June 19, 1923.

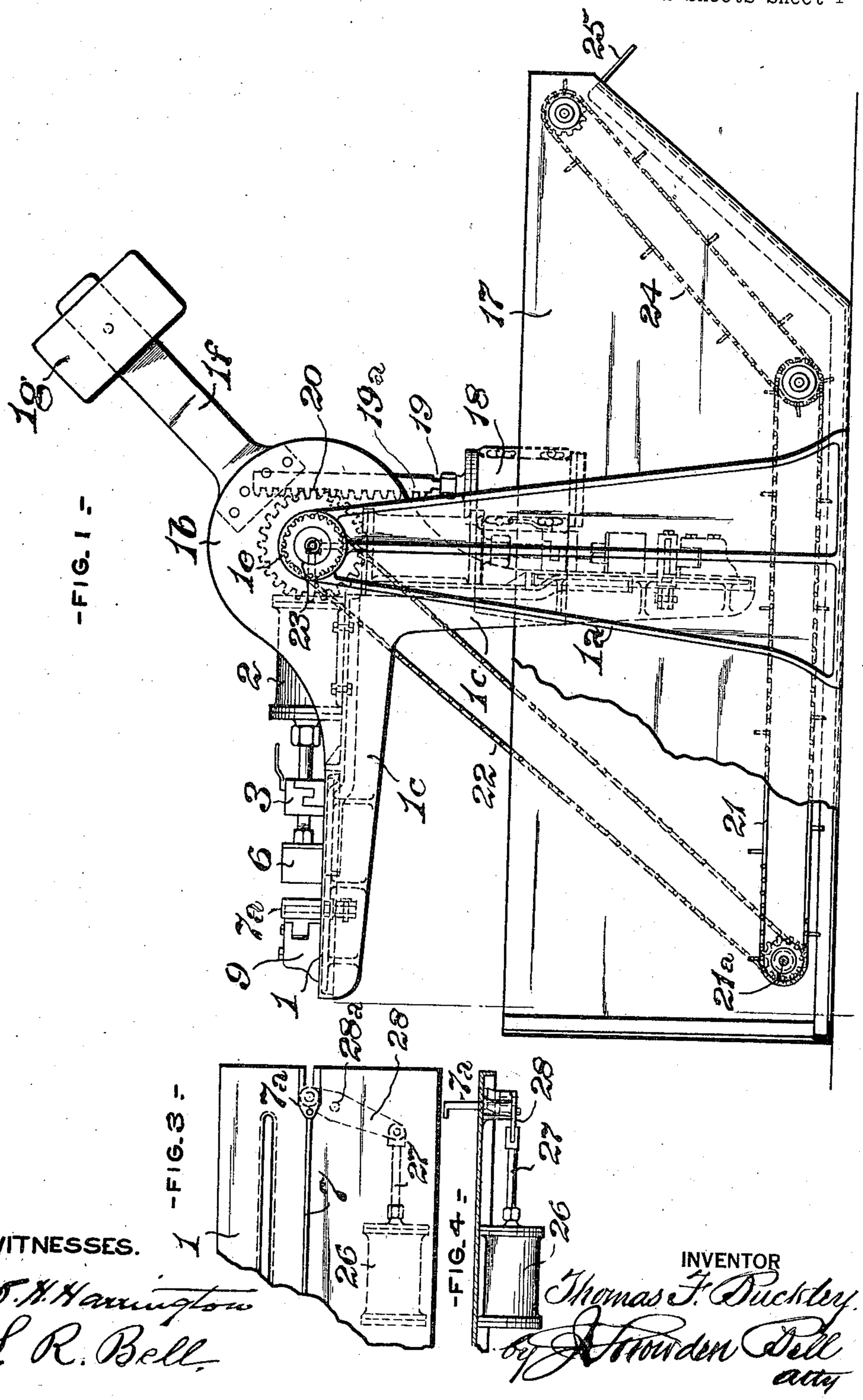
1,459,045

T. F. BUCKLEY

SPRING FORMING MACHINE

Filed Aug. 20, 1921

2 Sheets-Sheet 1



-FIG. 1.-

-FIG. 3.-

-FIG. 4.-

WITNESSES.

