A. F. NATHAN.

BORING AND TURNING MACHINE.

APPLICATION FILED JULY 23, 1908.

986,493.

Patented Mar. 14, 1911.

5 SHEETS—SHEET 1.

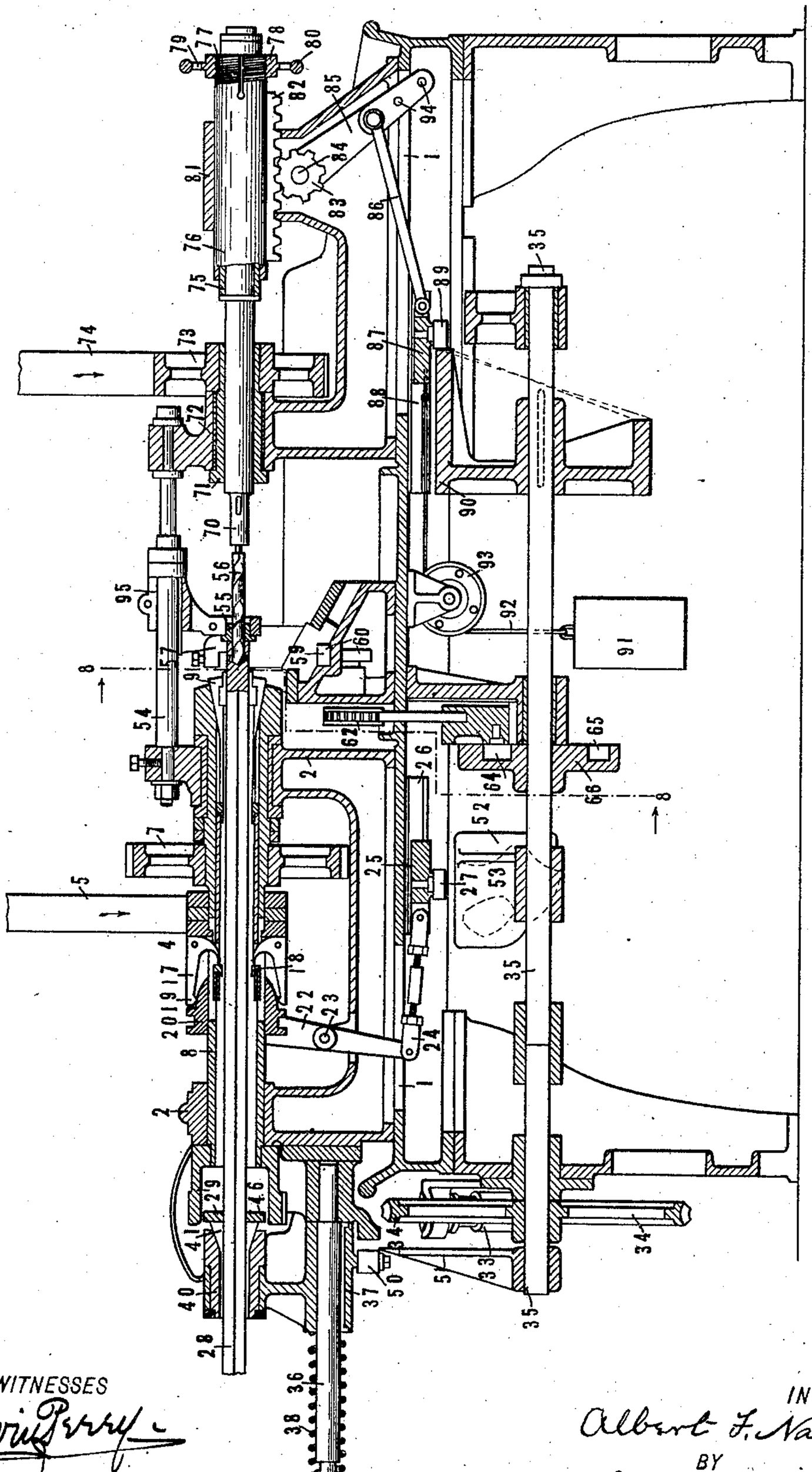

FIG. 1.

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5 SHEETS—SHEET 2.

FIG. 2.

