W. T. LE BLANC.

BRAIDING MACHINE.

APPLICATION FILED FEB. 19, 1908.

920,589.

Patented May 4, 1909.

5 SHEETS—SHEET 1.

Fig. 1.

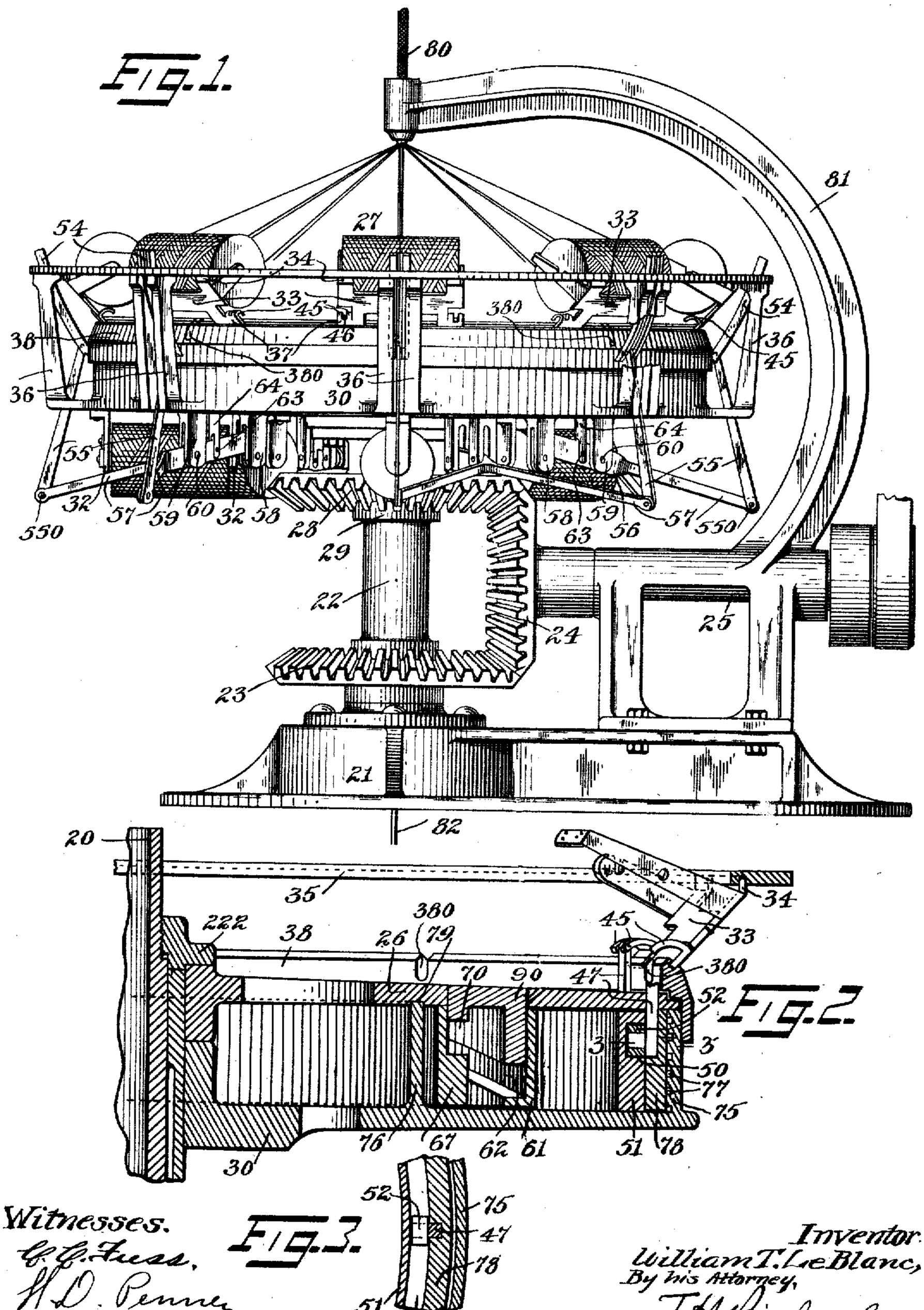

Fig. 2.

Fig. 3.

Witnesses.

C. C. Lucas.

H. D. Penney

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William T. LeBlanc,

By his Attorney,

F. H. Richards.

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5 SHEETS—SHEET 2.

FIG. 4.

