MACHINE FOR FINISHING SPRINGS

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MACHINE FOR FINISHING SPRINGS.

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To all whom it may concern:

Be it known that I, FRANK H. SLEEPER, a citizen of the Dominion of Canada, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Machine for Finishing Springs, of which the following is a specification.

This invention relates to a machine for conducting springs automatically into registration with a number of mechanisms for securing their ends so as to fit them for the market, the principal operation being to knot or coil their ends.

The invention is capable of use on springs of various kinds but it is particularly adapted for knotting the ends of double conical bed or cushion springs and I have shown it as used for that particular purpose. The invention involves the use of a pair of carriers, if both ends of the spring are to be operated upon, one for taking the springs from a feeder or from the coiling machine, locating them properly, bringing them into the proper position with respect to a knotter, knotting the ends and discharging the springs, and the other being arranged to receive the springs from the first named carrier and performing the same operations upon it to finish the opposite end and discharge the finished product. The invention, as shown, also involves means for compressing the springs finally before they are discharged from the second carrier, means for transferring the springs from one carrier to the other, means for intermittently rotating both carriers and holding them when stopped in proper position for the performance of the several operations, and means for timing all the above mentioned parts so as to secure accurate results. The location of the several instrumentalties for operation on the springs in certain relations to each other is also a feature of the invention.

Additional objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a front elevation of a machine constructed in accordance with this invention for finishing the ends of the conical furniture or bed springs;

Fig. 2 is an enlarged plan of the means for insuring the setting of the spring back on the carrier head at the beginning of the operation;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1, looking in the direction of the arrows and showing the means for turning the springs to the proper position on the heads for locating them so that they can be operated upon by the knotter;

Fig. 4 is a side elevation of one of the knotters looking at it on an incline as indicated by the line 4—4 in Fig. 1;

Fig. 5 is an opposite side view of the knotter, looking in the opposite direction as indicated by the line 5—5 in Fig. 1;

Fig. 6 is a similar view of the knotter, enlarged and partly in section, showing it in another position;

Fig. 7 is a bottom plan of the knotter guide for receiving the end of the spring;

Fig. 8 is an inclined plan as indicated by the line 8—8 of Fig. 1;

Fig. 9 is a plan on the line 9—9 of Fig. 1, and

Fig. 10 is a front view of the spring compressing device in a different position from that shown in Fig. 1.

I have shown the machine as comprising a large flat cast frame 9 mounted on a base 10 which also constitutes the base of a coiling machine 11, only the end of which is shown. This coiling machine can be driven in any desired way and is provided with any of the usual types of mechanism for coiling a wire and producing a double conical bed or cushion spring or, in fact, any other kind. It is provided with a driving shaft 12 from which its parts are operated and this shaft in the present machine extends beyond the end of the coiler and is supported by bearings in brackets 13 on the base 10. It constitutes the power shaft for the present machine and may be driven as stated in any desired way.

Spring carriers.

The shaft 12 is provided with a Geneva motion or any equivalent means for producing an intermittent rotation in a parallel shaft 18. I have shown this Geneva motion in the form of a double arm 14 on the shaft 12 having a pin 15 on it parallel with the shaft and rotating, of course, constantly. This pin enters one of a plurality of slots 16 in a Geneva wheel 17 and rotates this wheel a part, preferably 110

one sixth, of a revolution for each revolution of the shaft 12 as is readily understood. This wheel 17 is fixed on the shaft 18 which is provided with bevel gears 19 at its opposite ends and is supported on brackets 20 carried by the base 10. These bevel gears 19 operate bevel gears 21 on two vertical shafts 22 carried by brackets on the frame 9. Each of the shafts 22, by means of bevel gears 23, rotates intermittently a shaft 24.

