April 6, 1926. 1,579,325

T. C. KASEBERG

SPRING COILING MACHINE

Filed Sept. 17, 1923 7 Sheets-Sheet 1

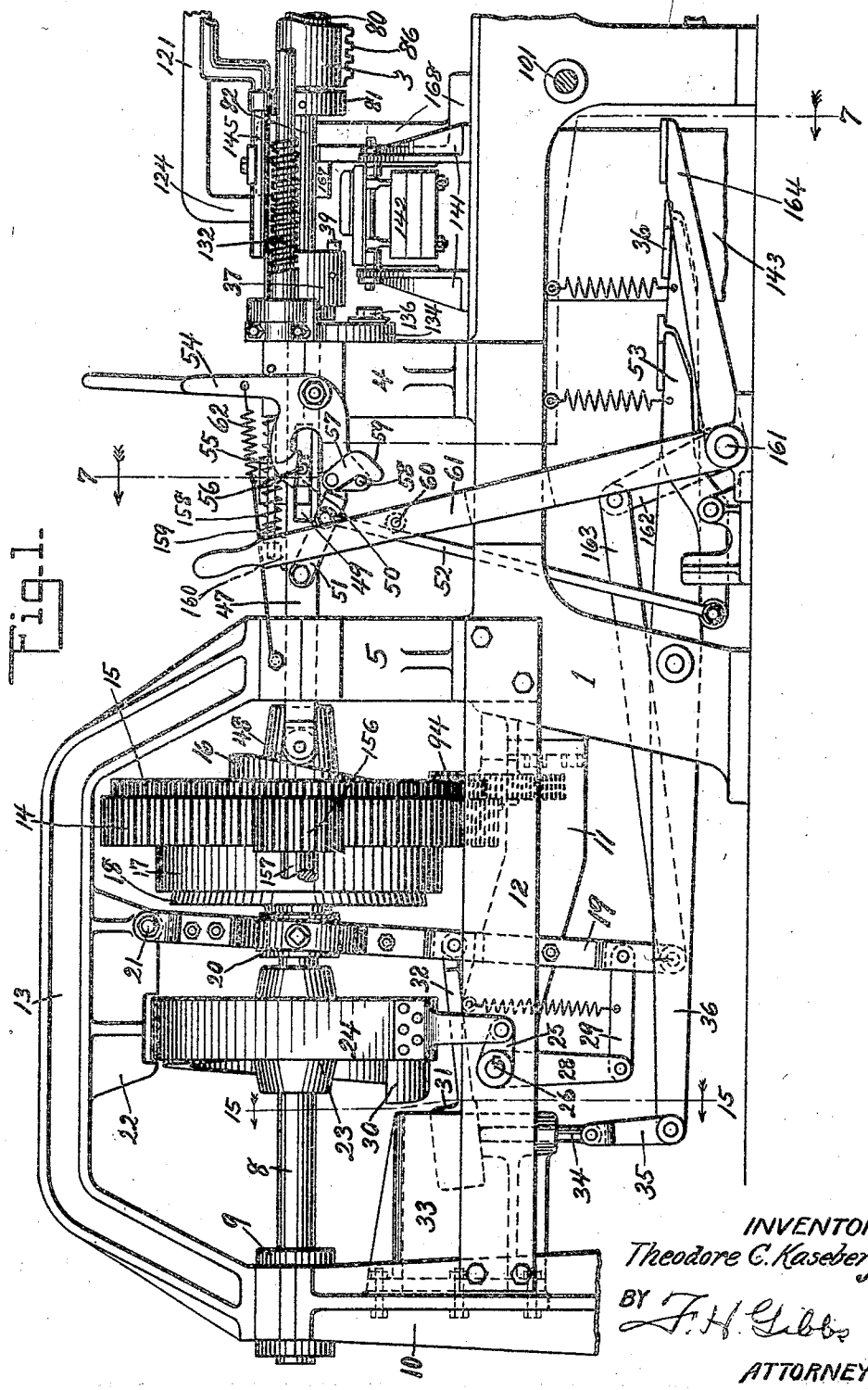

Fig. 1.

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Filed Sept. 17, 1923 7 Sheets-Sheet 2

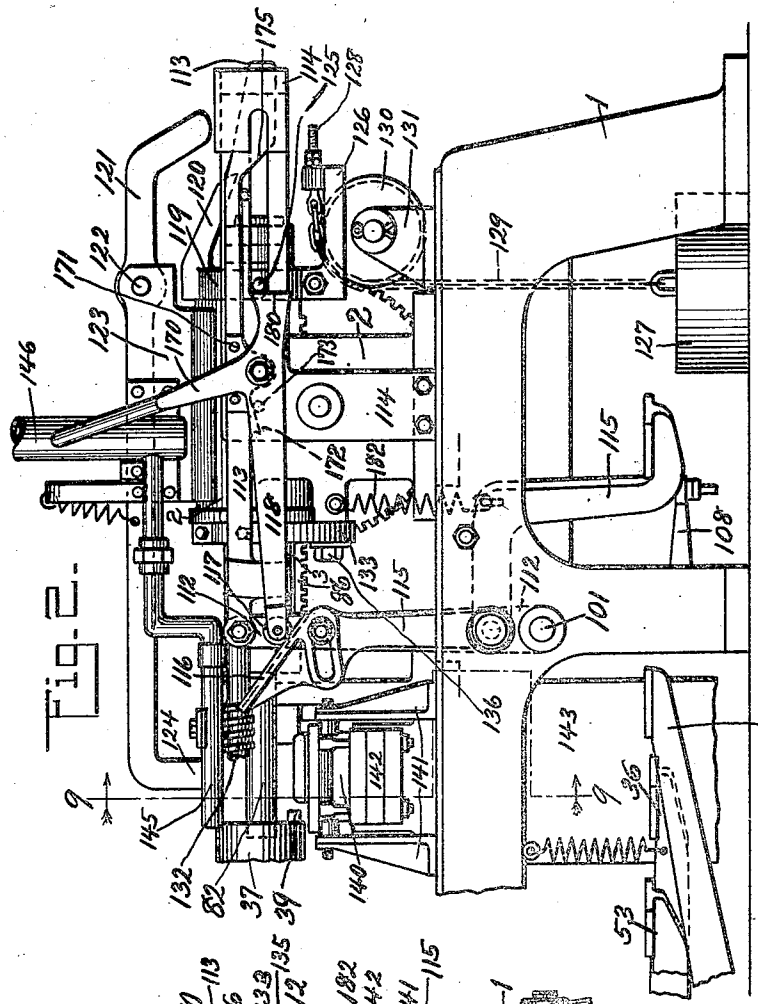

Fig. 2.

