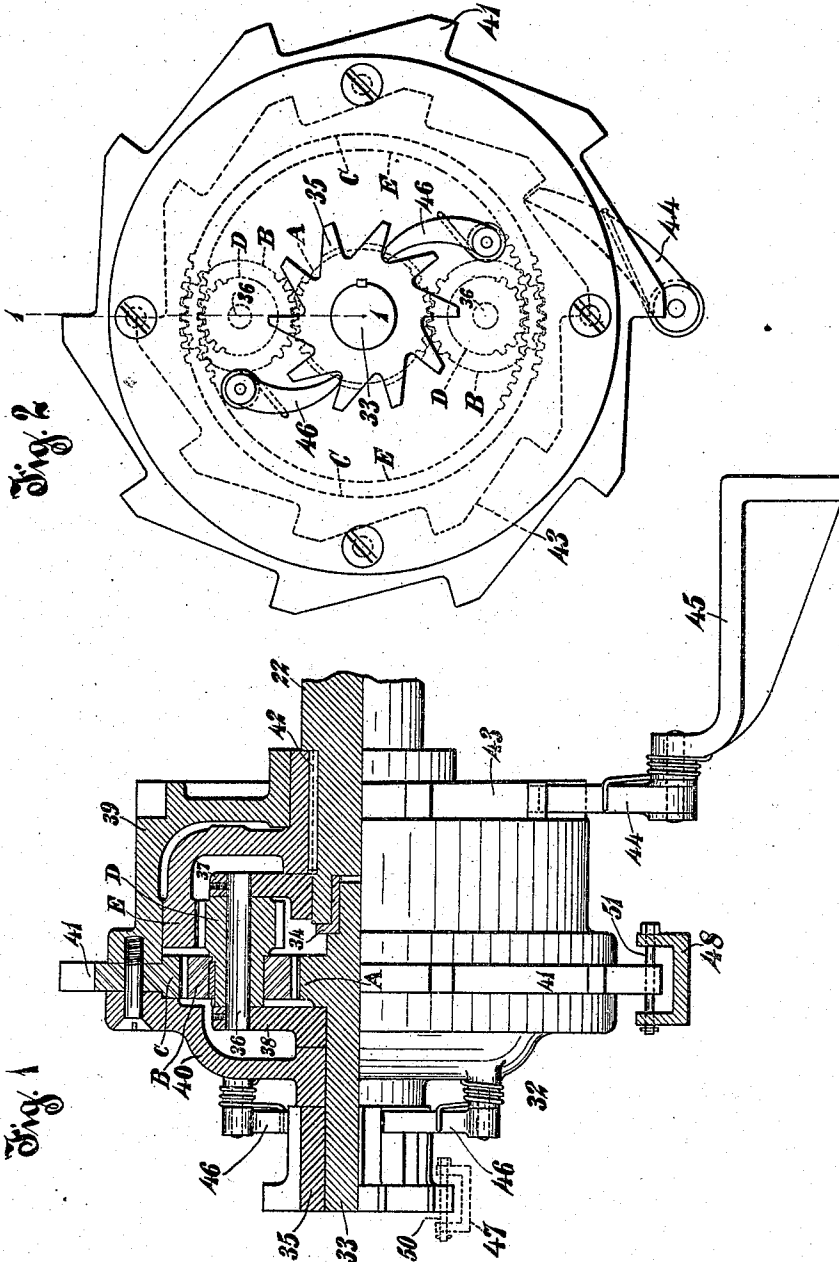


A. H. WOUTERS.
ADJUSTING MECHANISM.
APPLICATION FILED DEC. 31, 1906.

937,134.

Patented Oct. 19, 1909.