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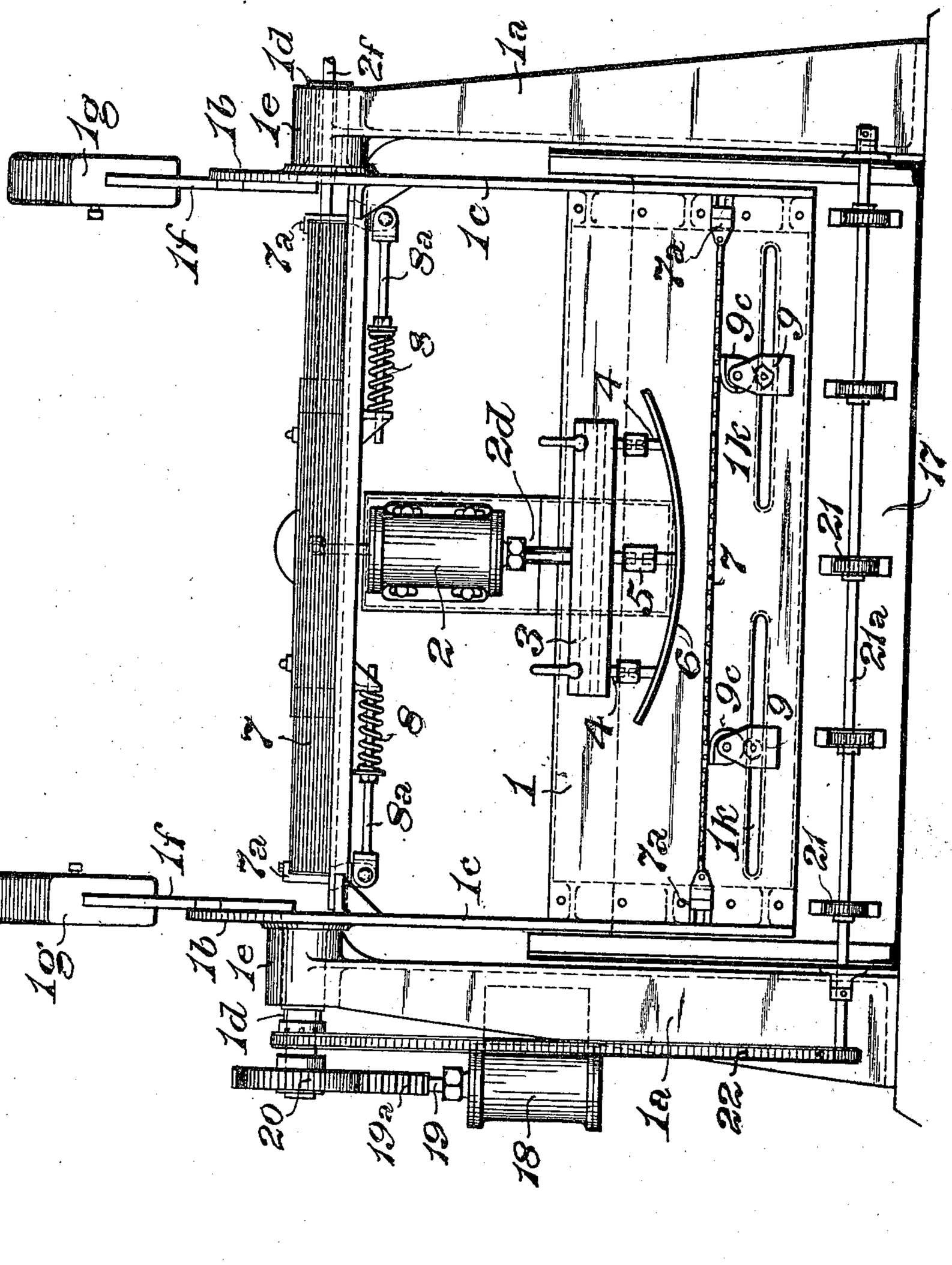

-FIG. 2.-

WITNESSES

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Patented June 19, 1923. 1,459,045

UNITED STATES PATENT OFFICE.

THOMAS F. BUCKLEY, OF SCRANTON, PENNSYLVANIA.

SPRING-FORMING MACHINE.

Application filed August 20, 1921. Serial No. 493,832.

To all whom it may concern:

Be it known that I, THOMAS F. BUCKLEY, of Scranton, in the county of Lackawanna and State of Pennsylvania, have invented a certain new and useful Improvement in Spring-Forming Machines, of which improvement the following is a specification.