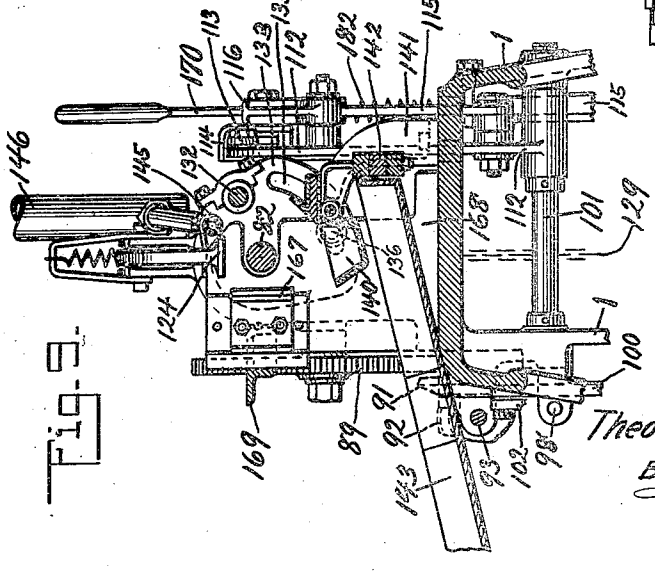

Fig. 3.

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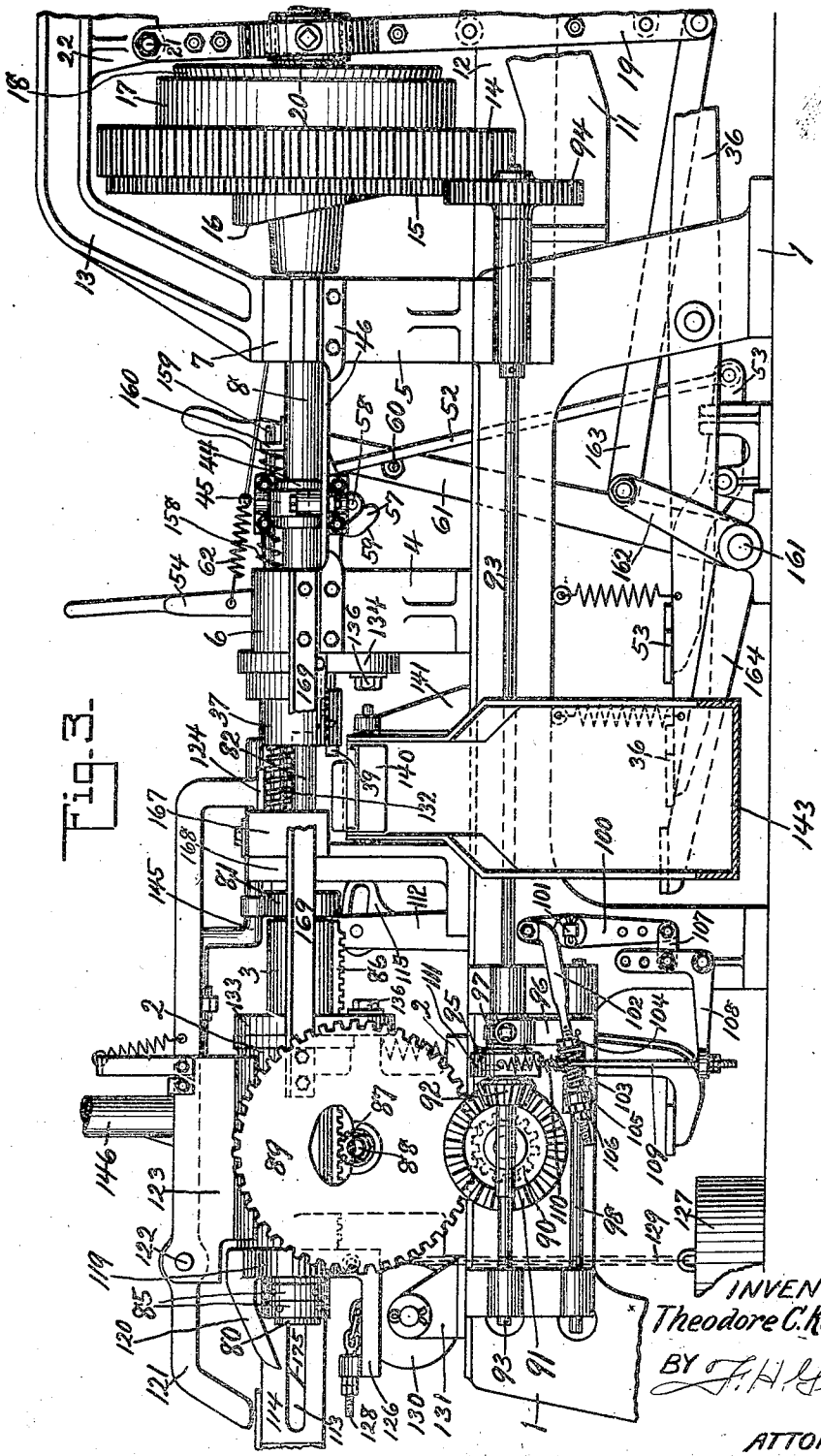

Fig. 3.

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SPRING COILING MACHINE

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Fig. 4.

