

No. 682,295.

Patented Sept. 10, 1901.

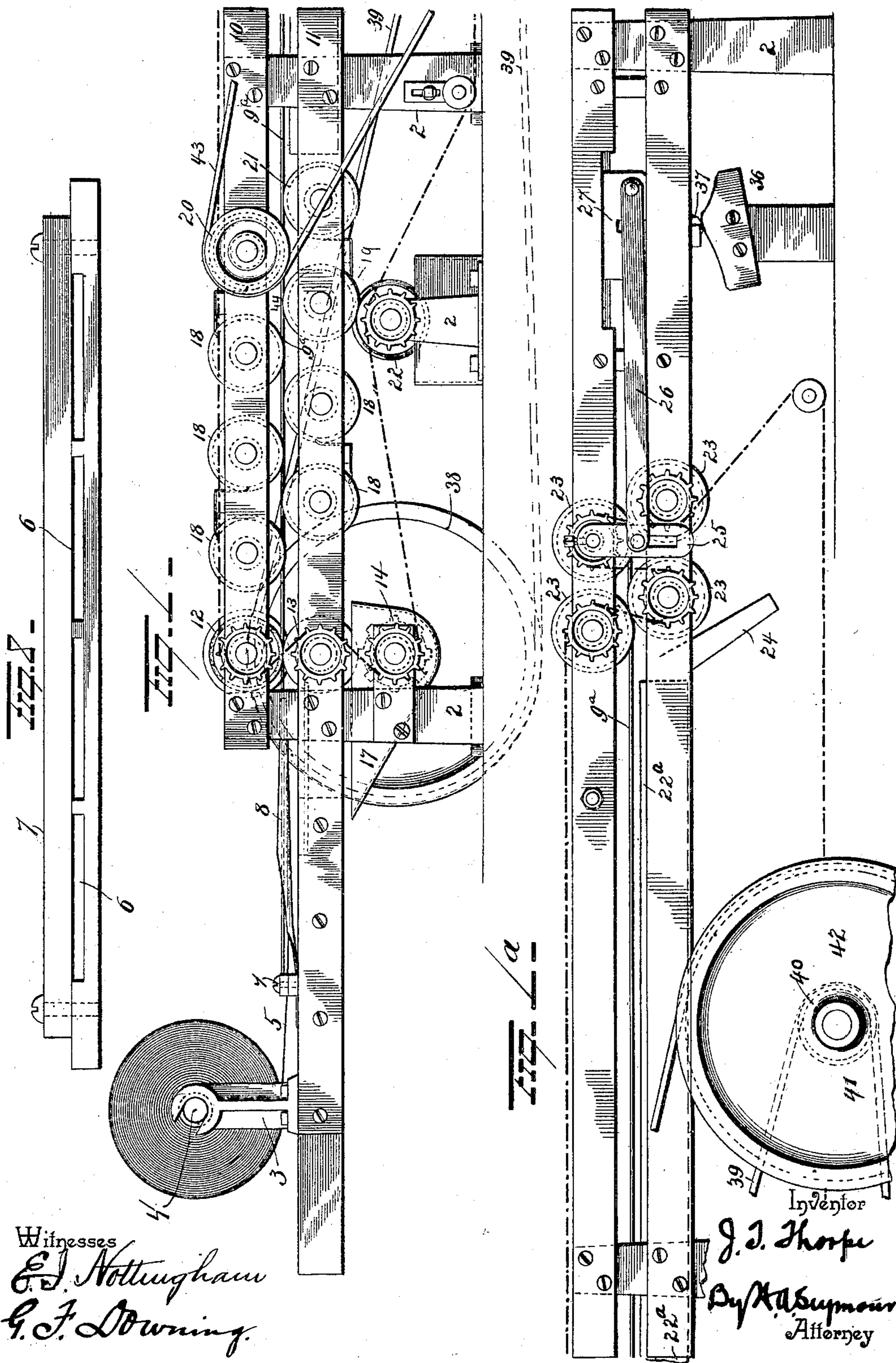
J. T. THORPE.

MACHINE FOR FORMING PAPER TUBES.

(Application filed Jan. 15, 1897.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses  
E. J. Nottingham  
G. F. Downing.

Inventor  
J. T. Thorpe  
By D. A. Supmaur  
Attorney

No. 682,295.