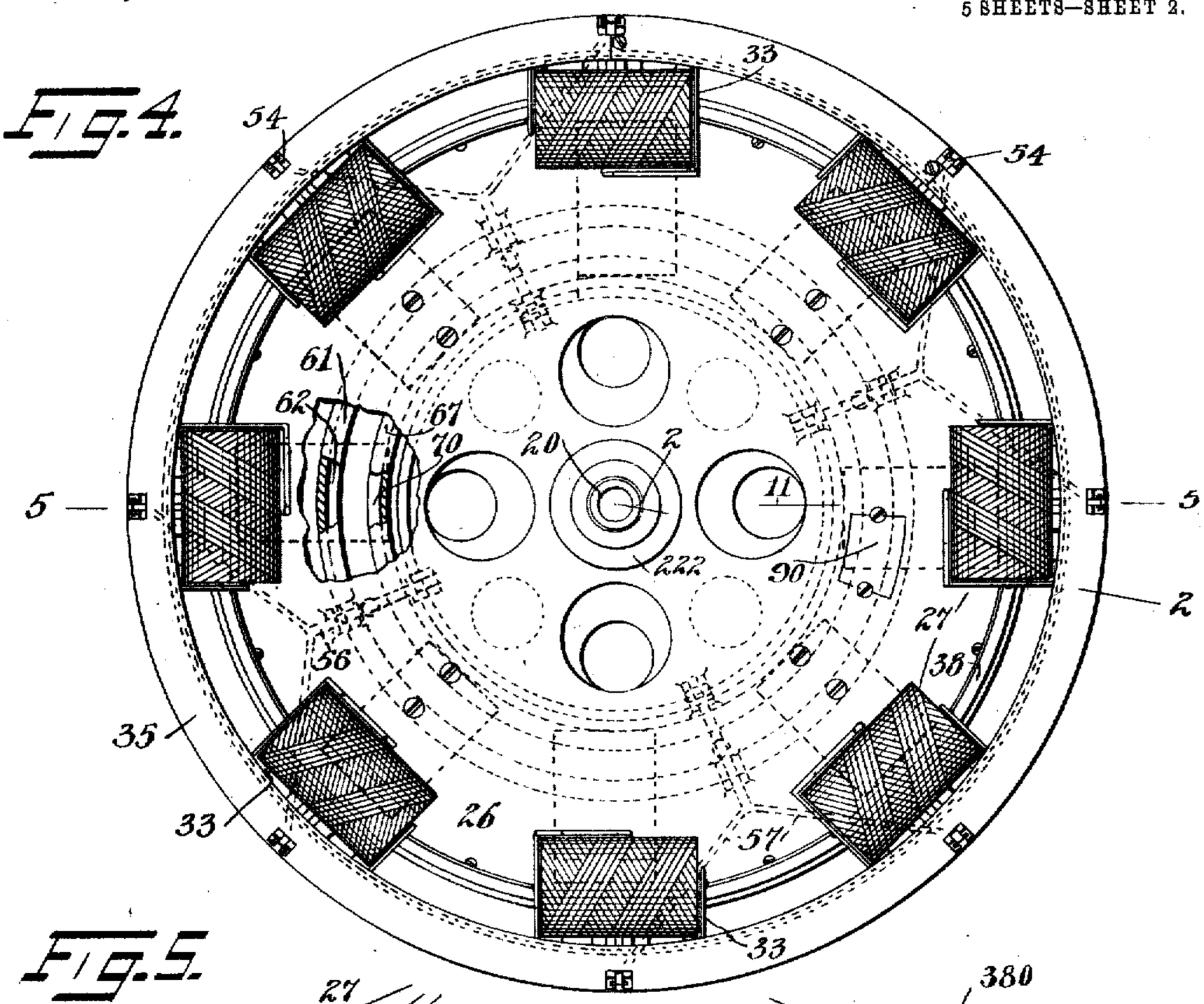
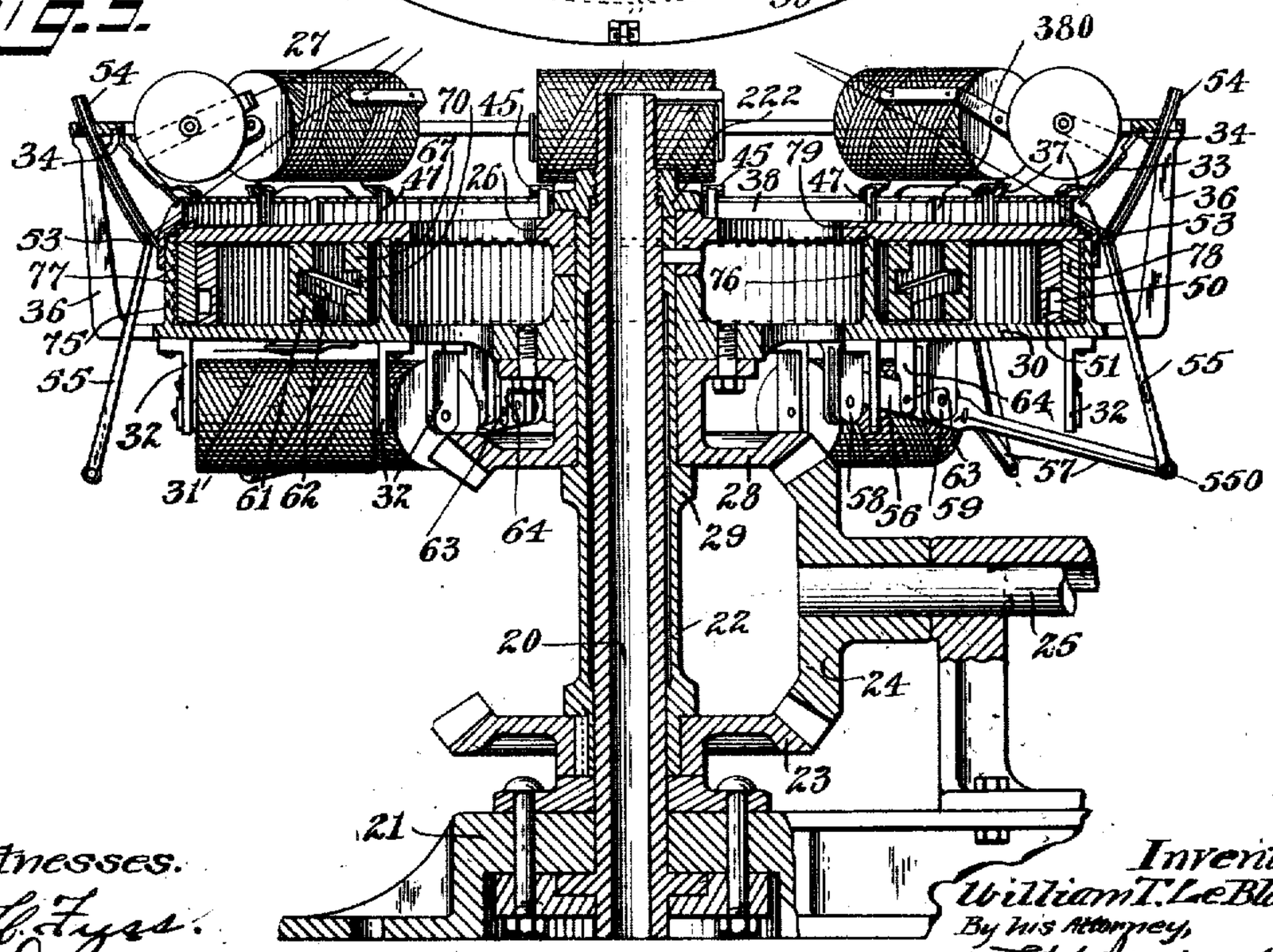


FIG. 5.



Witnesses.

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5 SHEETS—SHEET 3.

FIG. 6.

