No. 788,423. PATENTED APR. 25, 1905.

F. J. NUTTING.

ENGRAVING MACHINE.

APPLICATION FILED JUNE 19, 1903.

4 SHEETS—SHEET 1.

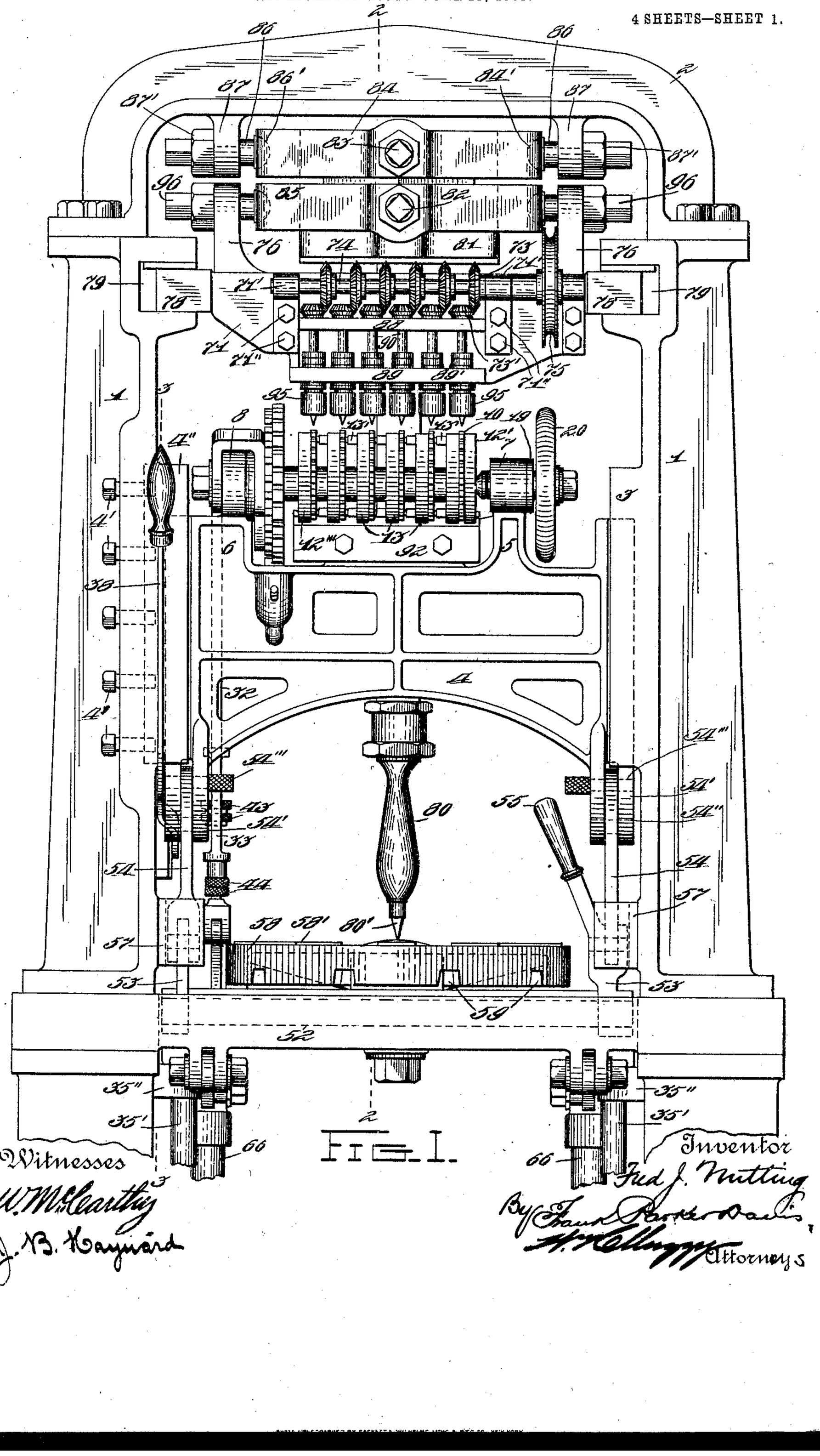

FIG. 1.

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4 SHEETS—SHEET 2.

FIG. 2.