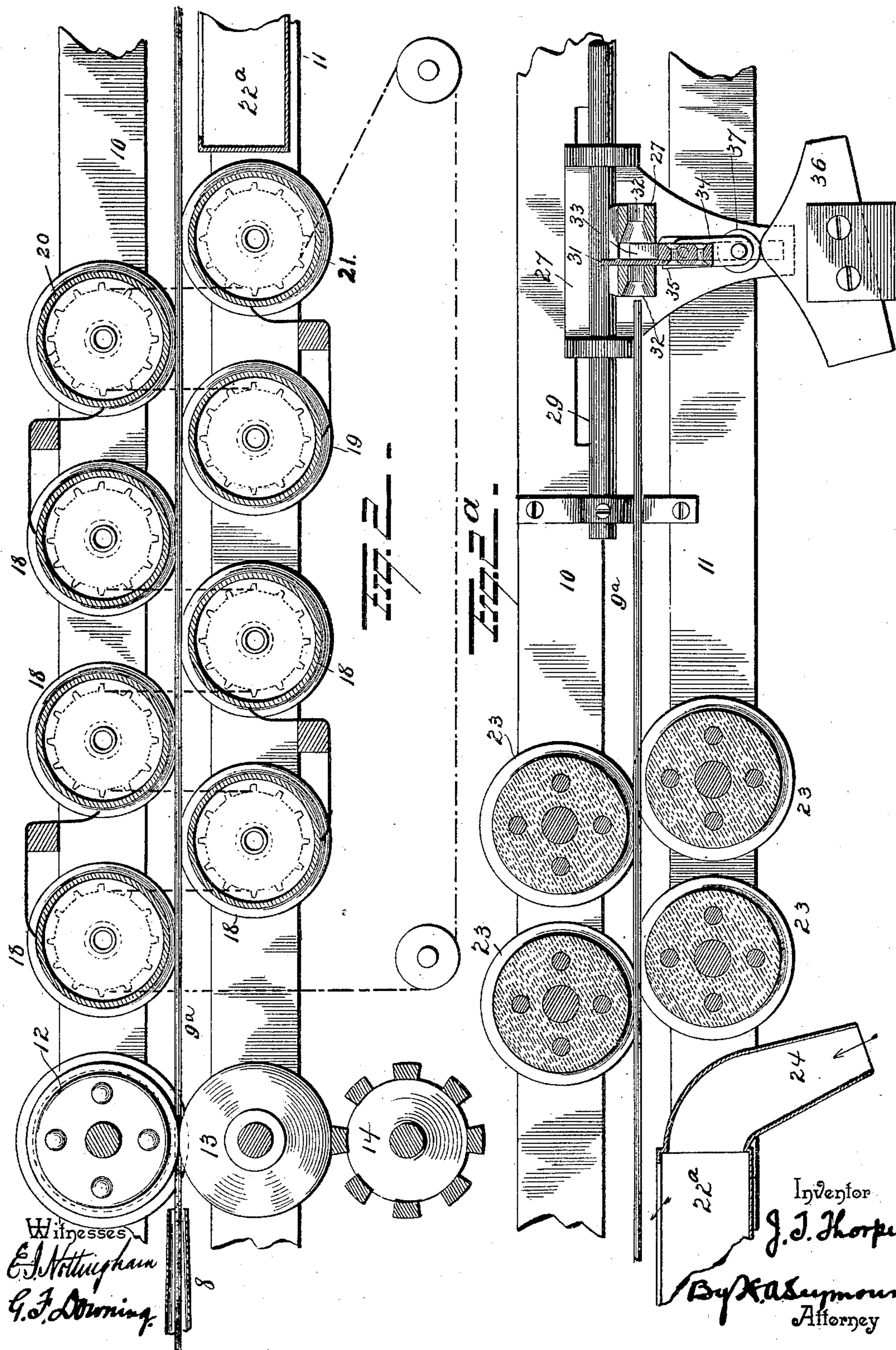
Patented Sept. 10, 1901.

J. T. THORPE.  
MACHINE FOR FORMING PAPER TUBES.

(Application filed Jan. 15, 1897.)

(No Model.)

