

No. 686,921.

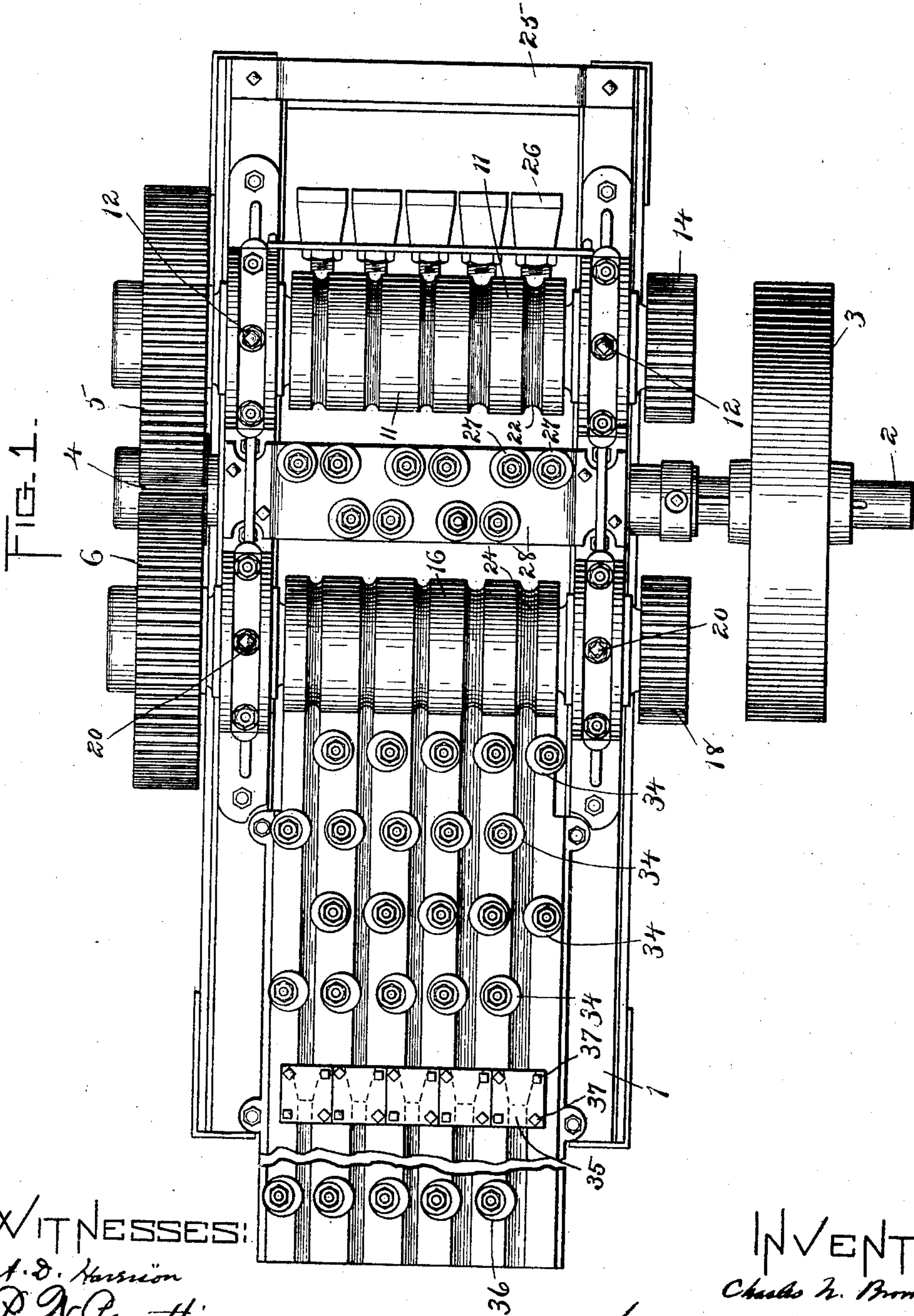
Patented Nov. 19, 1901.

C. N. BROWN.  
MACHINE FOR TREATING METAL PIPES OR TUBING.

(Application filed Dec. 13, 1899.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

