W. R. SMITH.

CIRCULAR LOOM.

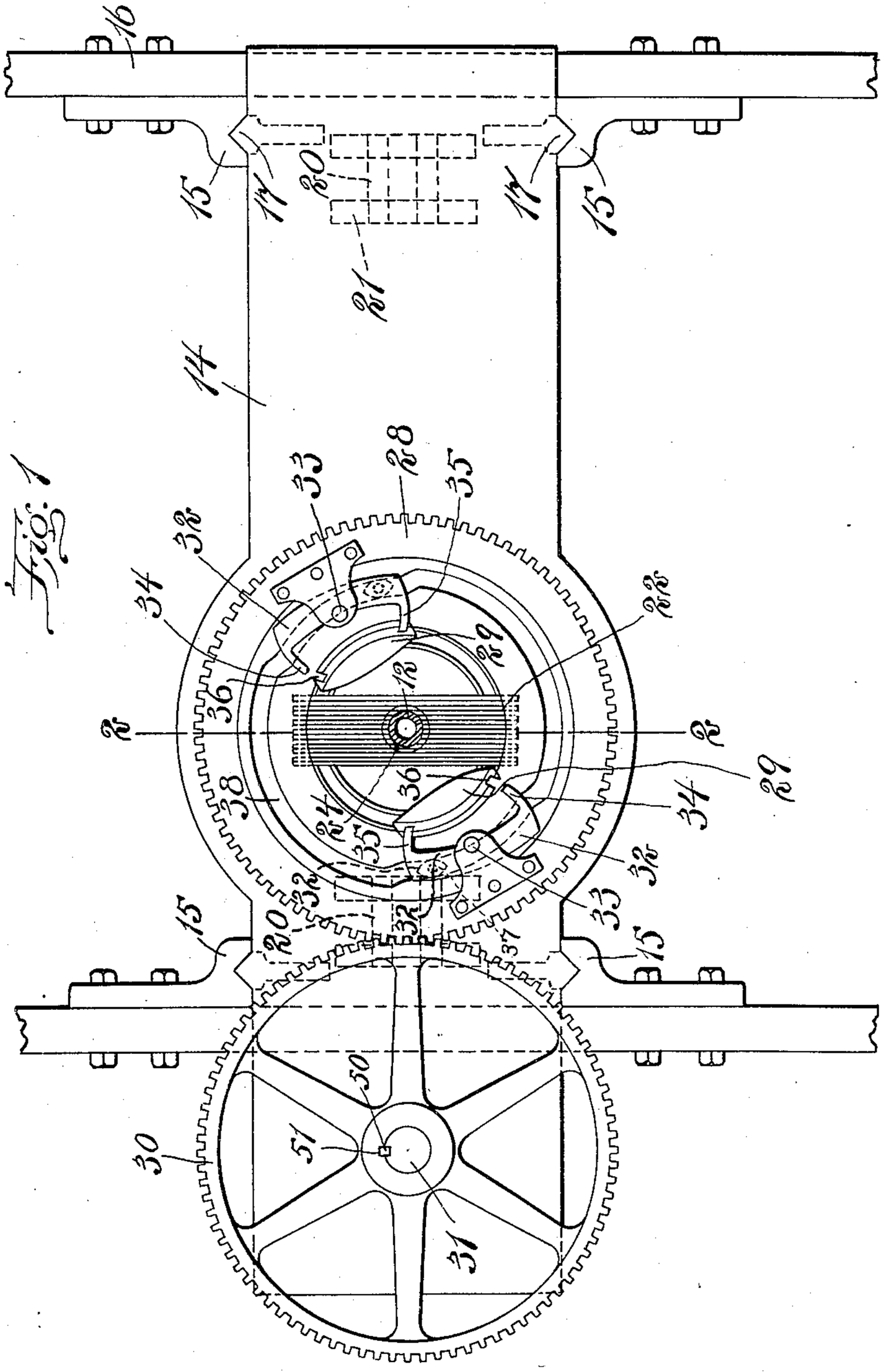
APPLICATION FILED JUNE 8, 1906.

