

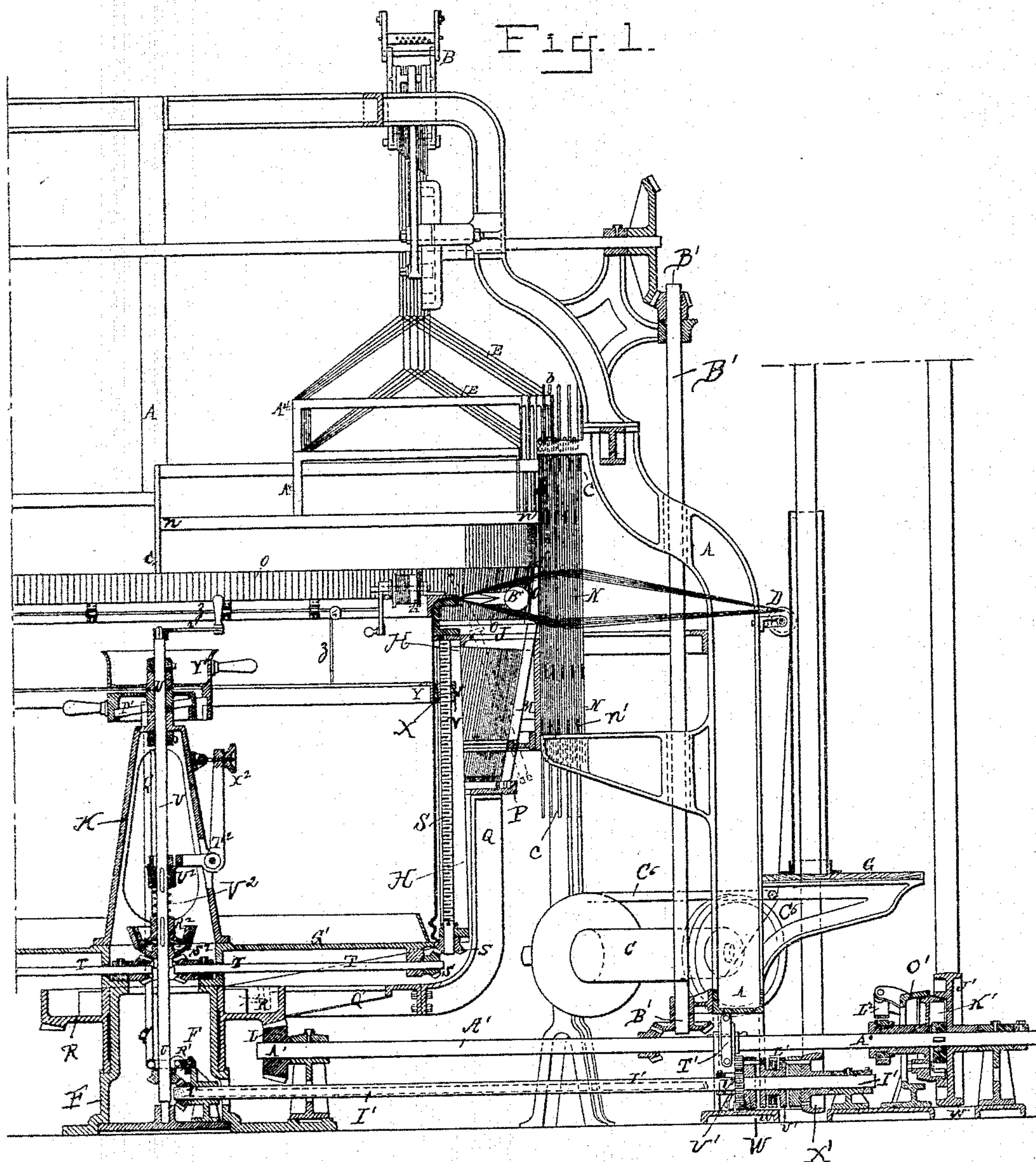
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5 Sheets—Sheet 1.

A. H. SORET, J. HURTU & V. HAUTIN.
CIRCULAR LOOM.

No. 491,324.

Patented Feb. 7, 1893.



