J. FRASER.

GYRATORY MACHINE.

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952,565. Patented Mar. 22, 1910.

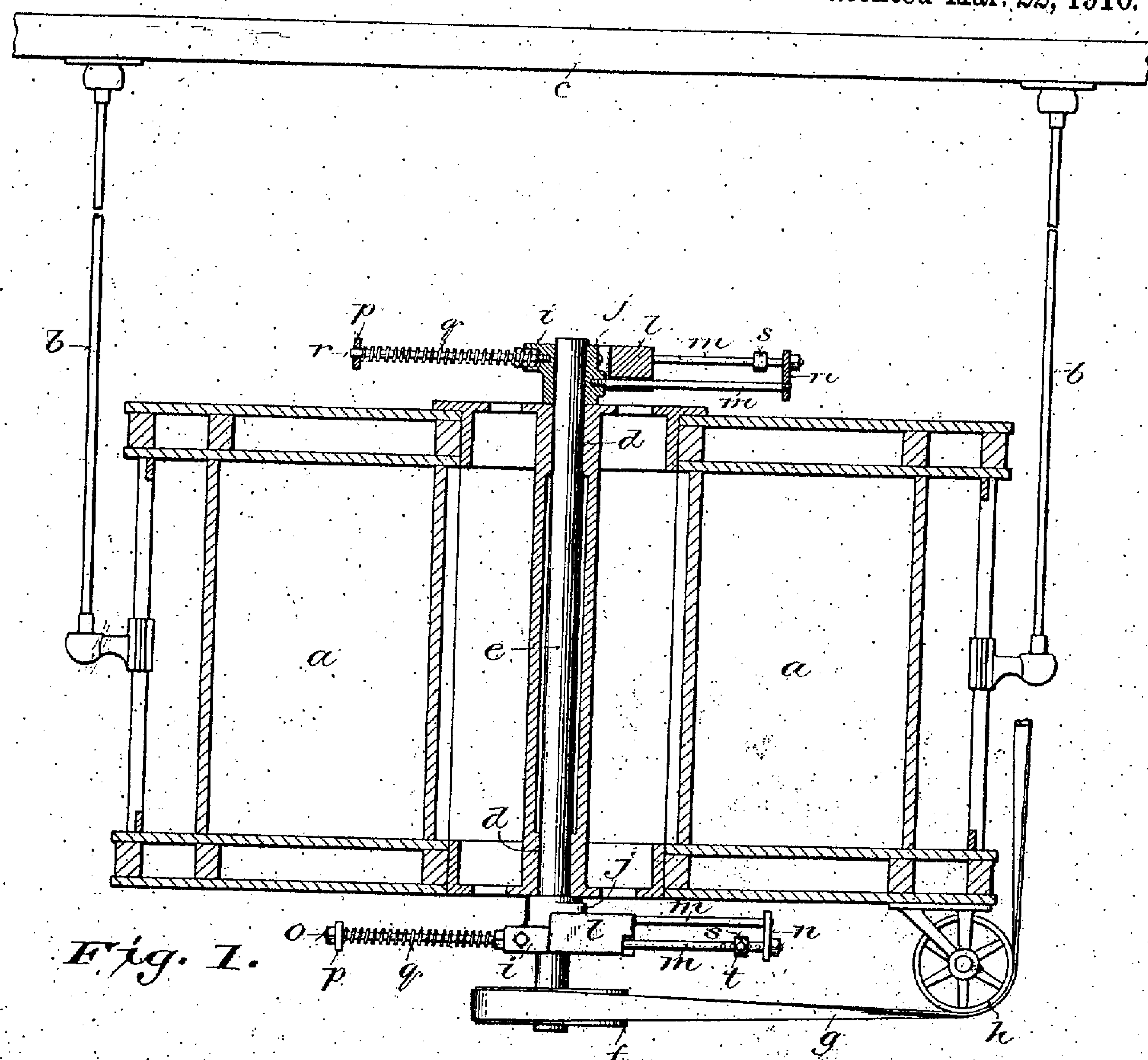

Fig. 1.