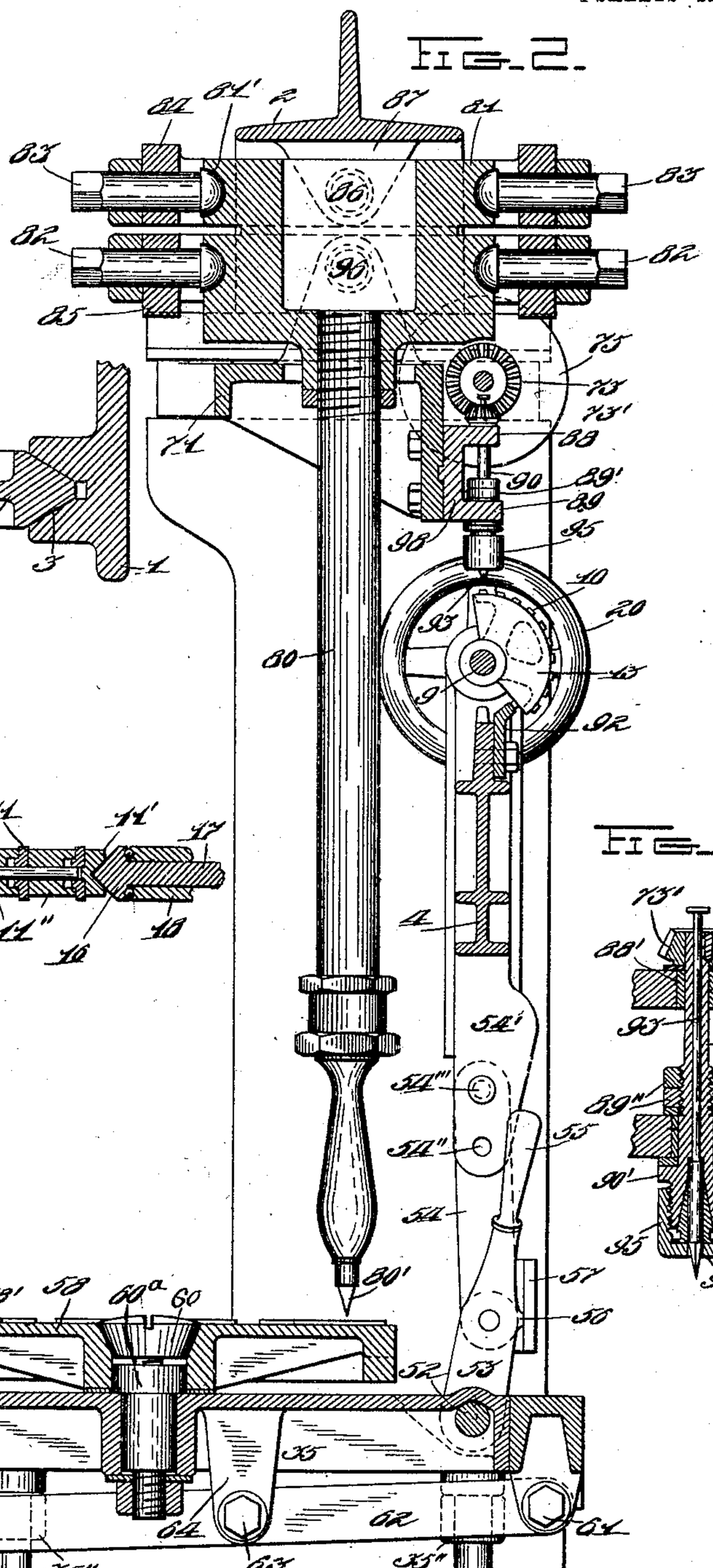

FIG. 7.

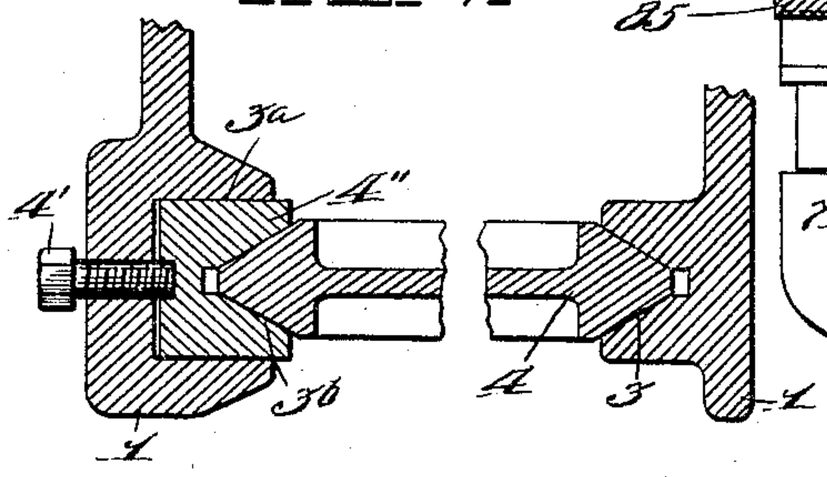

FIG. 8.