2 SHEETS—SHEET 1.



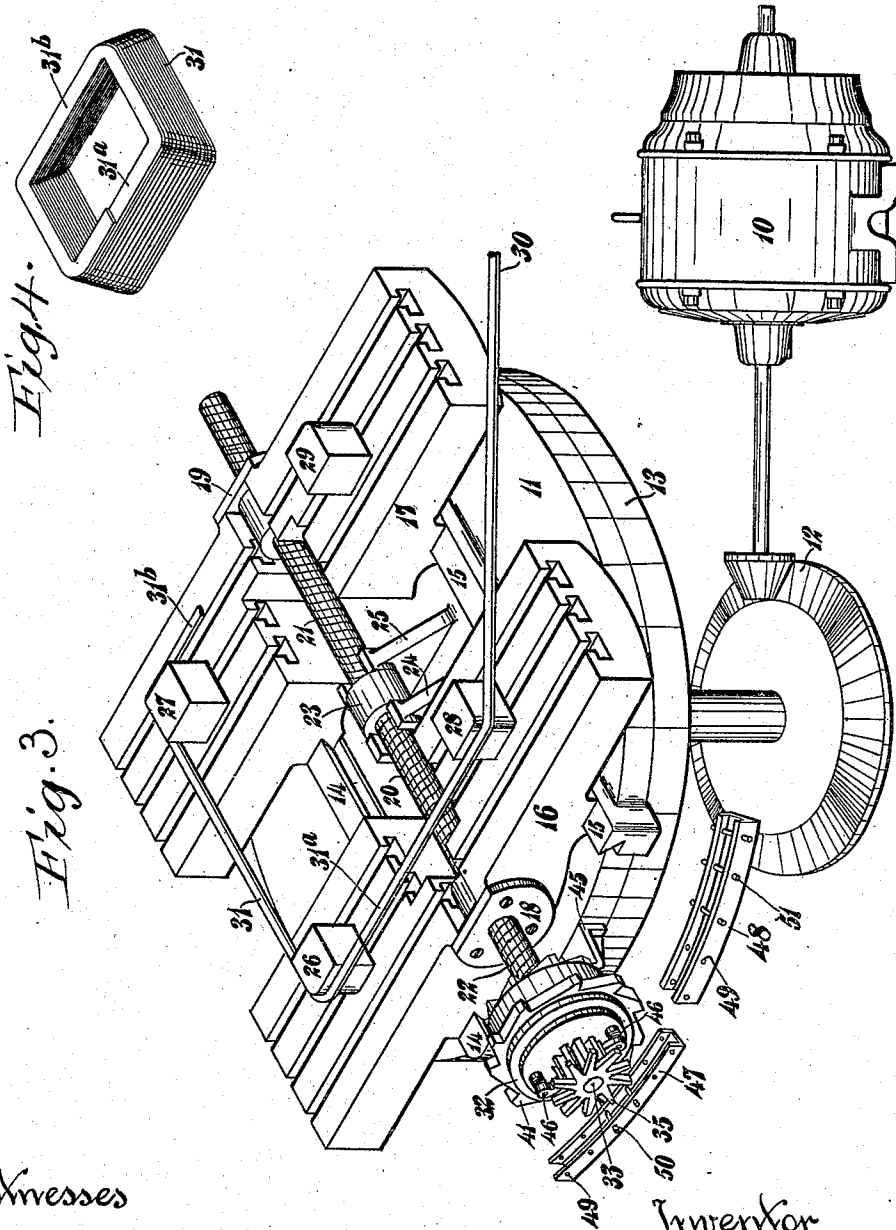
Witnesses
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Witnesses

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UNITED STATES PATENT OFFICE.

ALFRED H. WOUTERS, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

ADJUSTING MECHANISM.

937,134.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed December 31, 1906. Serial No. 350,118.

To all whom it may concern:

Be it known that I, ALFRED H. WOUTERS, belonging to the Kingdom of the Netherlands, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Adjusting Mechanism, of which the following is a full, clear, and exact specification.

My invention relates to adjusting devices and especially to devices for automatically adjusting the distance between the bending blocks on a coil forming machine.

In building some types of dynamo-electric machines, it is necessary to have coils the opposite sides of which are not in parallel planes; *e. g.*, coils in the shape of a wedge. Such coils may also be necessary for other purposes. An apparatus has been devised for forming such coils. In said apparatus it is necessary to provide a number of operating screws of different pitches together with their respective bushings, and also a number of star-wheels with different numbers of teeth, and in order to get all desired adjustments to change the screws or the star-wheels or both.

The object of my present invention is to provide an adjusting device whereby it is possible to obtain any desired adjustment without changing either the operating screw or the star-wheels, the adjustment of the coil-forming supports being obtained by variably moving two star-wheels, each of which is in operative connection with the operating screw or shaft. In the device which I have here shown it is possible to get an automatic movement between the coil-forming supports of any desired number of thousandths of an inch by merely varying the number of pins or rack teeth with which the star-wheels respectively cooperate.