908,161.

Patented Dec. 29, 1908.

4 SHEETS—SHEET 1.

Fig. 1



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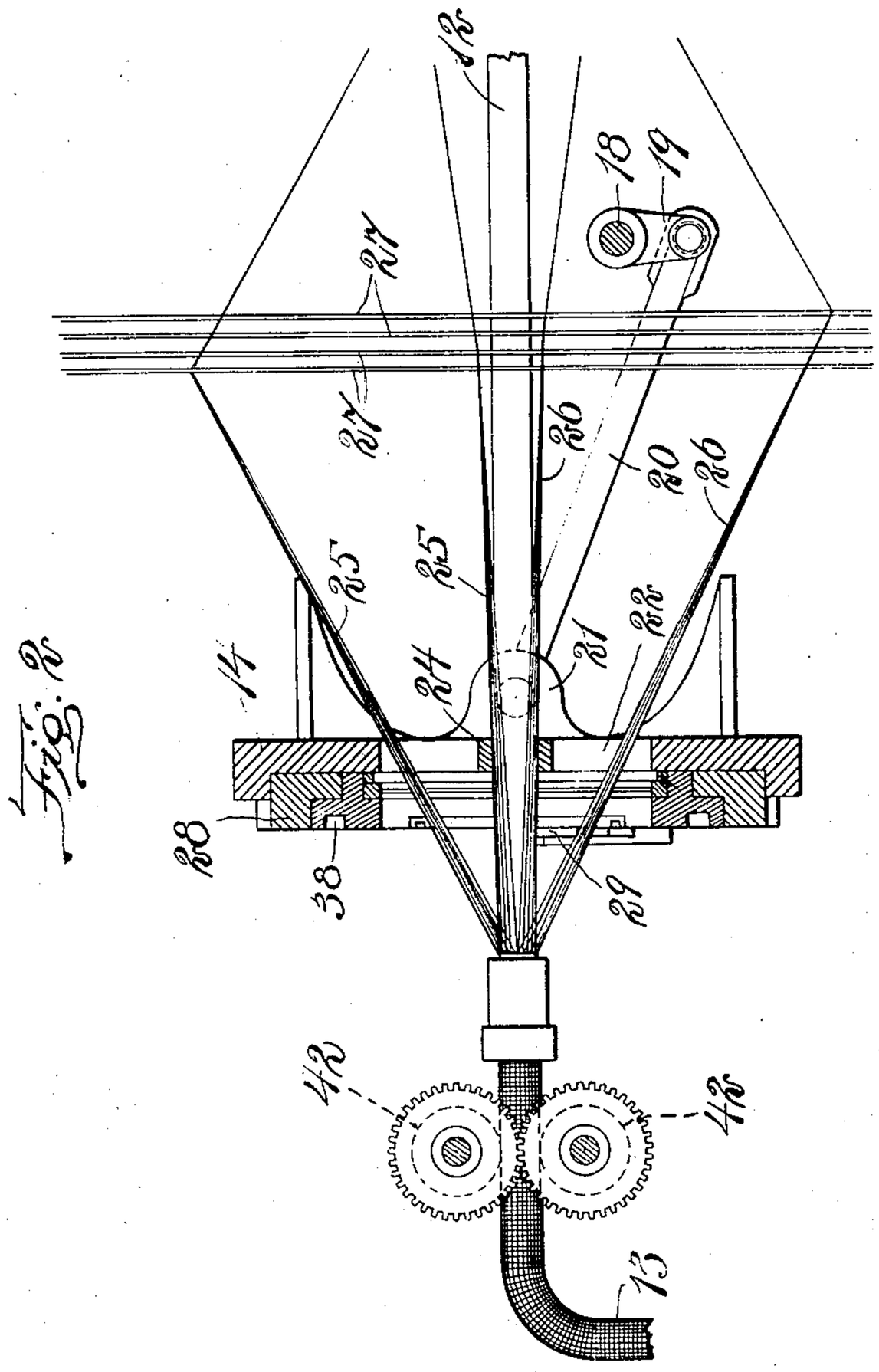

Fig. 2.