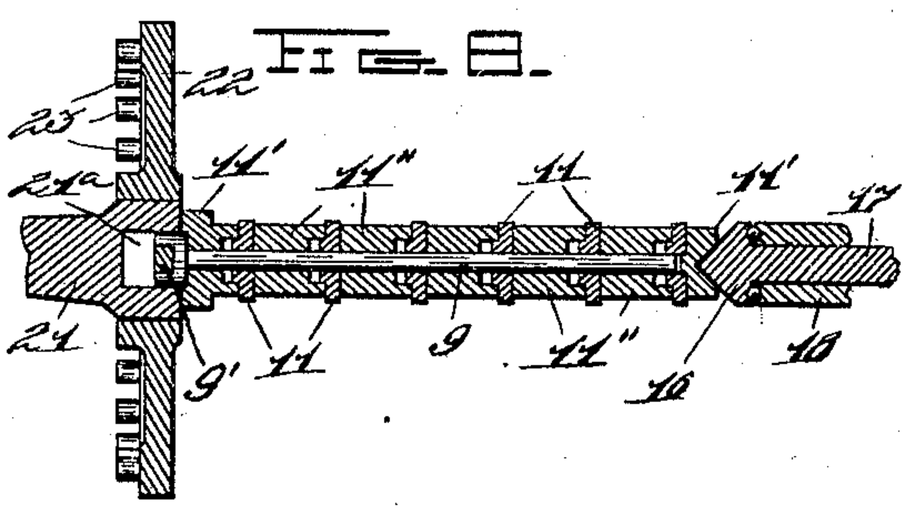

FIG. 9.

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4 SHEETS—SHEET 3.