With this object in view my invention comprises in one of its aspects the combination of a rotatable frame, supports upon said frame, means for moving said supports toward and from each other, and a plurality of devices for respectively operating said moving means in its entirety.

In another aspect my invention comprises the combination of a shaft rotatable about two axes, means for rotating it about one of said axes, mechanism operated upon one part of such rotation for turning it at one rate of speed about the second axis, and

mechanism operated upon another part of such rotation for turning it at a different rate of speed about said second axis.

In still another aspect my invention consists of the combination in an adjusting device, of a rotatable rod, and a plurality of devices for turning said rod, said devices being so connected together and to the rod that combined movement of more than one of said devices gives one adjustment of said rod, while separate movement of said devices gives another adjustment thereof.

In a more specific aspect my invention comprises the combination of an external gear and two internal gears separately movable about the same axis, two pairs of connected planet gears, one wheel of each of said pairs meshing with said external gear and one of said internal gears, and the other wheel of each pair meshing with the other internal gear, and separate means for rotating said external gear and one of said internal gears.

Many other features of my invention will appear from the following description and accompanying drawings and will be particularly set forth in the claims.

In the drawings Figure 1 is a side elevation of my adjusting device, the upper half of this view being in section on the line 1—1 of Fig. 2; Fig. 2 is an end elevation of the device shown in Fig. 1; Fig. 3 is an isometric view showing my adjusting device in connection with a coil forming apparatus for wedge-shaped coils; and Fig. 4 is a similar view showing a finished coil made by such machine.

Referring to the drawings, 10 is an electric motor or other source of power arranged to rotate the frame or table 11, as by means of friction cones or beveled gearing 12. The table 11 is here shown horizontal and resting upon a stationary support or bearing 13. This table is provided with ways 14 and 15 in which are slidable the carriages 16 and 17. The two carriages are provided with bushings 18 and 19 respectively, these bushings being threaded internally and meshing with the right and left handed screw threads 20 and 21 on the operating screw or shaft 22. The shaft 22 is also provided with a thrust collar 23 engaging thrust blocks 24 and 25 on the table 11. By rotating the shaft 22 the carriages 16 and 17

may be made to approach or recede from each other.

Adjustably mounted on the carriages 16 and 17 are coil-forming supports or bending blocks 26, 27, 28 and 29 around which the wire ribbon or other material 30 may be bent by special bending levers or in any other desired way to form the desired coil, as 31. As the table 11 is rotated in a clockwise direction by the motor 10, the wire 30 is unwound from a reel or its equivalent and bent around the coil-forming supports 26 to 29 inclusive. By mechanism hereafter explained, at each rotation of the table 11 the carriages 16 and 17 are advanced toward each other a predetermined distance, thus diminishing the distance between the sides 31^a and 31^b of the coil 31 at each successive rotation, and making the coil in the shape of a wedge.

On one end of the shaft 22 is mounted my improved adjusting device, denoted in its entirety by 32. This adjusting device comprises a shaft 33 in axial alinement with the shaft 22 but not directly connected thereto, the two shafts being separated by means of a bushing 34 preferably of brass or other anti-friction material. On the outer end of the shaft 33 is a notch plate and ratchet wheel 35, here shown as having ten teeth. On the inner end of the shaft 33, and here shown integral therewith though not necessarily so, is a gear wheel A which meshes with two planet gears B diametrically opposite each other and mounted on shafts 36, in turn supported between the plates 37 and 38. These plates are loosely mounted on the shafts 22 and 33 respectively. The two planet gears B also mesh with an internal gear C. The gear C is attached to the plates 39 and 40 to form a housing for the gearing, which housing as a whole is supported by and turnable about the frame of a gear E to be described. The shaft 33 is journaled in the plate 40. The gear C extends outward between the plates 39 and 40 and its outer surface forms a notch plate 41 also shown here as having ten teeth. Integral with the planet gears B or otherwise rigidly attached thereto, are other planet gears D, which mesh with a second internal gear E. The internal gear E is fastened to the shaft 22 as by means of a key 42.

The rim of the plate 39 is shaped to form the teeth of a ratchet wheel 43. A spring pressed pawl 44 mounted on an arm 45 extending from the table 11 co-acts with the ratchet wheel 43 to prevent rotation of the plate 39, together with the plate 40 and the internal gear C, in a clockwise direction as seen in Fig. 2. Spring-pressed pawls 46 mounted on plate 40 cooperate with the ratchet wheel 35 to prevent rotation of said ratchet wheel, together with the shaft 33 and the gear A, in a clockwise direction rela-

tive to the plate 40 and gear C as seen in Fig. 2.