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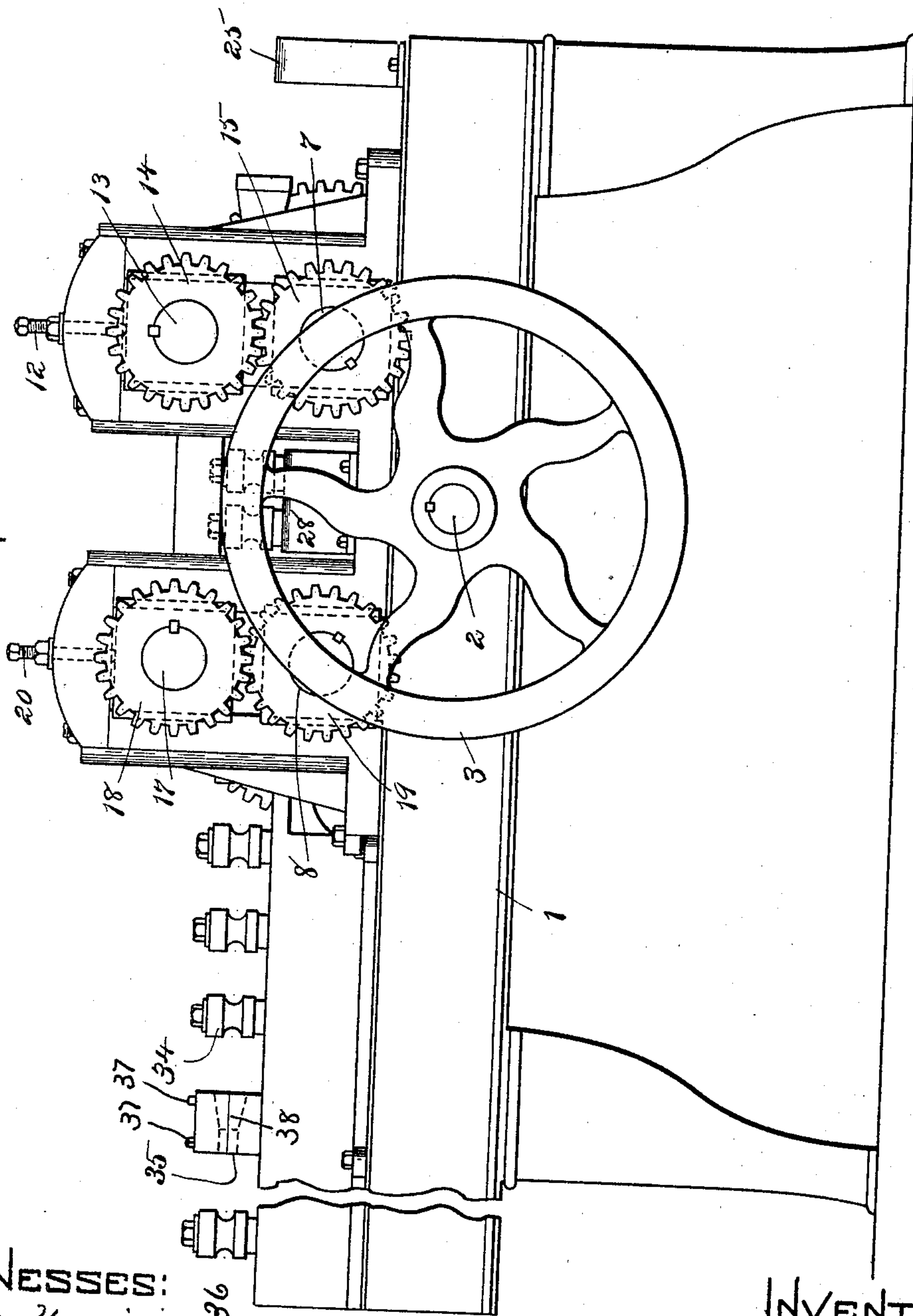
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5 Sheets—Sheet 2

FIG-2-



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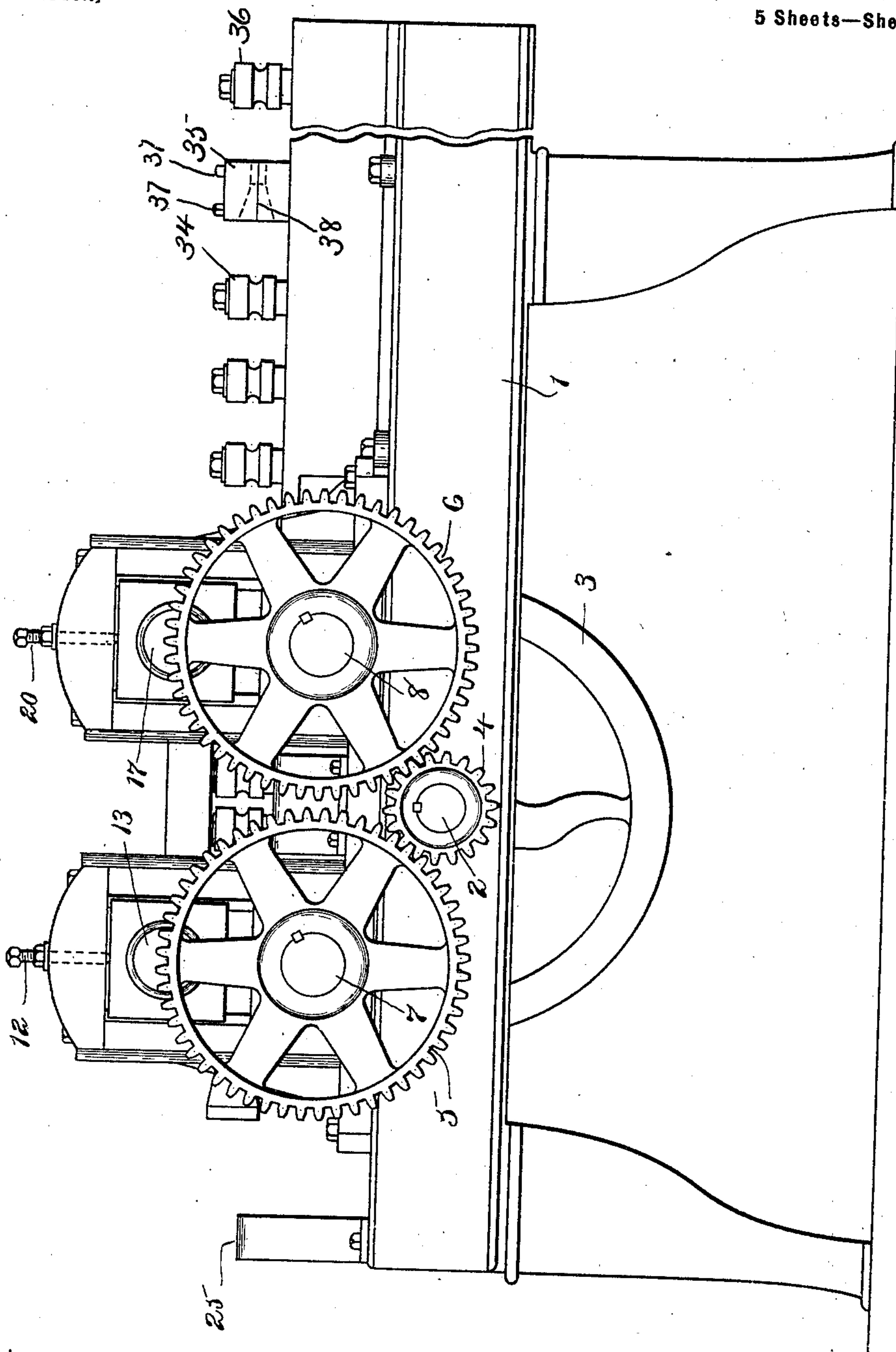
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FIG. 3.