FIG. 3

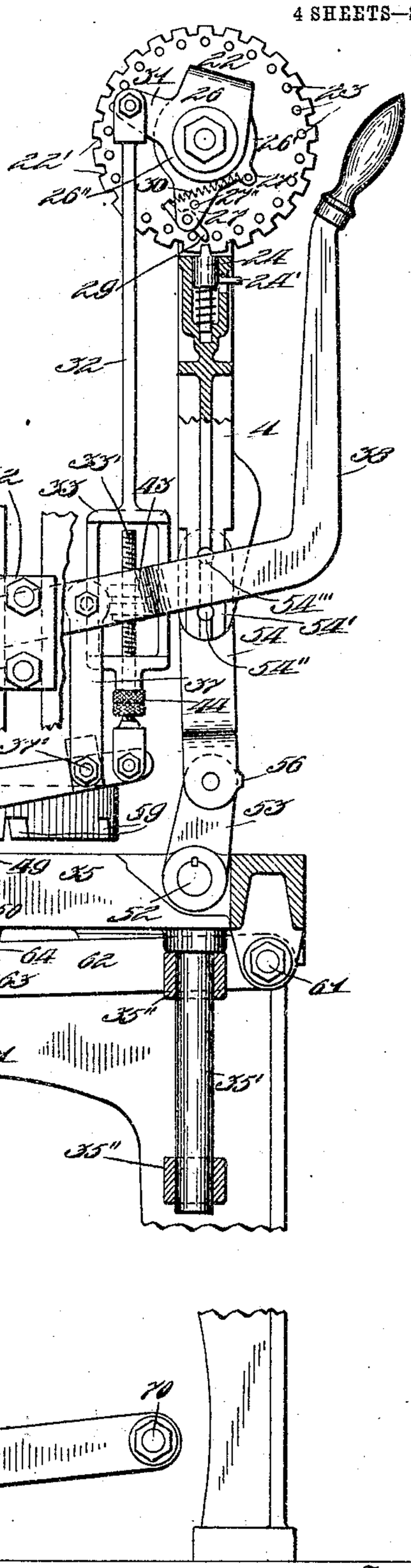
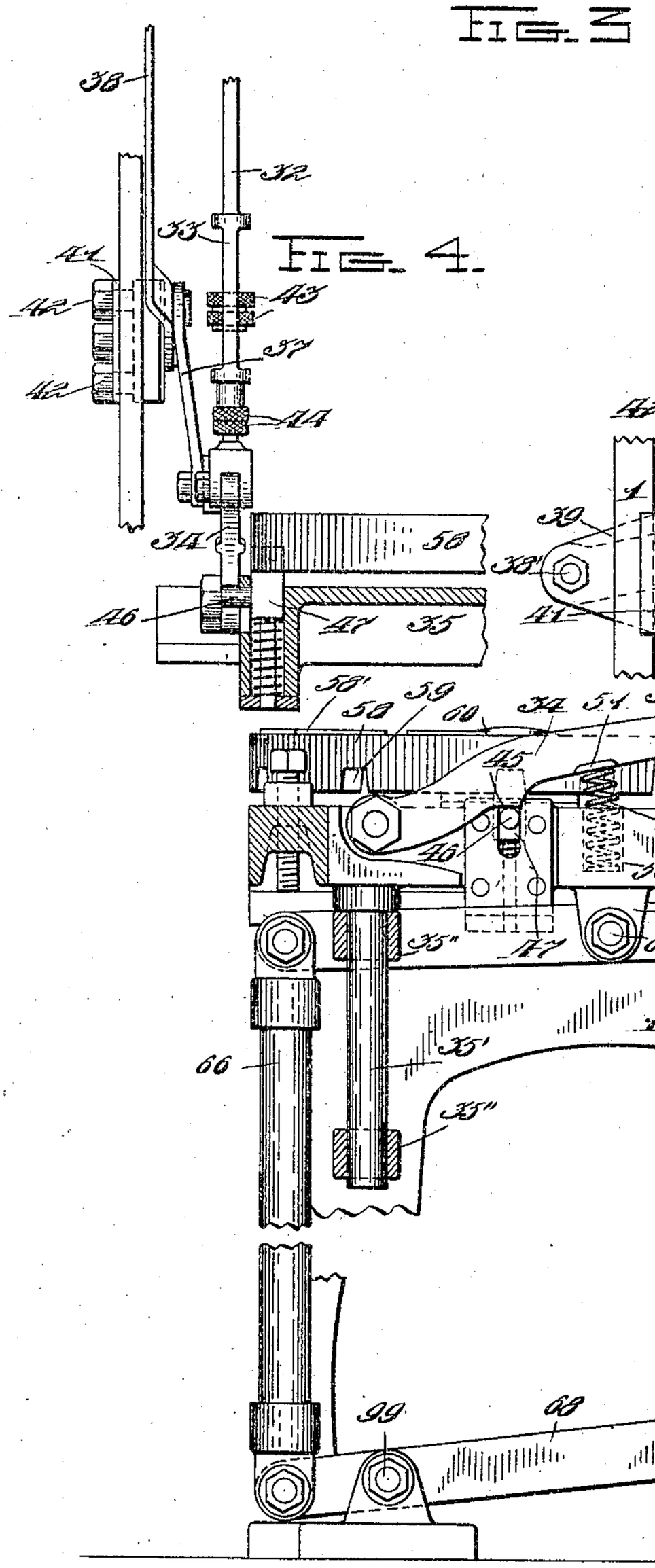


FIG. 4.



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4 SHEETS—SHEET 4.

FIG. 5.