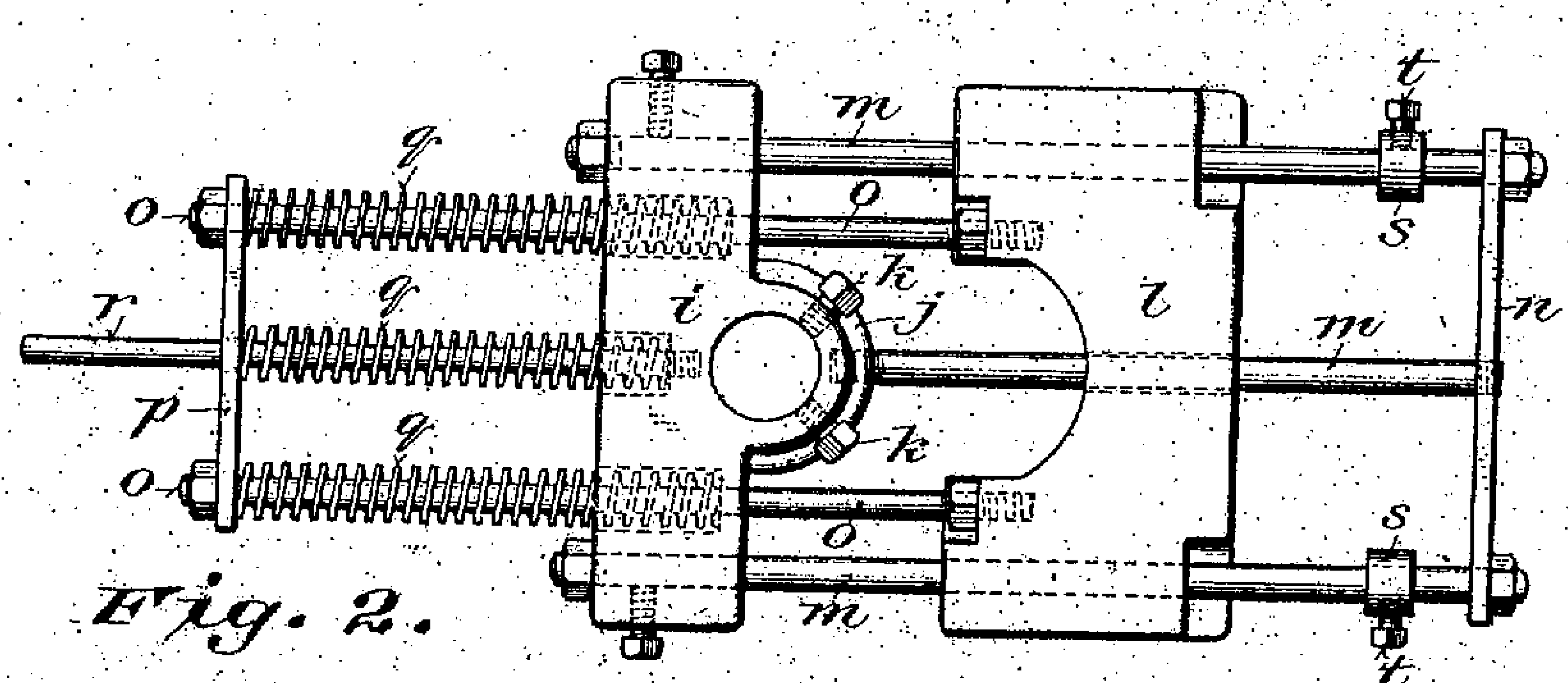

Fig. 2.

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UNITED STATES PATENT OFFICE.

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GYRATORY MACHINE.

952,565. Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed October 30, 1908. Serial No. 460,205.

To all whom it may concern:

Be it known that I, JOHN FRASER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Gyratory Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates more particularly to freely suspended or supported gyratory machines of the class shown and described in application Ser. No. 322,149 filed June 18, 1906.

The main objects of the present invention are to more evenly balance a machine of this kind when it is at rest around the central weighted shaft or axis, so that in starting and stopping its gyratory orbit will increase and diminish more gradually as the speed of said shaft increases and diminishes; to provide for shifting centrifugal weights of greater mass, and a more effective and advantageous arrangement of springs and guides; and generally to improve the construction and operation of the means for producing and determining the gyratory movement of machines of this class.