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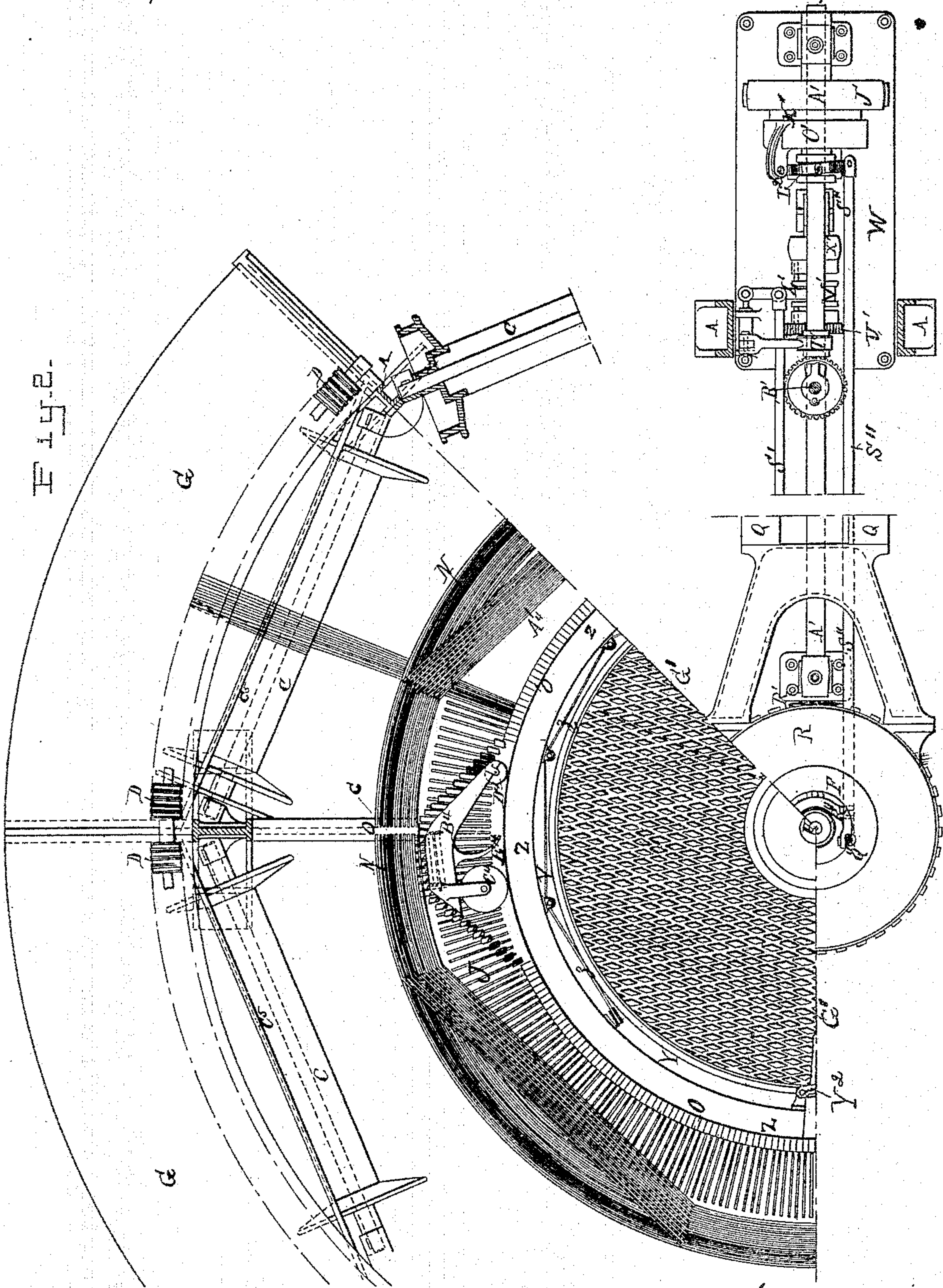
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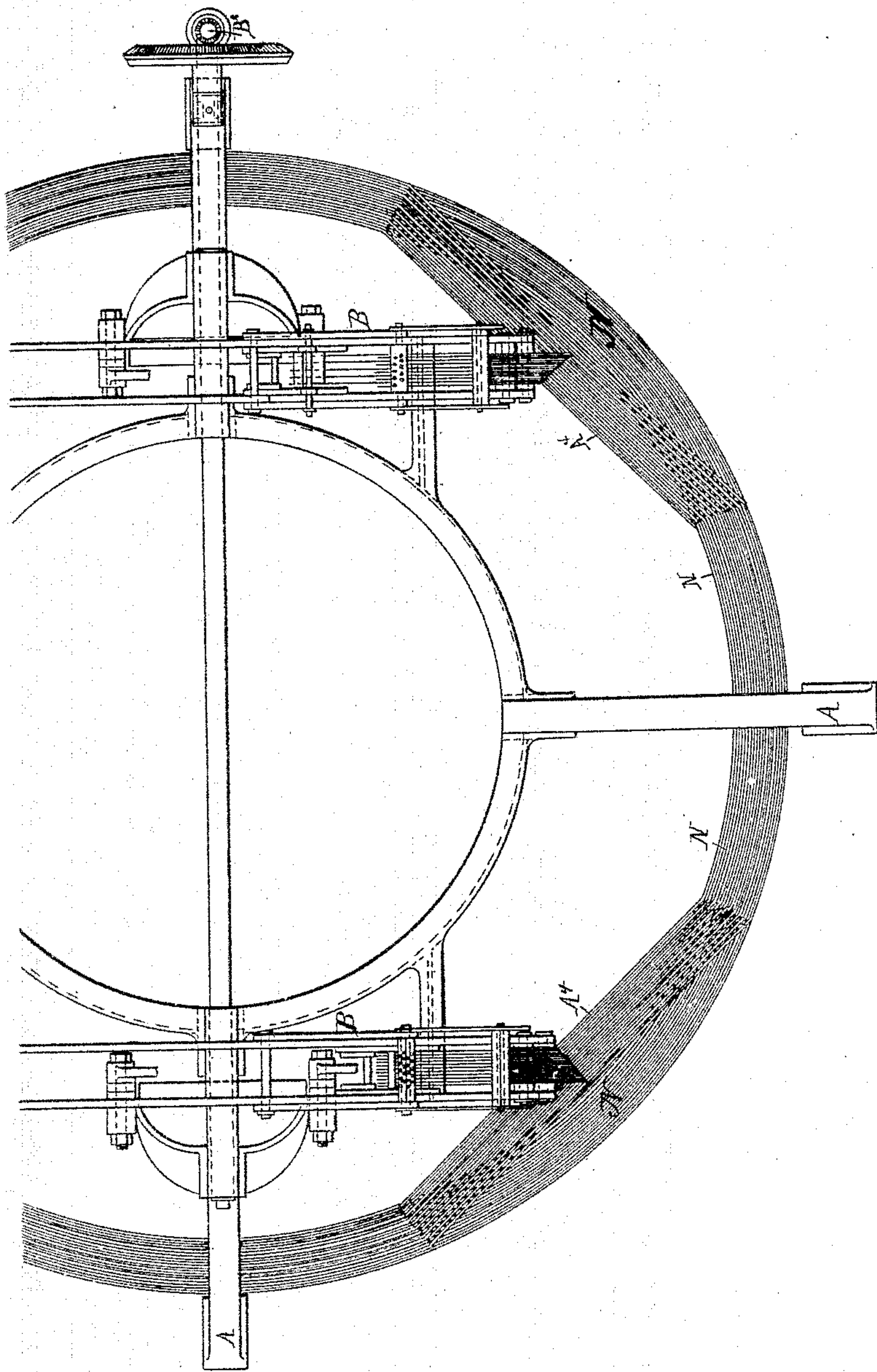
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Fig. 3-



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Fig. 4.

