P. E. LITTLE & M. J. RATTELSDORFER.

SPRING SETTING AND TEMPERING MACHINE.

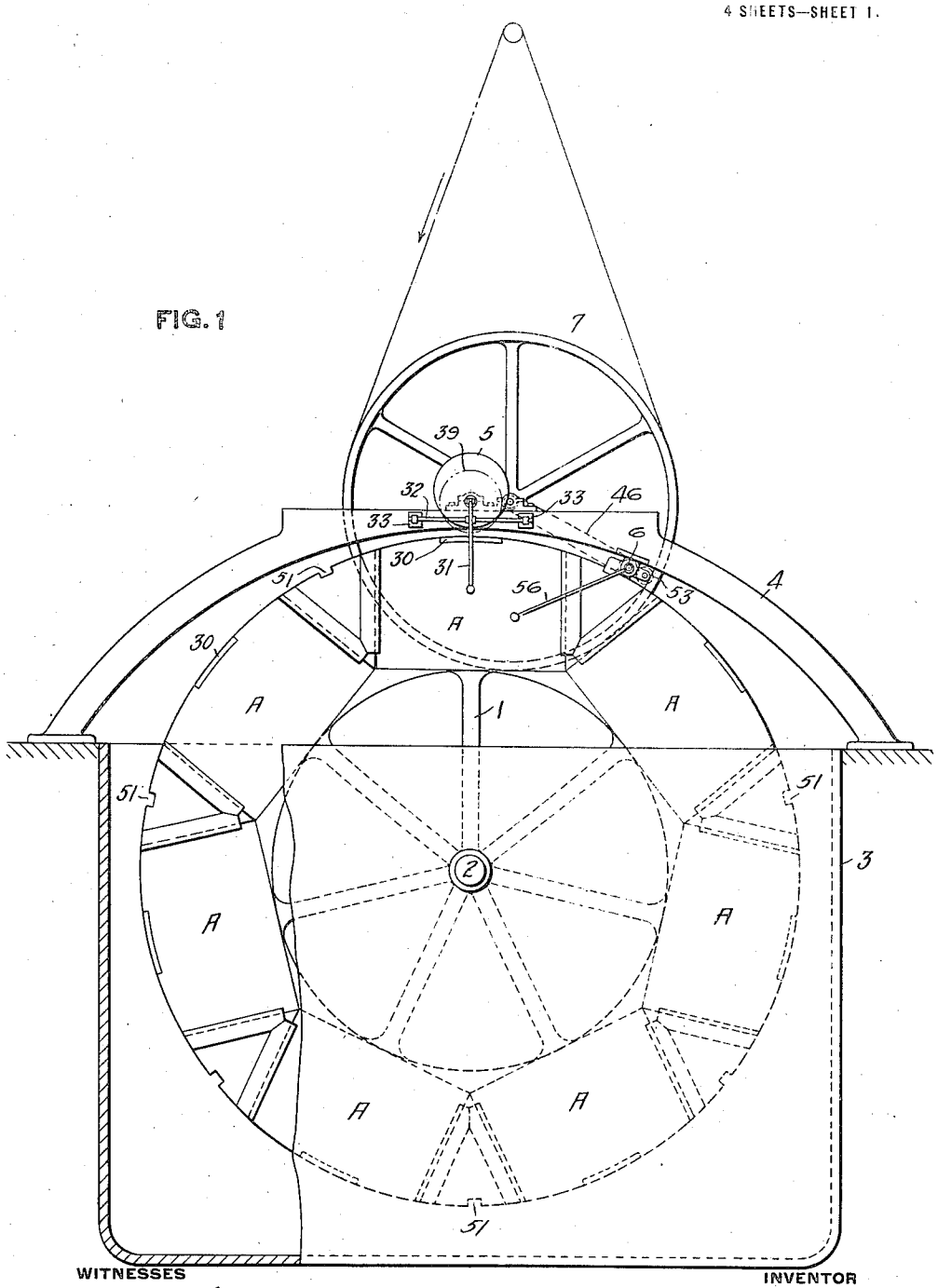
APPLICATION FILED JUNE 12, 1915.

1,247,695.

Patented Nov. 27, 1917.