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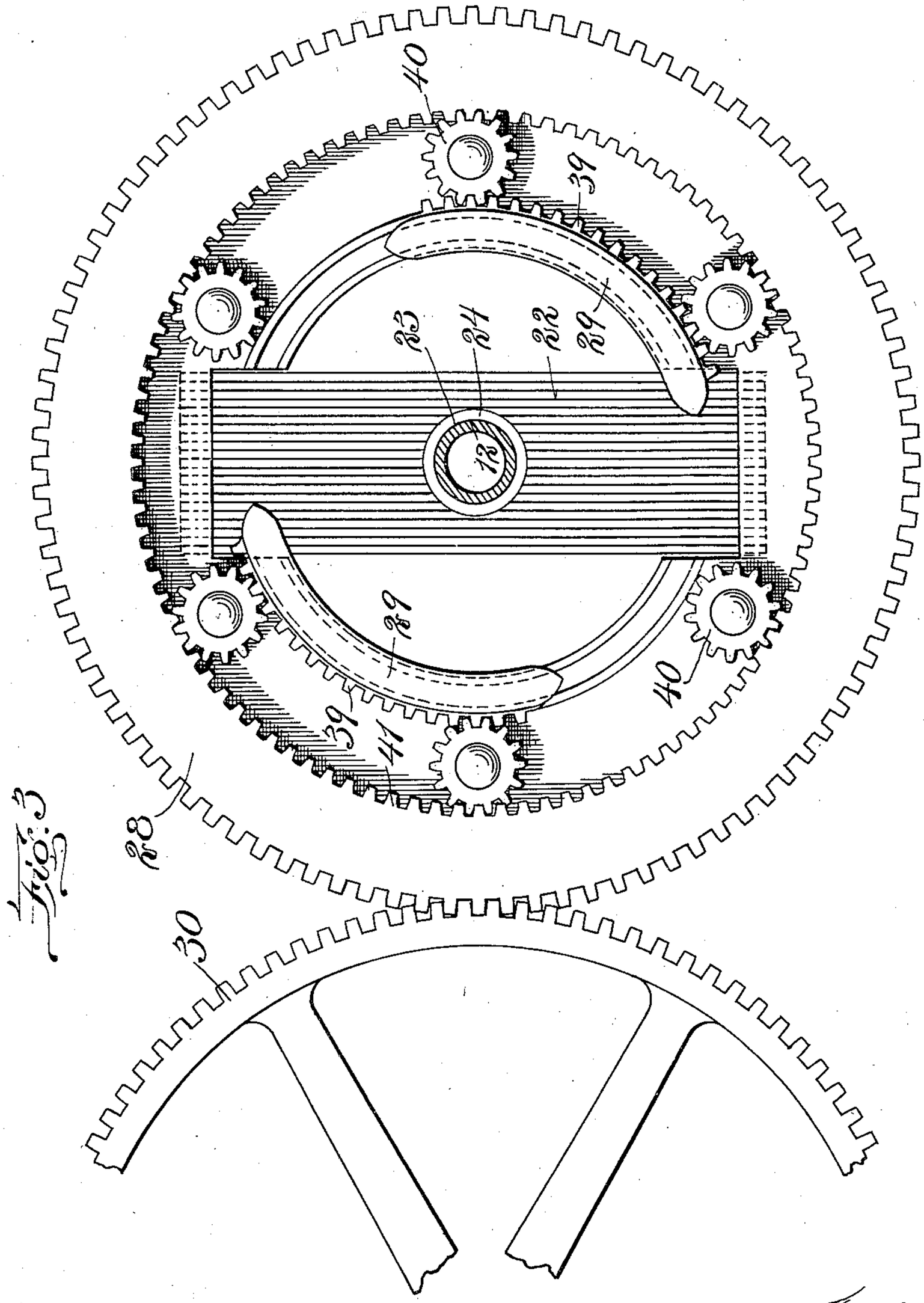

Fig. 3.