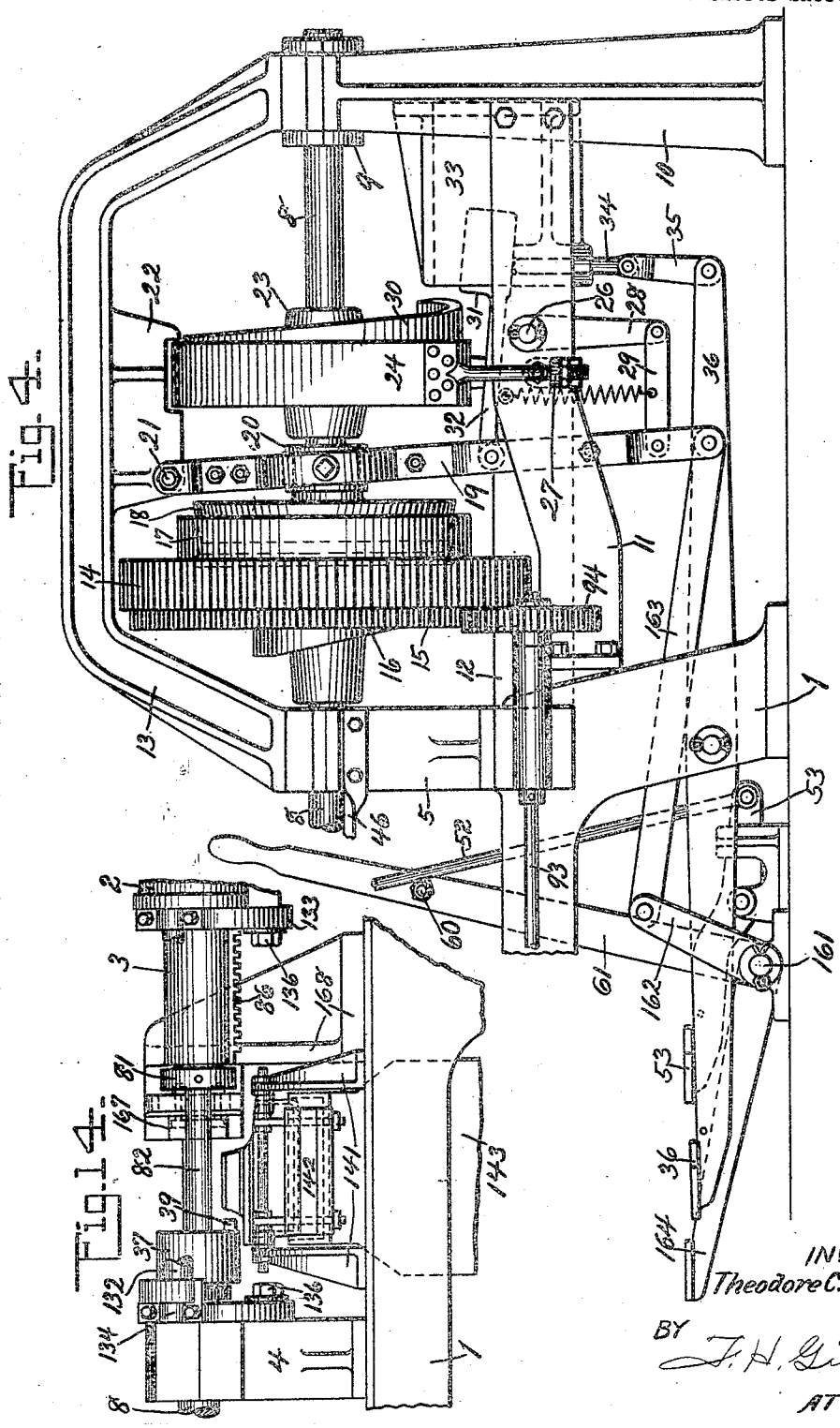

Fig. 4.

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SPRING COILING MACHINE

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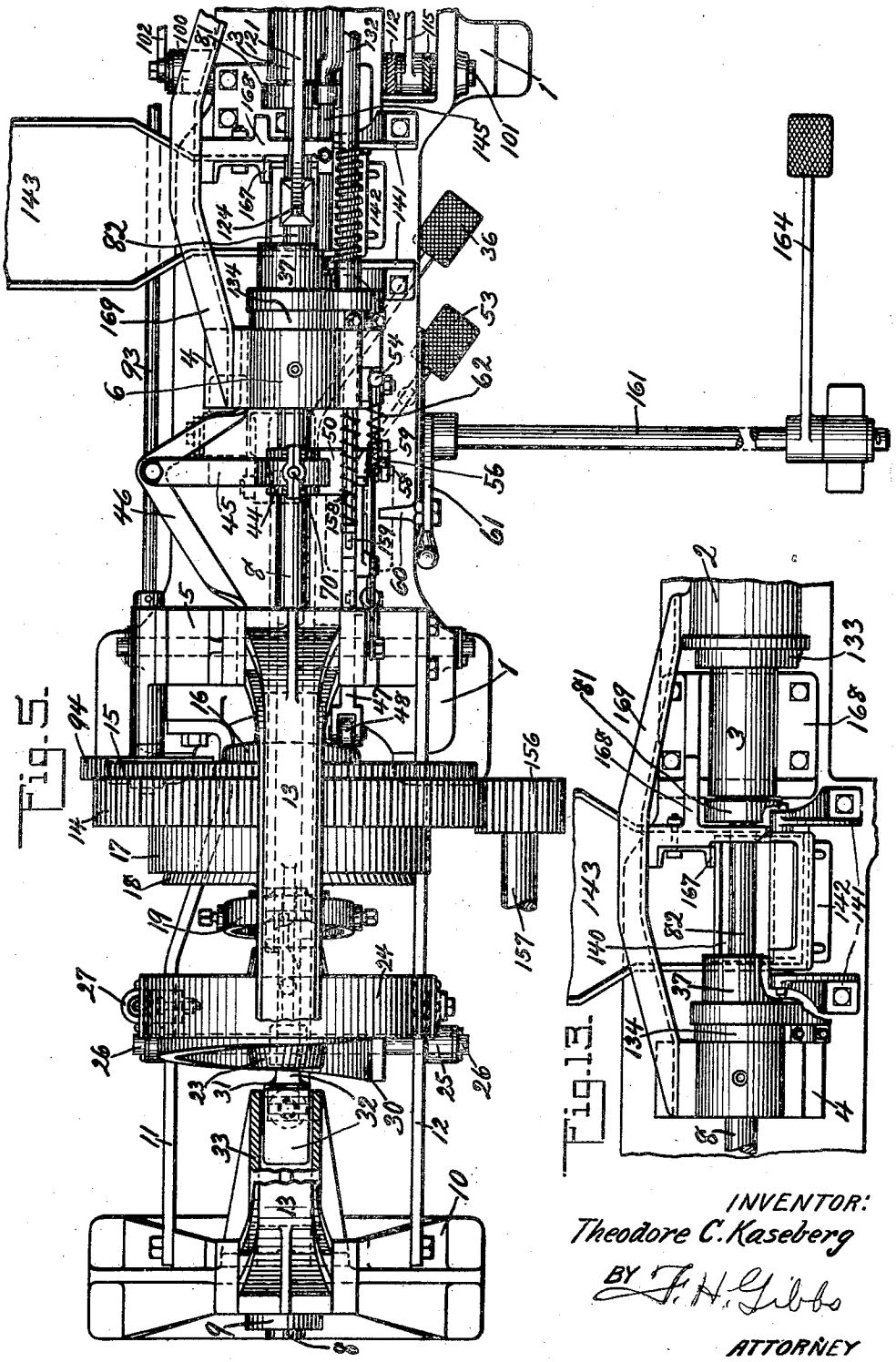

Fig. 5.

Fig. 13.