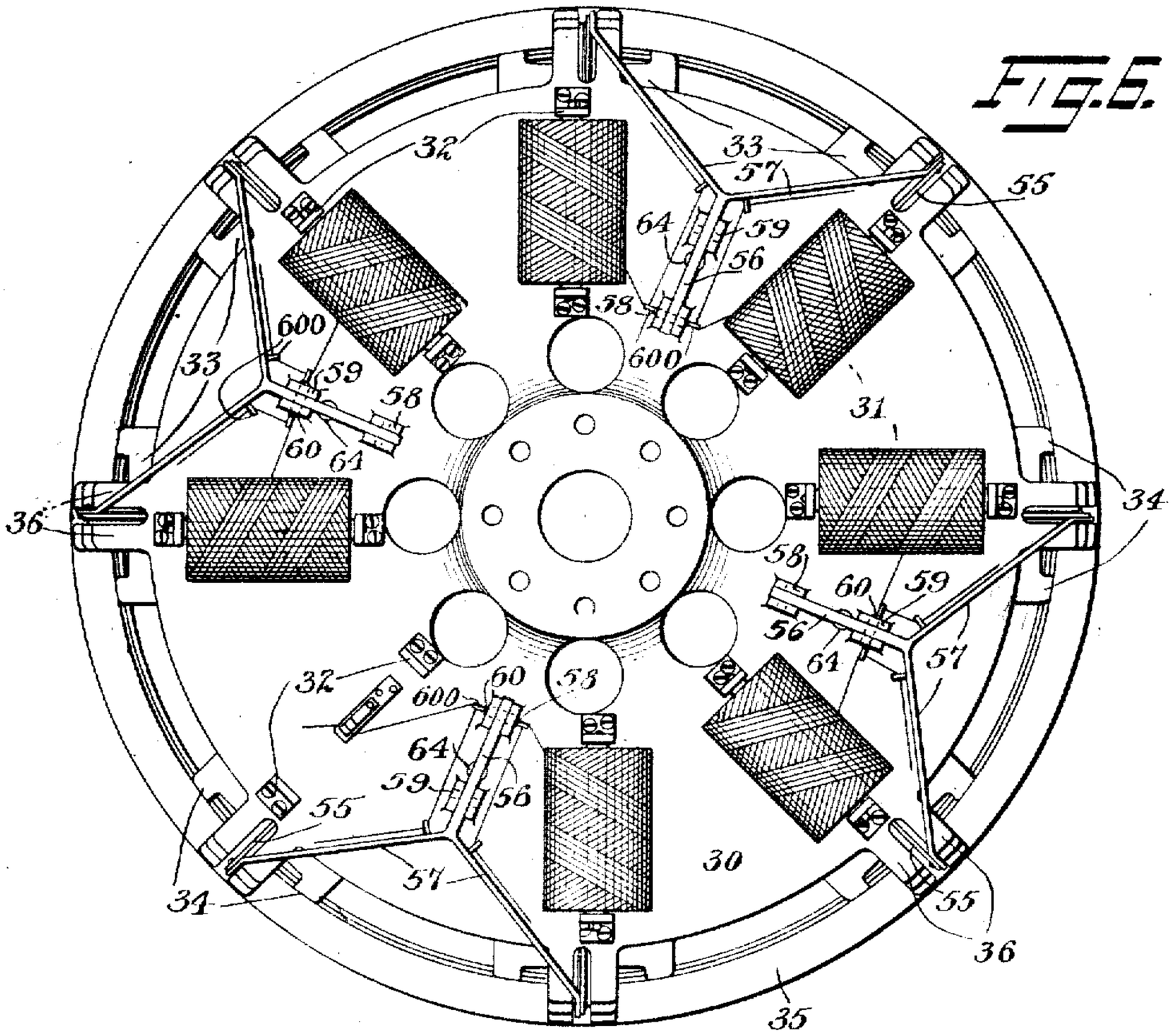


FIG. 7.

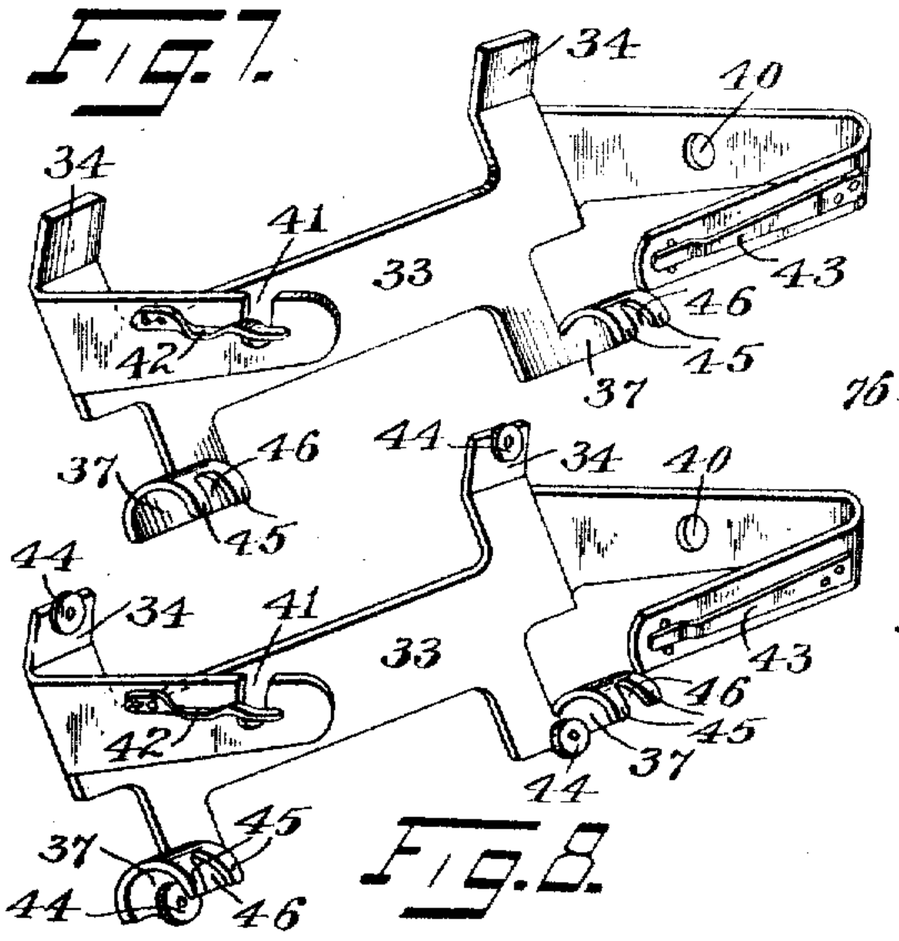
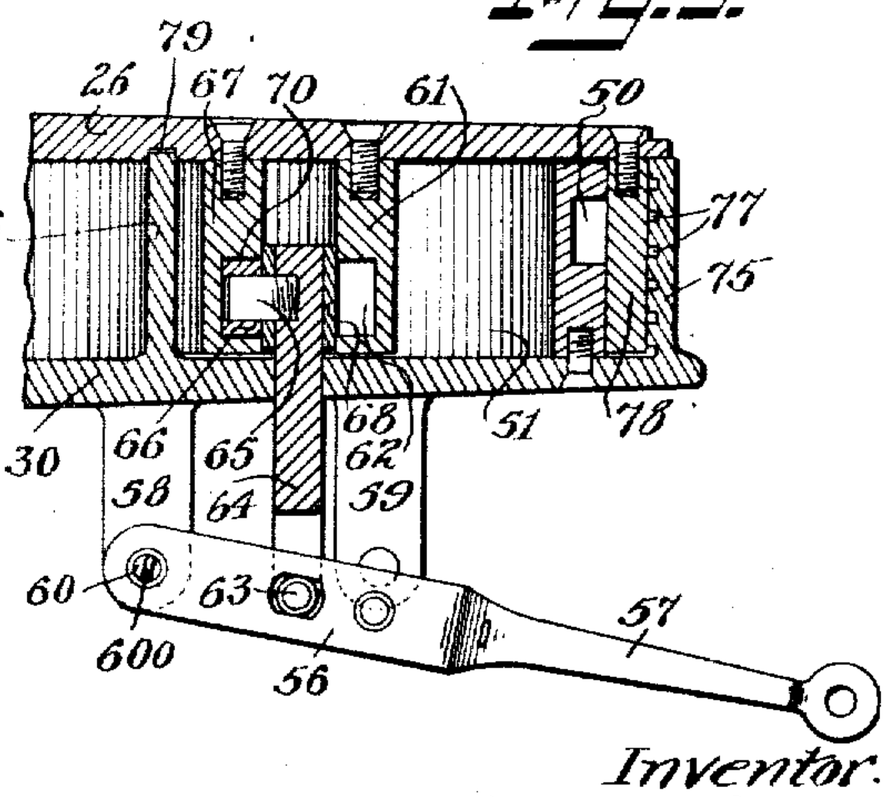