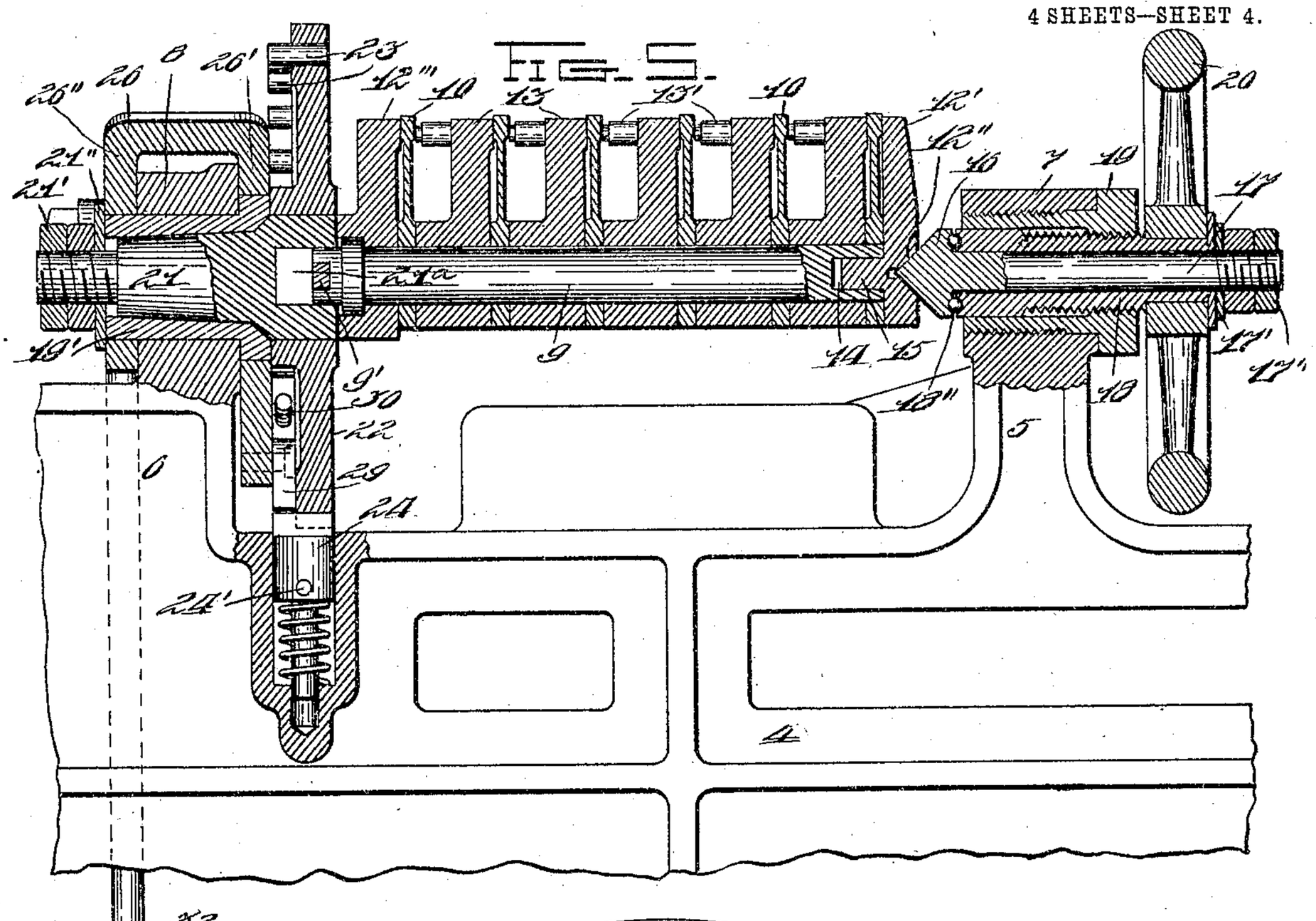

FIG. 6.