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SPRING COILING MACHINE

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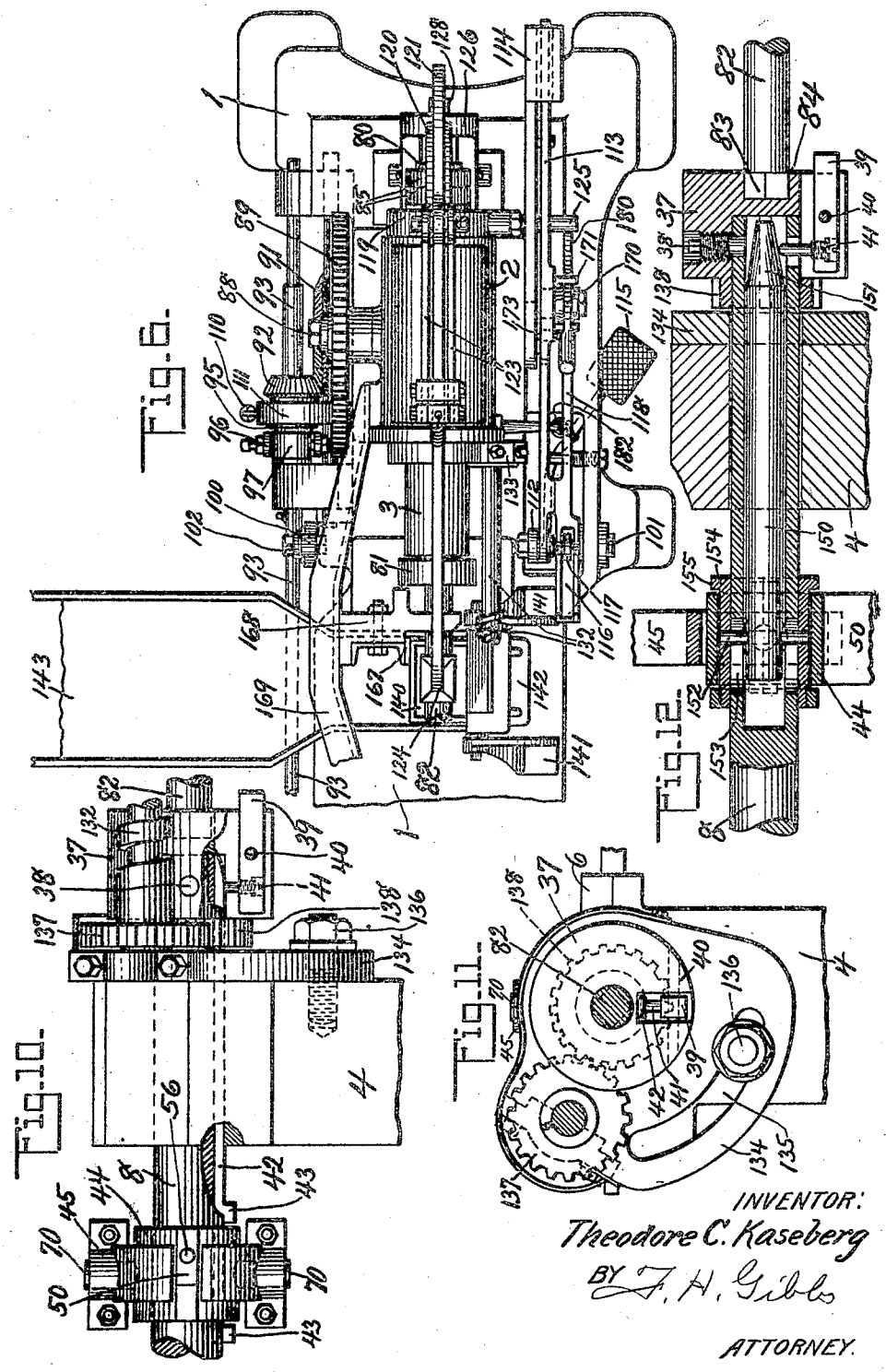

Fig. 6.

Fig. 12.

Fig. 10.

Fig. 11.

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SPRING COILING MACHINE

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Fig. 8.

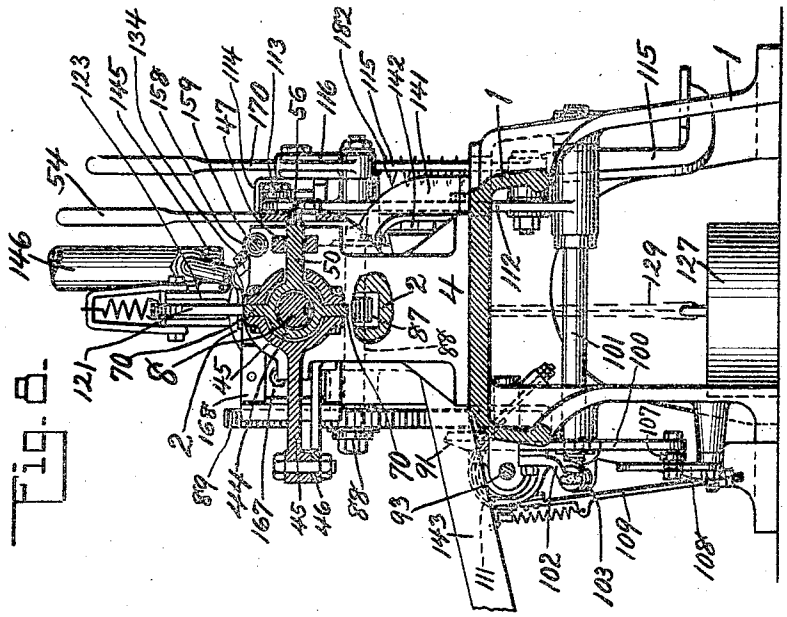


Fig. 7.

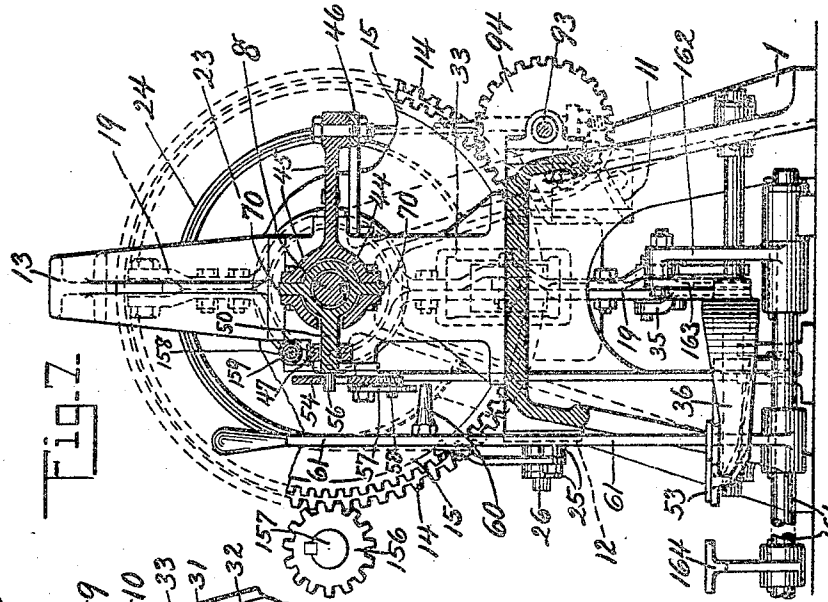
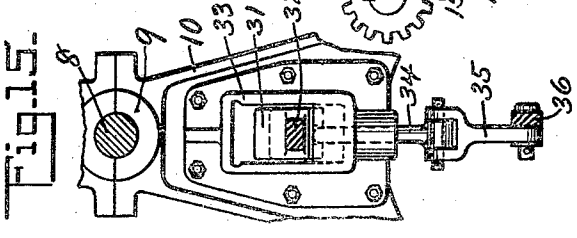


Fig. 15.