It consists in certain novel features of construction and in the peculiar arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in both figures.

Figure 1 is a central vertical section of a gyratory bolting machine embodying the present invention, the sieves being omitted; and Fig. 2 is an enlarged plan view of one of the shifting weights with its connections and associated parts for varying and regulating the gyratory movement of the machine in stopping and starting.

Referring to Fig. 1, *a* designates the case or frame of the bolting machine, which is freely suspended by jointed or flexible hangers *b*, from a ceiling or overhead support *c*, and is provided at or near the center with bearings *d* for a vertical rotary shaft *e*. This shaft is provided with a pulley *f* which is connected by a belt *g* running on guide pulleys *h* attached to the case or frame, with a suitably located driving pulley, not shown.

On the shaft *e* above and below the case *a* are mounted parallel with each other, two cross heads *i* formed centrally on one side with hubs *j* which are secured on said shaft by set bolts *k* or other suitable means.

Radially movable shifting weights *l* are mounted on parallel guide rods *m*, which are secured at their inner ends in the cross heads *i*. These rods are connected and held in the proper relation to each other at their outer ends by cross pieces *n*. The middle rod of each group projecting radially from the hub *j* of the associated cross head *i*, is located above or below the plane of the outer rods, and thus forms therewith and with the connecting cross piece *n*, a stiff self-bracing supporting and guiding structure for the shifting weight mounted thereon.

Two parallel rods *o*, passing loosely through each cross head *i* on opposite sides of the shaft *e*, are secured at one end in the associated weight *l*, and at their opposite ends are connected by a plate or yoke *p*. Spiral compression springs *q* encircling the rods *o* between the cross head *i* and the plate *p*, tend to draw and hold the weight *l* against the cross head *i*. A third rod *r* is preferably secured at one end in the cross head *i* midway between and parallel with the rods *o*, and passes loosely through an opening in the plate or yoke *p*, which serves as a guide therefor, and a spring *q* surrounding this rod between said cross head and plate cooperates with the other springs to draw the weight *l* toward the shaft *e* and to afford a yielding resistance to the outward movement of said weight by centrifugal force when the shaft *e* is rotated. The plate *p* is adjustably secured on the rods *o* by nuts, and affords means for adjusting the tension of the springs *q*.

The outer guide rods *m* are provided with adjustable collars *s* secured thereon by set screws *t* and serving as stops for limiting the outward movement of the weights *l*. The weights *l* are preferably cut away or recessed as shown, so that when they are thrown to the outer limit of their movement they will extend over the collars *s*.

The cross heads *i* are preferably counterbored to form sockets for the springs *q* around the rods *o* and *r*, so as to admit of shortening said rods in connection with springs of a given length.

The weights *l*, which are heavier than the cross heads *i*, are cut away on their inner sides between the rods *o*, as shown in Fig. 2,

to fit over the hubs *j* of the associated cross heads *i*, so that when the machine is at rest and said weights are held by the springs *g* in their inner positions, the machine will be approximately in balance around the axis of the shaft *e*, the cross heads *i* acting as counterweights with respect to the shifting weights *l*.

The machine operates as follows: In starting, the shifting weights *l* being held by the springs *g* at the limit of their inward movement close to the cross heads or counterweights *i*, the axis of the shaft *e* will at first be fixed or describe a very small gyratory circuit, but as the speed of the shaft increases, the weights *l* will be gradually moved away from it by increasing centrifugal force against the resistance of the springs *g*; the center of gravity being thus gradually shifted away from the axis of the shaft *e*, the latter with the freely suspended case or frame in which it turns, will be caused to gyrate in a gradually enlarging circuit about an axis coinciding with or passing through the center of gravity. When the shaft *e* attains its full normal speed, the outward movement of the weights *l* is arrested by the adjustable collars or stops *s*, and the case or frame *a*, with its load, gyrates about its center of gravity, which is determined or modified by the position of said weights relative to the axis of said shaft. The center of gravity of the machine being thus gradually shifted away from the axis of the shaft *e*, and the gyratory orbit or circuit increasing gradually from zero to its full or normal limit, the center of gravity or normal axis of gyration will never cross the path of gyration, and the erratic movements and consequent shock and jar to the machine and its supporting connections, which would occur if the weights were permanently adjusted to produce the normal gyratory circuit, are avoided.