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FIG. 5.

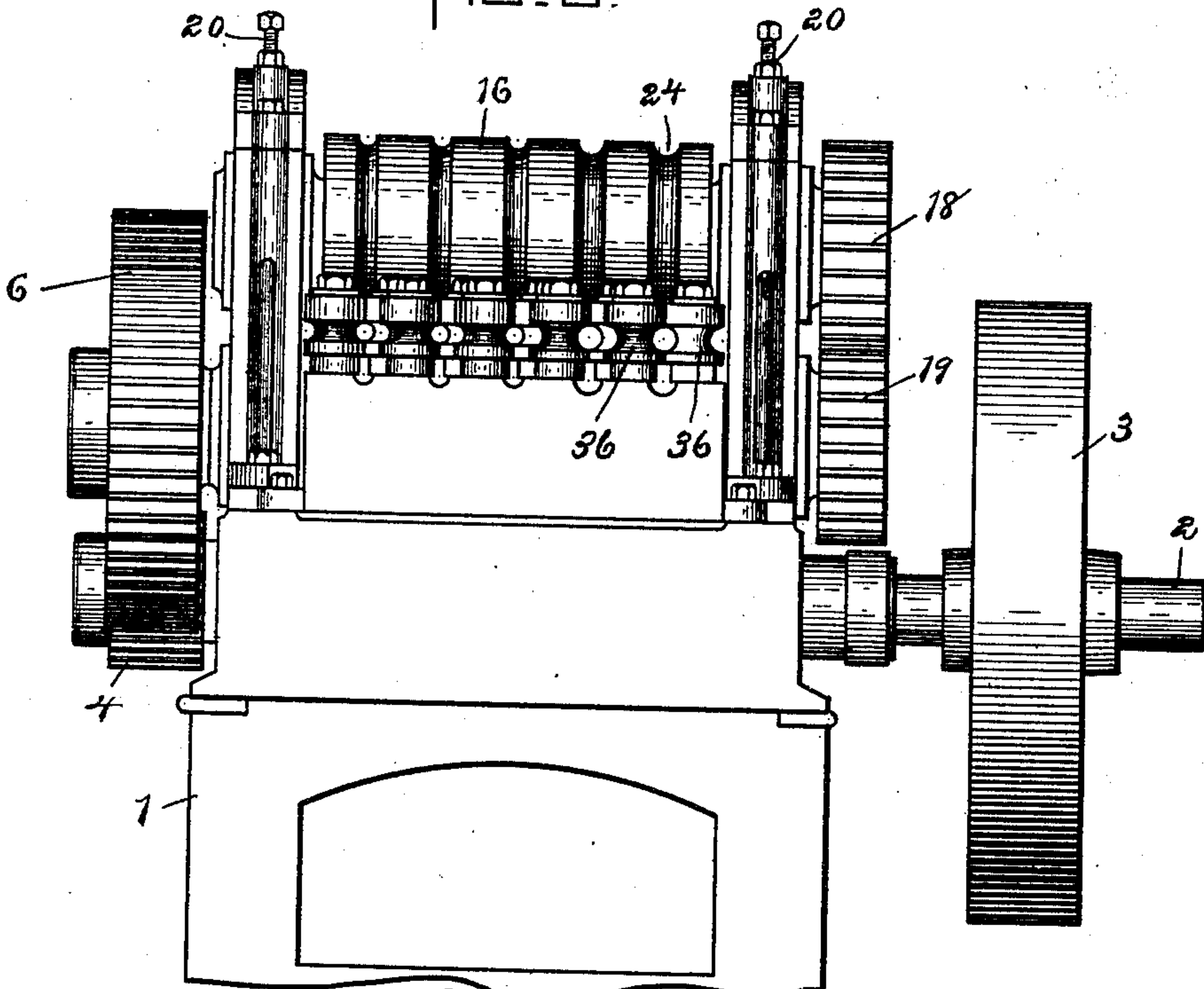
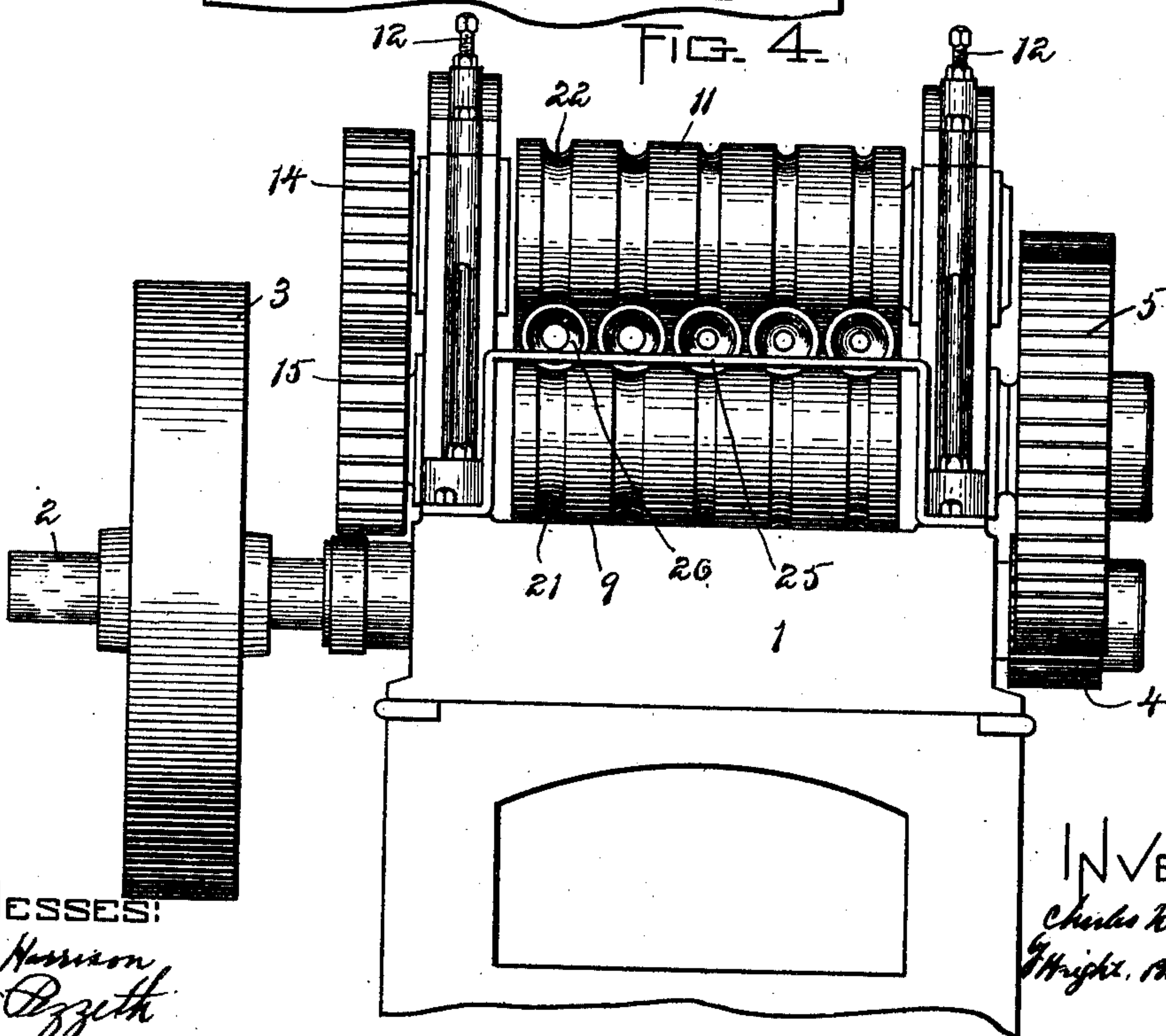