INVENTOR:
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Patented Apr. 6, 1926. 1,579,325

UNITED STATES PATENT OFFICE.

THEODORE C. KASEBERG, OF GRANITE CITY, ILLINOIS, ASSIGNOR TO AMERICAN CAR AND FOUNDRY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

SPRING-COILING MACHINE.

Application filed September 17, 1923. Serial No. 663,061.

To all whom it may concern:

Be it known that I, THEODORE C. KASEBERG, residing at Granite City, Madison County, State of Illinois, and being a citizen of the United States, have invented certain new and useful Improvements in a Spring-Coiling Machine, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof within the scope of the claims will occur to persons skilled in the art.

In said drawings:

Figure 1 is a view in elevation of a portion of a spring coiling machine constructed in accordance with this invention;

Fig. 2 is a view in elevation of the remainder of the spring coiling machine shown in Fig. 1, a portion of the machine being shown in both figures in order to show the manner in which the portions shown in the two figures are joined;

Figs. 3 and 4 are complementary views in elevation similar to Figs. 1 and 2, looking in the opposite direction;

Figs. 5 and 6 are complementary plan views similar to Figs. 1 and 2;

Fig. 7 is a transverse section taken on the line 7—7 of Fig. 1 looking in the direction of the arrows, parts being broken away to show other parts more clearly;

Fig. 8 is a transverse section taken on the line 7—7 of Fig. 1 looking in the direction opposite to the direction of the arrows;

Fig. 9 is a partial transverse section taken on the line 9—9 of Fig. 2 looking in the direction of the arrows;

Fig. 10 is a fragmentary plan view, partly broken away, showing the manner of operating the work holding dog;

Fig. 11 is an end elevation of the parts shown in Fig. 10;

Fig. 12 is a central longitudinal section of a modified construction of the dog operating means;

Fig. 13 is a fragmentary plan view showing the plate and chute for receiving a coiled spring and the support for the wiping-in device;

Fig. 14 is a view in elevation, partly broken away, of the parts shown in Fig. 13; and

Fig. 15 is a partial transverse section taken on the line 15—15 of Fig. 1 looking in the direction of the arrows.

It is an object of this invention to provide an improved device for coiling springs from heated bars. It is also an object of this invention to provide a spring coiling machine in which the work holding dog will always be stopped in position for receiving the work and will be released by the stopping of the machine and in which the mandrel, after being retracted to discharge the spring, will be automatically returned to position for receiving the work and will be retained in the work receiving position.

As shown in the drawings, the machine comprises a base 1 having a head 2 thereon in which the sleeve 3 is mounted for reciprocation. The base 1 also supports pedestals 4 and 5 which are provided with bearings 6 and 7, respectively, in which a shaft 8 is rotatably mounted. The shaft 8 extends beyond the bearing 7 and has its outer end supported in a bearing 9 mounted on a pedestal 10 which is connected by members 11 and 12 to the base 1. The bearings 7 and 9 are connected by a U-shaped bracing member 13. Rotatably mounted upon the shaft 8 is a main driving gear 14 to which is secured a ring gear 15, a cam member 16 and a clutch member 17. Splined on the shaft 8 is a clutch member 18 which cooperates with the clutch member 17 to drive the shaft 8, the clutch member 18 being operated by a clutch lever 19 which engages with the clutch collar 20 on the shaft 8 and is pivotally connected at 21 to a projection 22 carried by the bracing member 13. Keyed to the shaft 8 is a brake drum 23 which is engaged by a brake band 24 connected at one end to the crank 25 keyed on a shaft 26 journaled in the members 11 and 12. The other end of the brake band 24 is adjustably connected to a bracket 27 which is bolted to the member 11. Keyed to the shaft 26 is a crank 28 connected by a link 29 to the clutch lever 19. Secured to the

brake drum 23 is a brake cam 30 adapted to be engaged by a shoulder 31 formed on a bar 32 pivotally connected to the clutch lever 19. The bar 32 is mounted to travel in a slot in a guide member 33 attached to the pedestal 10 and is operated by a plunger 34 which is mounted to reciprocate in an opening formed in the guide member 33 so as to engage beneath the bar 32 and is connected by a link 35 to an operating lever 36 pivotally mounted on the base 1.

The shaft 8 is provided at its inner end with a head 37 secured thereto by a set screw 38 and having a dog 39 pivotally mounted therein on a pin 40 and carrying an adjusting pin 41 which engages with a tapered dog operating key or wedge 42 adapted to be reciprocated in a groove in the shaft 8. The key 42 is provided with spaced shoulders 43 between which there is loosely mounted, on shaft 8, a collar 44 having projections 70 engaged by a yoke 45 which has one end pivotally connected to a member 46 connecting the pedestals 4 and 5. Mounted for reciprocation in guide brackets attached to the pedestals 4 and 5 is a dog operating bar 47 having a roller 48 adapted to engage with the cam 16 and having a slot 49 through which extends a projection 50 on the collar 44, the slot 49 being of sufficient length to permit of the rod 47 making its full reciprocation without engaging with the projection 50 of the collar 44. Pivotally mounted on the bar 47 is a lever 51 connected by a rod 52 to a foot lever 53. Pivotally mounted on the pedestal 4 is a latch 54 having a shoulder 55 adapted to engage a pin 56 in the projection 50 of the collar 44 and a pivotally mounted cam 57 which normally engages a stop 58 mounted on the latch 54 and has an inclined surface 59 adapted to be engaged by the pin 60 carried by a lever 61. The latch 54 is biased to the engaging position by a spring 62 connected to the latch and to the pedestal 5.