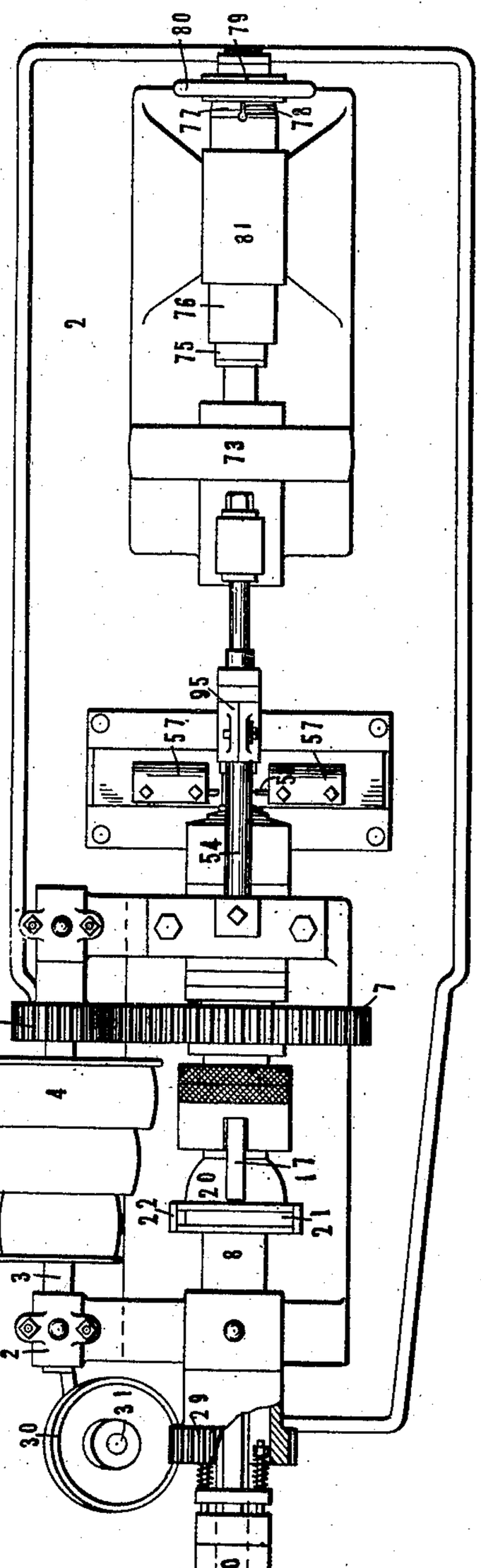


FIG. 12.

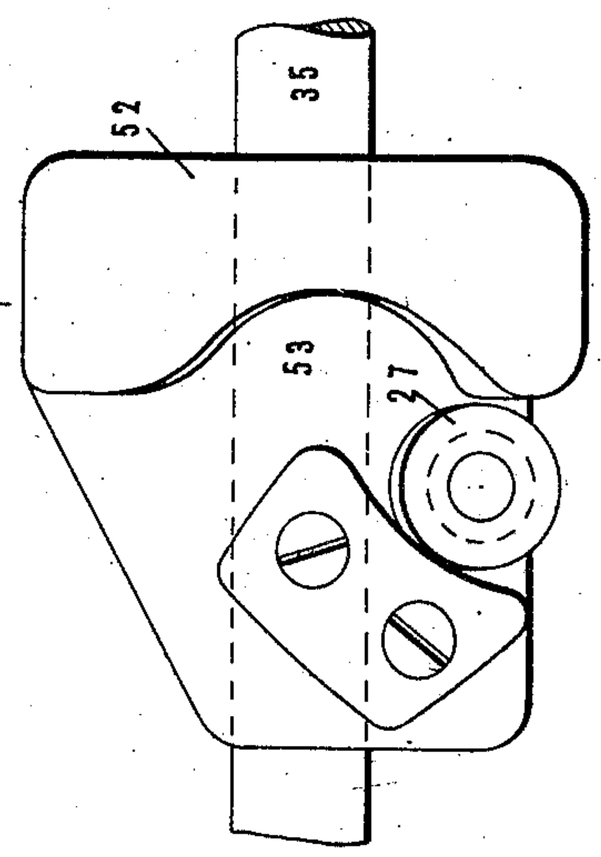


FIG. 11.