FIG. 4.



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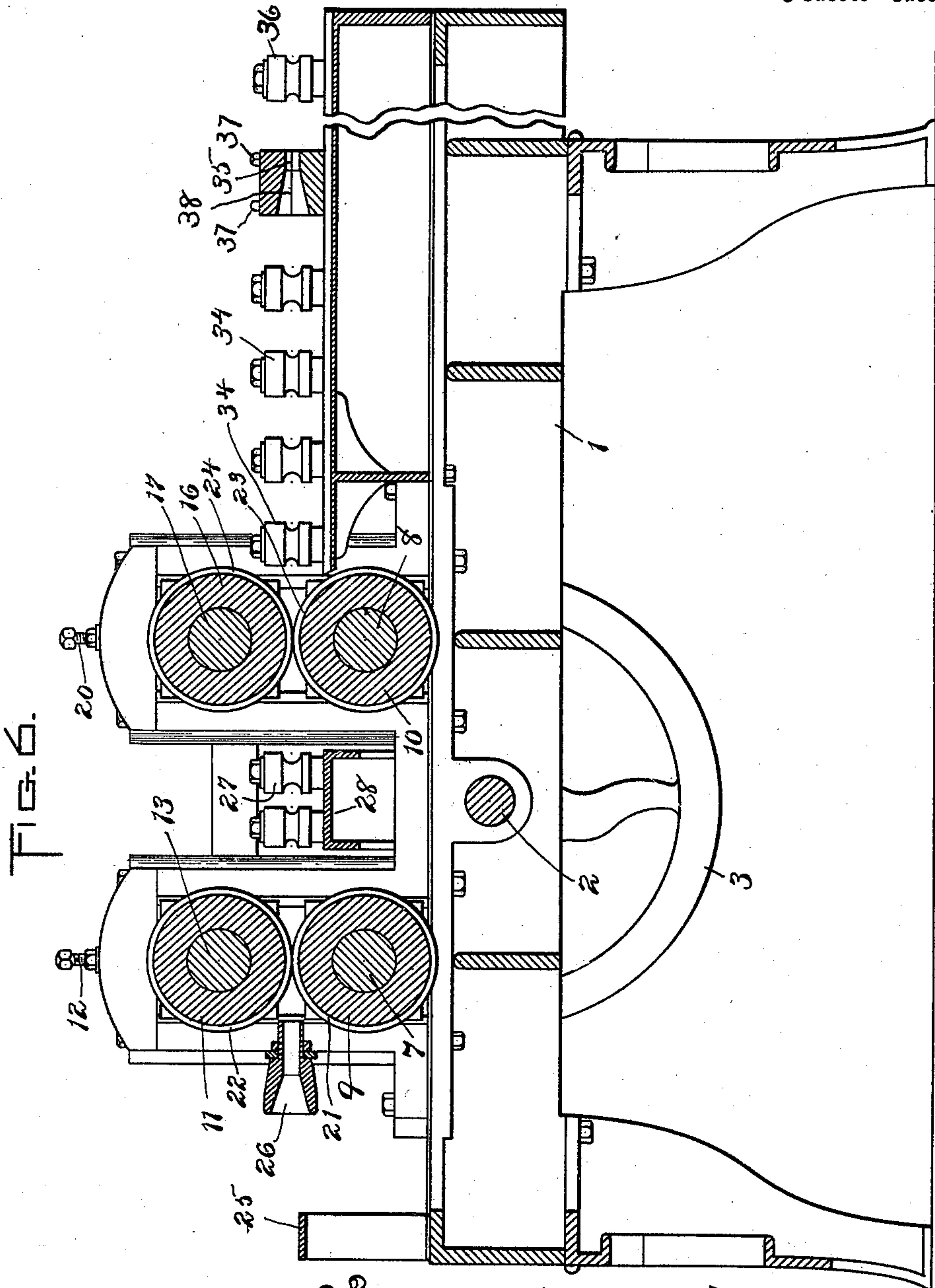
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