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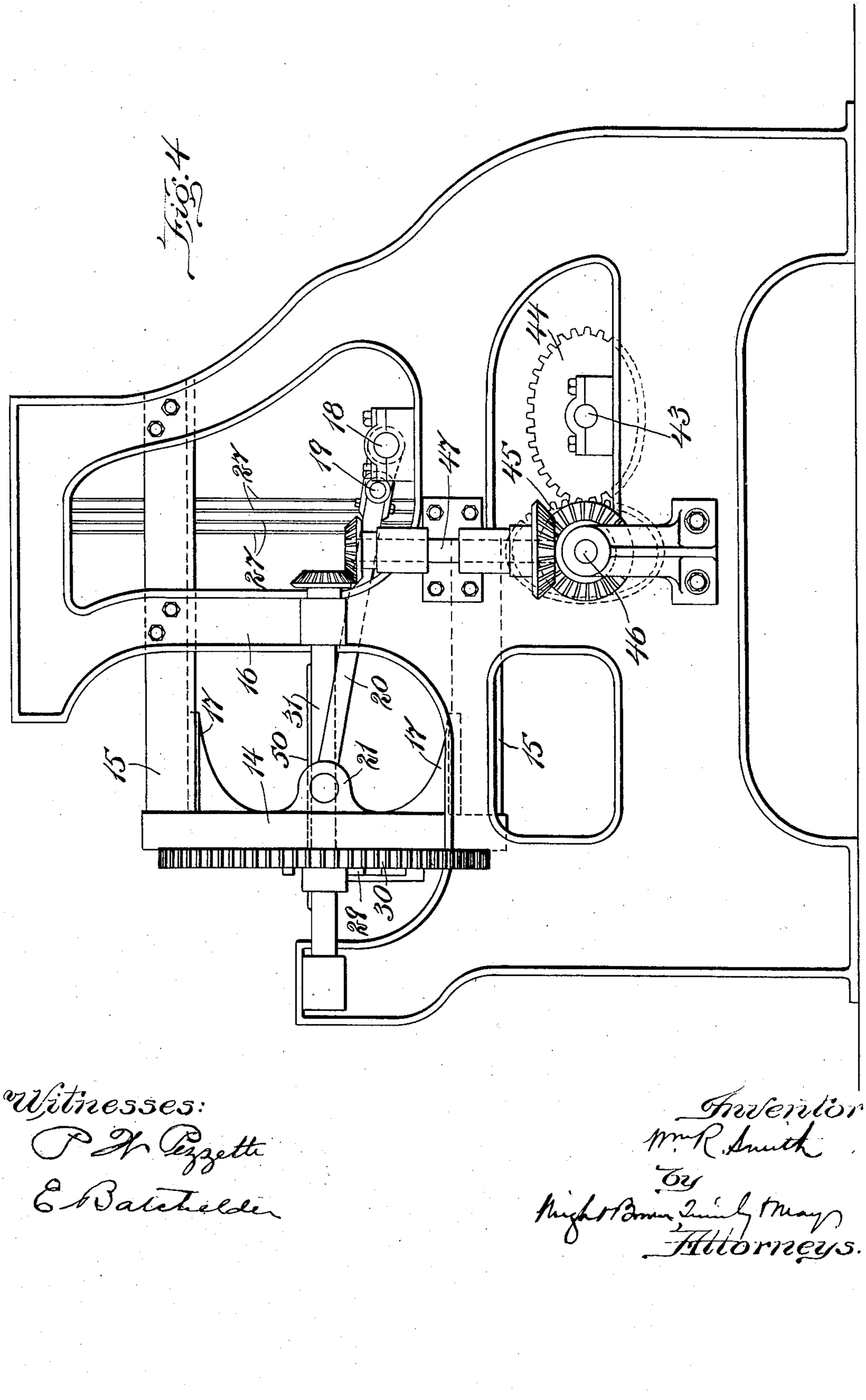
4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM R. SMITH, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF TO HERBERT H. HEWITT, OF BUFFALO, NEW YORK.