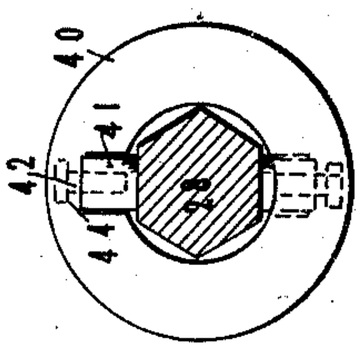
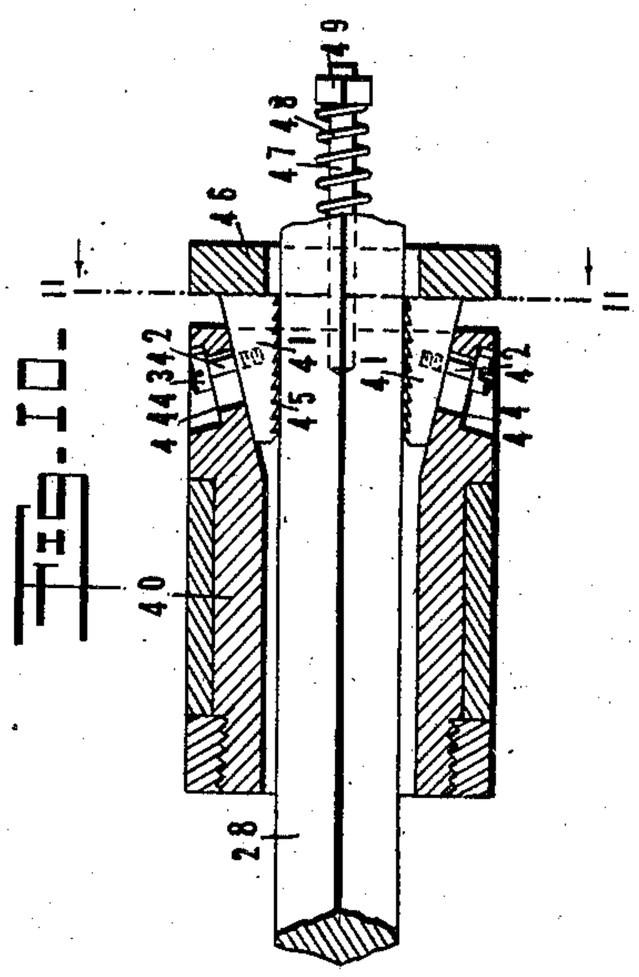


FIG. 10.



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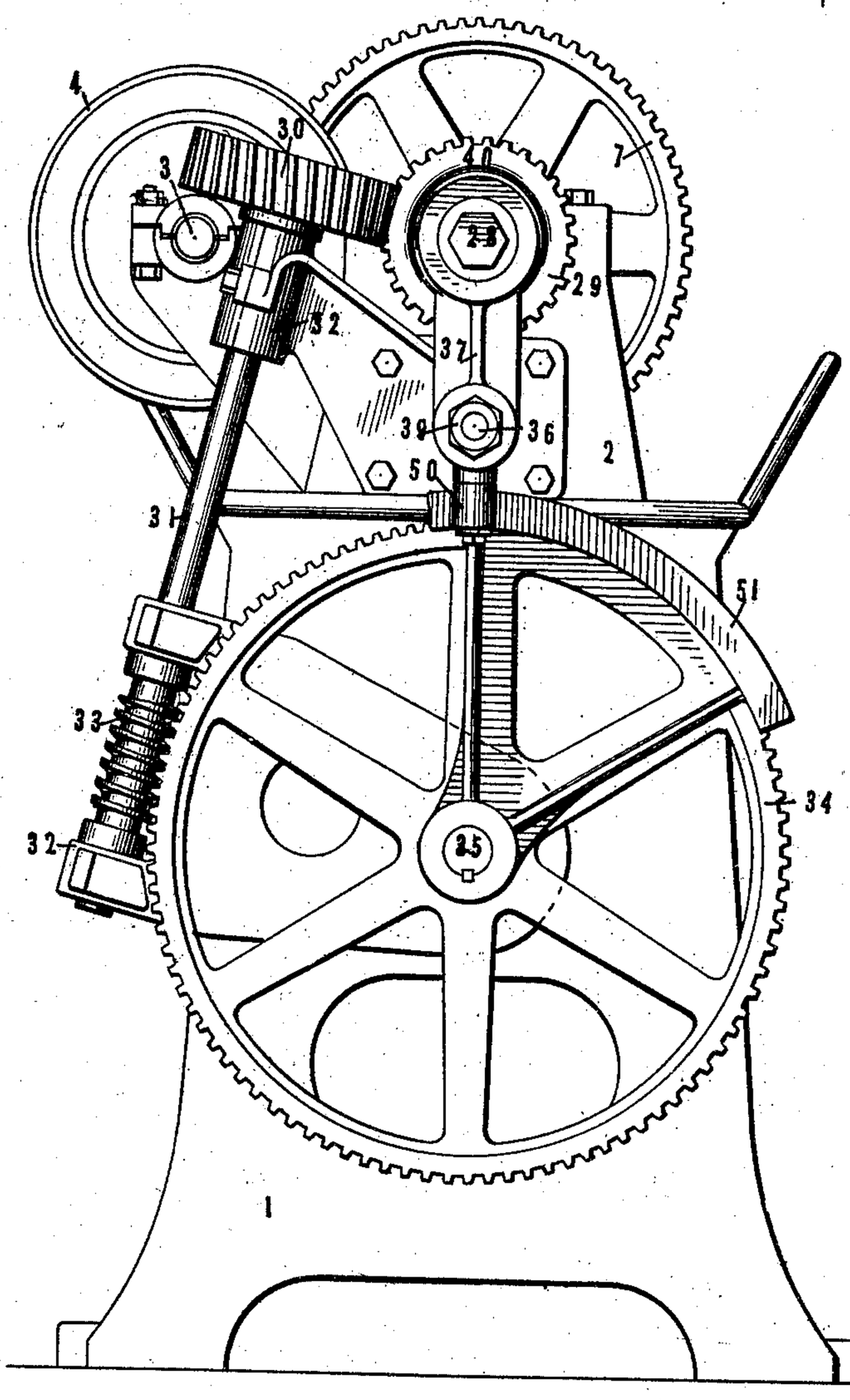
5 SHEETS—SHEET 3.