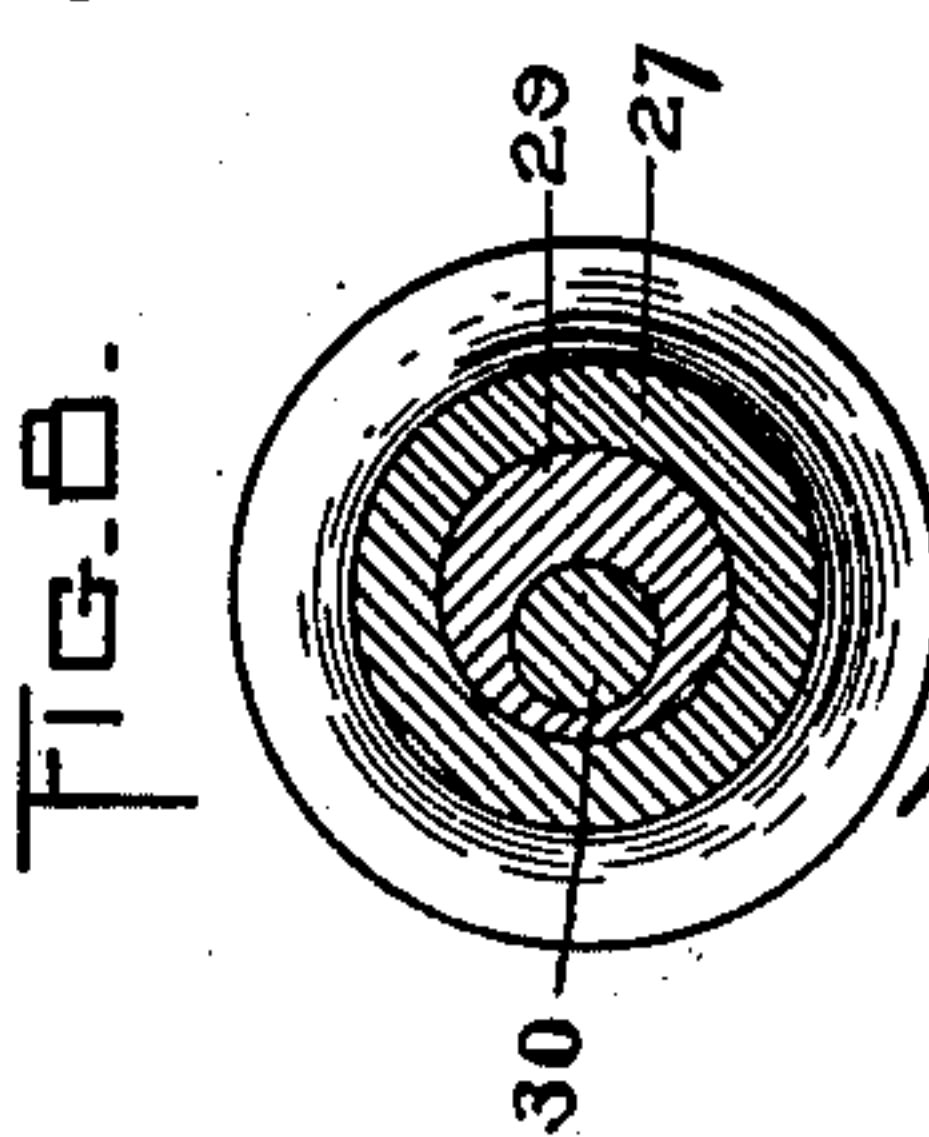
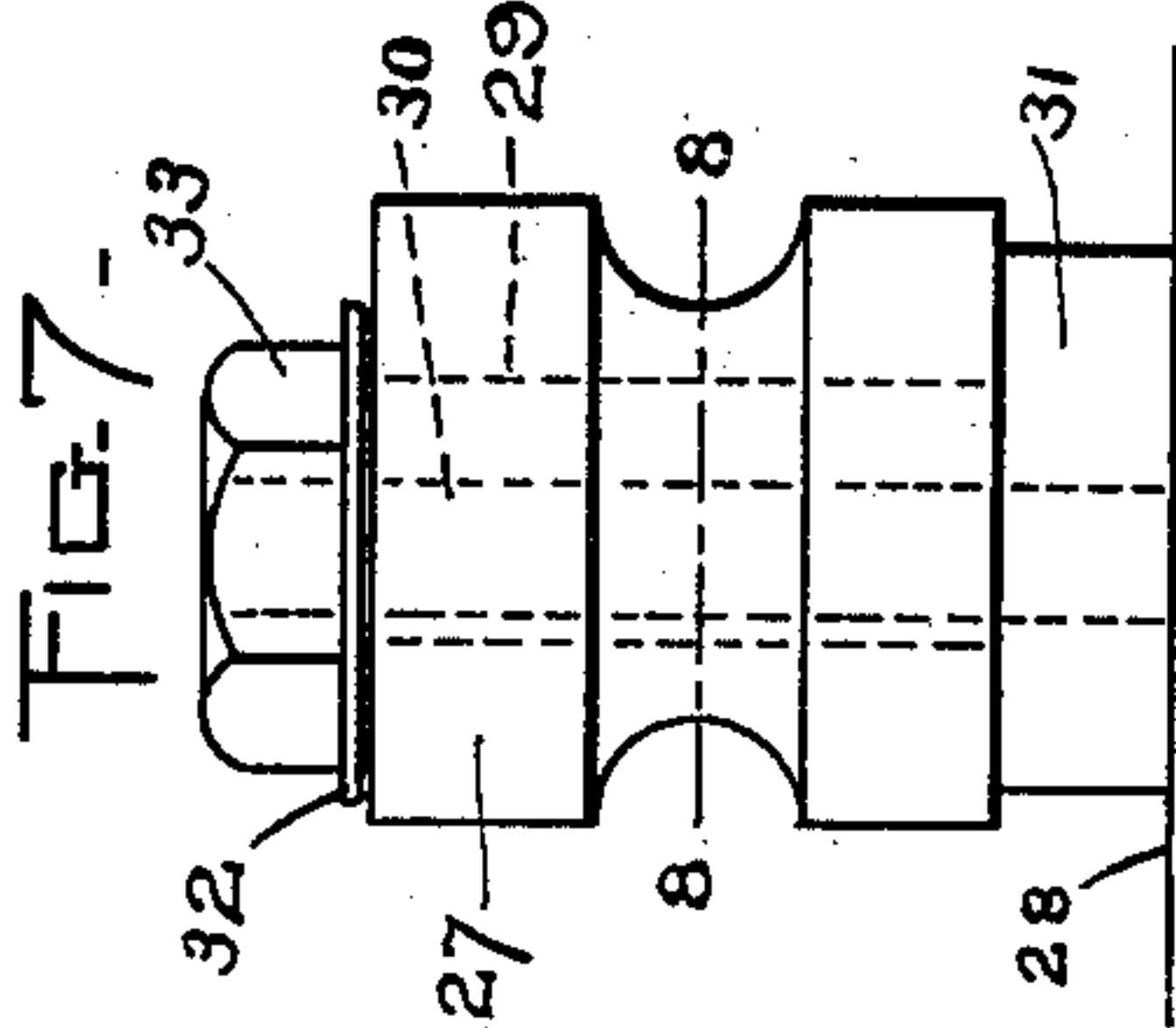
(Application filed Dec. 13, 1899.)