CIRCULAR LOOM.

No. 908,161. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed June 8, 1906. Serial No. 320,709.

To all whom it may concern:

Be it known that I, WILLIAM R. SMITH, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Circular Looms, of which the following is a specification.

This invention has for its object to provide a circular loom adapted to weave a tubular fabric of any desired number of plies, and to beat the weft threads into the shed formed by the warp threads, thereby giving the fabric the same density and closeness of texture that is possessed by a flat fabric, as ordinarily woven.

The invention consists, as a whole, in the combination of a fixed mandrel, on which the tubular fabric is woven, a shedding mechanism adapted to form sheds in the warp threads, the said threads in the completed fabric extending longitudinally of the mandrel, and a lay movable toward and from the apex of the shed formed by the warp threads, the said lay having a circular shuttle race, shuttles engaged with the said race, and adapted to pass through the sheds formed by the warp threads, and a reed engaging the warp threads, and adapted to beat the filling threads into the apex of the shed, all as hereinafter more fully described and claimed.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a front elevation of a portion of a circular loom embodying my invention. Fig. 2 represents a section on line 2—2 of Fig. 1. Fig. 3 represents a view similar to Fig. 1, showing a modified construction of the shuttle-operating mechanism. Fig. 4 represents a side elevation of the loom.

The same letters of reference indicate the same parts in all the figures.

In the drawings 12 represents a fixed cylindrical mandrel, which is preferably tubular, and is or may be curved at its outer portion, as indicated at 13.

14 represents a lay having a central opening through which the mandrel passes, the said opening being preferably concentric with the mandrel, and of sufficient diameter to permit the passage of the converging warp threads, hereinafter described, from a shedding mechanism at the rear side of the lay, to a point on the mandrel at the front side of the lay. The lay is movable in a direction parallel with the mandrel on fixed guides 15 supported by the frame 16 of the loom, the lay being provided with ribs or gibs 17 engaging said guides. Suitable mechanism is employed for reciprocating the lay, the mechanism here shown including a rotary shaft 18, having cranks 19, which are connected by rods 20 with ears 21 on the back side of the lay.

The lay is provided with a reed 22, composed of thin parallel strips of metal, or other suitable material, the reed being provided at its central portion with an orifice, which interrupts the continuity of the central reed strips, and is surrounded by a suitable collar 24 permanently attached to the interrupted reed strips, and to the continuous strips adjacent thereto. The said orifice surrounds the mandrel 12, the wall of the orifice, formed by the ring or collar 24, being adapted to slide freely upon the mandrel. The reed projects from opposite sides of the mandrel, its arrangement relative to the mandrel being such that it guides the warp threads 25 26 from a set of harnesses 27 to the mandrel, the two series of warp threads converging from points at opposite sides of the mandrel. The warp threads are divided into two series, the threads 25 comprising one series, and extending from points at one side of the mandrel, and behind the lay, to the periphery of the mandrel in front of the lay, while the threads 26 constitute another series extending from the opposite side of the mandrel, behind the lay, to the periphery of the mandrel in front of the lay, the two series of threads coming together at the periphery of the mandrel, so that they form an annular series surrounding the mandrel, and extending parallel therewith in the completed fabric. The harnesses 27 are controlled by any suitable harness mechanism, and are operated to form a shed in each series of warp threads, the threads of each series constituting the inner side of the shed, being in close proximity to the mandrel, while the threads constituting the outer side of the shed converge somewhat abruptly toward the mandrel, as shown in Fig. 2.

The lay is provided with a circular shuttle race, with which is engaged a rotary shuttle carrier 28, having one or more shuttles 29, which are moved in a circular path around the mandrel by the rotation of the shuttle carrier, and are adapted to pass through the sheds formed by the warp threads 25 26. The shuttle carrier 28 is preferably a ring,

fitted to move in an annular guide formed for its reception in the lay, and provided on its outer periphery with gear teeth, which engage the teeth of a driving gear 30, affixed to a shaft 31. Said shaft is journaled in bearings on the frame, and has a key 50 in sliding engagement with a groove 51 in the gear 30, which moves forward and backward with the lay. The said shaft is rotated by any suitable means, so as to impart continuous rotation in one direction to the shuttle carrier, thus revolving the shuttles around the mandrel, and carrying them through the sheds of the warp threads.