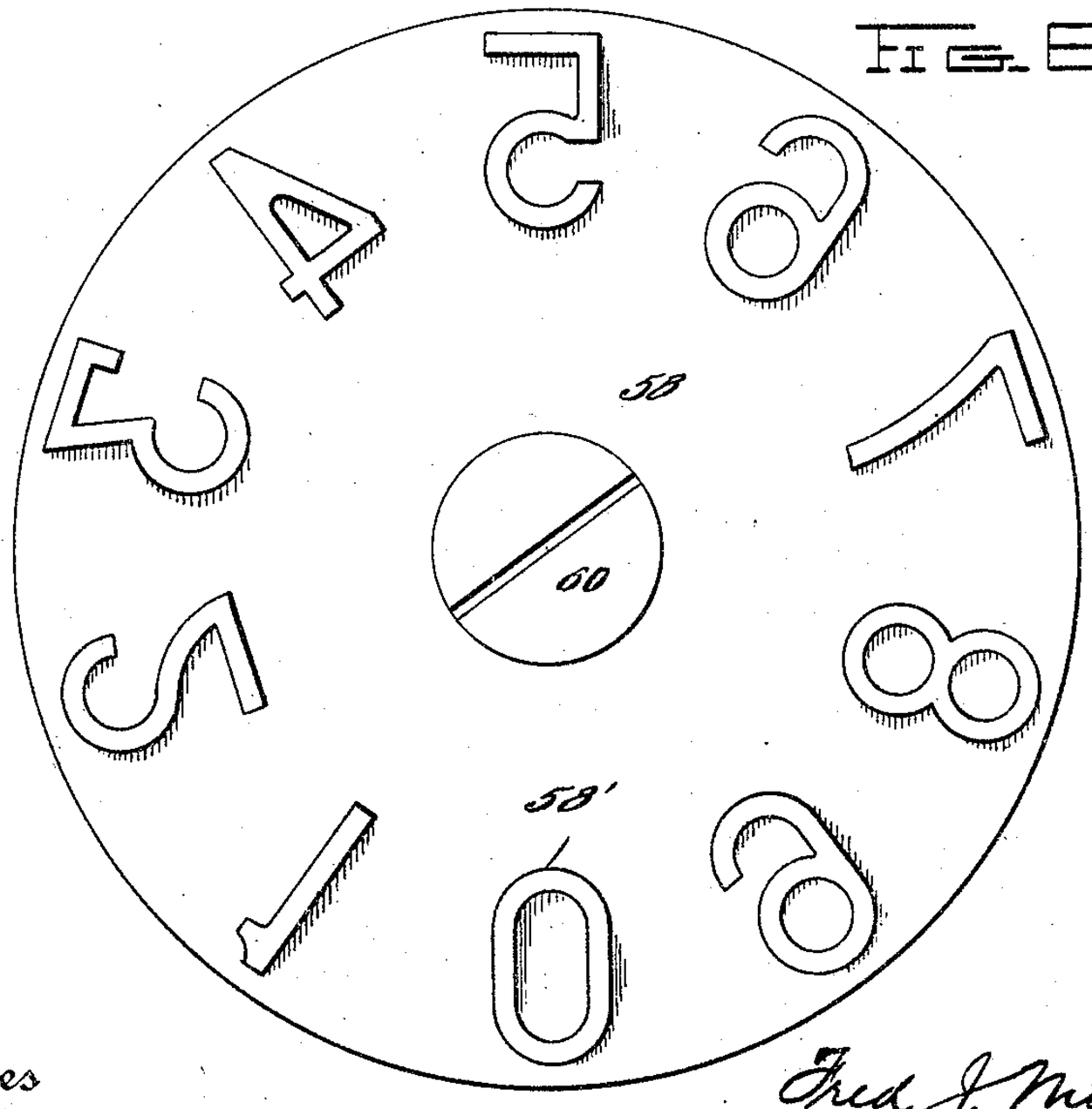

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PHOTO-LITHOGRAPHED BY SACHETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

No. 788,423. Patented April 25, 1905.

UNITED STATES PATENT OFFICE.

FREDERICK J. NUTTING, OF DAYTON, OHIO, ASSIGNOR TO NATIONAL CASH REGISTER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 788,423, dated April 25, 1905.

Application filed June 19, 1903. Serial No. 162,194.

To all whom it may concern:

Be it known that I, FREDERICK J. NUTTING, a citizen of the United States, residing at the city of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Engraving-Machines, of which I declare the following to be a full, clear, and exact description.

This invention relates to improvements in engraving-machines, and has more particular relation to improvements in such machines as are designed to engrave a plurality of similar designs, configurations, characters, or the like.

One of the several objects of the invention is to provide means whereby a series of similar designs, configurations, characters, or the like may be simultaneously engraved upon the surfaces of plates, disks, segments, or the like constructed of metal or other suitable material.

The invention consists of certain novel constructions, combinations, and arrangements of parts, all of which will be hereinafter more particularly set forth and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 represents a front elevation of the machine embodying my invention, the lower part of the same being broken away. Fig. 2 represents a vertical transverse section through the machine on the line 2 2 of Fig. 1, the lower portion of the machine being omitted. Fig. 3 represents a similar view approximately on the line 3 3 of Fig. 1, the lower part of the machine being shown, the intermediate parts and upper portion of the machine being broken away. Fig. 4 represents a detail vertical section, partly in elevation, of the latching device for the pattern-table with its coöperating parts. Fig. 5 represents a detail vertical section through the upper portion of the work-carrier, showing the construction for detachably securing the work in position. Fig. 6 represents a detail top plan view of one form of pattern-table constructed for numerals from "1" to "9," including a zero. Fig. 7 represents a detail horizontal section, partly broken away, through the sliding carriage and its guides. Fig. 8 represents a detail vertical section through a portion of the work-holder, showing the construction of the same for clamping disks in position instead of the segments shown in Fig. 5; and Fig. 9 represents a detail vertical section through one of the drill-bit spindles and the coöperating parts.