(No Model.)

5 Sheets—Sheet 5.



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# UNITED STATES PATENT OFFICE.

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## MACHINE FOR TREATING METAL PIPES OR TUBING.

SPECIFICATION forming part of Letters Patent No. 686,921, dated November 19, 1901.

Application filed December 13, 1899. Serial No. 740,163. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES N. BROWN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and  
5 useful Improvements in Machines for Treating Metal Pipes or Tubing, of which the following is a specification.

This invention relates to a novel machine for treating metal pipes or tubing; and it consists in certain novel features of construction  
10 and arrangement, which are hereinafter fully described in the specification, clearly illustrated in the drawings, and particularly pointed out in the claims.

15 Of the accompanying drawings, Figure 1 represents a plan view of a machine constructed in accordance with my invention with a portion broken away. Figs. 2 and 3 represent opposite side elevations with portions broken away. Figs. 4 and 5 represent  
20 opposite end elevations. Fig. 6 represents a vertical longitudinal section, partly broken away. Fig. 7 represents an enlarged elevation of one of the idle rolls. Fig. 8 represents  
25 a section on line 8 8 of Fig. 7.

The same reference characters indicate the same parts in all the figures.

The object of the invention is to remove scale from the interior and exterior of metal  
30 pipes or tubes and also to straighten or bend the same.

Referring to the drawings, in which I have illustrated an embodiment of my invention selected by me for the purpose of illustrating  
35 the invention, 1 designates the machine bed or frame, which has bearings for a main shaft 2, equipped with a belt-pulley 3 and with a gear-pinion 4. Said pinion meshes with two gears 5 and 6, mounted on the ends  
40 of shafts 7 and 8, to which are secured rolls 9 and 10. Above the roll 9 is a similar roll 11, mounted to rotate in suitable bearings, which have a vertical movement opposed by adjusting-screws 12 12, which regulate the  
45 pressure between the rolls 9 and 11. The shaft 13, to which roll 11 is secured, is provided on one end with a gear 14, meshing with a gear 15 of similar size on the shaft 7 of the lower roll, whereby the two rolls of the  
50 pair are caused to rotate in common at an

equal speed. In a similar manner the roll 10 is opposed by a roll 16, mounted above it upon a shaft 17, which has a gear 18 on its end meshing with a similar gear 19 on the shaft  
8 of the lower roll, the bearings of the upper  
55 shaft 17 being capable of vertical movement, which is opposed by adjusting-screws 20. Each of the rolls 9 11 of one pair and the rolls 10 and 16 of the other pair are provided with circumferential semicircular grooves 21 22 23  
60 24, the groove in one roll being in the same plane as the groove in the opposed roll and conforming to the cross-sectional contour of the pipe as the latter is passed between the rolls and the grooves in the two pairs of rolls  
65 being located in the same plane.