FIG. 8.

FIG. 9.



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5 SHEETS—SHEET 4.

Fig. 10.

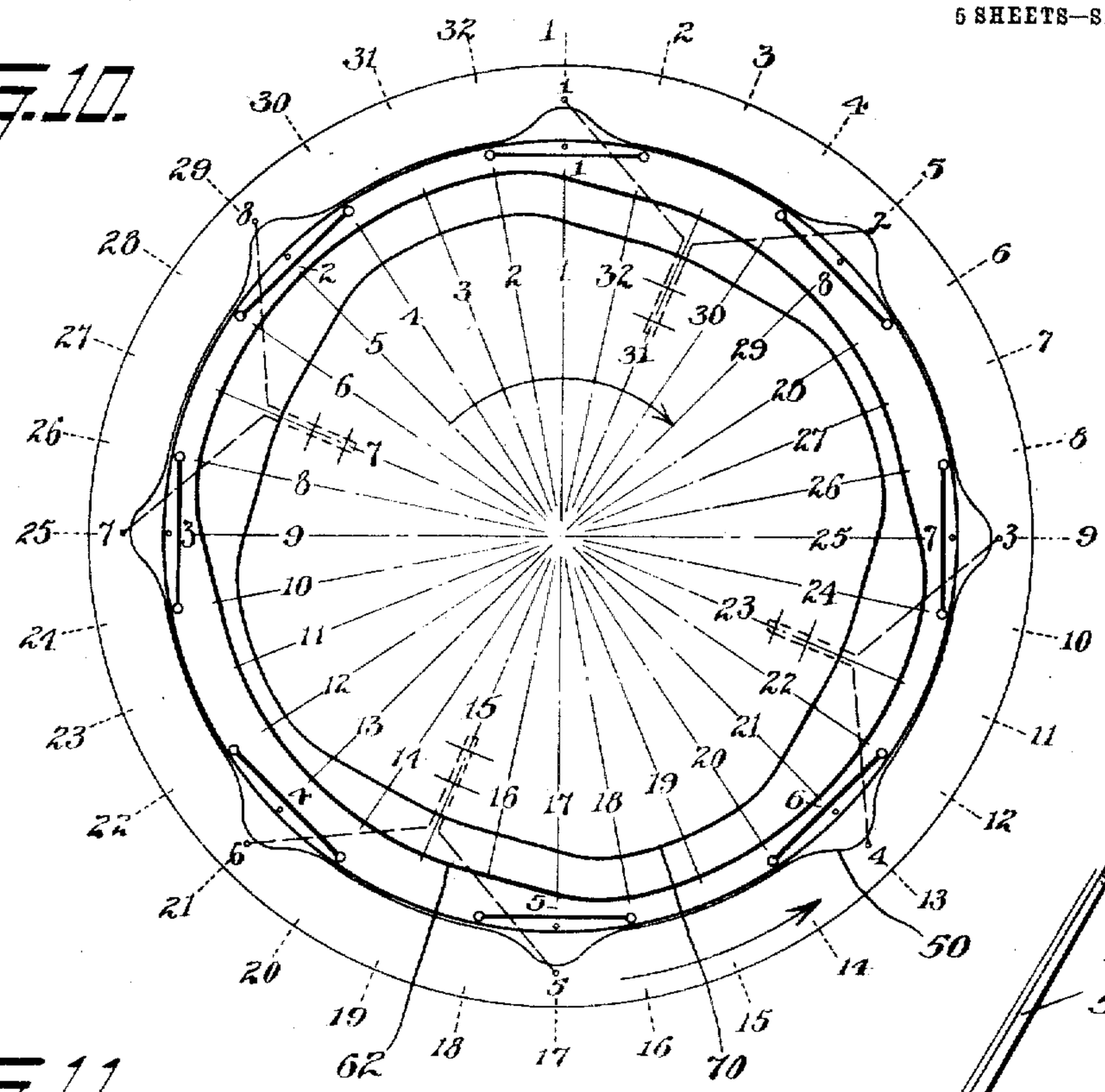


Fig. 11.

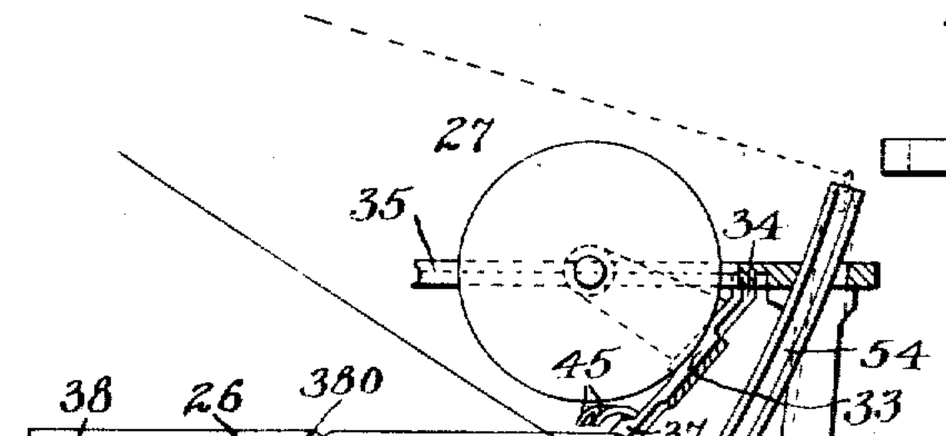
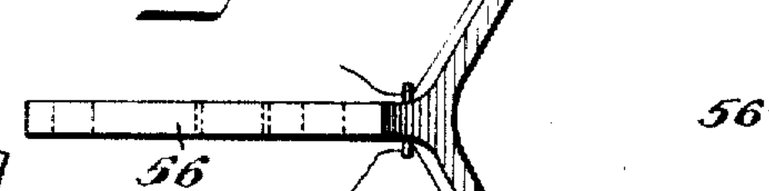


Fig. 12.