4 SHEETS—SHEET 1.

FIG. 1



WITNESSES

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FIG. 9

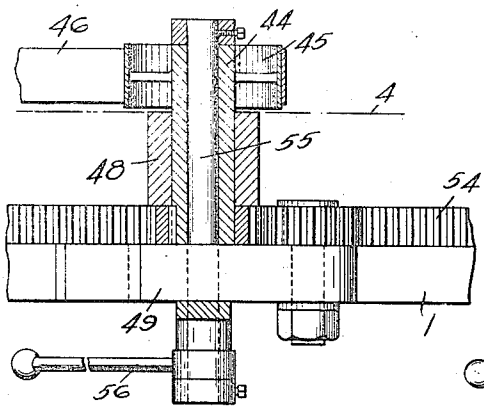
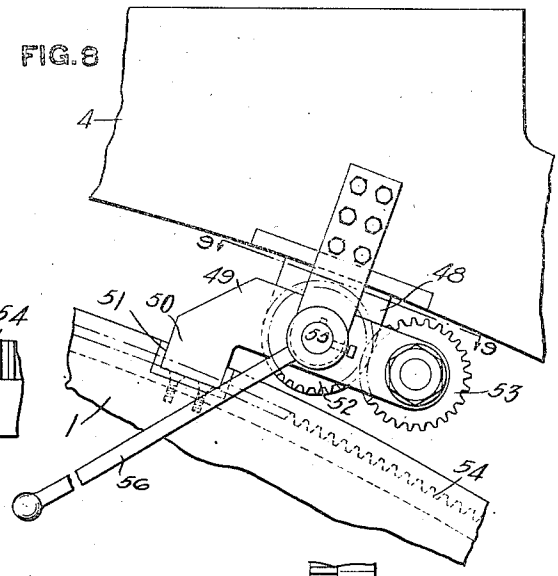


FIG. 8



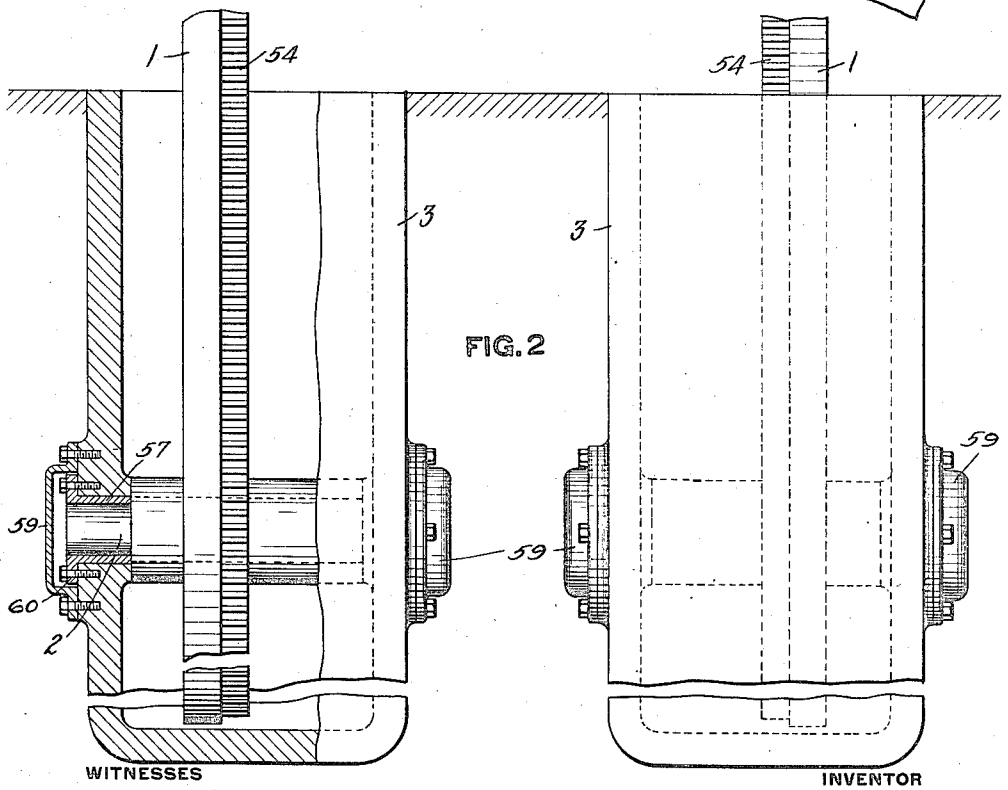


FIG. 2

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4 SHEETS—SHEET 3.