FIG. 3.



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5 SHEETS—SHEET 4.

Fig. 4.

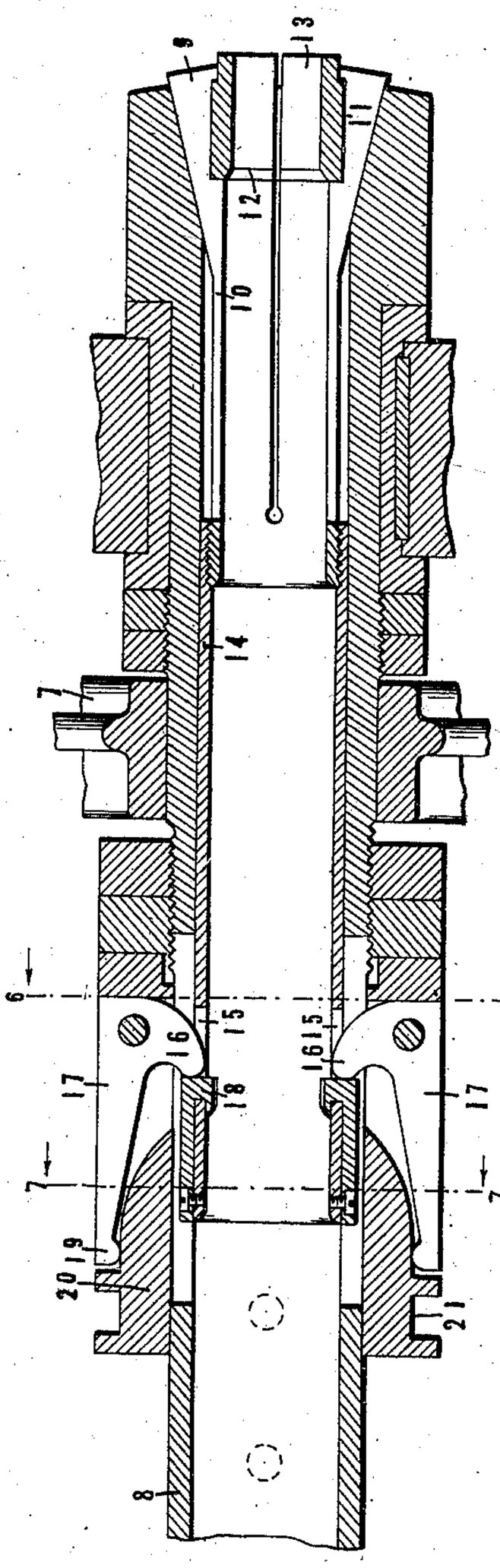


Fig. 5.

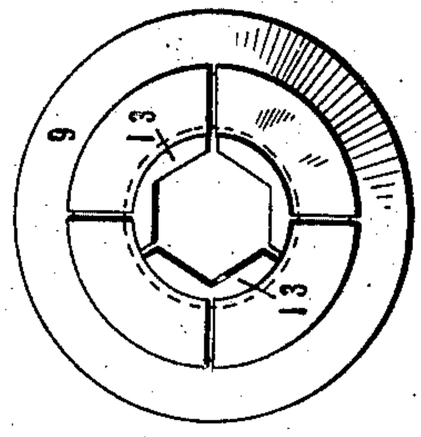


Fig. 6.