During the rotation of the table 11, the star wheels 35 and 41 successively pass through channels 47 and 48 respectively. The sides of these channels are provided with holes 49 in which may be placed removable pins or teeth 50 and 51, with which the teeth of the star wheels 35 and 41 engage respectively. Any other form of rack may be used if desired. This engagement causes these star wheels to be rotated in a counter-clockwise direction as seen in Figs. 2 and 3. When the notch plate 41 is moved in this direction, the notch plate 35 is correspondingly moved through the action of a pawl 46 and ratchet wheel 35, and, there being no relative movement between the gears A and C, the adjusting device 32 is moved in its entirety to rotate the shaft 22 through the same angle as the notch plate 41 is moved. If for example the pitch of the threads 20 and 21 is eight per inch, a complete rotation of the notch plate 41 causes the carriages 16 and 17 to approach each other one quarter of an inch; and one tenth of a rotation, such as is caused by each of the pins 51, causes said carriages to approach each other one fortieth of an inch. When the notch plate 35 is moved in this direction the pawl 46 allows relative movement between the parts 35 and 40 and there is a tendency for the internal gear C with its attached parts 39 and 40 to be driven backward through the action of the gears A and B. Such backward movement however is prevented by the pawl and ratchet 44 and 43, and so instead of driving the gear C backward or in a clockwise direction, (Fig. 2) the planet gears B with their connected parts D, 37 and 38 are driven forward or in a counter-clockwise direction around the shafts 22 and 33. During this movement the gears B roll around on the inside of gear C and drive the gears D likewise around on the inside of the internal gear E. But there is a different ratio between the gears D and E and the gears B and C, so that although the gear D rolls around on the inside of the gear E, said latter gear is driven slightly forward or in a counter-clockwise direction. If for example the pitch diameters of the gears A, B, C, D and E are proportionate to 9, 9, 27, 7 and 25, respectively, a complete rotation of the notch plate 35 and gear A will drive the gear E and shaft 22 one twenty-fifth of a rotation, as will be readily seen. Thus for one tenth of a rotation of the gear 35, such as is caused by each of the pins 50, the shaft 22 is turned one two-hundred-and-fiftieth of a rotation, and the carriages 16 and 17 approach each other one thousandth of an inch. Each of the pins 51 thus causes the carriages to approach each other one fortieth or .025 of an inch and each of the pins 50 causes said car-

riages to approach each other one thousandth or .001 of an inch. This movement of the carriages 16 and 17 preferably takes place during the movement of the table 11 through one quadrant only as shown, though if desired, it may take place in more than one quadrant; *e. g.* in each of two opposite quadrants. By thus moving the carriages toward each other at each rotation of the table 11, each turn of the coil 31 is smaller in one dimension by a predetermined amount than the turn preceding it, the larger turns which have been completed dropping down upon the carriages 16 and 17 out of the way of the smaller ones which are being wound. Thus wedge-shaped coils are formed. By varying the number of pins 50 and 51 any desired adjustment in thousandths of an inch may be obtained. The arrangement shown, with three of the pins 51 and two of the pins 50, gives a relative movement of the carriages 16 and 17 of .077 of an inch, if the gear proportions are as given above. With this arrangement, at each complete rotation of the table 11 the distance between the sides 31^a and 31^b of the coil is diminished by .077 of an inch.

The proportions given above are only given as an example and may be varied as desired. Also the pitch of the threads 20 and 21 and the number of teeth on the star-wheels may be anything desired.

Although I have described my invention particularly with reference to a coil-forming machine, it is equally applicable for obtaining nice adjustments of any other desired machine or instrument, and in the following claims I aim to cover my invention in its broadest aspect.

What I claim as new and desire to secure by Letters Patent is:—

1. In combination, a rotatable frame, a pair of supports upon said frame, means for moving said supports in a straight line toward or from each other, and a plurality of devices for respectively operating said moving means.

2. In combination, a rotatable frame, a pair of supports upon said frame, means for moving said supports in a straight line toward or from each other, and a plurality of devices for successively operating said moving means.