On each shaft 24 is a disc 25 having six recesses around its circumference through which pass chordal pins 27 on which are pivoted six radiating studs 28 carrying spring holding heads 29. These discs with their heads constitute two carriers for the springs. Each of the heads is provided with a conical base 30 and a spindle 31 for receiving one of the springs. Projecting out at the front from each of the studs 28 is an arm 32 which is connected with the hub 33 of the disc 25 by a spring 34. This pulls the arm inwardly against an adjustable stop 35 in the form of a screw carried by the hub. This construction yieldingly holds the head 29 in exactly radial position and holds all the members in the same plane, yet they are capable of individually yielding to move inwardly to the rear toward the frame 9 as indicated in Fig. 4.

Each of these heads 29 is hollow for receiving the stud 28 and is capable of sliding readily on it. A radial spring 36 is employed for each one to hold the head normally back in its innermost position in which it is stopped by the end of the stud 28 engaging the bottom of the hole in the head in which the stud is located.

It will be understood from what has been said that each carrier, consisting of a disc 25 and the studs and other parts supported by it, has an intermittent rotation, in this case turning 3 of a revolution at a time. At each stop a pair of opposite studs 28 are left in horizontal position where one of them registers with the point on the wire coiling machine 11, at which the spring is made so that the spring is coiled in said machine and delivered on one of the heads 29. The means for coiling it is not shown herein as it does not constitute a part of this invention. This device can be used with any kind of a coiling machine and in fact with a mere feeding machine for the springs, or in fact the springs can be placed on the holders by hand.

Spring positioning mechanism.

On the shaft 12 I have shown a cam 40 which in rotating moves a roll 41 in opposition to a spring 42. This roll is located on an arm 43 projecting from a vertical shaft 44 held in brackets 45 on the frame 9. On the upper end this shaft has an arm 46 carrying a tooth 47 at its end. When the cam moves to swing the arms 43 and 46 backwardly to the position shown in Fig. 2, the tooth 47 will move along the shaft 31 of the head 29 and engage one of the coils 70 near the middle of the spring 50 so as to bring its end up against the conical base 30 so as to insure that the spring shall accurately seat on this cone. This constitutes means for accurately positioning each 75 spring longitudinally.

It will be observed that the head 29 at this time is in horizontal position and that the next partial rotation of the carrier will move it upwardly from that position. Therefore, thereafter gravity will hold the spring in the position to which it is thrown by the tooth 47. This constitutes the first locating action of the machine. I have indicated by the letter A in Fig. 1 the position of one of the heads 29 when it receives a spring from the wire coiling machine and the spring is pushed up upon it as just described. The carrier then moves 3 of a revolution and this spring comes to the position B. Gravity holds it in the proper place on the conical base 30 but it is free to rotate on its axis. It will be obvious that although located longitudinally, it has not been located in any definite position circumferentially.

On the shaft 12, at 60°, or an exact multiple thereof, from the arm 14, is another double arm 70 carrying a stud 71 operating a Geneva wheel 72 having six radial slots 73. This Geneva wheel is fixed on a shaft 74 below the shaft 12 and provided with a gear 75 meshing with a gear 76 on a shaft 77 parallel with the shaft 12, and behind the shafts 74. The shafts 74 and 77 are carried by brackets on the base 10. On the shaft 77 are two bevel gears 78 meshing with two bevel gears or pinions 79 on two vertical shafts 80 extending nearly to the top of the frame 9. On each of these vertical shafts 81 is a bevel gear 81 meshing with a bevel gear 82 on an inclined shaft 83. This shaft is located at an angle of 60° to the horizontal and is provided at its upper end with a gear 84 which is adapted to mesh with a gear 85 in all positions of a longitudinally reciprocable shaft 86 on which the gear 85 is located.