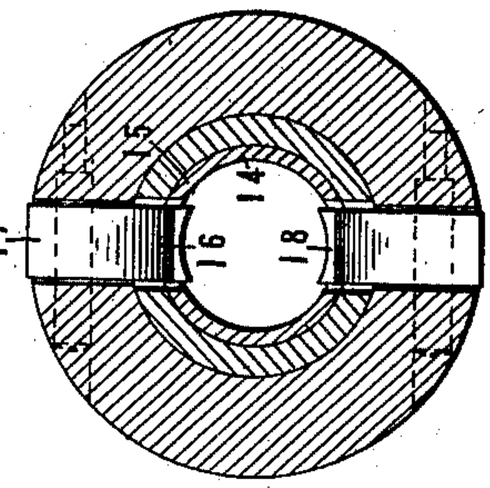
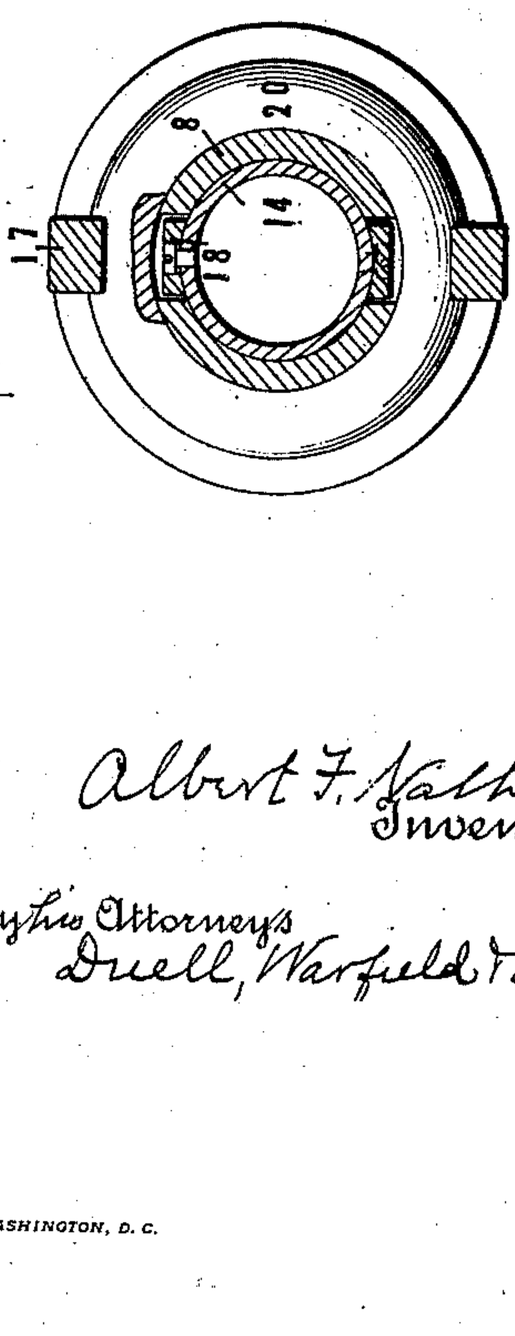


Fig. 7.



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6 SHEETS—SHEET 5.