Fig. 13.



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5 SHEETS—SHEET 5.

Fig. 14.

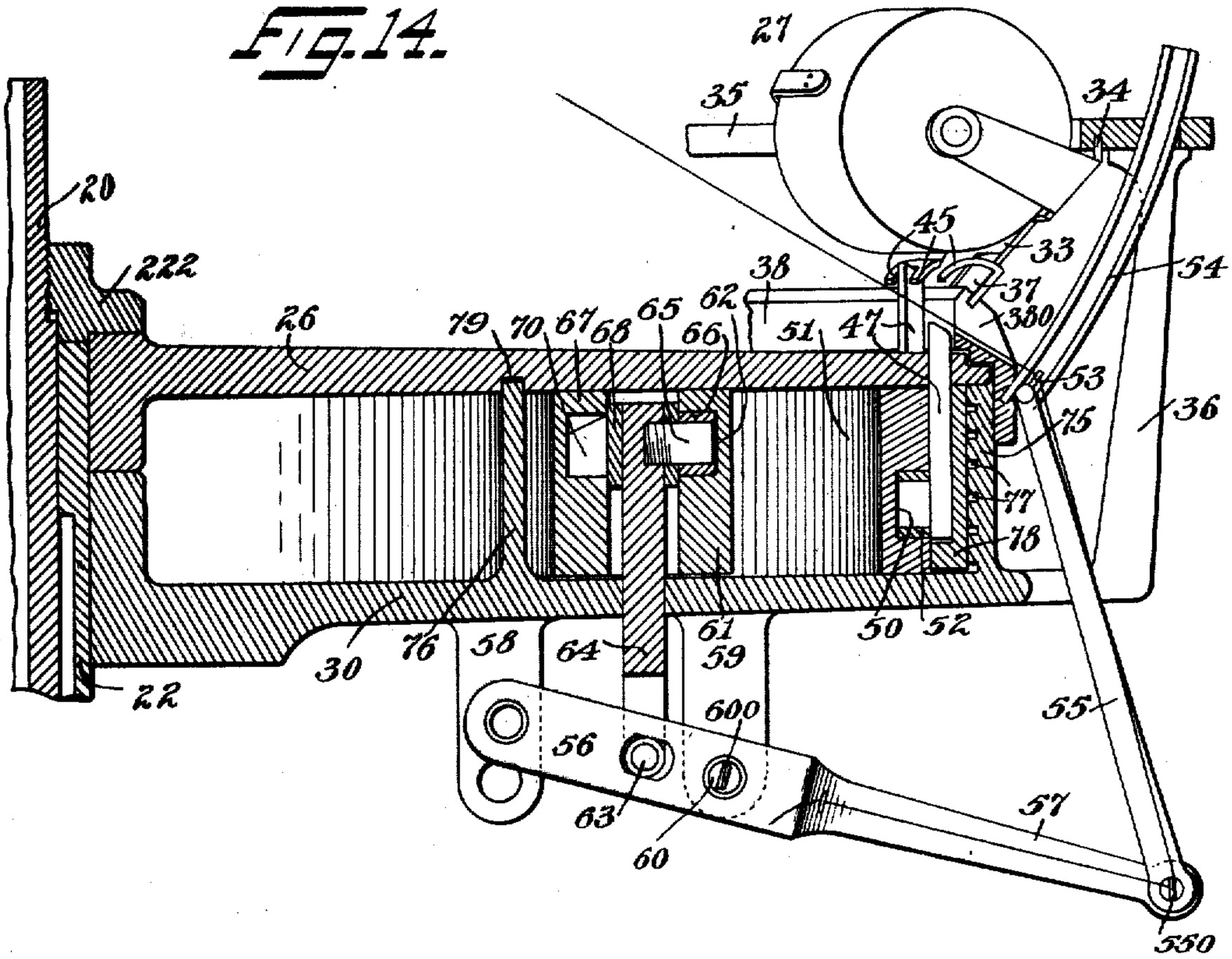


Fig. 15.

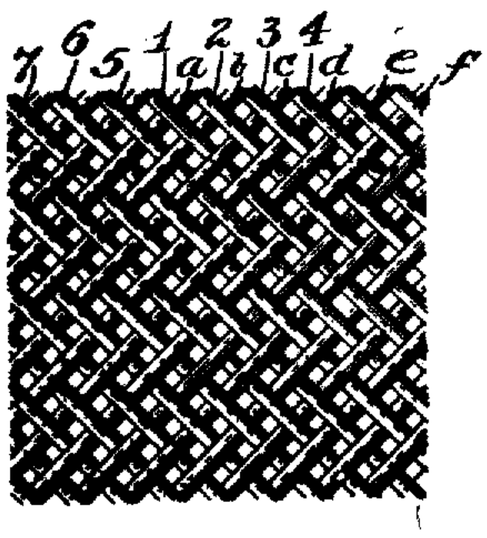
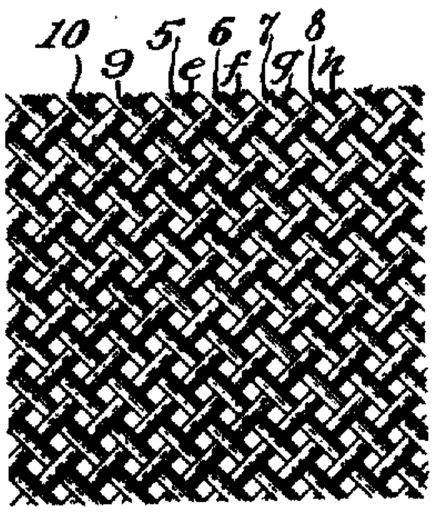


Fig. 16.



Witnesses.

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H. D. Penney

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UNITED STATES PATENT OFFICE.

WILLIAM T. LE BLANC, OF NEW YORK, N. Y.

BRAIDING-MACHINE.

No. 920,589. Specification of Letters Patent. Patented May 4, 1909.

Application filed February 19, 1908. Serial No. 416,730.

To all whom it may concern:

Be it known that I, WILLIAM T. LE BLANC, a citizen of the United States, residing in the borough of Brooklyn, city of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a specification.

This invention relates to braiding machines, and has for its object to provide improved mechanism of this class for effecting new results and in which the number of parts of the mechanism is minimized.