The sleeve 3 mounted in the head 2 has a spindle 80 rotatably mounted therein, the spindle 80 being provided with a head 81 in which the mandrel 82 is fixed so that the spindle 80 will be rotated when the mandrel is driven by the engagement of the squared end 83 of the mandrel with a correspondingly shaped opening 84 in the head 37 carried by the shaft 8. The spindle 80 is secured in the sleeve 3 by the head 81 and lock nuts 85. The sleeve 3 is prevented from rotating in the head 2 by a rack 86 which is formed on the sleeve 3 and engages in a slot in the head 2. The rack 86 is engaged by a pinion 87 mounted on a shaft 88 journaled in the head 2 and carrying a gear 89. The gear 89 meshes with a pinion 90 secured to the back of a bevel gear 91 which is journaled on an axle carried by the base. The bevel gear 91 is engaged by a bevel pinion 92 which is rotatably mounted on a shaft 93 journaled in suitable bearings carried by the base 1 and carrying a gear 94 which engages with the ring gear 15 carried by the main driving gear 14. The bevel pinion 92 is adapted to be connected with the shaft 93 by a clutch 95 operated by a yoke 96 which engages with the clutch collar 97, the yoke being connected to a rod 98 which is slidably mounted in bearings carried by the base 1. The rod 98 is operated by a lever 100 which is fixed on a shaft 101 and yieldingly connected to the rod 98 through the link 102 upon which the compression spring 103 is mounted between the nut 104 on the link 102 and the bracket 105 secured to the rod 98, the link 102 being secured in the bracket by means of a lock nut 106. The other end of the lever 100 is connected by the link 107 to a bell crank lever 108 which is pivotally mounted on the base 1 and connected by a rod 109 and spring 110 to a brake band 111 which acts upon a brake drum carried by the pinion 92.

Upon the shaft 101 is mounted a lever 112 having its upper end pivotally connected to an irregularly shaped bar 113 adapted to travel in the guide bracket 114 secured to the head 2. Pivotally mounted on the lever 112 is a lever 115 having at its upper end an inclined surface 116 adapted to engage with a roller 117 carried by a latch 118 pivotally mounted upon the slide bar 113. Secured to the sleeve 3 is a yoke 119 having an inclined projection 120 which is adapted to engage with one end of a lever 121 pivotally mounted at 122 in guide brackets 123 carried by the head 2, the other end of the lever 121 being provided with a portion 124 which is positioned over the mandrel 82. The yoke 119 is provided with an outwardly projecting lug or pin 125 and with an outwardly extending portion 126 to which a weight 127 is adjustably secured by an eye bolt 128 and a chain 129 which passes over a guide roller 130 carried in a bracket 131 mounted on the base 1.

To guide the work piece to the mandrel there is provided a guide worm 132 which is journaled in bearings carried by brackets 133 and 134 rotatably mounted upon the head 2 and the pedestal 4, respectively. The brackets are provided with slots 135 to receive lock bolts 136 carried by the head 2 and pedestal 4 to hold the brackets in their adjusted position, the brackets being adjustable to properly position the guide worms for guiding stock of different diameters and for guiding the stock for springs wound in different directions. The worm is designed to give the proper movement to the stock in order to give the proper pitch to the spring when coiled, a different worm being provided for each type of spring, and is driven by a gear 137 which meshes with a gear 138 of the same size carried by the

shaft 8. To receive the spring when the mandrel is withdrawn there is provided a plate or receptacle 140 which is pivotally supported by brackets 141 carried by the base 1 and provided with an adjustable counterweight 142. The counter weight 142 is proportioned so that the weight of the spring on the plate 140 will rotate the plate about its support, tilting the plate and depositing the spring on a chute 143 without a blow sufficient to cause deformation of the hot spring. To prevent the mandrel which is designed to become heated from becoming so hot that it will lose its temper there is provided a cooling means comprising a pipe member 145 having a slot through which air is blown on the mandrel from a supply pipe 146 the supply of air being regulated to keep the temperature of the mandrel slightly below the temperature at which it would lose its temper.

In the modified form of dog operating means shown in Fig. 12 the shaft 8 is hollow for a portion of its length and has mounted therein a plunger 150 having a tapered end 151 adapted to engage with the adjusting screw 41 carried by the pivotally mounted dog 39 in the head 37. The other end of the plunger 150 is provided with a pin 152 which projects through slots 153 in the shaft 8 and engages with a collar 154 adapted to slide on the shaft 8 and provided with shoulders 155 between which the collar 44 is adapted to engage.

In the operation of this device the main driving gear 14 is driven continuously by a gear 156 mounted on the drive shaft 157 driven from any suitable source of power (not shown). Operating the main driving gear 14 rotates the ring gear 15, gear 94 and shaft 93, and the cam 16 mounted on the main gear. Rotating the cam 16 operates the dog operating bar 47, the bar being returned to engagement with the cam by a spring 158 which surrounds the rod 159 and is confined between the pedestal 4 and a bracket 160 which is mounted on the bar 47 and guides the outer end of the rod 159. Assuming the machine to be stopped with the work holding dog 39 in proper position to receive the work piece, the operator will place the end of the work piece on the mandrel 82. With the work piece in place beneath the dog 39 the operator will operate the lever 53, raising the rod 52 and lever 51 so that upon reciprocation of the bar 47 by the cam 16, the lever 51 will engage with the projection 50 on the collar 44, forcing forward the collar 44 and the dog operating key 42 which, through its engagement with the pin 41, will operate the dog 39 to engage with the work piece. Forcing forward the yoke 45 will move forward the pin 56 permitting the latch 54 to be operated by the spring 62 to bring the shoulder 55 in back of the pin 56 thus locking the collar 44 in its forward position and retaining the dog 39 in its work holding position. The operator will then, if the work piece is short, operate the hand lever 61 operating the shaft 161 and crank 162 which is connected by the link 163 to the clutch lever 19, thus engaging the clutch members 17 and 18 and causing the shaft 8 to revolve and wind the work piece about the mandrel, the work piece being guided by the pitch worm 132 which is operated through the gears 137 and 138 from the shaft 8. If the work piece is of such length that it is necessary for the operator to grasp the tail end of the work piece in order to hold it against the pitch worm 132, the operator will step back so as to grasp the end of the work piece and will operate the lever 164 which is mounted upon an extension of the shaft 161. Operation of the lever 61 or of the lever 164 to operate the clutch lever 19 will cause the lever 61 to move past the latch 54, the pin 60 on the lever 61 engaging with the cam 57 on the latch 54 and pivoting the cam 57 about its point of support without moving the latch. The work piece will be wound about the mandrel 82 guided by the pitch worm 132 until the tail end of the work piece is forced into place by the wiping-in piece 167 which is carried upon a supporting stand 168, adjustably supported upon the base 1 and reinforced by a supporting member 169 secured to the pedestal 4 and head 2.