FIG. 3

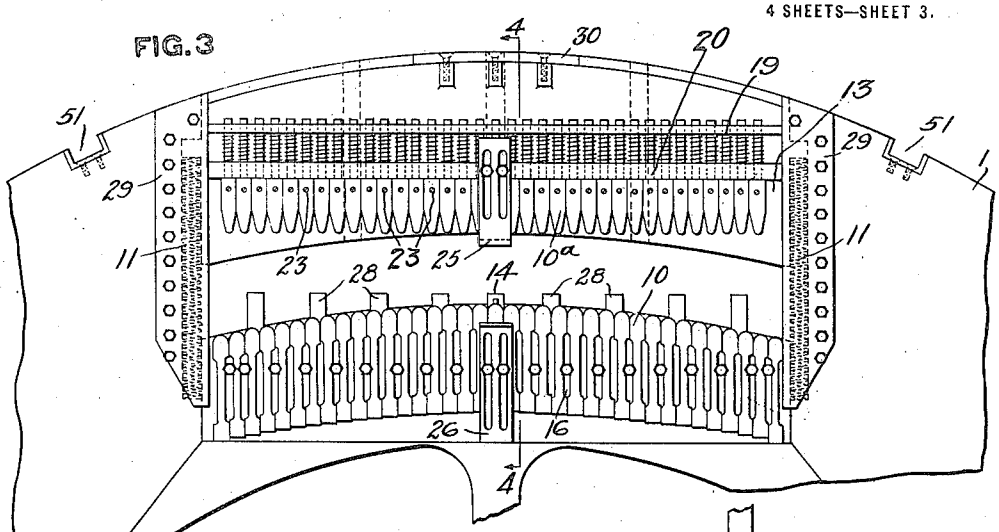


FIG. 4

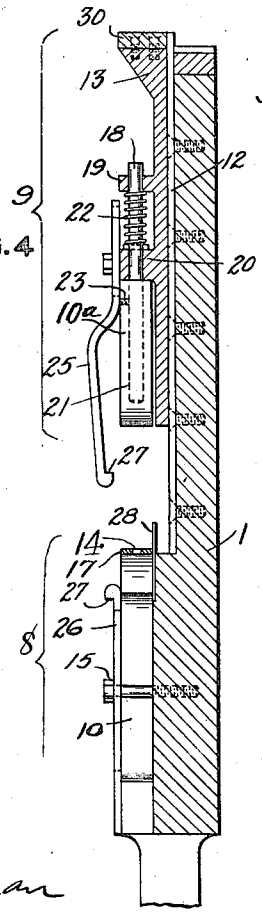
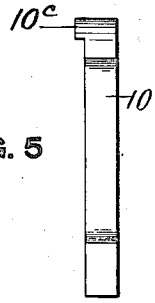


FIG. 5



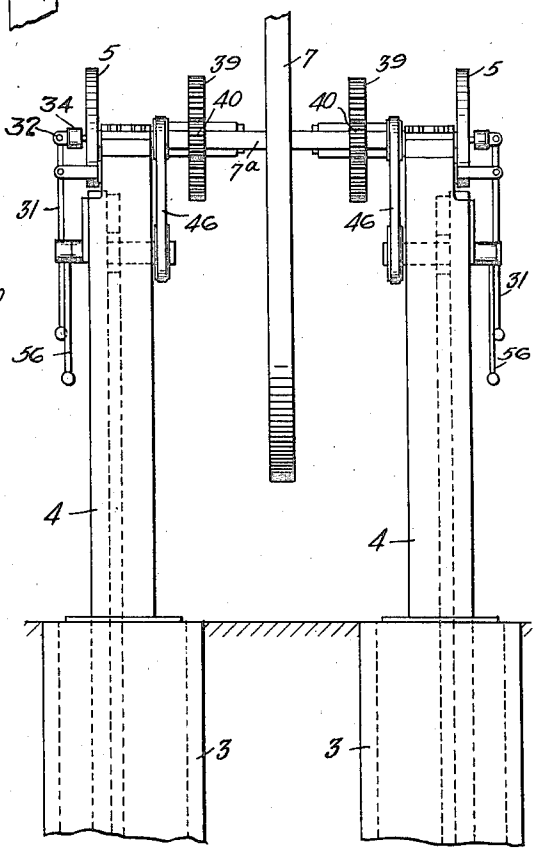


FIG. 6

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4 SHEETS—SHEET 4.