On the shaft 12 there is a cam 50. This operates a roll on an arm 51 on a shaft 52 which is provided with an arm 53 substantially at right angles to the arm 51. Connected with this arm 53 is a link 54 which is connected with an arm 55 on a shaft 56 mounted in bracket bearings 57 on the frame 9 of the machine. This shaft has two arms 58 projecting from it on the same side. Each of these arms is connected with a link motion 59. These two link motions are on opposite sides of the shaft and are not shown.
as of exactly the same construction but they act to turn two levers 60. These two levers are pivoted on studs 61 near the top of the machine frame and are provided with yokes 62 pivoted by means of studs 63 between two spaced discs or plates 64. These two studs 63 are arranged diametrically opposite each other and in this way are pivotally connected with the sliding shaft 65. This shaft is mounted to slide in bearings 66 on the frame and is provided with a gear or pinion 67, constantly meshing with the gear 84. It is also provided below the lower bearing with a conical head 68 having a wing 69 radiating therefrom. This shaft 65 is located at an inclination of 60° to the horizontal in the present case so that it will come in alignment with the axis of one of the studs 28 of the rotary carrier whenever that carrier is located in stationary position.

The operation of these parts of the device is as follows: The shaft 77 is rotated intermittently, one revolution for every six revolutions of the shaft 12, and therefore the gear 84 is rotated the same way. This causes the gear 67 to give a complete rotation each time the shaft 77 is rotated. Therefore, the head 68 is given a rotation and during this period of rotation the arm 60 is moved to bring the shaft 65 down and the wing 69 into contact with the free end of the spring 80 on the head 29 so that the spring will be turned on its axis to a position in which its end is at the point at which the wing 69 stops rotating. This is a definite point in the circumference controlled by the Geneva motion. Therefore, the spring, having first been registered longitudinally, is now registered circumferentially. This having been accomplished, the head 68 stops rotating, the arm 60 is withdrawn to pull this head up out of the way, and the spring is left properly registered on the head 29 at its position B. Now, while this Geneva motion is at rest the other one starts to work and this spring is moved from the position B to the position C.

Knotting mechanism.

On the shaft 12 is a cam 90 which operates a bell crank 91 and that by a link 92 swings one of two levers 93 directly. A link connected with the ends of the first lever 93 and link 92 swings the other. Each lever 93 has a projection 95 extending under the butt of the head 20. The motion of this lever 93, therefore, pushes this head 20 upwardly along the stud 28 in opposition to its spring 96. This is done to move the spring 96 up into the knotting machine. The two levers 93 are mounted adjustably in slots 96 on the frame 9 to provide for operation on the springs of different lengths.

On each of the shafts 80 at the upper end thereof is a bevel gear 100 meshing with another bevel gear 101 on the knotter shaft. The details of the knotter are not shown herein in full because they do not constitute a part of this invention, any ordinary kind of a knotter being capable of use, this invention not being restricted to any particular kind or make of knotter. The knotter, however, is mounted on a frame 102 carried by the main frame 9 and the shaft of the knotter is connected by gears 103 with the knotting head 104 which is provided with a radial slot and geared to rotate twice at each operation. Rotating with the knotter shaft is a disc 105 having a pin 106 thereon which is adapted to be received in a notch 107 on an arm 108. This arm on one side is carried by the shaft 56 which is designed to stop the knotter in a definite position and hold it there. The other arm 109 is mounted on a shaft 109 parallel with the shaft 56 and operated by it simultaneously by a link 110 connected to arms extending from the two shafts, one of them being the arm 55. The knotter is also provided with a clamping jaw 115 connected by arms 116 and links 119 with the link 110 operated from below. The knotter slide has a spring 117 to draw it back to normal position and an adjustable stop 118.

The above described features of the knotter are not new but it is provided with a guide or centering device which comprises a centering block 120 having spiral groove 121 for receiving the first two coils of the spring and provided with two pins 122 for receiving the end of the spring between them. There is an outer flange 123 against which the outer coil of the spring engages and these parts are mounted underneath the knotter so as to be in line with and receive the end of the spring when it is brought into registration with it by rotation of the carrier. An additional shield 124 is provided for engaging the spring and carrying it over toward the knotter as shown in Fig. 4. It will be remembered that the end of the spring has been previously fixed in proper place circumferentially. Therefore, when the spring is forced up, as shown in Fig. 6, there will be just enough of the end of the spring projecting from between the two pins 122 to provide enough wire for knotting the end of the spring.