One important feature of my invention relates to a structure which will permit, by the simple reversal of certain easily accessible portions, the making of either "whip-lash" or "basket" braid. By basket braid is meant braid of ordinary plain weave wherein each thread passes over and under the successive threads of the other series, and by whip-lash braid is meant a braid in which each thread passes successively over two threads and under two threads of the other series, one of said two threads being passed over and one being passed under by each of the threads at the respective sides of the thread in question. A fuller understanding of this latter form of braid may be had by reference to United States Letters Patent No. 858,735, issued to Jacob Lundgren, July 2, 1907, for braiding machines.

Among the features of this invention may here be mentioned that which relates to rotating a pair of superposed tables in opposite directions, each of said tables carrying, or being effective to forward, a series of bobbins in an annular orbit. Each of the tables will be effective for controlling the bobbins or thread of the other table. In the present instance cams will be provided upon each of the tables for controlling the bobbins or threads from the other table in certain movements made relative to the bobbins or threads upon the controlling table. In the illustrated structure the threads from the bobbins carried upon the lower table are caused to pass over and under the threads of the bobbins carried by the upper table by means of a single cam on the upper table. The upper table has a cam in fixed relation to the bobbin position upon it for timing the rise and fall of the threads from the bobbins upon the lower table in passing the upper bobbins. This assures a proper timing of the rise and fall of the thread relative to the bobbins which it passes. The threads from the lower table in their movement past the connections between the bobbins upon the upper table and this table are controlled by the upper table to effect their proper timing. In this manner all the timing is effected by moving cams. The mechanism for moving the threads from one series of bobbins which will pass the bobbins of the other series is so constructed that the movement of the parts will not affect the length of thread between the braiding point and the bobbin from which the thread is drawn. This feature is particularly useful in working upon wire. The illustrated structure for obtaining this result is by having the ways for the thread guide which is reciprocated struck on an arc having for its center the braiding point of the machine. For the purpose of simplifying the cam contour which is to control the rise and fall of the threads the threads are controlled in pairs, a single connection being afforded for each of said pairs with the cam. To further simplify the cam construction, particularly for the whip-lash form of braid, the levers for controlling the respective pairs of threads will be alternately pivoted at different fulcrum points relative to their points of connection with the cam so that levers of the first and third class will alternate one within the other. By having the threads controlled in pairs it is possible to employ a single cam groove in the manner herein contemplated.

In the drawings accompanying and forming a part of this specification Figure 1 is a side elevation of a practicable embodiment of a form of my invention. Fig. 2 is an enlarged vertical section of the device shown in Fig. 1, taken on a plane at about the line 2—2 of Fig. 4. Fig. 3 is a detail taken on a horizontal plane at about the line 3—3 of Fig. 2. Fig. 4 is a top plan view of mechanism illustrated in Fig. 1; in this view, however, the arm for supporting the take-off is not illustrated. Fig. 5 is a vertical section taken on a plane at about the line 5—5 of Fig. 4. Fig. 6 is an underside plan view of the lower table. Fig. 7 is an enlarged perspective view of one of the upper bobbin carriers. Fig. 8 is a perspective view similar to Fig. 7, but showing the addition of anti-friction rollers. Fig. 9 is an enlarged section somewhat similar to Fig. 2 but taken upon a different angular plane and shows the lever connection for making basket braid. Fig. 10 is a diagrammatic view illustrating the

cam layout of the machine. Fig. 11 is an enlarged vertical section taken on a plane at about the line 5—11 of Fig. 4, and shows a lower thread being passed between an upper bobbin carrier and one of its actuating pins or bolts. Fig. 12 is a top plan and end view of one of the arms for controlling the movement of the lower threads. Fig. 13 is a side view of said arm. Fig. 14 is an enlarged section taken through the cam on the lower table at its lowest portion and through the cams on the upper table at their highest portions; and is for the purpose of illustrating more fully the passage of the lower thread under the carrier for the upper bobbin. Fig. 15 represents an example of "whip-lash" braid; and Fig. 16 represents an example of "basket" braid

The illustrated mechanism will first be described in its adjustment for producing whip-las braid,—this trade term has previously been sufficiently explained it is believed for the present.

A standard in the form of a tubular shaft 20 is mounted upon a base 21 and is held from rotation. Upon the standard 20 is rotatably mounted a sleeve 22 which carries the miter gear 23 in mesh with a miter gear 24 fast upon the driving shaft 25, which shaft will be driven at a suitable rate of speed from some convenient source of power, not shown. The upper table 26 is fast with the sleeve 22, and carries the upper set of bobbins, designated without preference by the reference character 27. A ring 222 is employed for preventing the upward displacement of the table 26. The hub of the miter gear wheel 28 is supported by a shoulder 29 upon the sleeve 22, which gear is in mesh with the gear wheel 24. The lower table 30 rests upon and is fastened to the hub of the gear wheel 28. By means of the connection just referred to the tables will be rotated at the same speed in opposite directions. The lower table carries the lower series of bobbins, designated without preference by the reference character 31, said lower bobbins each being mounted upon suitable brackets or carriers 32 carried by the underside of the table.

Although the weight of the upper bobbins will be carried by the lower table, yet in view of the fact that these upper bobbins are forwarded and controlled in their revolution in their orbital path by the upper table, it is deemed proper to say that the upper bobbins are carried by the upper table. Each of the upper bobbins is mounted in a carrier 33, the carriers each having portions 34 for running in a track groove in a support 35 carried by arms 36 fast with the lower table and also portions 37 running in a track groove in a ring 38 mounted for free movement upon the outer edge of the upper table and fast with the lower table. As a convenient means for mounting the bobbins in the carriers 33 the pin which passes through the bobbins will engage with a hole 40 at one end and a slot 41 at the other end, a suitable spring 42 being employed for holding the pin in the said slot; and a tension device 43 is shown for tensioning the thread as it is drawn from the bobbin. In Fig. 8 the bobbin carrier is shown provided with anti-friction rollers 44 for running in the track grooves.