Means are provided for changing the point of connection between the shuttles and the shuttle carrier at suitable points, so that the part of the shuttle that is within the shed is always unobstructed. In the construction shown in Fig. 1 this change of connection is effected by means of rocking arms 32, pivoted at 33 to ears on the shuttle carrier, and provided at their ends with dogs 34 35, adapted to enter sockets 36 36, formed for their reception in the end portions of the shuttles. The arms 32 are provided at their inner sides with pivoted slides 37 shown by dotted lines in Fig. 1, which run in a fixed cam groove 38 on the lay, the shape of the groove being such that just before each shuttle reaches the shed through which it is to pass, the forward dog 34 is withdrawn from the shuttle by the action of the cam on the slide 37, the rear dog 35 moving into engagement with the shuttle, and propelling it through the shed. After the point of the shuttle is passed through the shed, the cam again acts on the slide 37 to insert the forward dog 34 in its socket, and withdraw the rear dog 35 before it reaches the outer rank of threads comprising the shed, the rear dog being thus caused to pass outside the threads, while the shuttle is propelled by the forward dog. This operation is repeated at each passage of the shuttle through a shed. In the construction shown in Fig. 3 the shuttles have segmental outer edges, on which are formed gear segments 39 meshing with small gears or pinions 40, which engage an internal gear 41 formed on the ring or carrier 28. The pinions 40 are journaled in bearings in the lay 14, and are so spaced apart that one pinion is always in engagement with each shuttle, the pinions which impel the shuttle during its passage through the sheds being at opposite sides of the reed, so that the part of the shuttle within the shed is unobstructed.

I do not deem it necessary to illustrate the mechanism for operating the harnesses, as this may be of any suitable type.

It will be understood that the positions of the two ranks of warp threads forming each shed are reversed after each passage of a shuttle through the shed, the result being the weaving of a continuous tubular fabric, which is fed progressively at a rate corresponding with the formation of the fabric, by means of suitable feed rolls 42, engaging the completed portion of the fabric at the outer portion of the mandrel, the said feed rolls being driven by suitable mechanism not shown. The feed movement of the fabric causes the weft threads to assume a helical form, the said weft threads being beaten into the annular apex formed by the junction of the two threads around the mandrel by the action of the reed when the lay is moved forward. The result is the formation of a closely woven tubular fabric having uniform density at all parts.

The mechanism for rotating the driving gear 30 should be organized to give said gear and the shuttle carrier a varying speed, the speed decreasing while the shuttles are passing through the sheds, and increasing while the shuttles are passing from shed to shed.

In Fig. 4 I have shown variable speed mechanism, comprising a shaft 43, which is driven from the same source of power as the shaft 18, and has an elliptical gear 44 meshing with an elliptical gear 45 on a shaft 46 which is geared to a shaft 47, the latter being geared to the shaft 31. The driving gear 30 and the said variable speed mechanism may be located at either side of the shuttle carrier. In Fig. 1 the said driving gear is shown as located at the left of the shuttle carrier, while in Fig. 4 it is shown as located at the right.

I claim:—

1. In a circular loom the combination of a fixed mandrel, a lay having a reed which surrounds and is movable upon the mandrel, and guides the warp threads in two series converging to the mandrel from opposite sides of the same, mechanism for forming sheds in the two series of warp threads, and means for carrying weft threads around the mandrel and through the sheds.

2. In a circular loom the combination of a fixed mandrel, a lay having a reed which surrounds and is movable upon the mandrel, and guides the warp threads in two series converging to the mandrel from opposite sides of the same, the lay being provided with a circular shuttle race surrounding the mandrel, a shuttle movable in said race through the warp sheds, and means for impelling the shuttle.