The knotting action is of the usual character. The part of the knotter which constitutes its slide is moved back by links 110 and 116 after the spring is centered in the centering device 120 and gripped by the jaw 115 it takes the spring with it and swings the stud 28 on its pivoted pin 27 to the position shown in Figs. 4 and 5. The nose 125 moves past the two pins. This bends the end of the spring over beyond the pins 122 into a radial position and leaves it projecting inwardly. At the same time the part of
the spring just beyond the pins projects into a slot in the head 104 which is located horizontally by the pin 106 and the notch 107 as shown in Fig. 6. Now, the Geneva motion which has just been described comes into action and rotates this head 104 two complete revolutions. This twists the projecting end of the wire around the next coil below as shown in Fig. 7, and the knotting action is completed. Now, the link 116 moves back while the jaw 115 and the top of the arm on which the jaw 115 is located engages a projection 141 on the slide and pushes it back. Then the lever 93 moves down to allow the spring 26 to draw the head 29 and spring downward to its original position on the carrier. The other Geneva motion now commences its operation and moves the head and spring from the position just described and brings it down into the second horizontal position D, leaving the knotter located in inactive position.

**General operation.**

On the shaft 12 there is a cam 130 operating a lever 131 directly. This is provided with a flat transferring plate 132 having a concave upper edge. When the first carrier comes down to bring the spring to the position D, the transferring plate 132 is in the position shown in Fig. 1. It, therefore, enters between two of the convolutions of the coil spring S. As the shaft 12 continues to rotate, the plate 132 is moved over from this position to one in which it is located about half way between the ends of the spindle 31 of the head 29 on the second carrier which is located in position A'. While the lever 131 is in that position the first carrier moves around another step, it being understood that each time it moves a new spring is introduced at the position A and longitudinally located there and the one in advance of it is circumferentially located at position B while the third one is being knotted at the position C. The two positions below are idle ones. As the first carrier moves through this space the second carrier also moves with it to bring the spring with one end knotted from the position A' to the position B'. It will be noted here that the transferring plate 132 performs the function of the locating tooth 47 on the other carrier. It is not necessary to describe the operations on the second carrier for the parts have been referred to in describing the first one and the same parts have been given the same numbers, although in some cases the operating connections, especially the links and levers, are not constructed with exactly the same dimensions. In position B' the spring is turned to the proper place. In position at C' it is knotted and then brought down to the position D'.

In this position a compressing device is used. The shaft 12 is connected with a transverse shaft 134 by a pair of bevel gears 135. This shaft 134 has an arm operating a link 135 which swings a lever 136 connected by a link 137 with a slide 138 on ways 139 carried by the frame 9. This slide 138 has a circular head 140 which is perforated to receive the spindles 31 and receives the end of each spring S which now has knots in both ends. It presses the spring up against the base of the spring holding head 29, as shown in Fig. 10, and then moves back out of the way. This simply serves to compress the springs, to bring them back to their original lengths and deliver the springs from the machine in a uniform manner to compensate for any irregularities which may have taken place due to the operations of the machine or of the coiling machine.

After this action takes place the second carrier rotates another step and brings the spring down to the position E' where it is inclined to such an angle that it will slide off and thus be discharged from the machine. No particular means is shown for removing the springs as they can be deposited on the floor or in any desired kind of container or conveyor.

It will be understood, of course, that although I have illustrated and described the machine as comprising two carriers, one for knotting each end of a double conical bed or cushion spring, the invention is adapted to be used for knotting either or both ends and can be used for springs of other shapes, sizes and kinds. If only one is to be knotted, the second carrier is thrown out of operation or removed.