3. In combination, a rotatable frame, a support upon said frame, means for moving said support relatively to the frame, and a plurality of automatic devices for respectively operating said moving means.

4. In combination, a rotatable frame, a support upon said frame, means for moving said support in a straight line relatively to the frame, and a plurality of devices for respectively operating said moving means at different speeds.

5. In combination, a rotatable frame, an

extension from said frame, means for moving said extension relatively to the frame, and a plurality of devices automatically operated upon the rotation of said frame for respectively operating said moving means.

6. In combination, a rotatable frame, an extension from said frame, means for moving said extension relatively to the frame, and a plurality of devices automatically operated upon the rotation of said frame for successively operating said moving means.

7. In combination, a rotatable frame, an extension from said frame, means for moving said extension relatively to the frame, a plurality of devices automatically operated upon the rotation of said frame for respectively operating said moving means, and means for varying the movement caused by each of said devices in a rotation of the frame.

8. In combination, a rotatable frame, supports upon said frame, means for moving said supports toward and from each other, and means whereby said moving means is automatically operated in different amounts during different parts of the rotation of the frame.

9. In combination, a rotatable frame, a pair of supports upon said frame, means for moving said supports in a straight line toward or from each other, and a plurality of devices for respectively operating said moving means step-by-step.

10. In combination, a rotatable frame, a support upon said frame, means for moving said support relatively to the frame, and a plurality of automatically operated devices for successively operating said moving means step-by-step.

11. In combination, a rotatable frame, supports upon said frame, means for moving said supports relatively to each other, and a plurality of automatic devices for respectively operating said moving means step-by-step with steps of different length.

12. In combination, a rotatable frame, extensions from said frame, means for moving said extensions toward or from each other, and a plurality of devices operated upon the rotation of said frame for successively operating said moving means step-by-step.

13. In combination, a rotatable frame, extensions from said frame, means for moving said extensions toward or from each other, and a plurality of devices operated upon the rotation of said frame for successively operating said moving means step-by-step, the number of steps caused by each of said devices in a rotation of the frame being variable.

14. In combination, a rotatable frame, supports upon said frame, a shaft in the frame for relatively moving said supports, a plurality of notched wheels for turning said shaft, and a plurality of removable

teeth arranged when in place to be engaged by said notched wheels to turn the latter.

15. In combination, a rotatable frame, supports upon said frame, a shaft in the
5 frame for moving said supports toward or from each other, a plurality of notched wheels which when similarly turned move said shaft dissimilarly, and a plurality of
10 sets of removable teeth arranged to be successively engaged by said wheels respectively to turn the latter as the frame is rotated.

16. In combination, a rotatable frame, supports upon said frame, a shaft in the
15 frame for moving said supports toward or from each other, a plurality of notched wheels which when similarly turned move said shaft dissimilarly, channels through which said wheels pass respectively as the
20 table is rotated, and a plurality of pins which can be inserted in holes in said channel in the path of said wheels to turn them.

17. In a coil-forming machine, a rotatable table, two carriages upon said table, two
25 bending blocks on each carriage, means for moving said carriages relatively to each other, and a plurality of devices for respectively operating said moving means.

18. In a coil-forming machine, a rotatable
30 table, two carriages upon said table, two bending blocks on each carriage, means for moving said carriages relatively to each other, and a plurality of devices operated upon the rotation of the table for respectively operating
35 said moving means.

19. In a coil-forming machine, a rotatable table, two carriages upon said table, two
40 bending blocks on each carriage, means for moving said carriages relatively to each other, and a plurality of devices operated successively upon the rotation of the table for respectively operating said moving
means at different amounts.

20. In a coil-forming machine, a rotatable
45 table, two carriages upon said table, two bending blocks on each carriage, means for moving said carriages relatively to each other, a plurality of devices operated upon the rotation of the table for respectively
50 operating said moving means, and means for varying the movement caused by each of said devices in a rotation of the table.

21. In a coil-forming machine, a rotatable table, two carriages upon said table, two
55 bending blocks on each carriage, means for moving said carriages relatively to each other, and a plurality of devices operated upon the rotation of the table for respectively operating said moving means step-by-
60 step in steps of different length.

22. In a coil-forming machine, a rotatable table, two carriages upon said table, two
65 bending blocks on each carriage, means for moving said carriages relatively to each other, and a plurality of devices operated

upon the rotation of the table for respectively operating said moving means step-by-step, the number of steps caused by each of said devices in a rotation of the table being variable.