At each end of the bobbin carrier there is provided a pair of fingers 45 between which a slot 46 is formed for the engagement of pins or bolts 47, which are carried by the upper table, passing through suitable openings therein, and are controlled in their vertical movement, which movement effects their engagement and disengagement with the fingers 45, by a cam groove 50 made in a flange 51, fast with the lower table. An anti-friction roller 52 is provided upon the end of each of the pins for running in the cam groove 50. Two of these pins will be provided for each carrier and will be caused to alternately become disengaged from the carrier for the purpose of permitting the passage of a thread from the lower bobbin carrier between the carrier and the table. The thread from the lower bobbins is caused to move up and down by means of suitable thread guides 53 adapted to move in ways 54, and to be moved by a link 55, said links being connected in pairs to levers 56, each of the levers 56 is provided with two arms 57 and is Y-shaped in general outline. In the present instance there are shown eight upper bobbins and eight lower bobbins, and there are shown four of these levers 56. Upon the lower side of the lower table there are shown a pair of hangers 58—59 for each of the levers 56. The levers 56 will be pivoted by means of pins 60 to one or the other of the hangers of its pair. The pins 60 at each end are provided with eyes 600 through which the thread will be passed in being carried from the bobbins to the thread guides. It will be noted that the guideways 54 are curved, the curvature having for its center the braiding point. By this means as the thread is moved up and down in the thread guides 53 the length of thread between the spool or bobbin and the braiding point will not vary as it is raised and lowered in its passage over and under the bobbins of the other series. The pivoting depending in each instance upon the cam formation being employed. In many instances of braiding all the lower threads will be raised and lowered in unison, and when making what is commonly known as whiplash braid, that is, a braid wherein each thread alternately passes over two threads and under two threads, the arms or levers controlling the thread movement will remain in an elevated position long enough for two

bobbins to pass under each thread, then will be quickly lowered and held in the lowered position until two bobbins have passed over each thread. This may be effected by such a cam as is illustrated herein, which comprises a flange 61 fast with the upper table and in which there is a cam groove 62; the outlines of this groove may be seen depicted in Fig. 10, and it will be seen that it has two low portions, from 2 to 8, that is, considering the figures upon the inside of the diagram, and from 18 to 24; and two high portions, from 10 to 16, and from 26 to 32. If the levers 56 are alternately pivoted to the hangers 58 and 59 and are connected by means of the pivot 63 to their actuators 64 this cam construction will cause the links 55 to raise and fall in unison. The high part of the cam being effective to raise the working end of the levers of the third class and the low parts of the cam being effective to raise the working ends of the levers of the first class.

The actuators 64 carry pins 65 and an anti-friction roll 66 for running in the cam grooves, and the actuators will be steadied between the flange 61 and the flange 67, which carries the cam groove 70, by means of sleeves 68.

When it is desired to make the ordinary form of braid known as basket weave, the roller 61 will be caused to traverse the cam groove 70, which, by reference to Fig. 10, as will be seen, has four low portions, from 2 to 4, from 10 to 12, from 18 to 20, and from 26 to 28 respectively; and four high portions, from 6 to 8, 14 to 16, 22 to 24, and 30 to 32 respectively. If the levers 56 are all pivoted to their respective hangers 58 this cam groove will then cause the lever ends to rise and fall in unison, and to pass over and under the successive bobbins. Fig. 14 shows the use of the cam groove 62 for the whip-lash form of braid; and Fig. 9 shows the employment of cam groove 70 for the basket weave form of braid.

The proper coöperation between the raising and lowering of the threads from the lower bobbins and the raising and lowering of the pins 47 will be effected by having the cams which control the movement of the lower thread carried by the upper table which controls the angular position of the upper bobbin carriers, and of having the movement of the pins, which are to rise and fall to permit the passage of the thread from the lower bobbins which are carried by the lower table, controlled by the movement of said lower table.

The various cam grooves 50, 62 and 70 may travel in an oil bath, there being provided upon the lower table a pair of integral flanges 75 and 76. The flange 75 is provided with a number of oil pockets or circumferential grooves 77, which in coöperation with the flange 78 which supports pins 47, will prevent oil from working out between the flange 75 and the top plate, and the flange 76 will run in a groove 79 in the lower surface of the top plate and prevent oil from working out in this direction.

I have not illustrated any mechanism herein for taking off the finished braid 80, other than an arm 81 through which it passes. The foundation 82 about which the braid is made will pass up through the hollow interior of the spindle 20.

The operation of the machine is substantially as follows: The bobbins, suitably wound, will be placed in their carriers, and the thread as it is drawn from each bobbin will be tensioned; but as the particular means for effecting the tension forms no part of this present improvement it has not been described in detail. The thread from the upper bobbins will be carried directly to the braiding point of the machine, which in the present instance is represented as just below the end of the take-off arm 81. The thread from each of the lower bobbins will be carried through the eye 600 at the fulcrum of the lever 56, will be carried through an eye at the pivot 550 between the link 55 and the arm 57, and from thence to the thread guide 53, which thread guides, as was before stated, will move in the ways 54 which are formed in an arc struck from the braiding point as a center, threads will then be carried from the thread guides 53 to the braiding point. If it is desired to make whip-lash braid the levers will be pivoted as illustrated more particularly in Fig. 6, wherein two levers are pivoted to the hangers 58 and are connected to the cam engaging member at a point intermediate their working points 550 and the fulcrum, and will consequently be regarded as levers of the third class. The alternate levers are fulcrumed to the hangers 59, and since the fulcrum is between the point of connection with the cam engaging member and the working point 550, these levers will be regarded as levers of the first order. In the present illustration there are two series of bobbins, an upper series and a lower series. In each of which series there are eight bobbins. The threads from the lower series of bobbins are controlled in pairs and consequently there will be half as many in number of levers as there are bobbins of the series, and since the levers are differently pivoted one from the other the cam groove has a series of elevations and a series of depressions half as many in number as there are levers. This serves a useful function, not only in enabling the production of the desired form of braid, but simplifies the cam formation.

When it is desired to make a basket weave on this machine the change will be effected merely by removing the cover plate 90 and

slowly turning the tables, and as each cam engaging member 64 becomes adjacent the opening, raising it and turning it until its roller 66 runs in the cam groove 70, and also the levers 56 will all be pivoted to the hangers 58. In making the whip-lash braid all the threads will be up at one time, and each thread will pass over two bobbins, when the threads will all descend in unison and enter the grooved slots 380 in the ring 38. Just prior to the time the first of the pins 47 for forwarding the upper carriers arrives adjacent to such slot the cam groove 50 will lower the first of said pins 47 and the thread will pass between the fingers 45 and the end of the pin 47. The cam groove 50 will then raise the pin 47 which it has just lowered and lower the second pin 47, permitting the thread to pass between such pin and the pair of fingers 45 which it engaged. In this manner each of the threads from the lower bobbins will pass under two of the upper bobbins and then the cam groove 62 will raise all the threads in unison between the upper bobbins and will cause such thread to pass over two of such upper bobbins before it is again lowered.