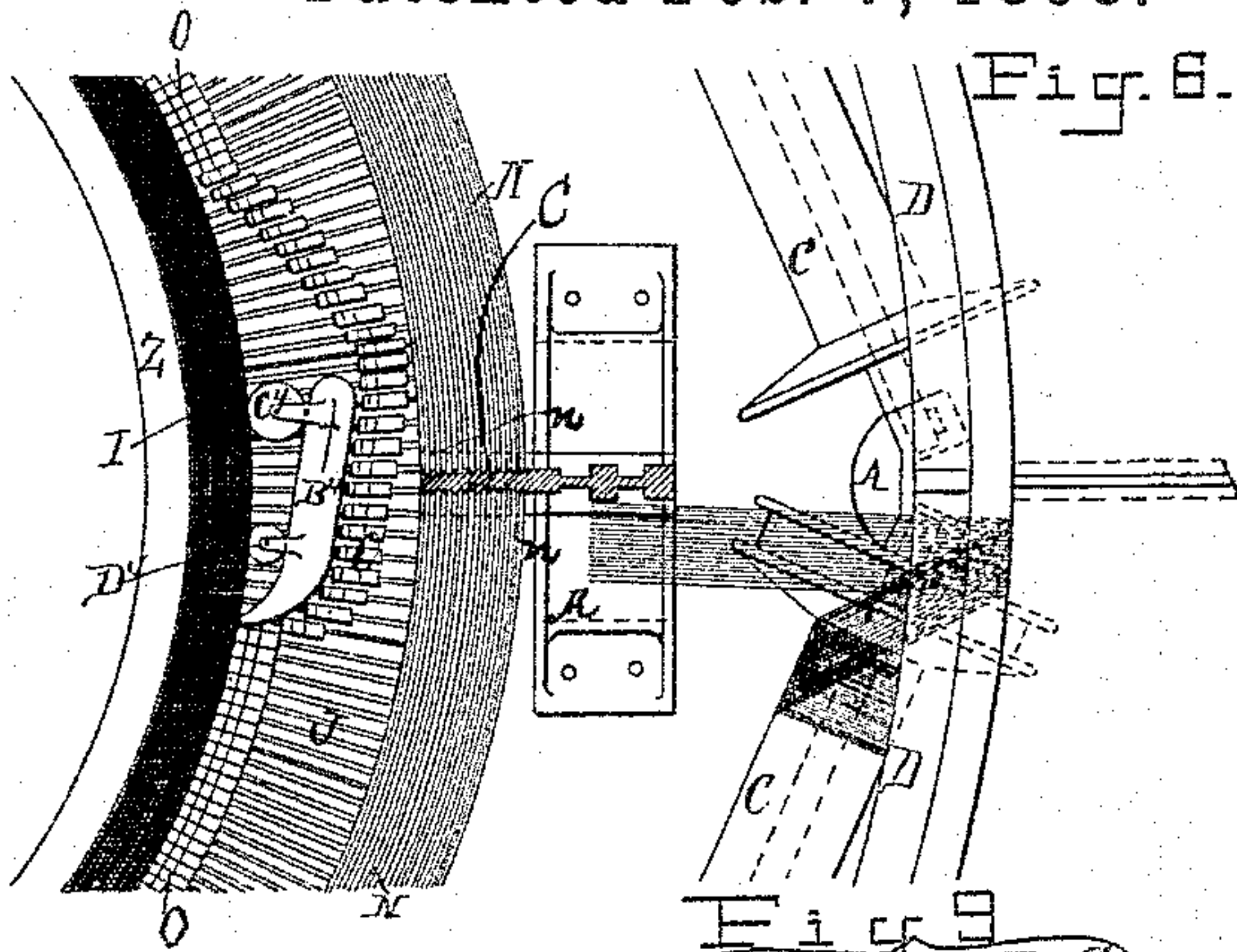
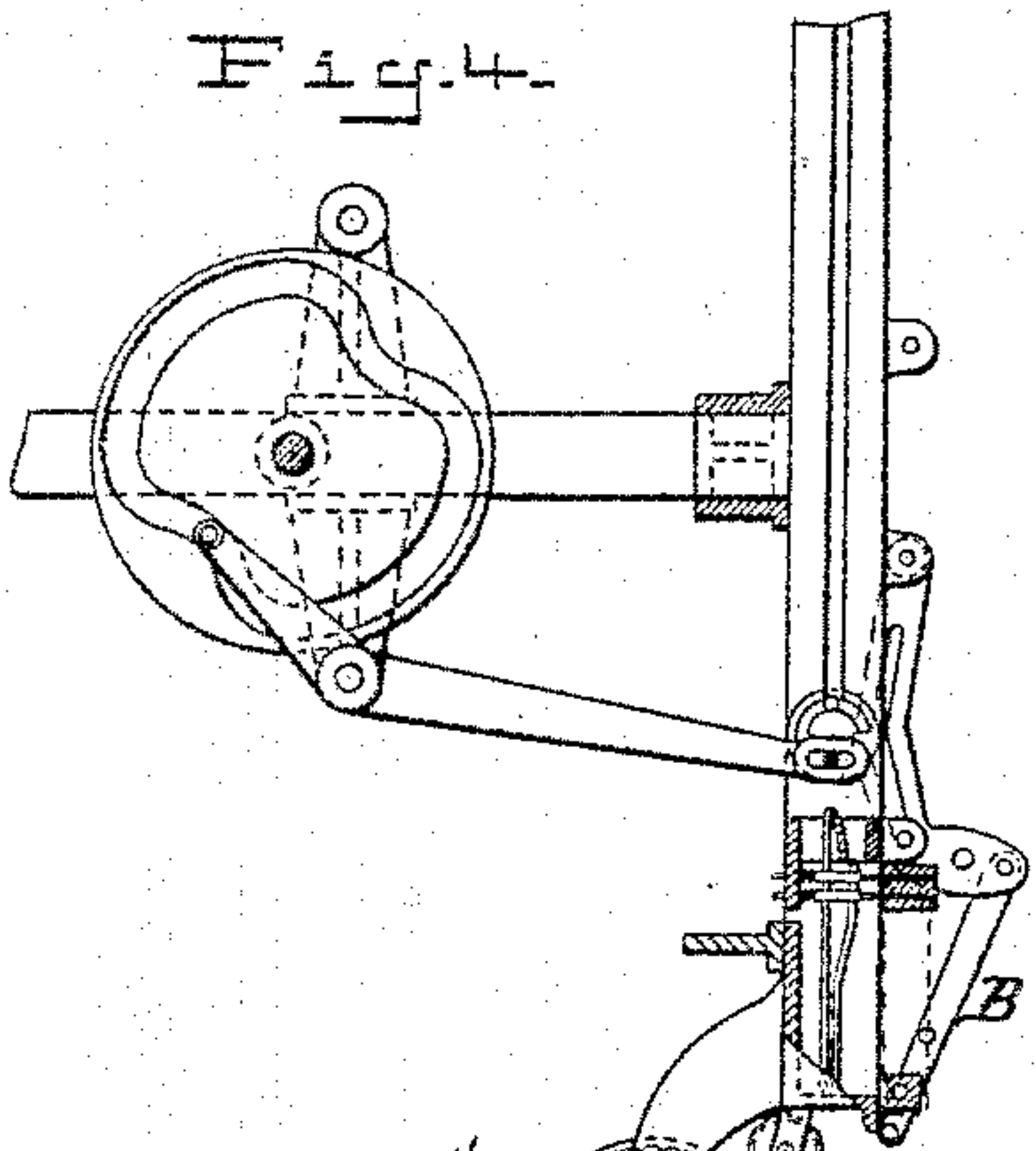
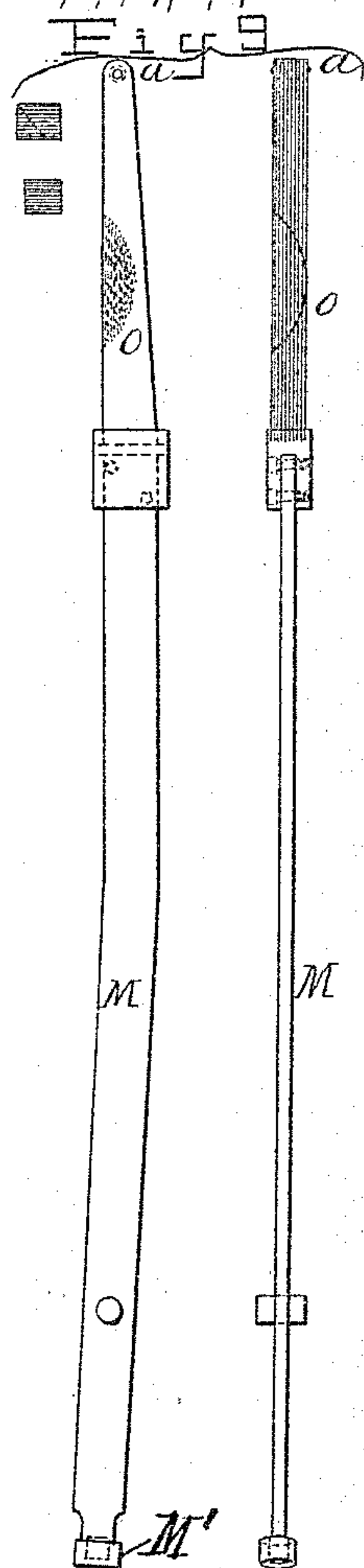
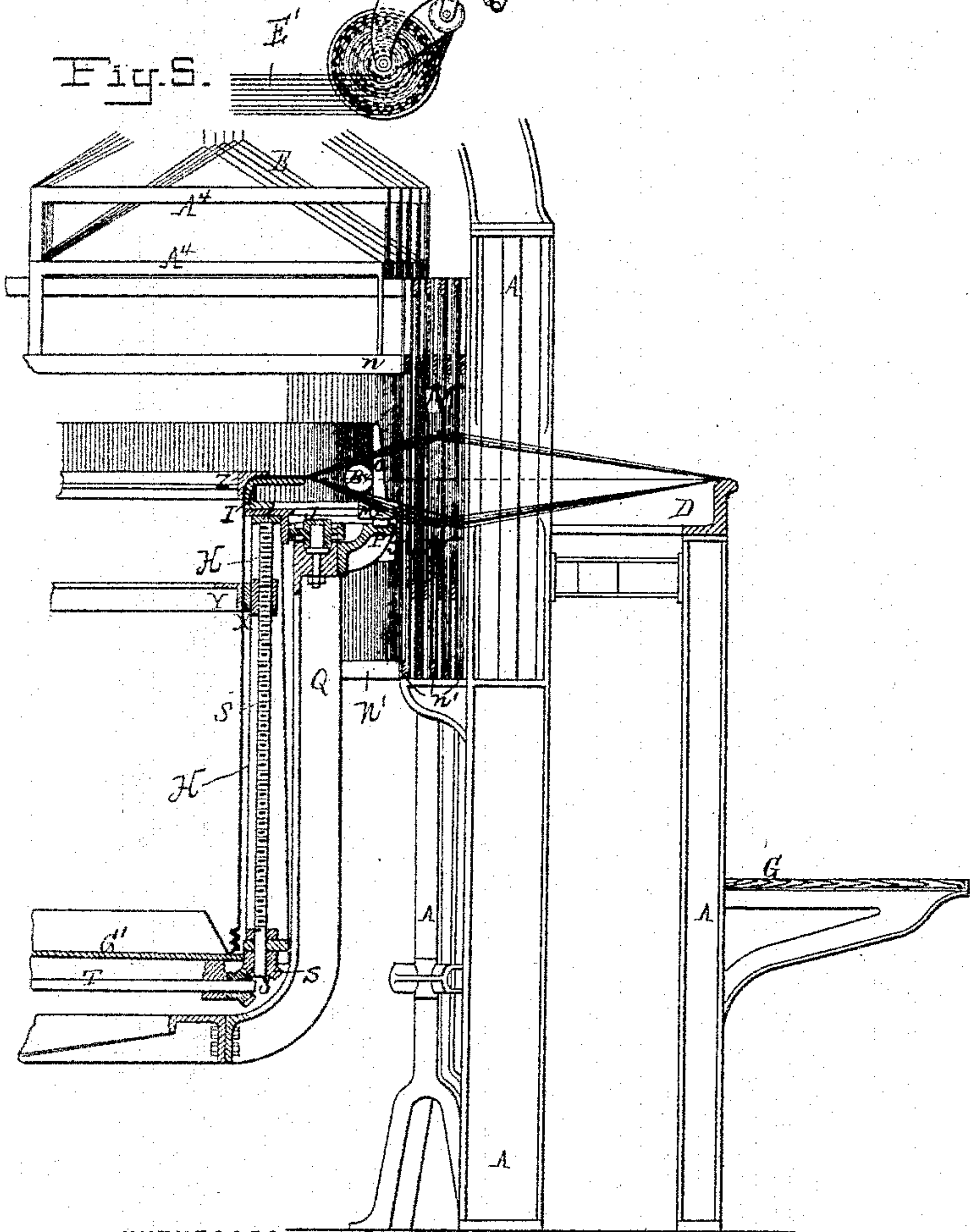