Described in general terms the machine may be said to comprise a swinging stylus supported upon the immovable main frame by a universal-joint connection and arranged to swing over a detachable pattern-plate formed with a series of raised numerals or characters about which the stylus is moved when the machine is in operation. A series of drills or other forms of cutters are mounted in a horizontally-movable carriage which receives its motion from its connection with the aforesaid stylus. The work to be engraved is mounted in a vertically-movable carrier beneath the several drills or cutters and is moved up into engagement therewith at will. The pattern-table is moved to and from the stylus by means of a suitable foot-treadle.

Described in detail, 1 in the drawings represents the side standards of the main frame, and 2 the arch-crown connecting the same. The side standards 1, as best shown in Fig. 7, are formed with grooves or channels 3 and 3^a. An adjustable grooved guide $4''$ is mounted in the way 3^a by adjusting-bolts $4'$. The groove or channel 3^b of this guide corresponds to the channel 3, and in these channels the respective opposite edges of the carrier 4 are guided. The adjustability of the guide $4''$ permits of the parts being kept in proper adjustment after the guide-channels have become worn. The carrier 4 is supported in position by link-bars 54, which are pivoted, as at $54''$, in pendent ears $54'$, formed on the opposite sides of the carrier, as best shown in Figs. 1 and 2. The pivot $54''$ may be locked after the work is placed in position by short removable locking-pins $54'''$, which pass through the ears and the links, as will be readily understood by reference to Fig. 1.

The links 54 are in turn pivotally connected to crank-arms 53, which are mounted upon the opposite ends of a transverse rock-shaft 52, mounted in a vertically-movable frame 35. One of the crank-arms 53 is provided with an operating-handle 55. Stop-noses 56 are formed on each of the cranks 53 and are arranged to abut against stationary plates 57, mounted on the standards 1 to hold the carrier 4 in its elevated position. It will be seen by reference to Fig. 2 that the arms 53 and links 54 form a toggle connection and that when the carriage is in its upper position (shown in Fig. 2) the alinement of the toggles will be broken slightly in a forward direction, so as to hold the carriage 4 firmly in its upper position by the engagement of the stops 56 with the plates 57. When it is desired to lower the carriage 4 and move the work out of the paths of the drills, the handle 55 is moved rearward, thus breaking the toggle to the rear to a sufficient extent to permit the carriage 4 to descend and properly lower the work.

The upper portion of the carrier 4 is formed with journaled standards 5 and 6, upon which are formed journal-blocks 7 and 8. The journal-block 7 is internally threaded to receive a sleeve 19, also having internal threads. A spindle or journal sleeve 18 is threaded externally and passes through the sleeve 19. At its outer end this sleeve 18 carries an adjusting-wheel 20, by means of which it is rotated and moved to the right or left, as desired. The inner end of said sleeve 18 is formed with an annular ball-run in which are mounted antifriction-balls 18″. The trunnion-spindle 17 is provided with a conical bearing-head 16, which is formed with an the annular ball-channel corresponding with channel or ball-run formed in the sleeve 18. The spindle 17 passes through the sleeve 18 and is secured in position in relation thereto by suitable washers and lock-nuts 17′ and 17″. By means of the above-described construction the spindle 17 may be moved in or out, as desired, by simply adjusting the wheel 20, and at the same time the spindle is perfectly free to rotate independently without undue end-thrust friction. In the bearing-block 8 is mounted a bushing 19′, formed with an internal conical bearing-passage for the reception of a conical spindle 21, which is secured in position therein by lock-nuts 21′ and the washer 21″. This peculiar conical construction of spindle and bearing is designed to automatically take up any wear which may occur at this end of the work-supporting shaft. The spindle 21 is recessed, as at 21^a, to receive one end of the supporting-shaft 9, which is secured therein by a suitable cross-bar 9′. The opposite end of the shaft 9 is formed with a socket 14, in which projects a stud 15, formed on a clamp-plate 12′. This plate is formed with a conical recess 12″, into which projects the conical end 16. A clamping-plate 12‴ is mounted upon the opposite end of the shaft 9, and the segments 10 to be engraved are slipped upon the shaft between the two clamping-plates with a series of interposed spacing-plates 13, having spacing-studs 13′. These spacing-plates hold the segments in such positions as to be engaged by the drills or cutters hereinafter described. When it is desired to remove the work from the shaft 9, the wheel 20 is rotated until the conical head 16 disengages from the clamp-plate 12′. The shaft 9 may now be moved to one side. During this movement the notched end of the shaft disengages from the bar 9′, which is fast in the spindle 21. The shaft is then removed entirely from the machine and after being reloaded is again returned to position and clamped in place by the rotation of the wheel 20.

