continually to the uniform motion of the fliers it gives a retarded motion compounded of the two whose differential is the same, and if deducted continually from the motion of the flier it gives an accelerated motion whose differential is the same.

The foregoing is not given as a rule for any one kind of roving, but is taken merely for illustration, the motions should be calculated according to the fineness of the roving required. The mechanical construction of said combination the application of which I claim as my improvement, is described as follows, viz: Two face wheels (bevels) are fitted loosely on a shaft at such distance apart as to admit a pinion to gear into both at once; this pinion is placed on an arm of the same shaft or piece of metal placed on the shaft, between them and projecting a little beyond their circumference; both wheels may be loose on the shaft and and kept in place by collars secured against them. Now as the teeth of the pinion take hold of, the teeth of, both wheels and it is at liberty to turn on its own axis. if one wheel turns it turns the pinion on its axis