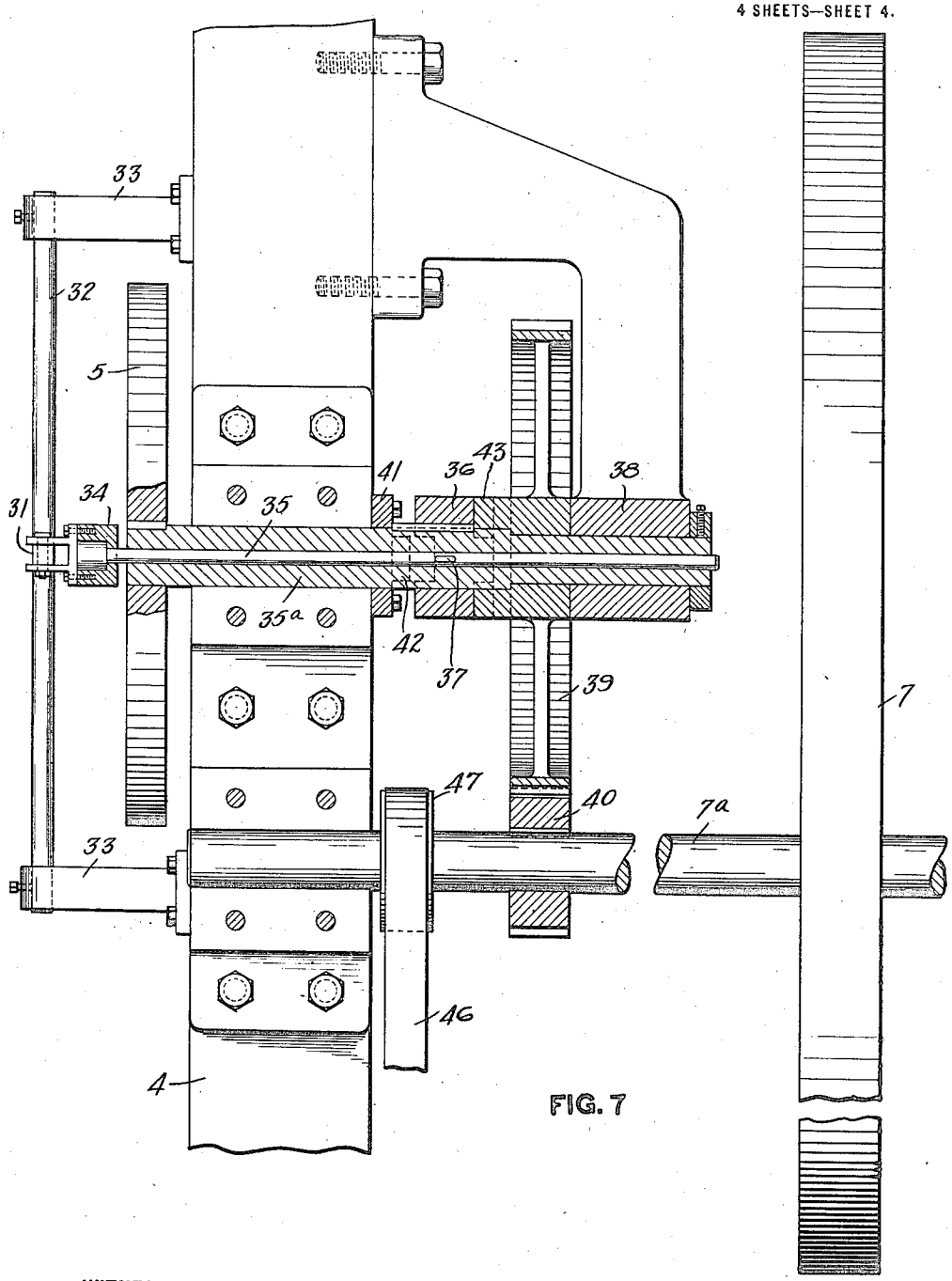


FIG. 7

WITNESSES

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UNITED STATES PATENT OFFICE.