Referring to Fig. 15, which is an example of whip-lash braid, the following will be observed: Thread *a* passes under threads 1 and 5 and over threads 7 and 6. Thread *b* passes under threads 2 and 1, over threads 5 and 6, and under thread 7. Thread *c* passes under threads 3 and 2, over threads 1 and 5, and under threads 6 and 7. Thread *d* passes under threads 4 and 3, over 2 and 1, under 5 and 6, and over 7. It will be seen by this weave that the passage of thread *c* is directly the reverse of that of thread *a*, since it passes under the threads which *a* passes over, and it will be seen that thread *e*, which is the fifth thread passes under the thread which *a* passes under, namely, under 1 and 5, and it passes over the threads which *a* passes over, namely 6 and 7. It will also be seen that although each thread passes over two threads and then under two threads, yet it will not pass over the same pair and under the same pair which the threads at each side of it pass over and under. By referring to thread *b* and thread 5 in this connection it will readily be seen that the foregoing statement is correct. The threads all cross in the same direction upon lines which bisect the angles formed by the threads in crossing.

Fig. 16 represents a form of plain weave, which has in the foregoing description been referred to as basket braid. In this illustration some of the threads have been numbered 10, 9, 5, 6, 7, and the crossing threads, *e*, *f*, *g* and *h*. It will be noticed that each of these threads passes under one thread and then over one thread, and that each thread passes under and over the threads which its immediately adjacent parallel thread passes over and under.

Having described my invention I claim:

1. In a braiding machine, the combination with means for carrying a series of bobbins, means for rotating said carrying means for revolving a series of bobbins carried thereby, means for supporting a second series of bobbins for orbital movement, a rotary member and means carried thereby in fixed positions for engaging bobbins upon said supporting means, a means fast with the said carrier for actuating said bobbin engaging means, and means for shifting the threads from bobbins carried by the said carrier between and around bobbins upon the said supporting means and embodying an actuator fast with the said rotary member.

2. In a braiding machine, the combination with a pair of superimposed tables mounted for independent coaxial rotation, of means for rotating said tables in opposite directions, bobbin carriers fast upon the lower table, means for supporting a series of bobbins for revolution above the lower table, pins carried by the upper table in fixed positions for engaging bobbins upon said supporting means, a cam fast with the lower table for actuating said pins, means for raising and lowering threads from the bobbin carriers of the lower table for passing the same over and under bobbins on said supporting means and embodying a cam fast with the upper table.

3. In a braiding machine, the combination with a pair of superimposed tables mounted for independent rotation, means for rotating said tables in opposite directions, bobbin carriers fast upon the lower table, means for supporting a series of bobbins for revolution above the lower table, pins carried by the upper table for engaging the bobbins of said series, a cam carried by the lower table for actuating said pins, means for raising and lowering the threads from the lower bobbins to pass over and under the upper bobbins and embodying a cam carried by the upper table.

4. In a braiding machine, the combination with a series of bobbins, means for revolving said bobbins through a fixed orbital path, a cooperative series of bobbins, means for revolving these through an orbital path in the opposite direction, and means for causing the threads from one series of bobbins to pass the bobbins of the other series, and embodying a cam fast with the means for rotating the bobbins which are passed by the said threads.

5. In a braiding machine, the combination with an upper and a lower table rotatable in opposite directions, a series of bobbins connected to each of said tables and rotatable thereby, a cam groove on the upper table for controlling the movement of the threads from the lower bobbins in passing the upper bob-

bins, and a cam groove on the lower table for controlling the connection between the upper table and its bobbins.

6. In a braiding machine, the combination with two series of bobbins, each series embodying in number a multiple of four, means for revolving said series in opposite directions, a series of levers, embodying half as many in number as the bobbins in a series, for controlling the lower threads in their passage over and under the threads of the upper series, and each embodying means for controlling two of said threads, a cam having a series of elevations and a series of depressions, each series embodying half as many in number as there are levers, a member pivoted to each lever and engaging said cam, the fulcrums of said levers being so arranged that levers of the first and third class will alternate one with the other, whereby all the threads will be raised and all the threads will be lowered at the same time.

7. In a braiding machine, the combination with a lever, means for rocking the same, a member for carrying the thread from the bobbin, segmental ways having as a center the braiding point of the machine, a thread guide mounted on said guideway, a link connecting the thread guide to the lever, and a thread guide at the fulcrum of said lever.

8. In a braiding machine, the combination of two rotary tables concentrically mounted, means for rotating these in opposite directions, a series of bobbins for each table, means for connecting the bobbins to the respective tables, means for causing the threads from the bobbins on one of said tables to pass at the respective sides of the bobbins on the other table, a pair of flanges carried by said other table and directed toward the first table, each flange having on its face directed toward the other flange a cam groove, the grooves differing in contour, and a member for actuating the thread passing means carried by said first table between said flanges and constructed and adapted for engaging either of said cam-grooves.

9. In a braiding machine, the combination with a series of bobbin carriers and means for revolving the same, of a second series of bobbin carriers, means controlled by said carrier revolving means for passing the thread from bobbins carried by the second series of carriers between and about the carriers of the second series.

10. The combination with a series of bobbin carriers and means for revolving the same, of a second series of bobbin carriers and means for revolving the second series, means for shifting the threads from the bobbins carried by the second series to cause the same to pass the bobbin carriers of the first series, and means carried with the first series for actuating the shifting means.

11. In a braiding machine, the combination with a series of bobbin carriers, a track for said carriers, a rotary member, forwarder devices carried by the rotary member and constructed and adapted for engaging and disengaging the said carriers, a second series of bobbin carriers and means for guiding the threads from bobbins carried thereby, means for moving the threads from bobbins carried by the second series of carriers between the carriers of the first series and between these and their track and embodying a cam fast with said rotary member, and means for actuating said forwarder devices to engage and disengage the carriers in proper timing relative to the said thread movement, and embodying a cam having fixed relation to the position of the thread guiding means of the second series.

12. In a braiding machine, the combination with a series of bobbin carriers, a track for said carriers, a rotary member, forwarder devices carried by the rotary member and constructed and adapted for engaging and disengaging the said carriers, a second series of bobbin carriers and means for revolving the same, means for passing the threads from bobbins carried by the second series of carriers between the carriers of the first series and between these and their track and embodying a cam fast with said rotary member, and means for actuating said forwarder devices and embodying a cam controlled by the means for revolving the second series of carriers.

13. The combination with a series of bobbins and means embodying connections constituted for engagement and disengagement for revolving the same, a second series of bobbins, means for shifting the threads from the bobbins of the second series to cause the same to pass the bobbins of the first series, and means carried with the first series for actuating the shifting means.

Signed at Nos. 9–15 Murray street, New York, N. Y., this 17th day of February, 1908.

WILLIAM T. LE BLANC.

Witnesses:
CHAS. LYON RUSSELL,
HENRY E. GREENWOOD.