23. In combination, a shaft rotatable about two axes, means for rotating it about one of said axes, mechanism operated by one part of such rotation for turning it at one rate of speed about the second axis, and
75 mechanism operated by another part of such rotation for turning it at a different rate of speed about said second axis.

24. In combination, a shaft rotatable about longitudinal and transverse axes, means for
80 rotating it about the transverse axis, toothed wheels connected to said shaft, said toothed wheels being turned through predetermined angles during each complete rotation of the shaft about its transverse axis, the connections between said toothed-wheels and the
85 shaft being such that moving them equal angular distances causes the shaft to turn about its longitudinal axis through different angles.

25. In an adjusting device, a rotatable shaft, two devices for turning said shaft, pawl and ratchet mechanism for causing said devices to move together when one of them is moved while allowing the other device to move independently, and gear
95 connections between said two devices and the shaft whereby movement of one of said devices gives a coarse adjustment and of the other device a fine adjustment.

26. In an adjusting device, a rotatable rod, and a plurality of devices for turning said rod, said devices being so connected together and to the rod that combined movement of more than one of said devices gives
105 one adjustment of said rod, while separate movement of said devices gives another adjustment thereof.

27. In combination, a shaft, an internal gear fixed on said shaft, a second internal
110 gear loose on said shaft, third and fourth connected gears meshing respectively with said two internal gears, a fifth gear meshing with the fourth, and pawl and ratchet mechanism between said second and fifth gears.

28. In combination, a shaft, an internal gear fixed on said shaft, a second internal gear loose on said shaft, third and fourth
120 connected gears meshing respectively with said two internal gears, a fifth gear meshing with the fourth, and means for driving said second and fifth gears respectively.

29. In combination, a shaft, an internal gear fixed on said shaft, a second internal
125 gear loose on said shaft, third and fourth connected gears meshing respectively with said two internal gears, a fifth gear meshing with the fourth, and mechanism for preventing rotation of said second gear in one direction when the fifth gear is rotated in the
130

other, and for causing said gears to all move together when said second gear is rotated in one direction.

30. In combination, an external gear and two internal gears separately movable about the same axis, two pairs of connected planet gears, one wheel of each of said pairs meshing with said external gear and one of said internal gears, and the other wheel of each pair meshing with the other internal gear, and ratchet mechanism connecting one of said internal gears to the external gear.

31. In combination, an external gear and two internal gears separately movable about the same axis, two pairs of connected planet gears, one wheel of each of said pairs meshing with said external gear and one of said internal gears, and the other wheel of each pair meshing with the other internal gear, and separate means for rotating said external gear and one of said internal gears.

32. In combination, an external gear and two internal gears separately movable about the same axis, two pairs of connected planet gears, one wheel of each of said pairs meshing with said external gear and one of said internal gears, and the other wheel of each pair meshing with the other internal gear, separate means for moving said external gear and one of said internal gears, and pawl and ratchet mechanism between the two last mentioned gears.

33. In combination, a rotatable frame, relatively movable supports on said frame, a shaft for causing such relative movement, and a plurality of notched wheels on the same axis and arranged to be successively turned upon the rotation of said frame to turn said shaft by their combined action.

34. In combination, a rotatable frame, relatively movable supports thereon, a shaft for causing such relative movement, and a plurality of notched wheels movable about the same axis to turn said shaft by their combined motion.

35. In combination, a rotatable frame, supports upon said frame, unitary means for progressively moving said supports toward each other, said moving means being arranged to give a resultant movement composed of a plurality of independently adjustable components.

36. In combination, a rotatable frame, supports upon said frame, means for progressively advancing said supports toward each other as the frame is rotated, and arranged to quickly feed the large component and to less quickly feed the smaller component of said advance.

37. In combination, a rotatable frame, supports upon said frame, a shaft in the frame for moving said supports toward or from each other, and a plurality of wheels which when similarly turned move said shaft dissimilarly.

38. In combination, a rotatable frame, two sets of supports thereon, means for varying the distance between said two sets of supports without varying that between the two supports of a set, and a plurality of devices for operating said moving means.

In testimony whereof I affix my signature, in the presence of two witnesses.

ALFRED H. WOUTERS.

Witnesses:

GEO. B. SCHLEY,
FRED J. KINSEY.