From what has been stated, it will be seen that this is a simple machine for avoiding the handling of springs several times while their ends are being knotted. It is conveniently located adjacent to the coiling machine to take the springs therefrom automatically and arranged to locate the springs longitudinally and circumferentially so that they will enter the knotter accurately. The springs are delivered from one carrier to the other and finally discharged from the second in an automatic manner. By delivering in the manner set forth, the unfinished end of the spring is brought to the outer side of the second carrier where it is ready to be operated upon by instrumentalities substantially the same as those that were used to operate upon its other end. When the machine is operating for knotting both ends, there are at all times eight springs carried by the machine and being received, operated upon and delivered, counting the spring sliding off in the position shown at E'. Also, there is delivered one complete spring knotted at both ends each time the main shaft 12 rotates through one revolution and the carriers rotate $\frac{1}{2}$ of a revolution.
Although I have illustrated and described only a single form of the invention, I am aware of the fact that modifications can be made therein by any person skilled in the art without departing from the scope of the invention, as expressed in the claims. Therefore, I do not wish to be limited to all the details of construction herein shown and described, but what I claim is:—

1. The combination with a coiling machine for making springs, of a knotting device, a rotary carrier and radial spindles on the rotary carrier for receiving the springs axially centered thereon from the coiling machine as they are made and carrying them around the axis of the rotary carrier to the knotting device.

2. The combination with a spring coiling machine, of a knotting device, means for entering the springs as they are delivered directly from the coiling machine and carrying them to the knotting device, and means for accurately locating said springs on the carrying device before they are presented to the knotting device.

3. The combination with a spring coiling machine, of a knotting device, a series of spindles for receiving the springs from the coiling machine and carrying them to the knotting device, and means for circumferentially locating said springs on the spindles.

4. The combination with a coiling machine for producing coiled springs, of a spindle adapted to be located in position to receive a spring therewith as it is delivered from the coiling machine, means for longitudinally locating the spring accurately on the spindle, and means for bodily moving the spindle into a position for presenting the spring to a device for performing further action upon the spring.

5. In a device of the character described, the combination of an intermittently rotatable carrier having a plurality of radial heads thereon adapted to receive springs, means for longitudinally locating the springs on the head while in the position in which the springs are received thereon, means for turning the carrier, and means for performing a knotting operation on the end of the spring while still on the carrier.

6. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, means for moving a spring on a head longitudinally to set it firmly against the base of the head, and a rotatable shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring and turning it.

7. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, a shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring, means for constantly rotating said shaft, and means for intermittently moving said shaft in an axial direction toward the spring supporting head.

8. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, a shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring, means for constantly rotating said shaft, and means for intermittently moving said shaft in an axial direction toward the spring supporting head.

9. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, a shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring, means for constantly rotating said shaft, and means for intermittently moving said shaft in an axial direction toward the spring supporting head.

10. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, a shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring, means for constantly rotating said shaft, and means for intermittently moving said shaft in an axial direction toward the spring supporting head.

11. In a machine of the character described, the combination with an intermittently rotatable carrier having heads radiating therefrom and adapted to receive springs thereon, a shaft located in a position in alignment with the spring-holding head when the carrier is stopped and having a conical head thereon for receiving the end of a spring and provided with a wing extending therefrom for engaging the free end of the spring, means for constantly rotating said shaft, and means for intermittently moving said shaft in an axial direction toward the spring supporting head.
located spring into registration with the knotting device the head on which the spring is located will be moved in an axial direction toward the knotting device.

13. In a machine of the character described, the combination of an intermittently rotatable carrier having a plurality of heads thereon for receiving springs, a knotting device having a guide thereon for centering the spring properly with relation thereto, and means whereby when the carrier turns to a position to swing the carrier into proper position the head on which the spring is located will be moved in an axial direction toward the knotting device.

14. In a machine of the character described, the combination of an intermittently rotatable carrier having a series of radiating heads adapted to receive springs and a knotting device located adjacent to the carrier, said heads being pivoted on the carrier on an axis to enable them to swing toward the knotting device and being radially movable to permit the spring thereon to be moved into the knotting device.

15. In a machine of the character described, the combination of an intermittently rotatable carrier having a series of radiating heads adapted to receive springs, a knotting device located adjacent the carrier, said heads being pivoted on the carrier on an axis to enable them to move toward the knotting device, and means for automatically moving said heads radially toward the knotting device in turn, said knotting device having means for moving the heads over on their pivots after the springs are registered therewith.