With the end of the coil forced into position by the wiping-in device 167, the operator, to stop the machine for the removal of the spring, will operate the lever 36, forcing up the link 35 and plunger 34 in the guide 33 and lifting the bar 32 so that the shoulder 31 will be engaged by the cam 30 on the brake drum 23. Rotation of the shaft 8 and cam 30 will cause the bar 32 to be moved towards the pedestal 10, operating the clutch lever 19 and disengaging the clutch members 17 and 18. Operation of the clutch lever 19 will also, through the link 29, operate the lever 28 and shaft 26, causing the lever 25 to be operated and bringing the brake band 24 into engagement with the brake drum 23, thus stopping the rotation of the shaft 8. It will be noted that the greater the movement given to the bar 32 by the cam 30, the greater will be the force applied by the brake band. This force may be varied by adjusting the connection of the brake band 24 to the bracket 27 so that the shaft 8 may be stopped at any point, thus enabling the operator to stop the shaft with the work holding dog 39 in position to receive the work piece. The operation of the clutch lever 19 also causes the operation of the shaft 161 and the lever 61, bringing the pin 60 into engagement with the inclined

surface 59 of the cam 57 and operating the latch 54 to withdraw the shoulder 55 from engagement with the pin 56, thus releasing the collar 44 and permitting the release of the dog 39 from the work.

To retract the mandrel 82 to permit of the discharge of the spring from the machine, the operator moves the lever 115 shifting the latch 118 until the arm 170 engages with a stop 171 on the slide bar 113 and disengaging the end 180 of the latch 118 from the pin 125 whereupon the slide bar 113 will be retracted until the shoulder 172 is engaged with the pin 173 carried by the head 2. The movement of the slide bar 113 causes a movement of the lever 112 and shaft 101 operating lever 100 and link 102 to operate the rod 98 and clutch yoke 96 and causing the clutch 95 to engage the pinion 92 with the shaft 93. Engaging the pinion 92 with the shaft 93 will cause the gear 91 to be rotated, rotating the pinion 90 and gear 89 and causing the pinion 87 in engagement with the rack 86 to operate the rack and shift the sleeve 3 and spindle 80 carrying with them the mandrel 82 and withdrawing the mandrel from the spring. As the sleeve 3 is moved outwardly carrying with it the yoke 119 the inclined portion 120 will engage with the inclined end of the lever 121 forcing down the other end 124 of the lever into engagement with the spring and forcing the spring from the machine should the spring be held by frictional engagement with the head 37 and the wiping-in member 167. The movement of the sleeve 3 and yoke 119 will also carry the pin 125 outwardly until the pin 125 engages with the inclined surface 175 on the slide bar 113 causing the bar 113 to pivot about its connection with the lever 112 and withdraw the shoulder 172 from engagement with the stop 173 thus releasing the slide bar 113 and permitting the return of the lever 112 by a spring 182 to a position in which the clutch 95 disengages the pinion 92 from the shaft 93 and also permitting the weight 127 through its connection with the yoke 119 to return the sleeve 3 and mandrel 82 to position for receiving the work piece. As the sleeve 3 is returned, the rack 86, will, through the gears 87, 89, 90 and 91 cause the pinion 92 and the brake drum to revolve. As the yoke 119 carried by the sleeve 3 returns to its inner position the pin 125 will engage with the end 180 of the latch 118 moving the latch 118 and slide bar 113 forward and operating the lever 112 in the direction opposite to the direction in which it was operated to engage the clutch 95 with the gear 92. Operation of the lever 112 in this direction causes the shaft 101 to operate the lever 100 and through link 107 and bell crank 108 to operate rod 109 and spring 110 to engage the brake band 111 with the brake drum, thus applying a brake and decreasing the speed of rotation of the gear 92 and decreasing the rate of return of the sleeve 3 and mandrel 82 and causing the mandrel to remain in engagement in the opening 84 in the head 37 when engaged therein by reducing the rate of the mandrel to such an extent that the mandrel 82 will not rebound when it strikes the head 37.

What is claimed is:

1. In a spring coiling machine, a shaft, a work holding dog, driving means for said shaft, a cam operated by and substantially unitary with said driving means, a reciprocating rod adapted to contact with and be operated by said cam, a pivotally mounted member adapted to operatively and detachably connect said reciprocating rod and dog and means to lock said dog in holding position.

2. In a spring coiling machine, a shaft, a work holding dog, driving means for said shaft, a cam operated by and substantially unitary with said driving means, a reciprocating rod operated by said cam and a pivotally mounted member adapted to operatively and detachably connect said rod and dog.

3. In a spring coiling machine, a shaft, driving means for said shaft, a clutch to connect said driving means and shaft, a work holding dog carried by said shaft, a braking drum on said shaft, braking means for said braking drum, means to operate said dog to work holding position by said driving means and manually controlled means adapted to be operated by said braking drum to operate said clutch, dog and braking means.

4. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, friction controlled means to operatively and detachably connect said driving means and mandrel, a work holding dog for securing the work to the mandrel, locking means for holding the dog in work engaging position and means operated upon disconnecting said driving means for releasing said dog.

5. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, friction controlled means to connect said driving means and mandrel, a work holding dog, a cam operated by and substantially unitary with said driving means, a reciprocating rod operated by said cam, a pivotally mounted member adapted to operatively and detachably connect said rod and dog, locking means for holding said dog in work engaging position and means operated upon disconnecting said driving means for releasing said dog.

6. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively engaging said shaft, a work guiding worm driven from said shaft and means supporting said worm adapted to permit partial displacement of said worm about said mandrel.

7. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, a dog adapted to secure the work on said mandrel, means operated by said driving means to set said dog in work holding position, friction controlled means operated by said driving means to stop the rotation of said mandrel and release said dog and means operated by said driving means to withdraw said mandrel from said driving means.

8. In a spring coiling machine, a mandrel for forming springs, driving means for said mandrel, a dog for securing the work to said mandrel, a clutch to connect said driving means and mandrel, a braking drum operatively connected to said mandrel, a cam on said braking drum, a brake band for said drum and manually operated means adapted to be positioned for engaging said cam to operate said clutch and brake band and release said dog.

9. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively and detachably connected to said shaft, friction controlled means to retract and disengage the mandrel from said shaft to discharge the spring, means automatically returning said mandrel into engagement with said shaft and friction controlled means checking the return of said mandrel.

10. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively connected to said shaft, means separating said shaft and mandrel for discharging said spring, a lever for forcing the spring from the machine and means carried by said mandrel adapted to operate said lever upon the separation of said shaft and mandrel.

11. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively connected to said shaft, means adapted to withdraw said mandrel from engagement with said shaft to discharge the spring, a lever for forcing the spring from the machine and cam means operated by the withdrawal of said mandrel to operate said lever.

12. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, means operated by said driving means for retracting said mandrel to discharge the spring, means automatically disconnecting said mandrel from said driving means when said mandrel is fully retracted and automatic means for returning said mandrel into engagement with said driving means.

13. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, means operated by said driving means for retracting said mandrel to discharge the spring, means automatically disconnecting said mandrel from said driving means when said mandrel is fully retracted, automatically operating means for returning said mandrel into engagement with said driving means and means checking the return of said mandrel.

14. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, means operated by said driving means for retracting said mandrel to discharge the spring, means automatically disconnecting said mandrel from said driving means when said mandrel is fully retracted, automatically operating means for returning said mandrel into engagement with said driving means and means operated by said mandrel for checking the return of said mandrel in its final stages.

15. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, gearing for retracting said mandrel to discharge the spring, a clutch for connecting said gearing and driving means, means automatically operating said clutch to disconnect said gearing and driving means and automatically operating means for returning said mandrel into engagement with said driving means.

16. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, gearing for retracting said mandrel to discharge the spring, a clutch for connecting said gearing and driving means, means automatically operating said clutch to disconnect said gearing and driving means, automatically operating means for returning said mandrel into engagement with said driving means and braking means automatically applied to said gearing to check the return of said mandrel.

17. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, gearing for retracting said mandrel to discharge the spring, a clutch for connecting said gearing and driving means, means automatically operating said clutch to disconnect said gearing and driving means, automatically operated means for returning said mandrel into engagement with said driving means and braking means operated by said mandrel to check the return of said mandrel to its final stages.

18. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, means operated by said driving means for retracting and disengaging said mandrel from said driving means, automatically operated means for returning said mandrel into engagement with said driving means and means automatically checking the return of said mandrel into engagement with said driving means.

19. In a spring coiling machine, a mandrel for forming the spring, means for retracting said mandrel to discharge the spring, means for returning said mandrel,

and frictional braking means for checking the return of said mandrel.

20. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for said shaft, means operated by said shaft driving means for retracting said mandrel from said shaft and automatically operated means for returning said mandrel into operative engagement with said shaft.

21. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for said shaft, gearing operated by said shaft, driving means for retracting said mandrel from said shaft and gravity operated means for engaging said mandrel with said shaft.

22. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for said shaft, means operated by said driving means for retracting said mandrel from said shaft, automatically operated means for returning said mandrel into engagement with said shaft and means operated by said mandrel for checking the return of said mandrel.

23. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for said shaft, gearing operated by said shaft, driving means for retracting said mandrel from said shaft, gravity operating means for engaging said mandrel with said shaft and a brake operated by said mandrel on its return adapted to check its return to engagement with said shaft.

24. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel and controlling means operated in one direction to cause said driving means to retract said mandrel, said controlling means being operated in the opposite direction to check the return of said mandrel.

25. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel and controlling means manually operated to cause retraction of said mandrel by said driving means, said controlling means being operated by the return of said mandrel to check the return of said mandrel.

26. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel and controlling means manually operated in one direction to cause retraction of said mandrel by said driving means, said controlling means being automatically operated in the opposite direction to check the return of said mandrel.

27. In a spring coiling machine, a mandrel for forming the spring, driving means for said mandrel, controlling means adapted to cause said driving means to retract said mandrel and means automatically operating said controlling means to slow the return of said mandrel.

28. In a spring coiling machine, a mandrel for forming the spring, means to retract said mandrel to drop the spring and a counterweighted pivotally mounted plate for receiving the spring from said mandrel.

29. In a spring coiling machine, a mandrel for forming the spring, means to retract said mandrel to drop the spring, a chute to receive the spring and automatically operated means adapted to receive the spring from the machine and deposit it in said chute.

30. In a spring coiling machine, a mandrel for forming the spring, means to retract said mandrel to drop the spring, a chute to receive the spring and means operated by the weight of the spring adapted to receive the spring from the machine and deposit it in said chute.

31. In a spring coiling machine, a mandrel for forming the spring, means to retract said mandrel to drop the spring, a chute for receiving the spring and a counterweighted pivotally mounted plate for receiving the spring from said mandrel and depositing it in said chute.

32. In a spring coiling machine, a shaft, a mandrel for forming a spring operatively engaging said shaft, a work-engaging and guiding worm driven from said shaft and means supporting said worm adapted to permit the displacement of said worm in an arc about the axis of said mandrel.

33. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively and detachably connected with said shaft, means adapted to retract and to disengage the mandrel from said shaft to discharge the spring, means adapted to automatically return said mandrel into engagement with said shaft and means for checking the return of said mandrel to said shaft.

34. In a spring coiling machine, a shaft, a mandrel for forming the spring operatively and detachably connected to said shaft, friction controlled means to retract and disengage the mandrel from said shaft to discharge the spring, means adapted to automatically return said mandrel into engagement with said shaft and friction controlled means for checking the return of said mandrel to said shaft.

35. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for said shaft, gearing operated by said shaft, driving means for retracting said mandrel from said shaft operated by said gearing and gravity operated means for engaging said mandrel with said shaft.

36. In a spring coiling machine, a mandrel for forming the spring, a shaft for driving said mandrel, driving means for

said shaft, driving means for retracting said mandrel from said shaft, gravity operated means for engaging said mandrel with said shaft and a brake operated by said mandrel on its return adapted to check its return to engagement with said shaft.

37. In a spring coiling machine, a mandrel for forming a spring, means to retract said mandrel to release the spring and a counterweighted pivotally mounted plate for receiving the spring from said mandrel.

38. In a spring coiling machine, a head, a mandrel and a work-holding dog movable in said head and means to operate said mandrel and dog semi-automatically in succession.

39. In a spring coiling machine, a rotatable head, a work-holding dog movable in said head, a key slidably movable in said head to operate said dog, a collar adapted to slidably move said key, a lever for operating said collar, a shaft and means on said shaft for operating said lever.

40. In a spring coiling machine, a rotatable head, a work-holding dog movable in said head, a key slidably movable in said head to operate said dog, a collar adapted to slidably move said key, a lever for operating said collar, a shaft, a gear on said shaft, a cam on said gear and a bar engaging said cam for operating said lever.

41. In a spring coiling machine, a rotatable head, a mandrel slidable in said head, a spindle carrying said mandrel, a slidably mounted journal box engaging said spindle, a rack carried by said journal box and means engaging said rack to shift said journal box, spindle and mandrel.

42. In a spring coiling machine, means for coiling the spring, means adapted to hold the work for said coiling means, means for withdrawing said coiling means from the spring and means semi-automatically operating said work-holding means and said withdrawing means in a prearranged sequence.

43. In a spring coiling machine, a rotatable head, a mandrel movable in said head, means to operate said mandrel to cause rotation of said head at interrupted periods in a prearranged sequence and semi-automatic means operated by said head rotating means to stop the rotation of said head after a determinable number of revolutions.

44. In a spring coiling machine, a rotatable head, a mandrel rotatable with and movable in said head, a work holding dog for said mandrel and means controlling the operation of said head and operating said mandrel and dog semi-automatically at interrupted intervals in a prearranged sequence.

45. In a spring coiling machine, a rotatable head, means for rotating said head, a shaft driven from said head, a pitch screw carried by said shaft and means to vary the angular relation of said head and pitch screw.

In witness whereof I have hereunto set my hand.

THEODORE C. KASEBERG.