25 is a horizontal bar or rest upon which the pipe may be supported prior to its entrance between the rolls 9 11, and 26 is a funnel gage and guide adapted to direct the end  
70 of the pipe properly into the rolls and gage it prior to its entrance.

Located between the pairs of large driving-rolls 9 11 10 16 is a pair of small opposed idle  
75 rolls 27 27, mounted with their axes of rotation vertical, the axes of rotation of the driving-rolls being horizontal. The rolls 27 are supported upon a suitable base or part of the machine-frame 28 and are grooved circumferentially to conform to the pipe and so located  
80 as to guide the pipe from one pair of driving-rolls to the other without deflection. An adjustment constructed as follows is provided for the rolls 27, whereby the space between them may be increased or diminished or the  
85 orifice between them moved laterally as a whole. 29 is a pintle passing centrally through the roll 27 and forming a bearing therefor, said pintle being bored eccentrically with a hole which is occupied by a vertical rod or  
90 stud 30, projecting upwardly from the base 28. The pintle 29 has an enlargement or base 31 at its lower end, upon which the roll 27 rests, and the upper end of the pintle projects slightly above the upper end of the roll  
95 and is surmounted by a washer 32 and a nut 33, which screws on the upper end of the stud 30. The pintle 29 may therefore be held at any angular adjustment by screwing down the nut 33, the varying angular adjustments  
100



of the pintle giving different adjustments to the roll 27 in a lateral plane.

Beyond the second pair of driving-rolls 10 16 are located a series of grooved idle rolls 34 34, similar to the rolls 27 and adapted to engage the pipe on opposite sides, the rolls on one side of the path of the pipe being in this instance, however, positioned alternately to those rolls on the opposite side of said path. 10 The rolls 34 rotate in the same plane with the rolls 27. At the end of the series of rolls 34 is a circular die 35, having a flaring entrance and located in the path of the pipe.

36 represents rolls similar to the rolls 34.

15 The operation is as follows: The driving-rolls being set in motion by means of power applied to the shaft 2, the pipe resting on the bar or rest 25 is introduced into the guide 26, which directs the end of the pipe properly between the first pair of driving-rolls 9 11. The 20 grooved surfaces of said rolls receive and propel the pipe, at the same time exerting a slight squeezing or crushing action thereon, which distorts the pipe somewhat and tends to loosen any scale which may reside on the interior 25 walls of the pipe. The rolls 27 serve to prevent any curling or bending of the pipe which might take place as a result of its passage through the driving-rolls 9 11. They have no 30 compressing or reducing function. Passing from the rolls 27 the pipe enters between the second pair of driving-rolls 10 16, which exert a propelling and slight distorting action similar to that of the first pair of driving-rolls. 35 The effect of said second pair of driving-rolls is counteracted and corrected and the pipe straightened by the action of the rolls 34 34. The pipe then passes through the die 35, which removes any scale clinging to the outer sur- 40 face of the pipe, and may be repeated, if necessary, and finally passes between the rolls of the series 36, which are not shown in full in the drawings, but are arranged similarly to the idle rolls 34 and provided with a similar ad- 45 justment. By suitably adjusting the rolls 36 the pipe can be finally delivered from the machine in either straight or bent condition. In passing through the machine the pipe will in general receive more or less of a permanent 50 elongation. This is incidental to the slight compression which the pipe undergoes; but it is not a prominent feature of the action of the machine. In passing through the driving-rolls a slight progressing annular wave or wrinkle 55 is formed in the walls of the pipe in advance of the rolls, which loosens the scale on the inside of the pipe. The scale is very brittle, and the amount of distortion of the pipe-walls necessary to loosen it is therefore slight. The 60 treatment of the pipe according to my invention distinguishes in this regard from the process of rolling a metal bar or rod. For the latter process it is common to employ a train of grooved rolls mounted in pairs, which are 65 driven or which revolve at successively-increasing speeds necessitated by the relatively large elongation which the rolls produce in

the rod. The orifices or passes between succeeding pairs of rolls are uniformly reduced 70 in area, so as to effect the desired reduction in the rod. A process essentially similar has been proposed for reducing or elongating pipes or tubes. As above stated, the elonga- 75 tion which the pipe undergoes in my improved process is incidental, and it may be and preferably is ignored in the construction of the machine. In other words, the orifices between 80 succeeding pairs of rolls are substantially equal, and the succeeding pairs of driving-rolls are driven at the same peripheral speed. Theoretically the required amount of flexure could be imparted to the pipe by employing 85 a single pair only of driving and flexing rolls; but in practice it is found that the necessary amount of driving power is better obtained by using two pairs of driven rolls, thereby 90 avoiding the danger of injury to the pipe which would result from concentrating the whole driving pressure in a single pair. It will be noted that in my machine both rolls of each pair of driving-rolls are positively ro- 95 tated. If only one roll of the pair or set were rotated, there would be a constant tendency to curve the pipe, due to propulsion on one side and relative retardation on the other side. This tendency I desire to avoid when 100 the pipe is passing from one pair of drivers to the succeeding pair and also prior to its passage through the scraping-die. It cannot be entirely avoided even by rotating both rolls of a pair of drivers, for in pipe made by 105 the hot process there is usually more or less irregularity in the walls, and in going through the machine the heavier wall will elongate somewhat more rapidly than the lighter wall, thereby causing the pipe to curve in various 110 directions. To correct this curvature, the vertical idle rolls are employed. A single pair suffices to straighten the pipe between the two pairs of drivers. Beyond the second pair of drivers the straightening-rolls 34 are 115 best arranged, as shown, singly or unopposed and alternating on opposite sides of the path of the pipe. It is found that at least four points of contact are necessary in this arrangement, and any greater number may be employed, there being preferably in all cases an 120 equal number on each side. If the scraping-die 35 were omitted, the rolls 34 could then serve in place of the rolls 36 to finally deliver the pipe in either straight or curved condi- 125 tion. Prior to my invention the process of "pickling," well known in the art, has been, as far as I am aware, the sole practical method employed for removing scale from pipes or tubes. This process is slow, laborious, and 130 costly as compared with my improved method, and the results are inferior. After the scale has been loosened from the interior of the pipe by passage through my improved machine a final treatment by the sand-blast leaves the interior clean and smooth.