16. In a machine of the character described, the combination of a pair of rotatably mounted carriers, means for simultaneously and intermittently rotating both of said carriers, heads on said carriers being adapted to receive springs one at a time on said heads on one side of the machine, means for intermittently moving said carriers to advance the heads one at a time to receiving position, means for positioning the springs and knotting their ends, and means for transferring a spring from a head on the first carrier to a head on the second carrier.

17. In a machine of the character described, the combination of a pair of rotatably mounted carriers, means for simultaneously and intermittently rotating both of said carriers, heads on said carriers for receiving and holding springs to be operated upon, means connected with each carrier for knotting the end of one of the springs carried thereby, and an oscillating lever having a plate adapted to move from a position under a head on the second carrier to a position in alignment therewith on the second carrier, the springs on the first carrier being brought into engagement with said plate by the rotation of the carrier.

18. In a machine of the character described, the combination of a pair of carriers each having a series of heads thereon arranged substantially in radial position, one of said carriers being adapted to receive springs one at a time on said heads on one side of the machine, means for intermittently rotating said carriers to advance the heads one at a time to receiving position, means arranged about one of the carriers for positioning the springs and knotting their ends, whereby after that carrier has rotated a definite number of steps it will have a spring located on one of the heads with its outer end knotted, the receiving position of the other carrier being in alignment with the last named position of the first carrier, and means for transferring a spring from a head on the first carrier to a head on the second carrier.

19. In a machine of the character described, the combination of a plurality of carriers each having a series of heads thereon, one of said carriers being adapted to receive springs one at a time on said heads on one side of the machine, means for intermittently moving said carriers to advance the heads one at a time to receiving position, means arranged adjacent to one of the carriers for positioning the springs and knotting them, means for transferring a spring from a head on the first carrier to a head on the second carrier, and means connected with the second carrier for knotting another part of a spring carried thereby.

20. In a machine of the character described, the combination of a pair of rotatably mounted carriers, means for simultaneously and intermittently rotating both of said carriers, heads on said carriers for receiving and holding springs to be operated upon, means connected with each carrier for knotting the end of one of the springs carried thereby, and an oscillating lever having a plate adapted to move from a position under a head on the second carrier to a position in alignment therewith on the second carrier, the springs on the first carrier being brought into engagement with said plate by the rotation of the carrier.

21. In a machine of the character described, the combination of a pair of carriers each having a series of heads thereon, one of said carriers being adapted to receive springs on said heads, means for intermittently rotating said carriers to advance the heads one at a time to receiving position, means arranged about one of the carriers for positioning the springs and knotting their ends, means adjacent to the second carrier for knotting the other end of a spring carried thereby, and means for automatically compressing each spring on the second carrier after it is knotted.

22. In a machine of the character described, the combination of a pair of carriers each having a series of heads thereon...
arranged substantially in radial position, one of said carriers being adapted to receive springs one at a time on said heads on one side of the machine, means for simultaneously and intermittently rotating said carriers to advance the heads one at a time to receiving position, means arranged about one of the carriers for positioning the springs and knotting their ends, whereby after that carrier has rotated to a definite part of the revolution it will have a spring located on one of the heads with its outer end knotted, the receiving position of the other carrier being in alignment with the last named position of the first carrier, means adjacent the second carrier for knotting the other end of a spring carried thereby, and means for automatically compressing each spring on the second carrier after it is knotted.

23. In a machine of the character described, the combination of a pair of carriers each having a series of heads thereon, one of said carriers being adapted to receive springs one at a time on said heads on one side of the machine, means for intermittently rotating said carriers to advance the heads one at a time to receiving position, means arranged about one of the carriers for knotting the springs at one end, and means connected with the second carrier for knotting the other end of each spring carried thereby, the second carrier being adapted to discharge the springs therefrom by rotating around to a position in which the respective heads are located at an inclination downwardly.

In testimony whereof I have hereunto affixed my signature.

FRANK H. SLEEPER.