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SPRING SETTING AND TEMPERING MACHINE.

1,247,695. Specification of Letters Patent. Patented Nov. 27, 1917.

Application filed June 12, 1915. Serial No. 33,846.

To all whom it may concern:

Be it known that we, PHILIP E. LITTLE and MARTIN J. RATTELSDORFER, residents of Coraopolis, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Spring Setting and Tempering Machines, of which the following is a specification.

This invention relates to spring setting and tempering machines.

The object of the invention is to provide a machine by means of which springs may be bent or set and then tempered by a successive action, and in a step by step manner, so that a spring which has been set can be tempered without removing it from its setting head, and also permitting the setting of a spring simultaneously with the tempering of previously set springs.

The machine comprises in its essentials a rotatable carrier for the bending heads located to carry the set springs into a tempering bath, together with suitable mechanism for bringing the several bending heads on said carrier into operative relation with mechanism for actuating the bending heads, other mechanism for rotating the carrier step by step and for locking it with a bending head in operative relation to the actuating mechanism, and means for locking the bending head after actuation so as to contain and carry the bent spring through the bath.

In the accompanying drawings Figure 1 is a side elevation of the machine, showing the tank for the tempering bath partly broken away, and showing the positions of the bending head on the rotatable carrier merely diagrammatically; Fig. 2 is an end elevation of the tempering tanks of a double machine, one of the said tanks being partly in section to illustrate the position of the rotatable carrier therein; Fig. 3 is a detail elevation of one of the bending heads; Fig. 4 is a vertical section therethrough on the line 4—4, Fig. 3; Fig. 5 shows a modified form of bending finger: Fig. 6 is an end elevation of the upper portion of a double machine illustrating the mechanism for actuating the bending heads and advancing the carrier from a common source of power; Fig. 7 is in part a plan view and in part a horizontal section illustrating the mechanism for actuating the bending heads; Fig. 8 is a side elevation of the mechanism for advancing and locking the carrier; and Fig. 9 is a sectional view thereof on the line 9—9, Fig. 8.

The essentials of the machine comprise a rotatable carrier 1 for a plurality of bending heads indicated diagrammatically at A, Fig. 1, and which carrier is journaled on a horizontal shaft or axle 2 in a tank 3 containing the tempering bath of oil or other liquid. Extending over the tank 3 is a frame 4 in which is mounted the mechanism for actuating the bending heads and rotating and locking the carrier 1, the essentials of this mechanism being an eccentric 5 for actuating the bending heads, mechanism for rotating and locking the carrier, indicated as an entirety by the numeral 6, Fig. 1, and a pulley or similar means 7 arranged to receive power from any suitable source and transmit the same to the spring setting eccentric 5 and the mechanism 6 for rotating and locking the carrier, all as is hereinafter more fully described.

Each of the bending heads A comprises a lower or stationary jaw, indicated in its entirety by the numeral 8, Fig. 4, and an upper or movable jaw, indicated in its entirety by the numeral 9, Fig. 4, which latter jaw is arranged to be moved toward and from the jaw 8. Each of these jaws is provided with a plurality of bending keys, those of the lower jaw being designated by the numeral 10 and being secured directly to the frame of the carrier 1 by means of tap bolts 15 which pass through slots 16 formed by cutting away the side faces of adjacent keys, said tap bolts entering threaded holes in the carrier 1. By this means the lower keys are vertically adjustable, in order that their upper or active ends may be set to any desired curvature. The keys for the upper jaws are designated by the reference numeral 10^a and are mounted on a plate or jaw member 13, which is radially slidable on the carrier 1, having its end portion projecting behind and guided by plates 29 bolted to the carrier 1 and being normally held in elevated or outward position by means of helical springs 11 located behind said guide plates 29 and at their inner ends bearing against suitable shoulders on the carrier 1 and at their outer ends bearing against projecting end portions of the plate 13. The movable upper jaw member 13 is provided with a pair of horizontal ribs 19 and 20 provided with alining openings through which pass shanks 18 which enter sockets 21 in the up-