My present invention relates to spring-forming machines of the general class or type of that set forth in Letters Patent of the United States No. 1,275,377, granted and issued to myself and Samuel S. Riegel, under date of August 13, 1918, and its object is to produce an appliance of such type which shall present all the advantages of that above specified, and shall, further, be of increased capacity of production within given time limits, and present automatically operating facilities for transferring the shaped spring plates into and out of an oil bath.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view in elevation of a spring-forming machine, illustrating an embodiment of my invention; Fig. 2, a front elevation, partly in section, of the same; Fig. 3, a partial plan view, showing a structural modification of the means for imposing tension upon the resistance member; and Fig. 4, a side view thereof.

In the practice of my invention, referring descriptively to the specific embodiment thereof which is herein exemplified, I provide a substantial supporting structure, comprising a pair of vertical posts or standards 1^a, 1^a, which are secured, at a proper distance apart, upon a base or bed of any suitable and preferred construction. An oil vat 17, which is open at its top, is attached to the bed, in the space between the supporting standards 1^a.

Two rotatable table carriers, each of which is in the form of a plate, having a hub or center 1^b, and arms 1^c, projecting, at a right angle one to the other, therefrom, are journaled, by short lateral shafts or trunnions 1^d, in bearings 1^e, on the tops of the standards 1^a. The table carriers are rigidly connected, one to the other, by flat tables or plates 1, 1, each of which is secured to the arms of the two carriers which extend in the same direction from the hubs or centers, 1^b, 1^b, thereof, the tables, 1, 1, being consequently located at a right angle, one to the other, arms, 1^f, 1^f, carrying counterbalancing weights, 1^g, 1^g, are secured to the table carriers, projecting therefrom at a proper angle to balance the weight of a pair of table carrier arms and table when standing in a horizontal plane.

Oscillatory movement, about the common axial line of the trunnions, 1^d, 1^d, is imparted to the table carriers and connected tables, 1, 1, so as to bring one or the other of said tables, as desired, into a horizontal plane, for operation in the shaping of spring plates, by the piston of a fluid pressure cylinder, 18, which is secured to one of the standards, 1^a. A rack, 19^a, is formed on the piston rod, 19, of the cylinder, 18, said rack engaging a pinion, 20, fixed on the trunnion, 1^d, of one of the table carriers, the range of traverse of the piston rod and rack being such as to effect the requisite movement, in either direction, of the table carriers and tables. The admission and exhaust of fluid under pressure to and from opposite ends of the cylinder may be effected by any suitable known form of valve mechanism, which, as it does not form any part of my present invention, is not herein set forth.

Each of the tables, 1, 1, carries a spring forming mechanism, which, in the instance exemplified, is similar to that set forth in an application for Letters Patent of the United States filed by me, under date of July 30, 1921, Serial No. 488,545. Said specific mechanism is not therefore claimed as of my present invention, and any other suitable and preferred form may be applied, without departure therefrom. In order, however, that the operation of the spring forming machine of my present invention may be fully and clearly understood, said mechanism will now be fully described.

A fluid pressure cylinder, 2, is fixed on each of the tables, 1, 1, said cylinder being fitted with a properly packed piston, which is secured upon a piston rod, 2^d, projecting from the inner end of the cylinder. Operating fluid, which is preferably compressed air, is supplied to actuate the piston, the admission and exhaust being effected through a pipe, 2^f, passing axially through one of the trunnions, 1^d, and controlled by any suitable known valve mechanism.

A cross head, 3, is secured to the outer end of the piston rod, said cross head being coupled, by a plurality of connections, to a curved templet or formation plate, 6. In the instance exemplified, a middle and

two end connections are applied, each of said connections comprising two rods, 4, having right and left hand screw threads, respectively, and connected by a corresponding threaded nut or turnbuckle, 5, the opposite ends of the rods being secured to the cross head and the formation plate, respectively. By this means, the curvature of the formation plate may be readily adjusted as desired.

A fixed flexible resistance member, which is shown in the form of a flat link chain, 7, the depth of which is substantially equal to the width of the widest spring plates which are to be bent, is extended longitudinally on the table, 1. The resistance member is held in tension by two helical springs, 8, located below the table, each of said springs being coiled on a rod, 8^a, which is coupled to a block, 7^a, fitted to slide in a guide slot in the table, and bolted to one end of the resistance member 7. The springs, 8, bear on collars on the rods, and on abutments fixed to the table, and their tension may be adjusted, as desired, by nuts, engaging screw threads on the rods, 8^a.