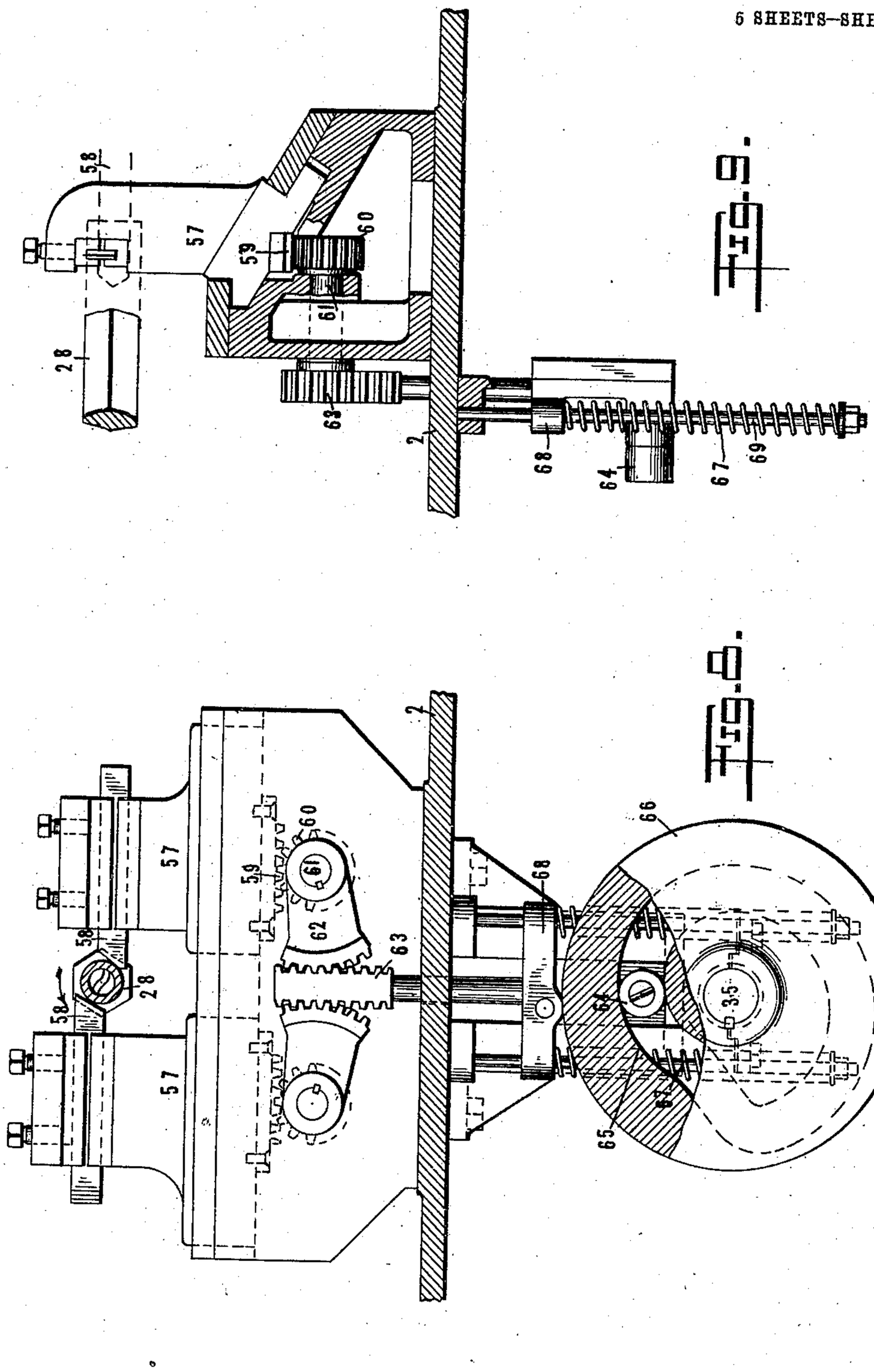

FIG. 9.

FIG. 10.

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UNITED STATES PATENT OFFICE.

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BORING AND TURNING MACHINE.

986,493. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed July 23, 1908. Serial No. 444,895.

To all whom it may concern:

Be it known that I, ALBERT F. NATHAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Boring and Turning Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to turning and boring machines and more particularly to a machine of this character adapted to form nuts from metal bars.

One of the objects of my invention is to provide a device of this character in which the torsional strain upon the stock will be reduced to a minimum.

Another object of my invention is to provide a device of this character in which the boring tool may be rotated at a greater speed than is ordinarily done in devices of this character, thereby insuring a smoother cut to the stock operated upon.

Other objects will in part be obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings there is shown an illustrative embodiment of the invention in which the reference numerals refer to similar parts in the several figures.

Figure 1 is a longitudinal vertical section of my improved turning and boring machine. Fig. 2 is a plan view of the same. Fig. 3 is an end view of the machine. Fig. 4 is a sectional view of the mandrel and chuck. Fig. 5 is an end view of the mandrel and collet. Fig. 6 is a sectional view taken on the line 6—6 of Fig. 4. Fig. 7 is a sectional view taken on the line 7—7 of Fig. 4. Fig. 8 is a sectional view taken on the line 8—8 of Fig. 1. Fig. 9 is a sectional view of the mechanism shown in Fig. 8 taken at right angles to the view in said figure. Fig. 10 is a sectional view of the stock-feeding clutch. Fig. 11 is a sectional view taken on the line 11—11 of Fig. 10; and Fig. 12 is a plan view of the cam which actuates the stock-holding chuck.

Referring to the several figures 1 represents a suitable frame of any desired form upon which are mounted the bearings 2 2 within which the shaft 3 is journaled, said shaft carrying a suitable pulley 4 to which motion is imparted by means of a belt 5 driven by any suitable means not shown, and also mounted upon said shaft is a pinion 6 engaging with a cogwheel 7 secured to the hollow mandrel 8. The bore of the mandrel is preferably flared at one end to receive the split end 9 of the sleeve 10 fitting within the mandrel, said split end being provided with suitable recesses 11 adapted to receive ribs 12 formed on a collet which is preferably formed from a plurality of sections 13. The sleeve 10 is secured to a second sleeve 14 slidingly engaging the inner bore of the mandrel and provided with recesses 15 with which the inner ends 16 of the levers 17 pivoted on the mandrel are adapted to engage and wearing plates 18 are preferably provided, with which said ends of the levers engage, as clearly shown in Fig. 4. The outer ends 19 of said levers are adapted to be engaged by a cone 20 sliding upon the mandrel and provided with an annular groove 21 with which one end of a forked lever 22 is adapted to engage, said lever being pivoted to the frame as at 23 and having its opposite end connected by an extensible link 24 with a sliding member 25 adapted to reciprocate within a grooved guideway 26 said sliding member having a downwardly projecting roller 27 secured thereto for a purpose hereinafter described.