per keys 10ª and which are secured to said shanks in different vertical positions by means of set screws 23 passing through the keys and bearing against the shanks 18. The upper keys are normally pressed downwardly by means of helical springs 22 surrounding the shanks 18 and at their upper ends bearing against the horizontal rib 19 and at their lower ends bearing against pins extending through the shanks 18. Interposed between the upper slidable jaw member 13 and the carrier 1 is a wear plate 12, and said jaw member at its upper surface is provided with a wear plate 30 arranged to be contacted by the eccentric 5 to depress said upper jaw and set the spring. Gage plates 28 are secured between the carrier 1 and the keys 10 of the lower jaw and project slightly above the latter, and form gages or guides for the inner edge of the spring blank and hold the latter properly in position while being bent. The central key of the lower jaw is provided with a teat 14 arranged to enter a hole at the central portion of the spring blank 17, as shown in Fig. 4 and prevent displacement of said blank. The working faces of the keys 10 and 10ª will be of a width corresponding to the width of the spring blanks. In case a wide spring is to be bent, the keys may be provided at the working ends with lateral projections as shown at 10ᶜ, Fig. 5, the latter view showing one of the lower bending fingers modified as indicated.

Centrally of the jaw members are secured the locking means, these comprising a spring member 25 provided with vertical slots and secured by bolts to the rib 20 of the upper jaw member 13 and extending downwardly and bent slightly outwardly and through the greater portion of its length lying substantially parallel to the face of said jaw member, and at its lower end provided with the inwardly projecting hook portion 27. Secured to the lower jaw by means of two of the bolts 15 is a locking member 26 provided at its upper end with an outwardly projecting hook portion 27 which is engaged by the hook portion 27 of the upper locking member when the upper jaw is forced downwardly in the process of bending the spring. These simple means provide for automatically locking together the bending jaws by the act of bending the spring, and serve to hold said heads locked together while the bent spring is being carried through the tempering bath. To release said locking member in order to remove the spring, the member 25 is pried outwardly by means of a suitable bar or tool until the hooks 27 are disengaged, whereupon the springs 11 immediately elevate the upper bending jaw.

The mechanism for driving the cam 5 for actuating the bending heads is as follows: The driving pulley 7 is secured to a shaft 7ª journaled in the frame 4, and having keyed thereto a pinion 40 which meshes with a gear 39 loosely rotatable on the shaft 35ª, which is journaled in a suitable bearing in the frame 4 and an outbearing 38 secured to said frame 4. Gear 39 is provided on one face with a clutch jaw 43 arranged to be engaged by a similar jaw on the clutch member 37 splined to and slidable on shaft 35ª. The opposite face of said clutch member 36 is also provided with a jaw face arranged to engage a locking jaw or tooth 42 on a member 41 secured to frame 4. Eccentric 5 is secured to the outer end of shaft 35ª, so that obviously when clutch member 36 engages the gear 39 said eccentric will be driven, whereas when clutch member 36 engages locking member 42 the eccentric will be stopped and will be locked in its stopped position. The clutch member 36 is moved into and out of locking arrangements with the gear 39 and locking clutch member 42 respectively, by means of lever 31 which is fulcrumed on a shaft 32 mounted in bearings 33 extending outwardly from the frame 4 and having its upper end pivotally connected to a yoke 34 on the end of clutch shifting rod 35 which extends through a bore in shaft 35ª and is provided with a pin 37 extending outwardly through a slot in said shaft 35ª and engaging the clutch member 36. When it is desired to actuate a bending head, the lower end of lever 31 is pulled outwardly, thereby moving the clutch shifting rod 35 inwardly and bringing the clutch 36 into engagement with the rotating gear 39. The eccentric 5 makes one complete rotation, and acts against the wear plate 30 on the upper face of the movable bending jaw 9, thus forcing the latter downwardly and bends the spring blank between the curved faces of the jaw members, and causes said jaws to be locked together by the locking members 25 and 26. By pushing the inner end of handle 31 inwardly, the clutch member 36 is drawn out of engagement with gear 39 and brought into engagement with the stationary jaw member 42, thus stopping the eccentric and holding it in exactly the right position for beginning the next rotation.