The chain, 7, is maintained, at two points in its length, at its normal distance from the cross head, as determined by the tension to which it is subjected, by the springs, 8, and the extent of its operative flexible length is limited by the blocks, 9, which are fitted, with the capacity of longitudinal movement, on the table, and are secured adjustably thereto, by bolts and nuts, said bolts passing through slots in the table, which are located at a right angle to the axial line of the piston rod, 2^d. The blocks, 9, are coupled to anvil blocks, 9^c, secured to the chain, 7.

As shown in full and broken lines, respectively, in Fig. 1, when one of the tables, 1, 1, has been brought into horizontal operative position, the other table has been, in and by the same adjustment, depressed into the oil vat, 17. The spring plate which has been shaped on the depressed table is then dropped therefrom upon a plurality of endless chain conveyors, 21, fitted to intermittently traverse longitudinally in the lower portion of the oil vat, 17, and actuated by a belt, 22, working on a pulley, 23, on one of the trunnions, 1^d, of the table carriers, and a pulley ratcheted on a shaft, 21^a, journalled in the lower portion of the oil vat, 17, said shaft being rotatable in one direction only.

The spring plate is delivered by the conveyors, 21, to upwardly inclined chain conveyors, 24, by which it is carried to the top of the oil vat, and discharged therefrom over an inclined end plate, 25.

Figs. 3 and 4 illustrate a structural modification of the means for imparting tension to the resistance member, 7, which consists in a fluid pressure cylinder, 26, the piston rod, 27, of which, is coupled to one arm of a double armed lever, 28, journalled by a pin, 28^a, on the table, 1. The opposite arm of the lever, 28, is coupled to one of the end blocks, 7^a, of the resistance member, and, by the application of pressure in the cylinder, 26, the lever imposes additional tension, as desired, upon the resistance member.

In the operation of a machine embodying my invention, one of the tables having been brought into operative horizontal position, the spring plate is bent to the desired curvature between the formation plate and the resistance member, as in Letters Patent No. 1,275,377, and in my application Serial No. 488,545 aforesaid. Pressure is then admitted to the cylinder, 18, and the other table is thereby raised into operative horizontal position, and the table on which the spring plate has been bent, together with the bent spring plate are depressed into the oil vat, 17. This table remains in depressed position during the bending of another spring plate on the table that has been raised into operative position, and the bent spring plate that has dropped from it, is carried forwardly and upwardly by the conveyors, 21 and 24, and discharged from the oil vat.

My invention presents the substantial advantages of increasing the amount of work that may be done in a given time, and of supplying the finished spring plates to and removing them from, the oil vat, without requiring manipulation by the operator. One table is always in readiness for operation, and its removal from operative position, coincidentally brings another table into such position, and delivers the plate that has been operated on to the oil vat, the delivery from which is performed, at the proper time, without further adjustment.

I claim as my invention and desire to secure by Letters Patent:

1. In a spring forming machine, the combination with an oil vat, of a plurality of tables at right angles to each other, journalled above said vat so as to swing into and out of the same, a flexible resistance member on each table, means to impart variable tension to said member, a power-actuated cross-head on each table movable towards and from said member, a formation plate of adjustable curvature carried by said cross-head, power-actuated means to oscillate said tables into horizontal position above said vat or into vertical position in the same, and a conveyor in said vat, driven by said means, to receive the completed plate from the vertical table and convey it out of said vat.

2. In a spring forming machine, the combination with an oil vat, of a pair of tables at right angles to each other journalled above said vat so as to be depressible therein, a power cylinder on each table, a forma-

tion plate operatively connected thereto, said connection comprising means to vary the curvature of said plate, a flexible resistance member on each table, means to impart variable tension to said member, a power cylinder connected to the pivotal axis of said tables to raise and lower the same out of and into said vat, and conveyor chains in said vat, operatively connected to said last mentioned power cylinder, to convey the finished springs out of said vat.

3. In a spring forming machine, the combination of a supporting table; a flexible resistance member, extending longitudinally thereon; a fluid pressure cylinder, located below the table; a double armed lever, journalled on the table and having one of its arms coupled to the resistance member, and the other to the piston of the cylinder; a power actuated cross head, movable towards and from the resistance member; and a curved formation plate connected to said cross head.

THOMAS F. BUCKLEY.

Witnesses:
JOHN F. MURRAY,
WILLIAM A. MAYLIN.