4 Sheets—Sheet 2.



**No. 682,295.**

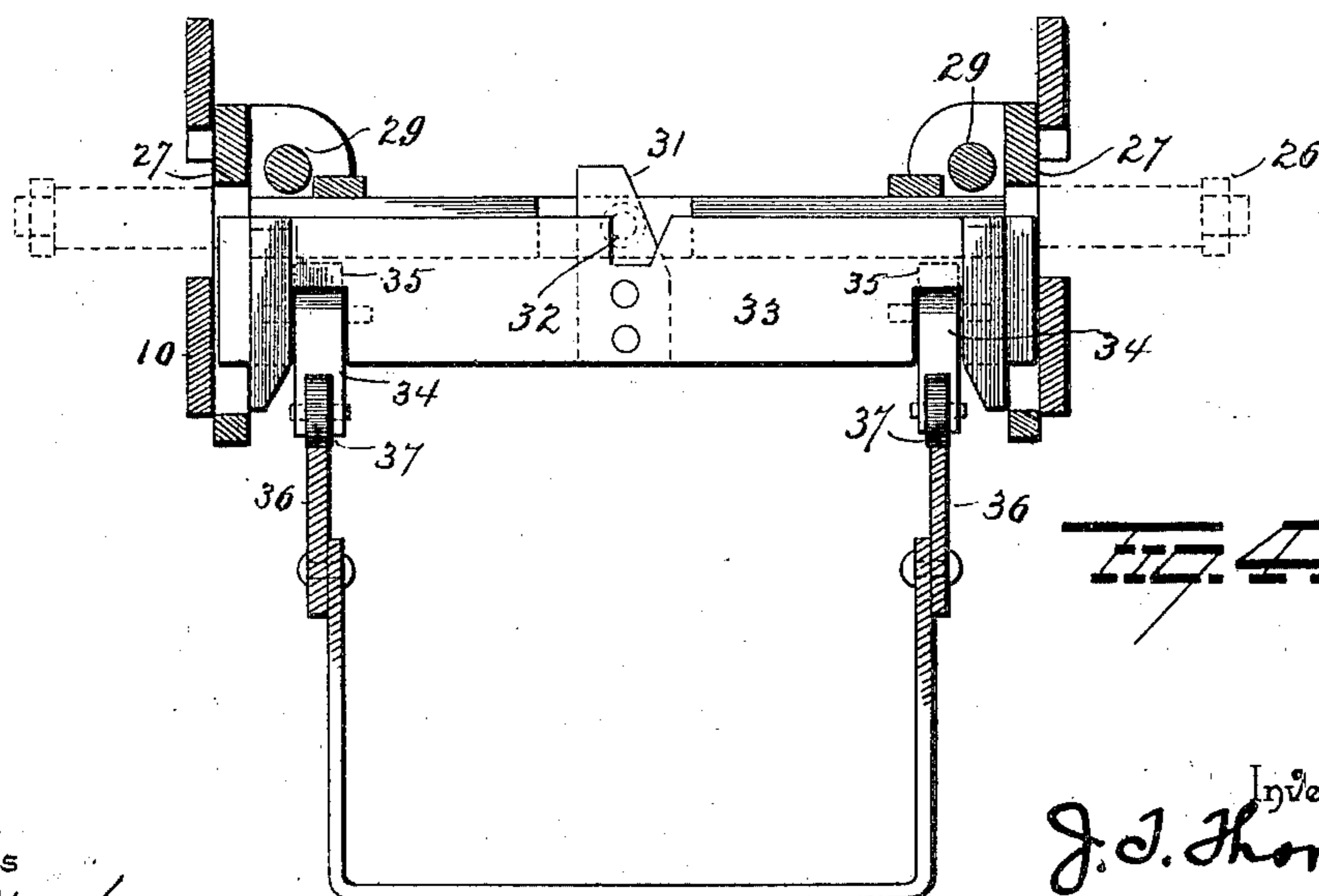
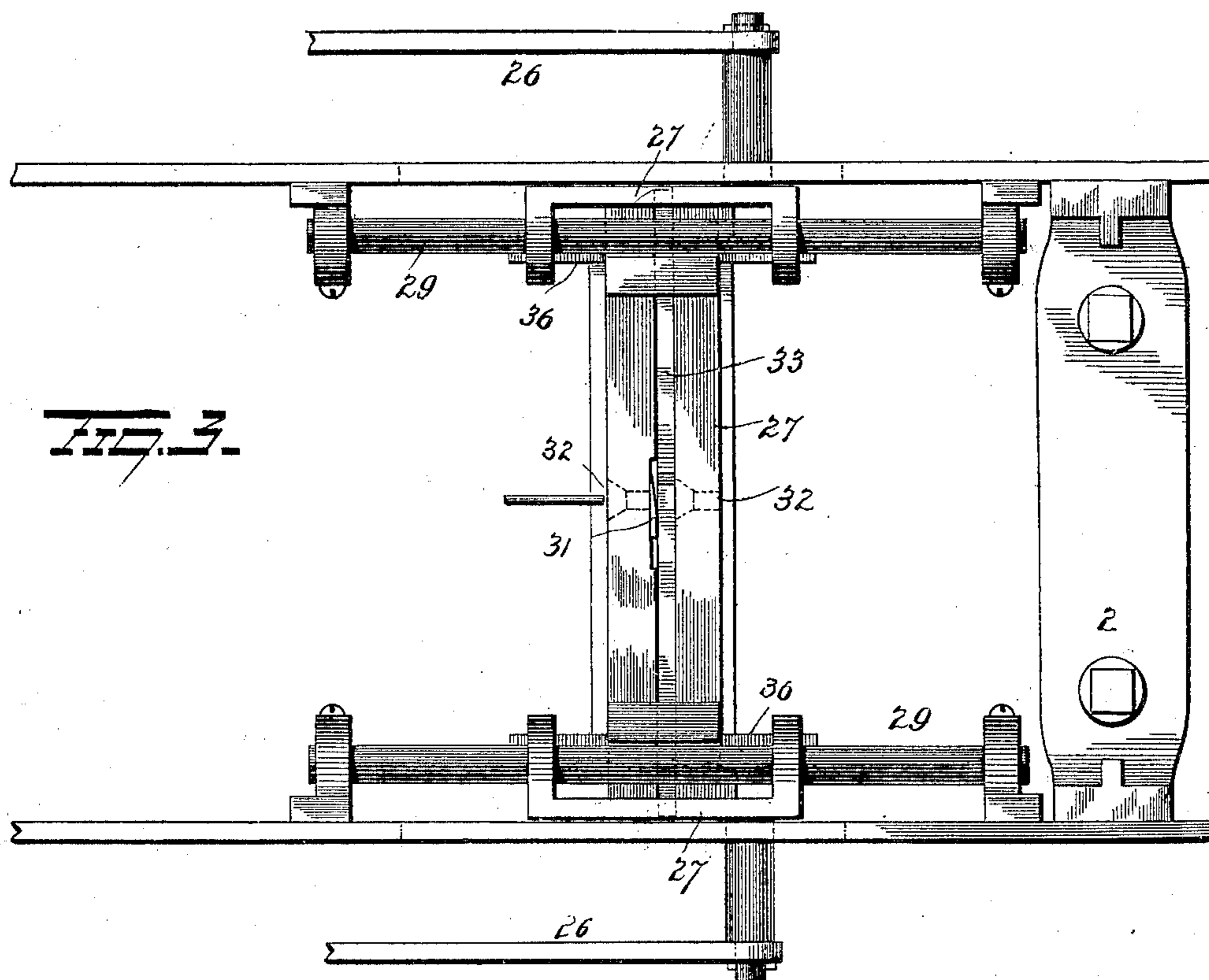
**Patented Sept. 10, 1901.**