Fig. 6.



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FIG. 7.

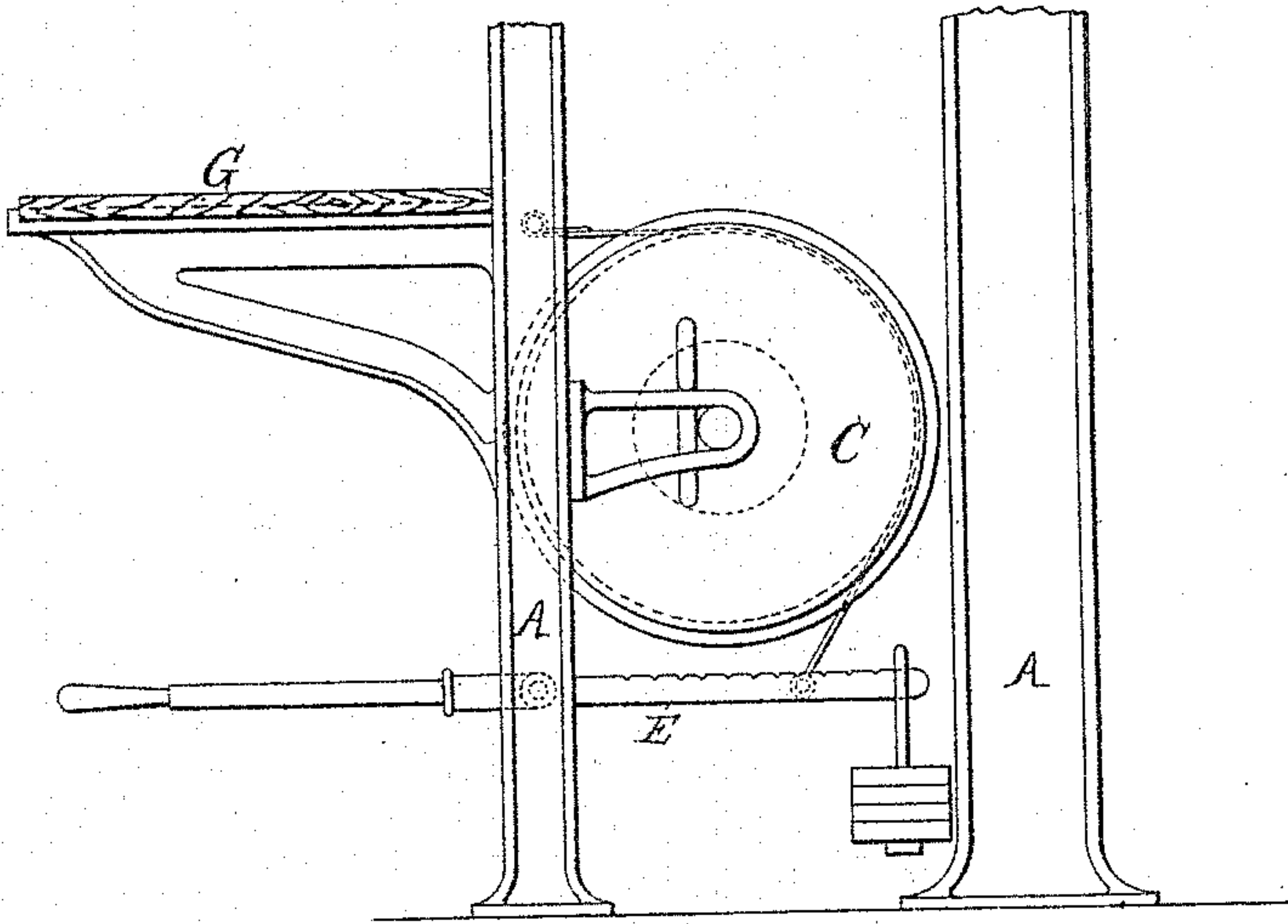


FIG. 8.