It will be noted in the drawings that the driving-rolls 9 11 10 16 are formed with sev-



eral sets of grooves, and the guiding-gages, idle rolls, and scraping-dies are repeated in parallel arrangement or sets. In this way the machine may be equipped for handling  
 5 different sizes of pipe or tubing, there being, as seen in the drawings, two larger grooves and three smaller ones on the driving-rolls, with other parts of corresponding dimensions, and provision is also made by such repetition  
 10 for taking account of the variation in standard sizes of commercial pipe. A quantity of pipe or tubing classified as of a given diameter will usually vary more or less from this diameter on account of wear in the pipe making  
 15 or drawing dies or from other causes, and accordingly if the driving-rolls are set to an adjustment corresponding to this diameter and a length of pipe which is slightly over diameter is introduced into the grooved space  
 20 intended to receive the normal size the rolls might injure or destroy the pipe. For each size of pipe that the machine is intended to treat I therefore provide two or more sets of grooves in the driving-rolls, each of a slightly  
 25 different depth from the others, and I make the internal diameters of the gages 26 to correspond with the grooves, so that the operator can try the end of the pipe in one of the gages, and if it will not readily pass through  
 30 this will be an indication that the pipe would not properly pass through the corresponding grooves in the driving-rolls. He can then try the next larger gage until one is found through which the pipe will pass. The gage  
 35 then acts as a guide to properly introduce the pipe to the rolls. The differences in the depths of the several sets of grooves, gages, &c., corresponding to one size of pipe are too small to be clearly indicated on the drawings;  
 40 but the construction will be readily understood from the foregoing description.

The scraping-dies 35 are made in two halves held together by bolts 37 37 and are thus adjustable to vary the size of the die-opening.  
 45 The meeting faces of the two die parts at 38 may be filed away to reduce the opening, or thin shims of metal, paper, or other material may be inserted at 38 and removed from time to time as the die wears and it is desired to  
 50 reduce its opening.

Having thus explained the nature of my invention and described a way of constructing and using the same, although without having attempted to set forth all the forms in which  
 55 it may be made or all the modes of its use, I declare that what I claim is—

1. In a machine for loosening scale on metal pipes, a plurality of pressure-rolls adjusted to produce a progressive inward flexure of the  
 60 walls of the pipe without materially reducing the diameter thereof in order to loosen the scale.

2. In a machine for loosening scale on metal pipes, a plurality of pressure-rolls adjusted to  
 65 produce a progressive inward flexure of the walls of the pipe without materially reducing the diameter thereof in order to loosen the

scale, and means for thereafter controlling the lineal shape of the pipe.

3. In a machine for loosening scale on metal  
 70 pipes, a plurality of pressure-rolls adjusted to produce a progressive inward flexure of the walls of the pipe without materially reducing the diameter thereof in order to loosen the scale, and a series of unopposed abutments ar-  
 75 ranged on opposite sides of the path of the pipe for controlling the lineal shape of the latter.

4. In a machine for loosening scale on metal pipes, a plurality of pressure-rolls adjusted to produce a progressive inward flexure of the  
 80 walls of the pipe without materially reducing the diameter thereof, and means for removing the loosened scale from the outer walls of the pipe.

5. In a machine for loosening scale on metal  
 85 pipes, a plurality of pressure-rolls adjusted to produce a progressive inward flexure of the walls of the pipe without materially reducing the diameter thereof, and means for removing scale from the inside of the pipe.  
 90

6. In a machine for loosening scale on metal pipes, the combination of a plurality of idle rolls arranged to engage the pipe on opposite sides, pintles upon which said rolls are mount-  
 95 ed, each pintle being adjustable eccentrically about an axis transverse to the plane of rotation of its roll, and means for supporting said pintles.

7. In a machine for loosening scale on metal  
 100 pipes, the combination of a die adapted to engage the periphery of the pipe, driving-rolls adjusted to engage the pipe and force it through said die without materially reducing the diameter of the pipe, idle rolls located both in front of, and beyond said die and al-  
 105 ternating on opposite sides of the path of said pipe, said rolls being positioned to compel the travel of the pipe along a predetermined lineal line.

8. In a machine for loosening scale on metal  
 110 pipes, the combination of a pair of opposed rolls grooved to conform to the pipe and adjusted to flex the walls thereof inwardly without materially reducing the diameter of the pipe, said rolls having different pairs of  
 115 grooves, each pair corresponding to a predetermined commercial size of pipe, but differing slightly in the orifice or pass which they offer for the passage of the pipe, and an equal  
 120 number of guiding-gages located in advance of, and in line with, the openings formed by the grooves, said gages having different-sized orifices corresponding to the different sizes of  
 125 said openings whereby a pipe may be gaged to its proper pair of grooves and have its walls flexed without materially reducing the diameter of the pipe.

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

CHARLES N. BROWN.

Witnesses:

R. M. PIERSON,  
 C. F. BROWN.