**J. T. THORPE.**  
**MACHINE FOR FORMING PAPER TUBES.**

(Application filed Jan. 15, 1897.)

(No Model.)

**4 Sheets—Sheet 3.**



Witnesses  
E. J. Nottingham  
G. F. Downing.

Inventor  
J. J. Thorpe  
By H. A. Seymour  
Attorney

No. 682,295.

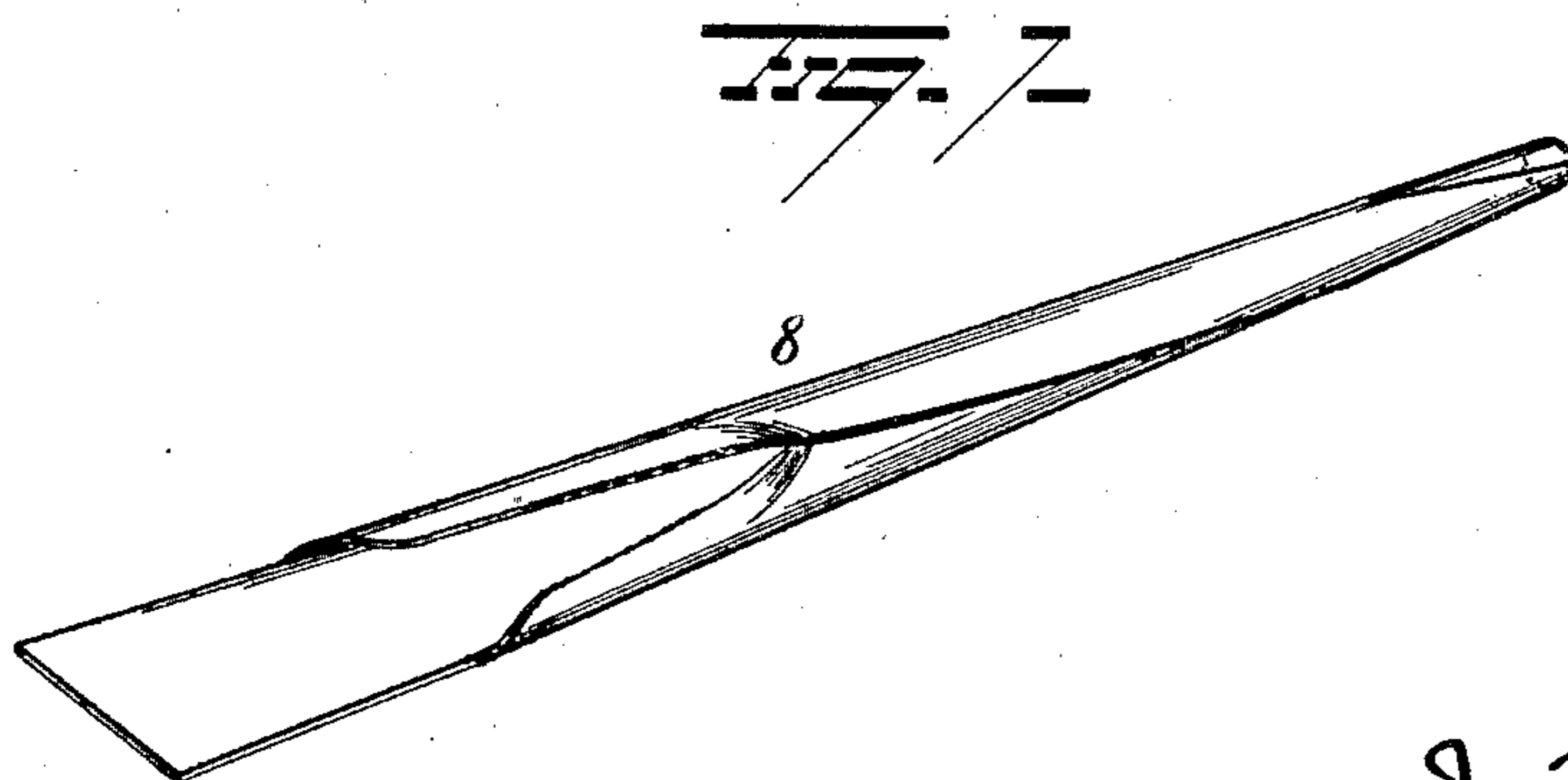
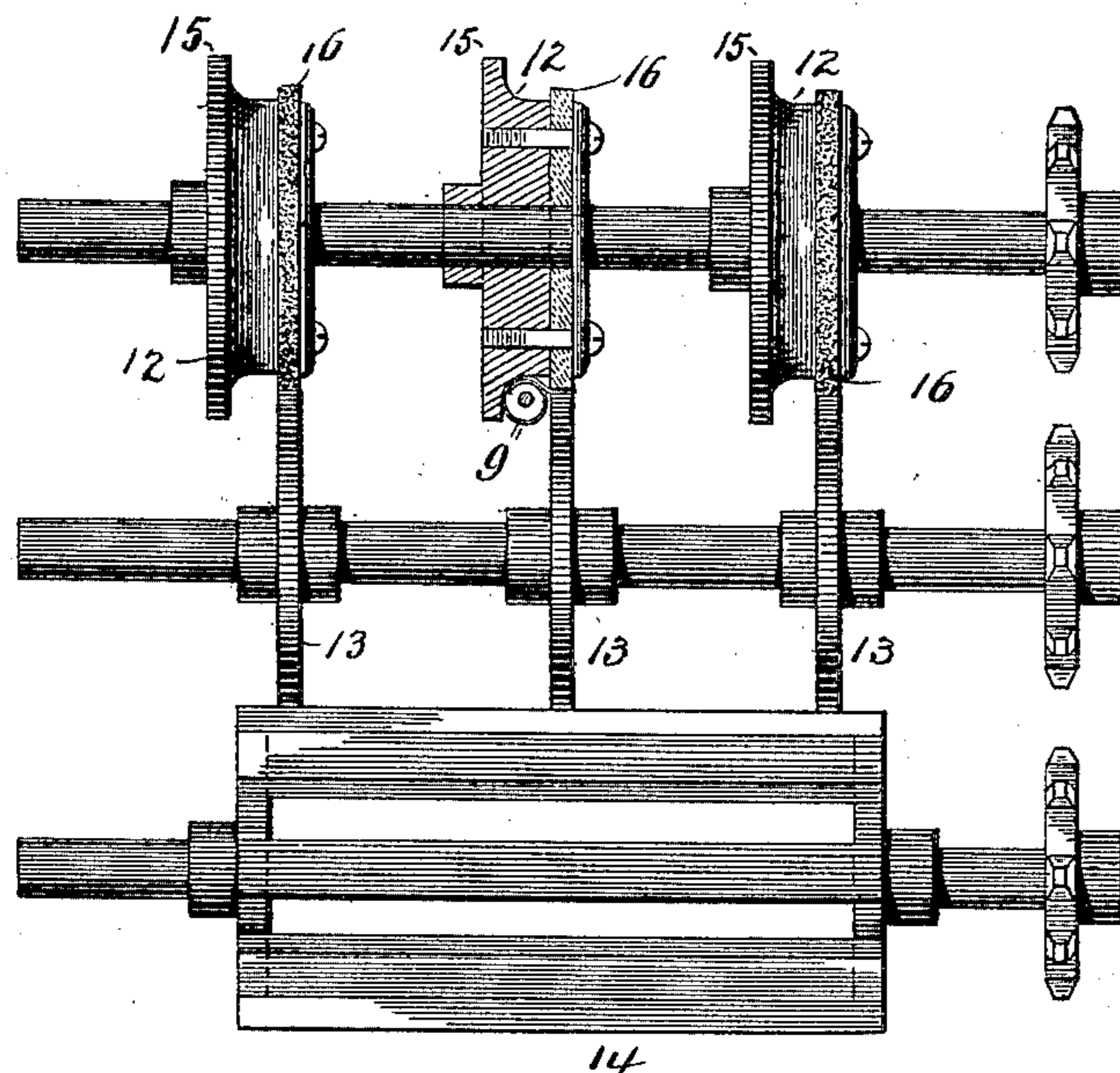
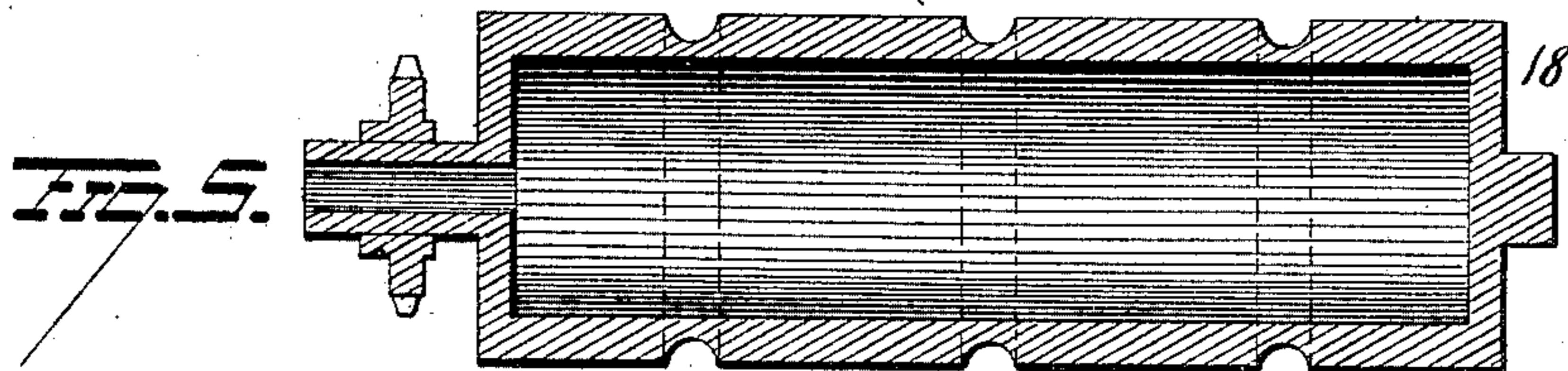
Patented Sept. 10, 1901.