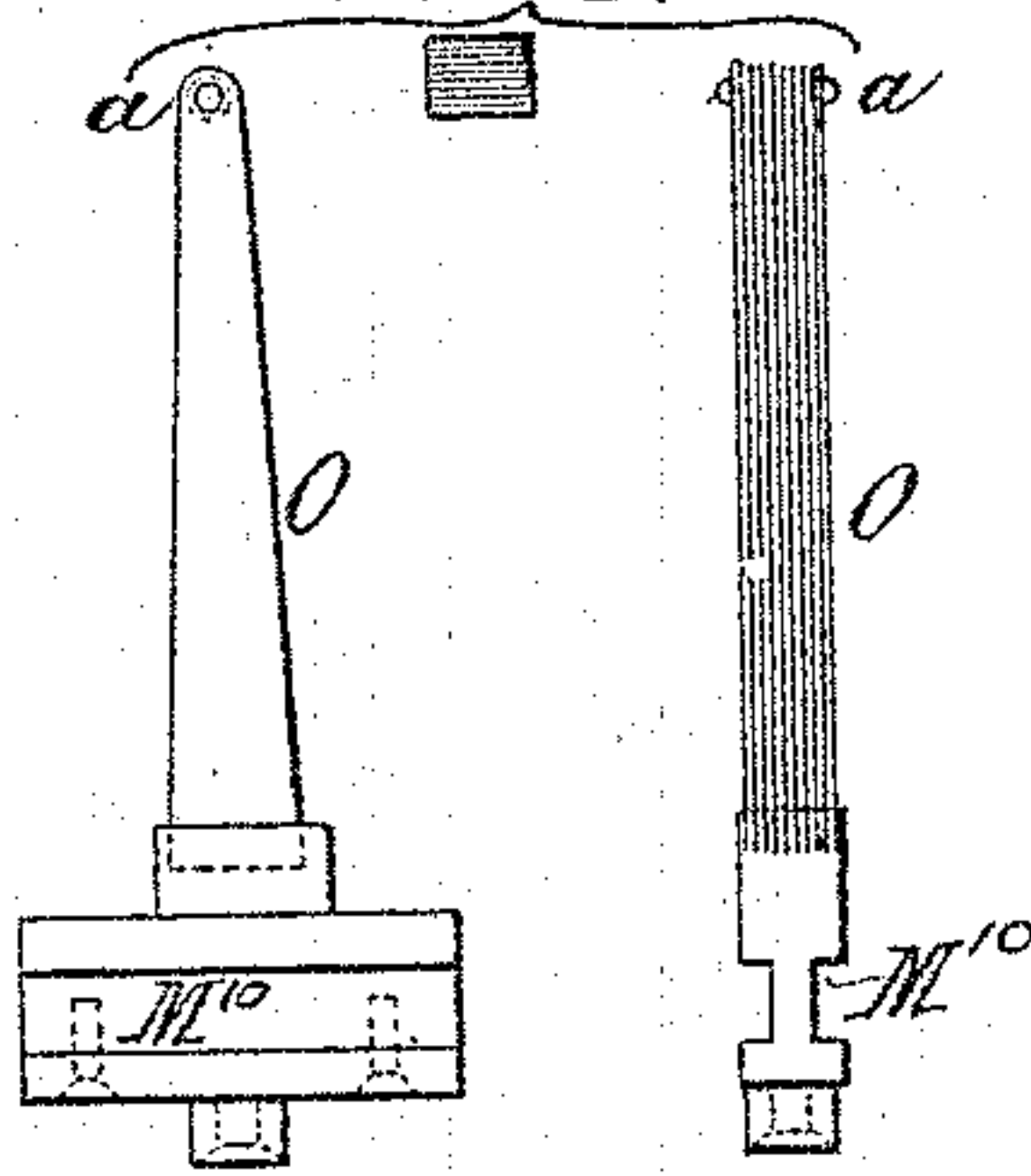


FIG. 11.

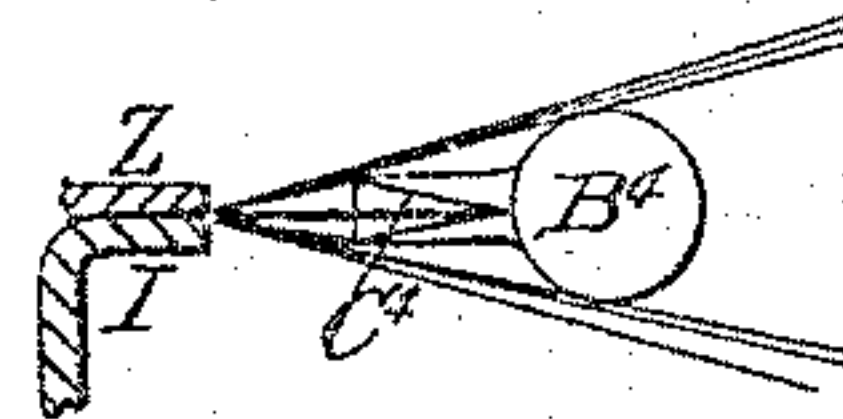


FIG. 12.

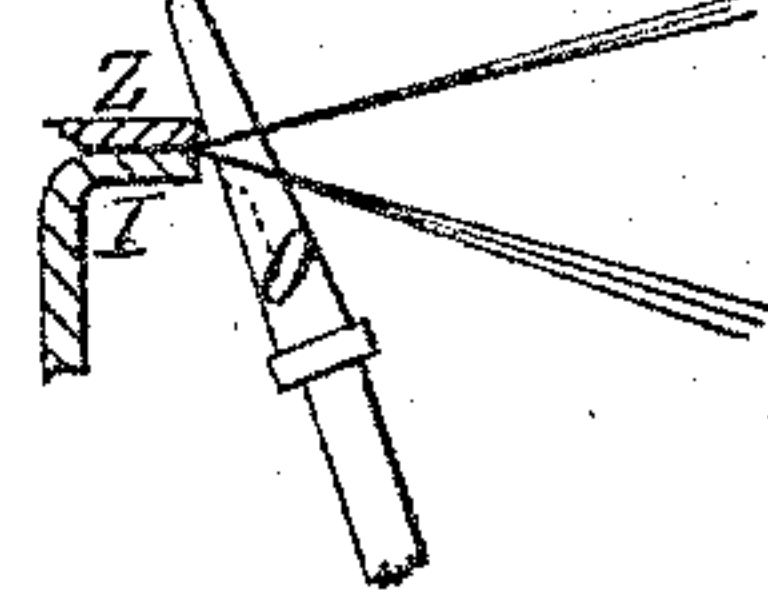


FIG. 10.