The mechanism for rotating and locking the carrier 1 is as follows: To shaft 7ª is secured a pulley 47, which is connected by belt 46 to a pulley 45 secured to the inner end of a hollow shaft 44 mounted in a bearing 48 on the lower face of frame 4. Extending through the hollow shaft 44 and rotatable therein is a short shaft 55 to whose outer end is secured a cross member 49 provided at one end with a downwardly projecting locking projection 50 adapted to enter locking recesses 51 in the periphery of the carrier 1. The member 49 at its opposite end carries a journal pin on which is rotatable a pinion 53 which meshes with a

pinion 52 secured to the outer end of the hollow shaft 44, and which pinion 53 is arranged to engage with rack teeth 54 formed on the carrier 1 and located slightly inwardly from its outer peripheral face. These parts are so arranged that when the locking projection 50 is in locking engagement with the carrier 1, the pinion 53 will be out of engagement with the rack 54, and vice versa. To the short shaft 51 is secured a lever 56, which projects at a slight inclination downwardly from the horizontal, and the weight of which tends to hold the locking mechanism in the position shown in Fig. 8. To unlock the carrier and permit its rotation, the workman lifts the end of lever 56 to disengage the locking projection 50 from the locking recess 51 and bring the pinion 53 into mesh with the rack 54. This starts the carrier to rotate, as soon as the next locking recess 51 comes into position the lever is released and drops (or it may be pulled down), thereby disengaging the pinion 53 from the rack bar 54, and causing the projection 50 to enter the recess 51 to lock the carrier in just the right position with the bending head underneath the actuating cam 5.

The shaft 2 of the rotatable carrier 1 is journaled in bushings 57 secured in openings in the walls of the tank 3 containing the tempering bath. These openings are sealed externally by means of caps 58 bolted to the side walls of the tank, space preferably being left between the interior of the caps 59 and the flanges 60 of the bushings 51 to permit of the insertion of a gasket to prevent leakage of tempering fluid.

In the operation of the machine, the spring blank to be bent and tempered is placed in whichever one of the bending heads A is in position to be actuated by the eccentric 5. In this position, the rotatable carrier is locked against rotation by the member 49, and the pinion 53 for rotating the carrier is rotating idly. The gear 39 is also rotating idly. The lever 31 is then moved to bring the clutch member 36 into locking engagement with the gear 39, whereupon the eccentric 5 is rotated and acts against the upper face of the upper jaw member 9 of the bending head and forces it downward against the resistance of the springs 11 and bends or sets the spring blank between the keys of the upper and lower jaws. Upon reaching its lowermost limit, the locking members 25 and 26 on the bending jaws engage and lock the jaws in closed position. The lever 31 is immediately actuated to disengage clutch 36 from gear 39 and bring it into engagement with the stationary locking tooth 42, thus stopping the eccentric 5 in its proper position. The workman then lifts lever 56 to disengage the locking projection 50 of member 49 from the locking recess 51 in the rotatable carrier 1, and bring the rotating pinion 53 into mesh with the rack bar 54. This advances the carrier until the next bending head is brought into position to be actuated by the eccentric 5, and when this point is reached the locking projection 50 of member 49 falls into the locking recess 51 on the carrier which is at that moment in proper position for being engaged by said locking member. The process above described is repeated with reference to each of the successive heads when brought underneath the cam 5. When the bending head first acted upon is again brought into position under the eccentric 5 the locking member 25 is disengaged from the locking member 26 whereupon the springs 11 lift the upper bending head and permit the set and tempered spring to be removed and another spring blank to be inserted and subjected to the bending and tempering operations.

The operation of the machine may be so timed that each spring may remain in the tempering bath for the necessary length of time to give it the desired treatment. In the use of the machine the springs are tempered immediately after bending, without removing them from the bending means, so that not only is there a great saving in time and labor, but the springs are also of superior quality because they are held in the bending means while being tempered and thus prevented from warping.