J. T. THORPE.  
MACHINE FOR FORMING PAPER TUBES.

(Application filed Jan. 15, 1897.)

(No Model.)

4 Sheets—Sheet 4.



Witnesses

E. J. Nottingham.  
G. F. Downing.

Inventor

J. T. Thorpe

By H. A. Symonds.  
Attorney

# UNITED STATES PATENT OFFICE.

JOHN T. THORPE, OF WASHINGTON, DISTRICT OF COLUMBIA.

## MACHINE FOR FORMING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 682,295, dated September 10, 1901.

Application filed January 15, 1897. Serial No. 619,330. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN T. THORPE, of Washington, District of Columbia, have invented certain new and useful Improvements in Machines for Forming Paper Tubes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in machines for making tubes, and more particularly imbibing-tubes, in imitation of the straws used for imbibing liquids; and my invention consists in mechanism for folding paper fed from a continuous strip into tubular form, applying an adhesive material to the overlapping side edge of the tube, folding said side edge down onto the tube, drying the adhesive material, and finally severing the continuous tube thus formed into short lengths.

My invention further consists in mechanism for applying a coating of wax to the continuous tube and for calendering the latter before it is severed into short lengths.

My invention further consists in the continuous operation of shaping a strip of flexible material into tubular form, pasting the overlapping edge to the body of the tube, heating the tube to dry the paste, waxing the outer surface of the tube, and finally severing the end of the tube from the body.

My invention further consists in parts and combinations of parts, as will be more fully explained, and pointed out in the claims.

In the accompanying drawings, Figures 1 and 1<sup>a</sup> are views in side elevation of the machine, Fig. 1<sup>a</sup> being a continuation of the part shown in Fig. 1. Fig. 2 is an enlarged view in section of the pasting, drying, and waxing wheels. Fig. 2<sup>a</sup>, which is a continuation of the section of frame shown in Fig. 2, is a similar view showing the drawing-wheels and cutter. Fig. 3 is a view in plan of the cutter. Fig. 4 is a view in elevation of same. Fig. 5 is a view of a drying-cylinder constructed for use on a machine making three tubes at a time. Fig. 6 is a view of a battery of pasting-rolls. Fig. 7 is a view of the former, and Fig. 8 is a view of the paper-guide.

While my machine is intended and designed for the manufacture of a plurality of

tubes at the same time, I have shown in the main figures of the drawings simply the mechanism and devices for forming a single tube and severing same into proper lengths. The devices for forming each additional tube would simply be a duplication of the mechanism illustrated.

The frame of the apparatus may be of any approved construction mounted on the legs 2. This frame is shown on Sheet 1 of the drawings, the portion Fig. 1<sup>a</sup> thereof being a continuation of the portion shown in Fig. 1. This frame carries near one end the brackets 3, on which the roller 4, carrying the paper-rolls, is mounted. This roller 4 extends transversely the frame and carries as many rollers as there are formers. The paper strip 5, which is of a width sufficient to form a single tube, is first passed through a slot 6 in the paper-guide 7, and passes from thence into and through the former 8. The paper-guide 7 extends transversely of the machine and is provided with a slot 6 for each strip, the several formers being in a line with the slots in the guide. The formers 8, one for each paper strip, are preferably made of sheet metal the side edges of which are turned so as to gradually convert the flat paper strip into a tube 9, with one edge overlapping the other, as clearly shown in Fig. 6. Extending from the paper-guide 7, as clearly shown in Fig. 1, is the rod or mandrel 9. This rod 9 passes through the former 8, as shown in Fig. 2, and through and between the pasting, drying, and waxing rollers or pulleys. This rod is supported on the lower series of rolls, between which it passes, and is of sufficient stiffness to support the continuous tube as it passes between the several rollers or pulleys and prevents distortion of the tube while the latter is passing between the several wheels, rollers, or cylinders. The frame, starting from a point adjacent to the inner end of the former 8, is composed of upper and lower sections 10 and 11, which latter support bearings for upper and lower series of pulleys or rollers. The first series of rollers encountered by the paper tube as it emerges from the former is the pasting-rollers 12, 13, and 14. These rollers are located in the same vertical plane and are designed to supply paste to the under side of the overlapping flap or side edge of the tube