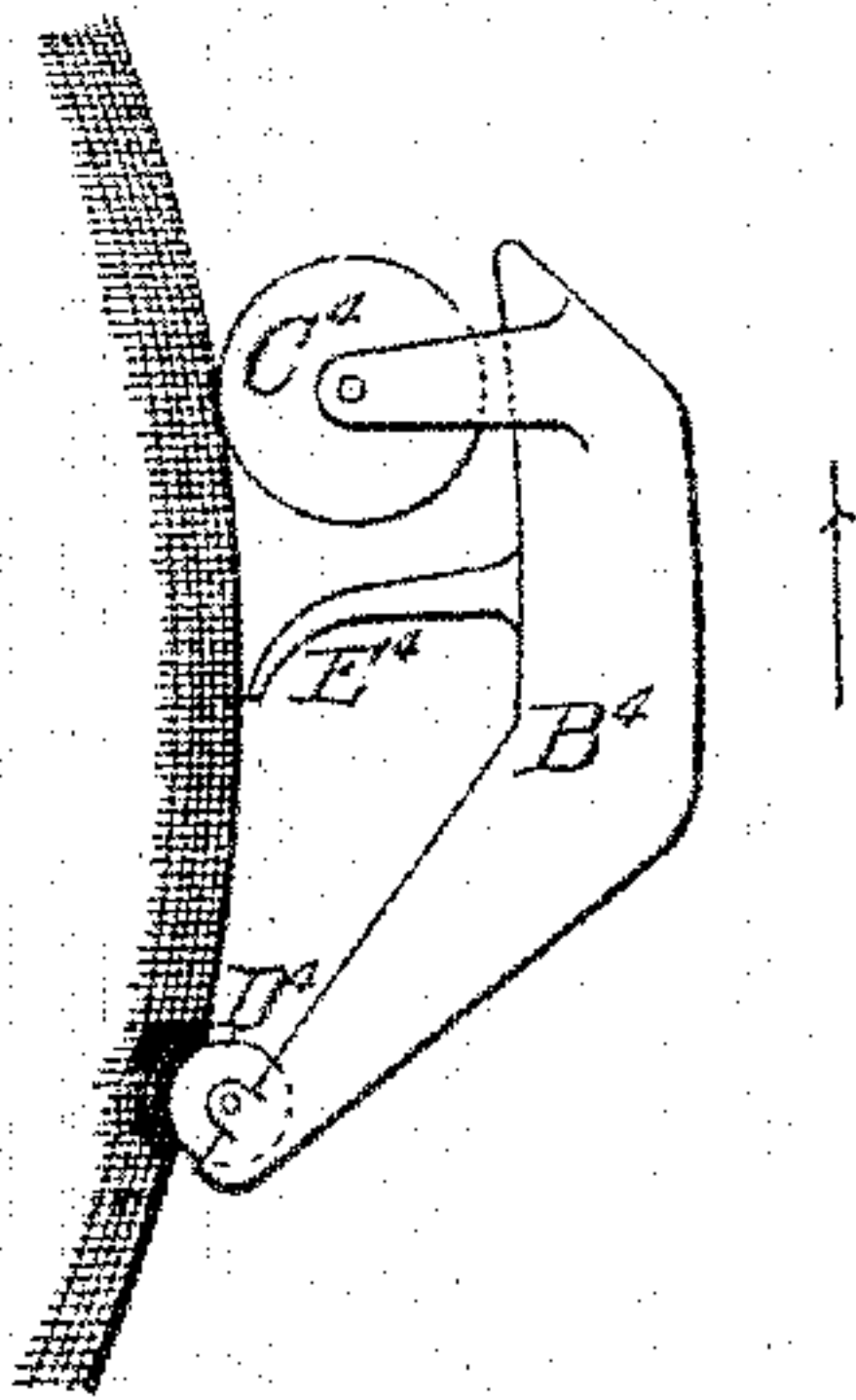
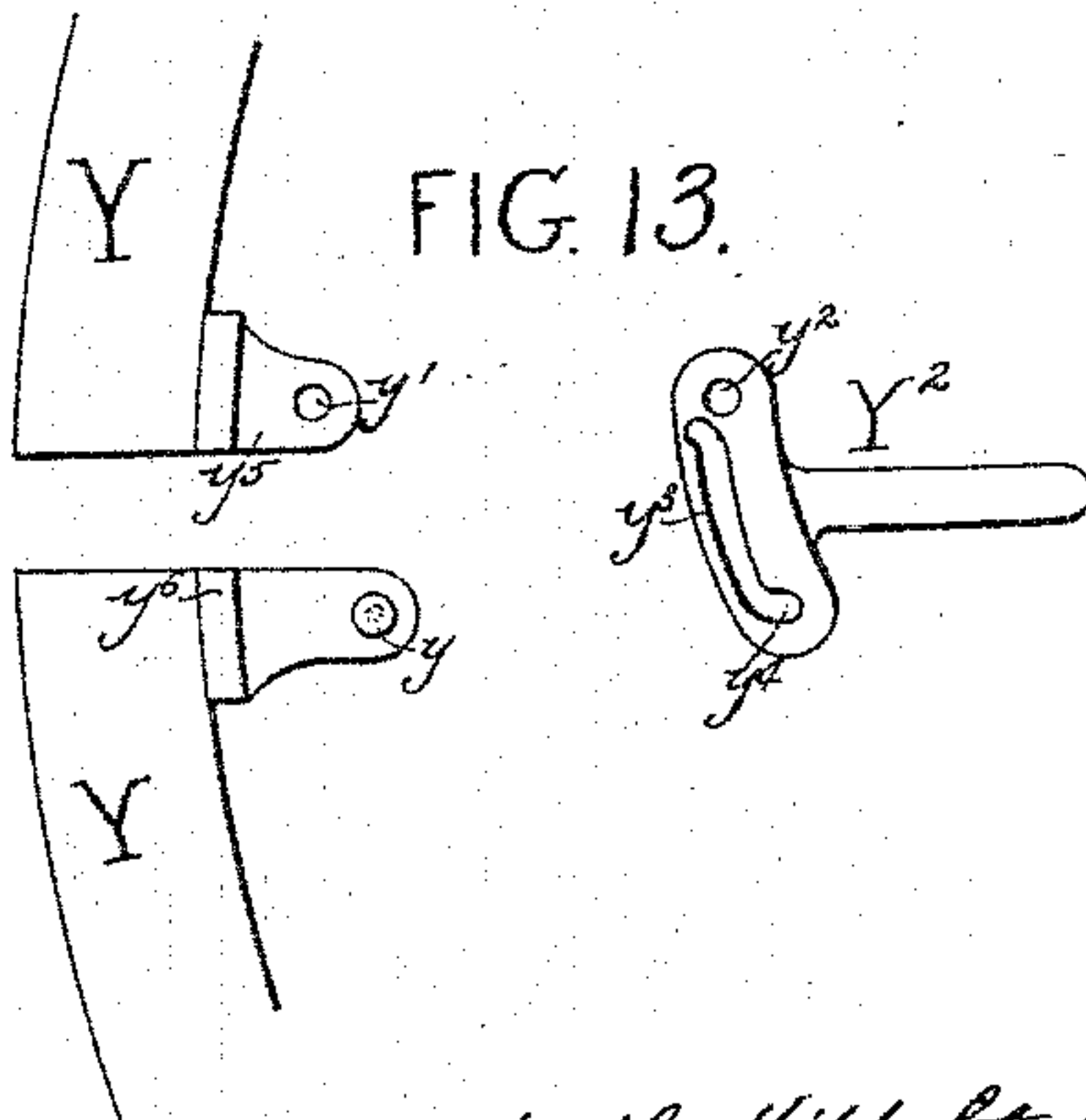


FIG. 13.



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UNITED STATES PATENT OFFICE.

AIMABLE HIPPOLYTE SORET, OF ELBEUF, AND JACQUES HURTU AND
VICTOR HAUTIN, OF PARIS, FRANCE.

CIRCULAR LOOM.

SPECIFICATION forming part of Letters Patent No. 491,324, dated February 7, 1893.

Application filed October 24, 1888. Serial No. 239,083. (No model.) Patented in France February 20, 1888, No. 188,836; in England August 10, 1888, No. 11,521, and in Germany August 21, 1888, No. 47,760.

To all whom it may concern:

Be it known that we, AIMABLE HIPPOLYTE SORET, of Elbeuf, (Seine-Inférieure,) and JACQUES HURTU and VICTOR HAUTIN, of Paris, (Seine,) France, have invented Improvements in Circular Looms, (for which we have obtained Letters Patent in France, No. 188,836, dated February 20, 1888; in Great Britain, No. 11,521, dated August 10, 1888, and in Germany, No. 47,760, dated August 21, 1888,) of which the following is a specification.