In stopping, as the rotary speed of the shaft *e* and the centrifugal force acting on the weights *l* are reduced, the weights *l* are gradually moved inwardly toward said shaft, the center of gravity of the machine gradually approaches the axis of the shaft and the gyratory orbit or circuit described by said shaft gradually diminishes until it finally comes to rest when the weights resume their initial positions, and the axis of gyration or the center of gravity of the machine coincides with the axis of said shaft. Thus in stopping as in starting, erratic movements and consequent shock or jar to the machine are avoided, and a cushion, guide or other means for confining the movement of the machine within certain limits, is dispensed with.

Various changes in the details of construction and arrangement of parts may be made without departing from the principle and scope of the invention.

I claim:

1. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member and provided on one side with a counterweight, a radially shifting weight on the opposite side of said shaft, and a spring tending to move said shifting weight toward said counterweight, substantially as described.

2. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member, a counterweight having a hub on one side secured on said shaft, guides extending transversely from said counterweight on opposite sides of its hub, a radially shifting weight mounted on said guides and recessed on the inner side to pass over said hub close to said counterweight, and a spring tending to move said shifting weight toward the counterweight, substantially as described.

3. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member, a counterweight secured to one side of said shaft, guides extending transversely from said weight on opposite sides of said shaft and provided with adjustable stops, a radially shifting weight mounted on said guides between said stops and counterweight, and a spring tending to move the shifting weight toward the counterweight, substantially as described.

4. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member, a cross head and counterweight secured to said shaft on one side thereof, guides extending transversely from said cross head, a radially shifting weight mounted on said guides on the opposite side of the shaft from the counterweight, rods secured to the shifting weight and passing loosely through the counterweight parallel with said guides on opposite sides of said shaft, and spiral springs mounted on said rods between the counterweight and seats on the outer ends of the rods, substantially as described.

5. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member, a cross head and counterweight secured to one side of said shaft, parallel guides extending laterally from said cross head, a radially shifting

weight mounted on said guides and provided with rods passing loosely through said cross head parallel with said guides, and having adjustable spring seats at their outer ends, and spiral springs mounted on said rods between said cross head and seats, substantially as described.

6. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member and provided on one side with a cross head and counterweight, parallel guides extending laterally from said cross head in different vertical and horizontal planes, a radially shifting weight mounted on said guides, and springs tending to move said shifting weight toward said cross head and counterweight, substantially as described.

7. In a gyratory machine the combination with a member capable of free gyratory movement in an approximately horizontal plane, of a vertical rotary shaft centrally journaled in said member and provided on one side with a cross head and counterweight, parallel guides extending laterally from said cross head in different vertical and horizontal planes, adjustable stops mounted on certain guides, a radially shifting weight mounted on said guides and recessed on the inner side to pass around said shaft close to the cross head, rods secured to the shifting weight and passing loosely through the cross head parallel with said guides on opposite sides of the shaft, a yoke adjustably mounted on the outer ends of said rods, and spiral springs mounted on said rods between said yoke and cross head, substantially as described.

8. In a gyratory machine the combination with a member capable of free gyratory movement, of a vertical rotary shaft journaled in said member and provided on one side with a counterweight and on the opposite side with a radially shifting weight, parallel rods attached to said shifting weight and passing loosely through said counterweight on opposite sides of said shaft, a yoke connecting said rods at their outer ends, a rod attached to said counterweight between and parallel with the other rods and passing loosely through said yoke, and spiral springs mounted on said rods between said yoke and counterweight and tending to move the shifting weight toward the counterweight, substantially as described.

In witness whereof I hereto affix my signature in presence of two witnesses.

JOHN FRASER.

Witnesses:
W. C. BANKS,
W. A. WAGER.