throughout its entire length, so as to effect a complete closure of the tube at the side. The upper roller 12 is preferably made of metal and provided on its periphery with a groove formed in the arc of a circle, the groove being bounded on one side with a flange 15, integral with the roller, and on its other side with a flange 16, preferably formed of rubber and secured to the body of the roller by screws, as shown in Fig. 6. The tube as it emerges from the former enters the groove in the wheel 12, with its free edge projecting outwardly in line with and immediately under flange 16. The pasting-wheel 13 is located immediately below flange 16 and is supplied with paste by the feeding-wheel 14, which latter is located within the vessel 17, designed to hold paste, and consists of two heads carrying a series of slats or bars. These slats or bars are adapted to be moved through the vessel 17, take up paste therefrom and deposit it on the pasting-wheels 13. These wheels or rollers are all positively actuated, the rollers 12 and 13 rotating in a direction to pull the paper through the former 8. Hence it will be seen that paste is continuously supplied to the wheel 13, which deposits it on the under side of the overlapping edge of the tube 9. The tube thus formed and supplied with paste passes from between rollers 12 and 13 to the rollers 18, which latter are provided with semicircular grooves. These grooves force the overlapping side edge of the tube down onto the body of the tube, and as the rollers 18 are heated it will be seen that by the time the tube passes the last of the series of rollers 18 the paste employed has been thoroughly dried and the overlapping edge firmly united to the body of the tube. Where the machine is in battery form, or, that is, where there are a plurality of tube-formers on a single frame, I would construct the rollers 18 as shown in Fig. 5, which discloses a single roller or cylinder having a plurality of semicircular grooves. While I have only shown the roller or cylinder with three grooves therein, I would have it understood that I am not limited as to number. These rollers are preferably hollow and are heated by the combustion of gas therein, by means of steam, or in any other approved manner. After the tube has been shaped and its overlapping edge pasted or cemented to the body of the tube it is passed between the waxing-rollers 19, 20, and 21. The lower roller 19 of the series moves in contact with the roller 22, the periphery of which moves in a vessel containing melted paraffin or other wax or other material employed in waterproofing the tubes. This roller 22 is provided with a convex periphery of a shape and size to conform to the groove in roller 19 and operates to keep the groove coated with the wax or other waterproofing material. These rollers are all hollow and heated, as previously described, and hence the wax as it is brought into contact with the paper tube is in a fluid condition,

and as the paper is absorbent and heated to a certain extent the wax deposited thereon by the roller 19 spreads itself over the entire tube and is evenly distributed over same during its passage between the heated rollers 20 and 21. If desired, the wax or other material can be supplied from above onto wheel 20 as well as below; but it has been found in actual practice that the wax deposited onto the tube (by a roller embracing the lower half of a tube) of absorbent material evenly distributes itself throughout the tube and thoroughly coats same. The tube after it has been coated with wax, as above described, passes over the cooling-chamber 22<sup>a</sup> and between the drawing-rolls 23. The cooling-chamber is an elongated box extending lengthwise the machine provided on its upper surface with a series of slits or slots through which air, forced into the box by a blower connected with pipes 24, escapes and comes in contact with the coated tube, which latter in its passage to the drawing-rollers passes over and in close proximity to the slotted top of the box. The tube is thoroughly dried in its passage over the cooling-box, and after it passes beyond the latter it enters between the drawing-rollers 23. These rollers are made of rubber, with peripheral grooves conforming in shape with the tube and are designed by their frictional contact with the tube to keep it taut and draw it steadily along. The shaft-carrying roller 23 is provided, preferably, at both ends with the cranks 25, to which are connected the pitmen 26, only one of which, however, is shown in Fig. 1<sup>a</sup>. These pitmen are connected at their rear ends to the sliding frame 27, which latter carries the vertically-sliding frame 33. The sliding frame 27 is mounted at its ends on the rods 29 and carries the vertically-sliding frame 33.

From the foregoing it will be seen that as the paper is fed through the former and between the several rollers described the frame carrying the vertically-movable frame is moved with the tube and at equal rate of speed. This is essential in order to produce a straight cut. The frame 27 is provided with an opening 32 in line with the rod 9<sup>a</sup>, the end of the opening being enlarged so as to allow ample room for the passage of the tube and to prevent the tube coming in contact with any angles during the return movement of the frame 27, which contact would not only injure the tube, but would interfere seriously with the progressive movement thereof.

Mounted within the frame 27 is the vertically-sliding bar or frame 33, carrying the cutter 31. This bar 33 is supported at its ends against endwise or lateral movement and is provided with a cutter 31 for each tube. This cutter 31 is simply a beveled blade located between the two sections of frame 27 or within a recess in frame 27, and when in its lower and normal position, which it assumes by gravity aided by springs, if necessary, rests