From the above description it will be understood that as the cone 20 is moved toward the flared end of the mandrel 8 it will force the inner ends 16 of the levers 17 to move toward the rear of the machine thereby drawing the sleeves 14 and 10 within the mandrel, and causing the split end of sleeve 10 to force the sections 13 of the collet against the stock 28 to securely grip the same and hold it in position within the bore of the mandrel.

Secured to the rear end of the mandrel is a spiral gear 29 adapted to mesh with a second spiral gear 30 positioned at substan-

tially right angles thereto, said second gear being secured to the shaft 31 journaled in suitable bearings 32 32 and provided with a worm 33 meshing with the worm wheel 34 which is secured to a shaft 35 journaled in suitable bearings upon said frame.

Secured to the frame of the machine and projecting rearwardly therefrom is a rod 36 upon which a sliding member 37 is mounted, said member being normally forced toward the frame of the machine by means of a suitable spring 38 surrounding said rod and having one of its ends bearing against a nut 39 secured to the outer end of the rod. The upper end of said sliding member is provided with a bushing 40 having a horizontal bore formed therein, the forward portion of which is slightly flared to receive the dogs 41 41, which may be retained in position by any suitable means. As shown they are so retained by means of bolts 42 secured thereto and having their heads 43 engaging suitable recesses 44 formed in said bushing, all of which is clearly shown in Fig. 10. The dogs, which preferably have their clamping faces 45 roughened or serrated are normally forced in their inner positions by means of the rings 46 which engages their outer ends and is slidingly mounted upon rods 47 and normally forced into engagement with the dogs by means of the spring 48 surrounding said rods and engaging nuts 49 secured thereto. Projecting downwardly from said sliding member is a roller 50 adapted to be engaged by a segmental cam 51 secured to the shaft 35. These parts are so arranged that, as the shaft 35 rotates, the segmental cam 51 will engage the roller 50 thereby forcing the sliding member to move rearwardly against the tension of spring 38 whereby the dogs 41 will be moved to grip another portion of the bar or stock, and as said cam passes out of engagement with the roller the spring will force the sliding member into its normal or innermost position, thereby feeding the stock forward a certain distance, depending upon the length of throw of said sliding member.

Rigidly mounted upon the shaft 35 is a member 52 provided with a cam groove 53 which, as said member rotates, is adapted to engage the roller 27 secured to the sliding member 25 to cause said slide to reciprocate in its guideway 26, thereby swinging the lever 22 upon its pivot and causing the cone 20 to move toward the rear of the machine a certain distance, and then to move back to occupy its normal position. The relative positions of the segmental cam 51 and the member 52 upon the shaft 35 are such that the cone 20 will be in its rearmost position thereby freeing the section 13 of the collet from the stock at the same time that the sliding member 37 is moved toward the frame of the machine to occupy its normal position, whereby the stock may be fed forward the required distance and when the sliding member reaches its normal position the cone will again be forced forward, thereby drawing the sleeves toward the rear of the mandrel and causing the split end of the sleeve 10 to force the collet into intimate contact with the stock in the manner described above. A stop 95 is preferably provided to limit the forward movement of the stock, which stop may be adjustably mounted upon the rod 54 which is mounted upon the frame in any suitable manner, and which may be provided with an opening in which a bushing 55 may be secured to provide a bearing for the boring tool 56 hereinafter described. While I have shown this stop as applied to the machine I have found that the machine will operate without the use thereof in a highly satisfactory manner. Tool stocks 57 are mounted upon the frame at either side of the mandrel 8 and between said mandrel and said stop 95, said tool stocks being adapted to reciprocate upon the frame of the machine in a horizontal direction and carrying cutting tools 58 adapted to engage with the stock as indicated in Fig. 8. Said tool stocks are reciprocated by means of racks 59 secured to their under sides with which engage the pinions 60 mounted upon shafts 61, said shafts also having secured thereto segmental gears 62 engaging the double rack 63 to the lower end of which is secured a roller 64 adapted to engage a cam groove 65 formed in the cam disk 66 secured to the shaft 35. This cam groove is so shaped as to cause said tool stocks to advance slowly toward the stock to cut the same and to permit said tool stocks to be retracted rapidly by means of the springs 67 engaging a cross-head 68 secured to the spindle of the double rack 63 and sliding upon rods 69 as plainly shown in Figs. 8 and 9.

The parts thus far described are all quite old and well known in the art, and are all mere matters of mechanical construction within the ordinary skill of the machine designer, being merely shown for the purpose of affording a better understanding of my invention, in which these old elements have been brought into a new combination with other elements, thereby producing new results and functions.