3. In a circular loom the combination of a fixed mandrel, a lay having a reed which surrounds and is movable upon the mandrel and guides the warp threads in two series converging to the mandrel from opposite sides of the same, the lay being provided with a circular shuttle race surrounding the mandrel, a shuttle carrier rotatable in the shuttle race, a shuttle, and means for connecting the carrier with different parts of the shuttle,

said means being organized to permit the passage of the shuttle through the sheds.

4. In a circular loom the combination of a fixed mandrel, a lay having a reed which surrounds and is movable upon the mandrel, and guides the warp threads in two series converging to the mandrel from opposite sides of the same, the lay being provided with a circular shuttle race surrounding the mandrel, a shuttle movable in said race through the warp sheds, and varying speed driving mechanism for impelling the shuttle.

5. In a loom, the combination of a mandrel, a shuttle-supporting member having a shuttle-race, a rotative member surrounding the shuttle-supporting member and provided with a shuttle actuator, and shed forming mechanism, the shuttle actuator being adapted to move the shuttle through the shed and the fabric woven being adapted to be formed upon the mandrel.

6. In a loom, the combination of a mandrel, a lay, a shuttle-supporting member fixed to the lay, a rotary member provided with a shuttle actuator, means for forming a shed, the shuttle actuator on the rotation of said rotary member being adapted to carry the shuttle through the shed and the fabric being adapted to be formed in tubular shape upon the mandrel.

7. In a loom, the combination of a mandrel, a lay, a shuttle-supporting member carried by the lay, a revoluble member movable with the lay, a shuttle actuator carried by the revoluble member, means for forming a shed, the shuttle actuator serving to carry the shuttle through the shed and the fabric as woven surrounding the mandrel, and a reed movable with the lay for compacting the fabric.

8. In a loom, the combination of a lay, a mandrel extending through the lay, a ring surrounding the mandrel and connected to the lay, said ring having a shuttle race, a revoluble member turnable upon the ring and provided with a shuttle actuator for the shuttle, means for forming a shed, the shuttle actuator being adapted to move the shuttle through the shed, and the fabric being woven in tubular form upon the mandrel.

9. In a loom, the combination of a mandrel, a lay, a shuttle-supporting member connected with the lay, a revoluble member movable with the lay, a shuttle actuator, and shed forming mechanism, the shuttle actuator being adapted to carry the shuttle through the shed, the fabric being produced in tubular form around the mandrel, and the said shuttle supporting member having means to operate the shuttle actuator with respect to the shuttle to carry the shuttle actuator free of the shed as said revoluble member turns.

10. In a loom, a shuttle supporting member having a substantially annular shuttle race, a shuttle to travel in said race, a rotative member surrounding the shuttle supporting member, and means coöperative with said rotative member for actuating the shuttle.

11. In a loom, a shuttle supporting member having a shuttle race, and a rotative member surrounding the shuttle supporting member and provided with shuttle actuating means.

12. In a loom, a shuttle supporting member, a rotative member surrounding the shuttle supporting member and provided with shuttle actuating means, and means for forming a shed through said shuttle supporting member.

13. In a loom, a shuttle supporting member having a substantially annular shuttle race, and opposite shed receiving apertures intersecting respectively said race.

14. In a loom, a shuttle supporting member having a shuttle race, a shuttle actuator movable around the shuttle supporting member, and means for operating the shuttle actuator to cause it to alternately engage opposite ends of a shuttle in said race.

15. In a loom, a shuttle supporting member having a shuttle race, a rotative member coöperative with the shuttle supporting member and provided with opposite arms, and means to operate the shuttle actuator during the turning movement of said rotative member to cause the arms to alternately engage a shuttle.

16. The combination of a mandrel, a lay having a reed movable relatively to the mandrel for guiding warp threads in a plurality of series to the mandrel, mechanism for forming separate sheds in said series of warp threads, and means for carrying a weft thread through the sheds.

In testimony whereof I have affixed my signature, in presence of two witnesses.

WILLIAM R. SMITH.

Witnesses:
C. F. BROWN,
W. W. BEERS.