This invention relates to circular looms for weaving textile fabrics and has for its object to insure a regular action of the mechanism and obtaining fabrics in which the tension of the warp and weft threads is equalized.

The main features of our invention are: First. The action of the shuttles and their mode of advancing between the warp threads. Second. The method of driving these shuttles by a divided batten which also serves to beat up the weft threads. Third. Method of taking up the woven fabrics by means of hoops partaking of reciprocating vertical movements.

The loom admits of the use of a Jacquard mechanism and is under the control of an attendant who stands in the center of the machine.

Our invention involves no alteration in the structure or formation of the fabric which is produced as in ordinary looms by the introduction of a weft thread in the shed or opening of the warp threads and we will consequently confine ourselves to describing the particular arrangements and action of the parts which we have invented.

Referring to the accompanying drawings, Figure 1 represents in vertical section, taken through the axis, a circular loom according to this invention and illustrates the starting motion, the mechanism for opening the shed, taking up the fabric, &c. Fig. 2 represents a partial plan of the loom, the upper part being removed. Fig. 3 represents a partial plan of the upper part of the side opposite to that represented in Fig. 2, and showing the Jacquard mechanism in its position at the upper part of the loom. Fig. 4 represents a vertical section taken through the axis of one of

the jacquards and illustrating the arrangement of the cords or chains working the heddles. Figs. 5 and 6 illustrate in elevation and in plan respectively a modification of the arrangement of the divided batten and of the shuttle which it drives. Fig. 7 illustrates the improved arrangement of the beam with a brake. Figs. 8 and 9 represent different views of the several arrangements of the divided batten. Figs. 10, 11 and 12 illustrate separately the shuttle, its mode of traveling in the opening of the warp threads and the beating up of the weft. Fig. 13 is a view on a larger scale of a detail.

The circular loom illustrated in Figs. 1, 2, 3, is constructed with a framework composed of uprights A suitably fixed or supported on the floor and connected together by rigid rings or other suitable supports. These uprights carry the reels or beams C for the warp threads, the internal and external breast beams I and D respectively, the Jacquard mechanism B, the external platform G and a radially slotted table J. At the center of this framework there is a support F carrying an internal platform G' provided at its circumference with four vertical guides or slides H supporting the inner edge of the table J. The platform G' carries a central hollow pillar K supporting at its upper part a starting mechanism P' for starting and stopping the weaving mechanism and also supporting the parts controlling the taking up of the fabric, the mechanism for feeding forward the material being situated in the interior of the said pillar. Mechanism connected with the starting of the loom and the taking up of the fabric is also arranged at the lower part of the frame underneath the platform G'.

The warp beams C, any suitable number of which may be employed, are arranged around the loom and are provided with a brake which impedes the too rapid unwinding of the thread. This brake (see Fig. 7) is provided with a strap embracing a brake pulley, and being attached at one end to the frame and at the other to a lever E loaded with suitable weights according to the amount of retarding friction which it is desired to exert on the beam. The beams C are removable so that

they can be replaced by full beams when empty. The warp threads are drawn from the beams C over rods C⁵, Figs 1 and 2, which direct the threads tangentially over the outer breast beam D, Figs. 5 and 6, and equalize the length and tension of the said threads during the whole of the period of the formation of the fabric. The said rods obviate the inconvenience that would otherwise arise from the polygonal arrangement or grouping of the beams around the loom and the gradual diminution of their diameters. The progress of the unwinding may be watched by a boy or attendant stationed on the outer platform G'. The outer beam D, over which the warp threads from the beams C are drawn may be composed of a series of short loose rollers working on a bar or rod of suitable shape, Figs. 1 and 2, or it may consist of rigid bars or segments connecting the uprights, Fig. 5.

The leaves N, (Figs. 1 and 2,) which are employed to operate the warp and form the shed, are divided into a series of independent sections each containing a suitable number of heddles. The loom represented by way of example in the drawings is arranged for four sections each containing ten heddles. Each leaf is formed by two flat bars *n* and *n'* of iron bent to the required curve according to their distance from the center, and guided at their extremities in guides *c* (Figs. 1, 2 and 6) attached to the uprights of the frame. Each leaf carries a series of heddles stretched vertically between the bars *n n'* and carrying suitable eyes at the center for the passage of the warp threads. These leaves and heddles which open the warp threads being well known it is unnecessary to give further details with regard to their construction and action, but it must be understood that owing to their curvature they are suspended on vertical lines passing through their centers of gravity by means of attachments A⁴, Figs. 1 and 5. Moreover the leaves are suspended from the hook of the jacquard by means of chains E guided by rods *b* attached to their extremities (Fig. 1.)

The jacquards B, which control the action of the leaves, are arranged at the upper part of the loom, Figs. 1, 3 and 4, and receive motion from a shaft B' operated by the main shaft A' by suitable gearing. The jacquards operate in the usual manner, but act alternately to change the position of the warp in opening the shed for the passage of the weft. The loom in the example illustrated being divided into four sections, the Jacquard mechanism is similarly divided and works in pairs, there being two shuttles.

The divided batten of sley hereinbefore referred to is made in separate parts and is guided in the slots in the table J, Figs. 1 and 2; each of the said parts is composed of a rocking rod or arm M, (Figs. 1 and 9,) at the upper extremity of which there are attached a number of thin steel plates O separated by washers or distance pieces of suitable thickness, and con-

nected together by a rivet *a*, the warp threads passing through the open spaces between the said plates. These plates are cut to a shape which facilitates the progress of the shuttle B⁴ (Figs. 2 and 6). At the lower part of the arm M there is a loose bowl or roller M' working in a groove in an annular cam P, Fig. 1, which imparts to the arms the movements necessary to admit of the passage of the shuttle B⁴. These arms may be differently arranged as indicated in Figs. 5 and 8. In Fig. 8 the blades are attached to a sliding bar M¹⁰ guided on the slotted table J being provided at its lower part by the bowl which works in the cam groove P. The divided batten is worked by the cam P carried by supports Q (Figs. 1 and 5) formed in one with a toothed bevel wheel R working on the central support E and driven by a corresponding bevel pinion L fixed on the main driving shaft A'. The groove of this cam is made with curves or inclines which move back the battens O in order to allow the shuttle B⁴ to pass and then cause them to move forward or close up behind the shuttle so as to push it forward and compel it to travel round the loom according to the movements of the annular cam P (Figs. 2 and 6).

The shuttle B⁴ placed in the open angle formed by the warp threads is provided at its front end with a lens shaped roller or wheel C⁴, Figs. 1, 2, 10 and 11 and at the hinder end with a similar roller D⁴ which roll on the last crossing of the warp threads and press thereon, thus traveling along the circular shed. The middle part of the shuttle, of circular form, contains a bobbin carrying the weft thread. The tube E⁴ guides the weft thread and places it in front of the edge of the wheel D⁴ which rolls on the thread and lays it in the place which it has to occupy in the fabric. This wheel having rolled over the thread the batten closes up immediately behind the shuttle, finishing the beating up of the weft and maintaining it until the next crossing of the warp. While one shuttle is traveling round one quarter of the circumference of the loom the warp threads in the succeeding quarter are shifted and the shed reopened so that the two shuttles are enabled to advance following one another in their circular path without any stops and depositing the weft thread in the different sheds. The speed at which the shuttles move being relatively slower than in rectilinear looms the weft thread may be stretched and introduced into the fabric in this condition without risk of breakage. Notwithstanding this the weaving progresses faster, the shuttle not being stopped as in rectilinear looms. Another effect resulting from this arrangement is that the weft thread is firmly pressed up between the warp threads by the action of the traveling wheels of the shuttle and the intimate or close contact of the threads is completed by the batten acting directly behind the shuttle.