The boring tool 56 is secured within a spindle 70 which in turn is secured to the sleeve 71 rotatably mounted within the bearing 72 and having a pulley 73 secured thereto adapted to be driven by a belt 74 which in turn is driven by any suitable mechanism (not shown). The other end of said spindle 70 is rotatably mounted within the sleeve 75 secured within the sleeve 76 having a split end 77 which is preferably

threaded as shown at 78 and with which the threaded member 79 engages, said member being provided with suitable handles 80 by which it may be rotated in order to cause the split end to grip the inner sleeve 75. The sleeve 76 is mounted to reciprocate within the bearing 81 and is provided on its under side with the rack 82 with which the pinion 83 secured to the shaft 84 engages, which shaft is adapted to be rotated by means of an arm 85 secured thereto, to the opposite end of which a link 86 is secured, the other end of said link being pivoted to a slide 87 mounted to reciprocate within the grooved guideway 88 and carrying a downwardly projecting roller 89. A cam member 90 secured to the shaft 35 is adapted to engage said roller and is so shaped as to provide a slow feed of the sleeve 76 and the tool carrying spindle 70 toward the stock, and a quick return movement thereof, said return movement being accomplished through the agency of the weight 91 to which the cord 92 is secured, which passes over a suitable pulley 93 and is secured to the slide 87 as clearly shown in Fig. 1. The pulleys 4 and 73 and the driving mechanism therefor are so proportioned and arranged that the boring tool will be rotated at a greater speed than the mandrel and in the same direction therewith, and in practice, I have obtained highly satisfactory results when a boring tool having a diameter of about $\frac{5}{8}$ of an inch rotates at the rate of 713 revolutions per minute and the stock having a diameter of about $1\frac{1}{2}$ inches opposite the cutting off tools rotates at the rate of 188 revolutions per minute, although, of course, I do not wish to be limited to these exact figures.

The operation of the device will now be clearly understood. After the stock has been inserted in position the machine is started up and the boring tool will be fed toward and into the stock by the mechanism above described and at the same time the cutting tools which have their cutting edges in opposition to the movement of said mandrel and also to the movement of said boring tool, will be advanced toward the stock and cut the same as said boring tool is operating. When the end portion of the stock has been bored and cut from the main portion in the manner above described, the boring tool and cutting tools will be withdrawn and at the same time the cone 20 will be retracted to permit the collet to become disengaged from intimate contact with the stock and the sliding member will also be retracted to allow the dogs to grip the stock at a fresh portion thereof. As the operation continues the sliding member will be forced forward again to feed the stock through the mandrel in order to present a fresh portion thereof to the boring and cutting tools, and as said sliding member assumes its normal position the cone will be thrust forward to cause the levers to draw the sleeve within the mandrel, thereby again forcing the collet to firmly grasp and hold the stock, as already described, at which point in the operation the boring tool and cutting tools will again advance toward the work and the operation above described will be repeated.

In order to vary the longitudinal movement of the spindle carrying the boring tool, I have provided the outer end of the arm 85 with a series of holes 94 with any one of which the end of the link 86 may esgage.

By constructing a machine of this character in which the boring tool and the stock revolve at different speeds in the same direction, and with the cutting tools arranged with their cutting edges in opposition to the direction of rotation of the drill, I have found that the torsional strain upon the stock is considerably less than when the parts rotate in opposite directions or where one part rotates and the other part remains stationary, as the result of which the machine works smoother and the completed product is in a more finished condition than when made in machine of the old type.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. A nut-blank making machine comprising, in combination, a rotatable mandrel adapted to hold the metal stock, a rotatable boring tool in alinement with said mandrel and adapted to operate upon said stock, and means for rotating said boring tool and said mandrel in the same direction and at different speeds.

2. A nut-blank making machine comprising, in combination, a rotatable mandrel adapted to hold the metal stock, a rotatable boring tool in alinement with said mandrel and adapted to operate upon said stock, means for rotating said boring tool and said mandrel in the same direction and at different speeds, and a cutting tool adapted to cut apertured nut-blanks from said stock and

having its cutting edge arranged in opposition to the direction of rotation of said boring tool.

3. The method herein disclosed of making nut-blanks which comprises rotating the metal stock in a given direction and at a given speed, rotating a boring tool continuously in the same direction and at a greater speed than the speed at which the stock is rotated, and simultaneously advancing said boring tool axially into the end of said stock.

4. The method herein disclosed of making nut-blanks which comprises rotating a metal stock in a given direction and at a given speed, rotating a boring tool continuously in the same direction and at a greater speed than the speed at which the stock is rotated, simultaneously advancing said boring tool axially into the end of said stock, and advancing a cutting tool against said stock in a plane normal to the axis of rotation of the stock and at a distance from its free end substantially equal to the thickness of the required blank.

In testimony whereof I affix my signature, in the presence of two witnesses.

ALBERT F. NATHAN.

Witnesses:
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PAUL. A. WOLFF.