below, so as to uncover the opening 32, and thus permit of the free passage of the tube. The knife-frame 33 carries two legs 34, pivotally secured to said frame, the two legs carrying rollers 37 at their lower ends and provided at their upper ends with toes 35, which prevent the legs from swinging in one direction, but permitting a free swinging movement in the other direction. Located below the frame of the apparatus and under the path traveled by the sliding frame 27 are the cams 36. These cams are in line with the rollers 37, as clearly shown in Fig. 4, and operate to elevate the rollers and frame 33, carrying the cutter or cutters sufficiently to bring the beveled edge of the cutter in contact with the tube and sever it by a straight shear cut. As the frame 27 and cutter or cutters are moving in the direction of feed of the paper tube the toes 35 prevent the legs 34, when the rollers 37 on the latter engage the cams 36, from yielding or turning, but, on the contrary, hold the legs vertically and cause the frame 33, carried by the legs, to rise, thus bringing the cutter or cutters into contact with the tube or tubes. When, however, the frames are moving forwardly or in a direction opposite the direction of movement of the tube, the legs yield when they come in contact with the cams and pass over same without elevating frame 33. With this construction it will be seen that the cutter moves with and at the same rate of speed as the tube and after severing the end of the tube drops below the tube, thus leaving the frame 27, carrying bar 33, to be moved forwardly.

With the apparatus constructed as above described the paper in the form of a narrow ribbon is converted into tubular form, and the overlapping side edges pasted to the body, are then waxed, cooled, and cut into regular lengths in one continuous operation.

In the drawings I have shown a drive-wheel 38, carrying a belt or pulley 39, leading around a smaller pulley 40. This pulley 40 is fast on a shaft 41, carrying the larger pulley 42. This pulley 42 is coupled up by the belt 43 with the pulley 44, fast on the shaft carrying the roller 20.

The several pasting, heating, waxing, and drawing rollers are all coupled up by means of toothed wheels or a sprocket-chain (the latter being shown in the drawings) with the roller 20. Hence as all of the sprocket-wheels are of uniform size it follows that the several rollers move at uniform speed and all rotate in a direction to feed the paper tube toward the cutters.

It is evident that numerous slight changes might be resorted to in the relative arrangement of parts herein described without departing from the spirit and scope of my invention, and hence I would have it understood that I do not limit myself to the precise details of construction herein shown, but con-

sider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for forming tubes having a single straight longitudinal seam, the combination with a former, and a rod located in line with the discharge end of the former, of a pasting-roller for applying paste to the under side of the overlapping edge of the material of the partly-formed tube, and means for forcing the edge with the paste thereon down onto the body of the tube.

2. In an apparatus for forming paper tubes from a continuous strip of paper the combination of a former for shaping the strip, a rod around which the strip is shaped, means for applying adhesive to the overlapping edge of the material of the partly-formed tube and means for forcing the overlapping edge onto the body of the tube.

3. In an apparatus for forming paper tubes, the combination of a former and rollers for applying an adhesive to the overlapping edge of the material of partly-formed tube.

4. In an apparatus for forming paper tubes the combination of a former, rollers for applying an adhesive to the material of the partly-formed tube, means for drying the tube thus formed, and roller for applying wax to the tube.

5. In an apparatus for forming paper tubes from a continuous strip of paper, the combination with means for shaping the strip into tubular form, rolls for feeding or drawing the paper through the shaping means, a rod or core over which the tube is formed, said rod or core passing between the feeding-rollers, means for applying an adhesive to the paper of the partly-formed tube, means for forcing the overlapping edge of the partly-formed tube down onto the body, and a cutter for severing the tube thus formed into short lengths.

6. In an apparatus for forming paper tubes, the combination with a former and means for pasting the free edge of the partly-formed tube to the body of the latter, of a device for drying the pasted tube, and means for waxing the latter.

7. In an apparatus for forming paper tubes the combination of a former means for applying an adhesive to the overlapping edge of the paper of the partly-formed tube, means for drying the tube, means for waxing the same, and means for cooling the waxed tube.

8. In an apparatus for forming paper tubes having a straight longitudinal seam from a continuous strip of paper, the combination with means for shaping the strip into tubular form, rolls for feeding or drawing the paper through the shaping means, a rod or core over which the tube is formed, said rod or core passing between the feeding-rollers, means

for applying an adhesive to the paper of the partly-formed tube, and a cutter for severing the tube thus formed into short lengths.

5 9. In an apparatus for forming paper tubes, the combination with a former for shaping the paper strip and means for applying an adhesive to the overlapping edge of the material of the partly-formed tube, of heated rollers or cylinders having grooves which approxi-  
10 mately embrace the tube, cause the overlapping edge to adhere to the body of the tube and dry the adhesive, substantially as set forth.

15 10. In an apparatus for forming paper tubes, the combination with a former for shaping the paper strip and means for applying an adhesive to the overlapping edge of the material of the partly-formed tube, of grooved rollers or cylinders for drying the tube and  
20 devices for waxing the tube, substantially as set forth.

11. In an apparatus for forming paper

tubes, the combination with a former for shaping a tube from a continuous strip of paper and means for pasting the under side of the overlapping edge of the partially-formed tube to the body of the tube, of heating devices for drying the paste, means for waxing the dried tube, and means for severing the waxed tube into short tubes of approximately equal size. 30

12. In an apparatus for forming paper tubes, the combination with a former for shaping a paper strip of pasting-rolls and a feed-wheel comprising two heads and slats connecting the heads, the said feed-wheel adapted to supply paste to one of said pasting-rolls. 35

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN T. THORPE.

Witnesses:

S. W. FOSTER,

W. CLARENCE DUVALL.