It is obvious that various other arrangements of mechanism for actuating the bending heads, for locking the jaws of the bending heads, and for advancing the carrier step by step, may be made without departing from the spirit of the invention.

What we claim is:—

1. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, spring bending means on said carrier and having a member movable radially of said carrier, mechanism independent of said carrier and mounted in operative relation to the periphery thereof and arranged to actuate the movable member of said bending means, and mechanism for rotating said carrier step by step to bring said bending means in succession into operative relation to the actuating mechanism and into the bath.

2. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, spring bending means on said carrier and having a member movable radially of said carrier, mechanism independent of said carrier and mounted in operative relation to the periphery thereof and arranged to actuate the movable member of said bending means, mechanism for rotating said carrier step by step to bring said bending means in succes-

sion into operative relation to the actuating mechanism and into the bath.

3. A spring setting and tempering machine, comprising a rotatable carrier mounted to rotate on a horizontal axis and arranged to extend into a tempering bath, spring bending means on said carrier, a frame located above said rotatable carrier, mechanism mounted in said frame in operative relation to said carrier and arranged to actuate said bending means, and mechanism for rotating said carrier step by step to bring said bending means in succession into operative relation to the actuating mechanism and into the bath.

4. A spring setting and tempering machine, comprising a plurality of bending heads, a receptacle for a bath, a movable carrier for said bending heads extending into said receptacle, mechanism independent of said carrier and mounted in operative relation thereto and arranged to actuate said bending means, mechanism arranged to move said carrier and bring said heads in succession into operative relation to said actuating mechanism and into the bath, and independently controllable power mechanism connecting with both said bending means actuating mechanism and said carrier rotating mechanism.

5. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, spring bending means on said carrier, mechanism mounted in operative relation thereto and arranged to actuate said bending means, mechanism for rotating said carrier to bring said bending means in succession into operative relation to the actuating mechanism and into the bath, a source of power, and independently controllable mechanism connecting said source of power respectively with said actuating mechanism and with said rotating mechanism.

6. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, a plurality of spring bending heads mounted on said carrier, mechanism mounted in operative relation to said carrier and arranged to actuate said bending heads, mechanism for rotating said carrier to bring said bending heads in succession into operative relation to the actuating mechanism and into the bath, a driving shaft, and independently controllable driving connections between the same and the actuating mechanism and the carrier rotating mechanism respectively.

7. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, spring bending means on said carrier, mechanism mounted in operative relation thereto and arranged to actuate said bending means, mechanism for rotating said carrier to bring said bending means in succession into operative relation to the actuating mechanism and into the bath, a source of power, independently controllable mechanism connecting said source of power respectively with said actuating mechanism and with said rotating mechanism, and means for locking said carrier with the bending means in position to be actuated by said actuating mechanism.

8. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, a plurality of spring bending heads mounted on said carrier, mechanism mounted in operative relation to said carrier and arranged to actuate said bending heads, mechanism for rotating said carrier to bring said bending heads in succession into operative relation to the actuating mechanism and into the bath, a driving shaft, independently controllable driving connections between the same and the actuating mechanism and the carrier rotating mechanism respectively, and means for locking said carrier with a bending head in position to be actuated by said actuating mechanism.

9. A spring setting and tempering machine, comprising a rotatable carrier arranged to extend into a tempering bath, a plurality of bending heads mounted on said carrier, each head comprising a stationary member provided with adjustable bending keys, a movable jaw member provided with movable spring pressed keys, means for actuating said movable head, a lock for locking said movable head in relation with said stationary head after actuation, springs arranged to open said members upon release of said lock, and means for rotating said carrier step by step.

10. In spring setting and tempering machines, the combination of a carrier, a spring setting and tempering head mounted thereon and comprising a stationary member provided with adjustable bending keys, a movable member provided with spring pressed bending keys, means for actuating said movable member, means for locking said movable member in relation to said stationary member after actuation, and springs arranged to separate said movable member from said stationary member upon the release of said locking means.

In testimony whereof, we have hereunto set our hands.

PHILIP E. LITTLE.
MARTIN J. RATTELSDORFER.

Witnesses:
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WILLIAM B. WHARTON.