Fig. 6 illustrates a modified form of the

shuttle which may be employed with advantage in certain kinds of work. As the shuttle travels along the shed the front wheel C¹ produces a depression in the fabric, Fig. 10, which is utilized to support the wheel and facilitate the motion. With this object the rings or annular plates I and Z, Figs. 1 and 11, supporting the fabric in course of formation are arranged to form a tangent with the curve of the depression produced by the wheel D⁴ so that the said wheel is supported thereon and its rolling action is facilitated. It will be observed that the wheel is held out of contact with the said rings by the warp threads only. The fabric expanding immediately behind the wheel D⁴ projects slightly from the edges of the rings I Z and allows the batten O, Fig. 12, to perform the beating up of the weft against the said rings. The taking up of the fabric produced is performed by means of a loop or annular clamp X, Figs. 1 and 5, against the inner edge of which the fabric is nipped or held by an open ring Y which is expanded or contracted so as to hold or release the fabric by means of a cam Y², Figs. 2 and 13, provided at the opening in the ring.

Fig. 13 shows in detail the means for expanding the open ring Y. On the ends formed by the opening of the ring are brackets y⁵ y⁶. The cam Y² is pivoted at its end y² to one of the brackets, y⁵, at y⁷. A pin y on the bracket y⁶ works in the groove y³ y⁴ in the cam Y². As this cam is pushed outward the pin y will slide along the groove y³ and enter the curved part y⁴, and in this position will hold the ring in its expanded position, as the cam is drawn inward, the pin y sliding in the groove y³ allows the ring Y to contract. The hoop X is provided with nuts V in which work vertical screws S which by the intervention of bevel wheels s and radially arranged shafts T are driven by a central bevel wheel S². These screws S raise or lower the clamp formed by the hoops or rings X and Y. The said wheel S² is connected to a shaft U by means of a friction cone or clutch R² operated by the lever T², rings U², helical spring V² and the adjusting screw X². By working this screw the attendant stationed on the platform G' is enabled to release the clutch and disconnect the wheel S² in order to arrest the movement of the screws and consequently also that of the hoop X. The shaft U is driven by the shaft I' which receives motion from the shaft A', when the hoop X is to be moved downward, and from a bolt working on a pulley X', when the hoop is to be moved upward, as hereinafter explained. The shaft A' drives the shaft I' by means of an eccentric T' acting through a pawl lever upon a ratchet wheel U' which imparts a step-by-step motion to the shaft I' in a suitable direction for taking up the fabric. The pulley X' on the contrary causes the shaft I' to rotate in the direction required for raising the hoop X. It is consequently necessary to arrange the ratchet wheel U' and

the pulley X' loosely upon the shaft I' and to place a clutch mechanism between them so as to alternately connect and disconnect them from the shaft. This clutch marked V' in Figs. 1 and 2 is worked by the attendant by means of a cam Y' at the upper part of the pillar K operating a vertical rod Q' connected to a bell crank lever R', rod S', and a lever L' working in the throat or groove of the clutch. When the hoops X Y have been slowly brought down by the aforesaid step-by-step motion to the bottom of their stroke, the loom is stopped as hereinafter described and the fabric is clamped to the breast beam I by the hoop Z, which is constructed to be tightened in a similar manner to the hoop Y. This being done the hoop Y is loosened by acting on the cam Y² and the pulley X' is put in gear in order to rapidly elevate the hoop X. At the same time the hoop Y is raised by working a winch Z² connected to the said hoop by suitable cords z. The hoop Y is tightened in the hoop X when the motion of the hoop X has been arrested. Then the fabric between the hoops Z and X is stretched by turning a crank handle Z' on the upper extremity of the shaft U. The hoop Z is now loosened, the ratchet wheel U' is put in gear and the loom started afresh.

The mechanism for starting and stopping the loom is situated on the main shaft A' supported by bearings cast or otherwise attached to a base or support W, Figs. 1 and 2, and consists of a loose pulley J' driven by a belt and provided with a friction cone K' which is incapable of rotation independent of the shaft A', but can slide longitudinally thereon. On being pressed toward the pulley J' the cone causes the shaft A' to rotate with a speed proportionate to the pressure exerted. On being brought back in the opposite direction toward a fixed ring O' it renders the shaft A' immovable, stopping with it a quickness proportionate to the pressure exerted. This friction cone or clutch is worked by a lever L² moved by a rod S'', a bell crank lever R'', a rod Q'', and a cam P' situated at the center of the loom at the upper part of the pillar K within convenient reach of the attendant stationed on the platform G'. The fabric woven in a tubular form as herein before described is afterward cut in a longitudinal or helical direction according as it is desired to obtain pieces of material of great width or pieces in which the warp threads and the weft threads are equally inclined or oblique relatively to the direction of the length of the piece. In the first case there is a saving owing to the avoidance of waste, in the second case greater strength is obtained for clothing purposes.

The circular loom herein described with reference to the drawings, by way of example only, may be modified as regards the dimensions and may be arranged with one shuttle and two sections of leaves or with two shuttles and four sections (as in the example illus-

trated) or with four shuttles and eight sections, and so on, this being rendered possible owing to the smallness of the shuttles relatively to the length of the circumference. In like manner each section of leaves can be provided with any suitable number of leaves to accommodate them to the Jacquard mechanism employed according to the pattern or tie up.

10 We claim as our invention:—

1. In circular looms a device for taking up the woven fabric consisting of two hoops, a cam to press the one against the other, and mechanism substantially as described for lowering the hoops step by step, substantially as set forth.

2. In circular looms a device for taking up the woven fabric consisting of hoops, a cam to press the one against the other, mechanism substantially as described for lowering the hoops step by step, and devices for rapidly raising the hoops to again grasp the cloth, substantially as set forth.

3. In a circular loom, the combination of the inner breast-beam, and a hoop Z, with a shuttle provided with lenticular wheels which bear against the breast-beam and hoop, and a divided batten and means to reciprocate the latter to close in behind the shuttle and propel it forward, and to complete the beating up of the weft, substantially as set forth.

4. In a circular loom the combination of a circular breast-beam, a divided batten surrounding the breast-beam, heddles outside

the batten, beams for the warp and an external platform for the attendant watching the bobbins, with an internal platform, take-up mechanism inside the breast-beam, and mechanism for stopping and starting the loom and for operating the take-up device, located at or near the center of the internal platform and within reach of the weaver on the internal platform, substantially as described.

5. A circular loom comprising beams provided with brakes, Jacquard mechanism, heddles operated by the Jacquard mechanism, a breast-beam, a hoop adapted to be closed down upon the breast-beam, shuttles adapted to bear against the breast-beam and hoops, battens to act on the shuttles, a cam adapted to oscillate the battens, a take-up device consisting of vertically reciprocating hoops, starting and stopping devices and mechanism to operate the movable parts, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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