As each of the segments or disks is to have a series of numbers or characters engraved thereon, it becomes necessary to partly rotate the shaft 9 at intervals to bring different portions of the peripheries of the segments into cutting positions. To accomplish this result, the spindle 21 supports a disk 22, which is provided about its periphery with a series of teeth 22′ and a series of laterally-projecting pins 23. Journaled upon the bushing 19′ is a yoke 26. One arm, 26′, of this yoke, as best shown in Fig. 3, is provided with two noses 27 and 27′. A pivoted pawl 29 is mounted on the nose 27 and is normally drawn against the stop-pin 27″ by a coil-spring 30, which connects it to the nose 27′. The remaining arm, 26″, of the yoke 26 is formed with a nose 31, to which is connected a pendent operating-link 32 for rocking the yoke in a manner hereinafter described. A spring-pressed plunger 24 is mounted in a suitable socket in the carrier 4, so as to normally engage the teeth of the wheel 22, and thus lock said wheel in position. This plunger is provided with an operating-pin 24′, whereby it may be disengaged from the wheel 22 when desired. Its disengagement, however, in the regular operation of the machine is accomplished by the pawl 29. When the yoke 26 is oscillated, the pawl 29, which normally projects between two of the pins 23, will engage one of said pins and will thus be straightened out in line with the nose 27, which action will cause the pawl to engage the upper end of the plunger 24 and force said plunger downward and out of engagement with the teeth of the wheel 22. After the wheel is freed from the plunger 24 it will move with the yoke 26, as the pawl 29 has meantime come to a stop against the pin 27″ and is prevented from turning farther upon its pivot. The movement of the yoke 26 is just sufficient to cause the pawl 29 to move the wheel 22 one notch, when the plunger 24,

which is released by the forward movement of the pawl 29, will again engage the wheel and lock the same in position.

While the machine is normally set so that the oscillation of the yoke 26 will move the wheel 22 the distance of one tooth only, I provide devices whereby this movement of the wheel may be increased or decreased, as desired. These devices comprise a rectangular frame 33, formed on the lower end of the link 32, and an adjusting-bolt 33′, which passes loosely through an aperture formed in the lower side of the frame 33. Adjusting and locking nuts 43 and 44 are mounted on the bolt 33′ above and below the lower side of frame 33. The positions of these locking-nuts in relation to each other determines the throw of the link 32, as the bolt 33′ may be given a greater or less independent movement before the nuts 43 engage the bottom of the frame 33 to draw the link 32 downward. The stroke of the bolt 33′ remains always the same. This bolt is pivoted at its lower end to the forward end of a lever 34, which is pivoted at its rear end to the frame 35. The lever 34 is normally forced into its upper position by a coil-spring 49, mounted in a socket 50 in the frame 35 and engaging an ear 51, formed on said lever. The lever 34 is operated by a pivoted hand-lever 38, which is pivoted at 38′ upon a lug 39, formed upon a block 41, which is vertically adjustable in the standard 1 by suitable clamping-plates 42. A pivoted link 37 connects the lever 38 to the lever 34. From the above-described devices it will be seen that while the lever 38 may have considerable movement the link 32 will only partake of a very slight portion of this movement, as the bolt 33′ moves down for a considerable distance before the nuts 43 engage the frame 33. The downward movement of the lever 34 causes a shoulder 45 formed thereon to engage a pin 46, projecting from a spring-pressed plunger 47, which is suitably mounted in the frame 35 and is arranged to engage notches 59, formed in the under side of the pattern-table 58. This plunger 47 when it engages the notches 59 locks the table 58 in its adjusted positions, so that when said plunger is depressed the table is left free to be rotated upon its spindle 60ª to bring a fresh figure or character 58′ into coöperative relation with the stylus-point 80′. The spindle 60ª is mounted in the frame 35, and the rotary table 58 is secured thereon by a conical adjusting and securing nut 60. As the spindle 60ª and the shaft 52 are both mounted in the vertically-movable frame 35, it follows that when this frame is elevated the characters on the table 58 will be brought into engagement with the stylus-point 80′, and the segments or disks 10 upon the shaft 9 will be brought into engagement with the drills or cutters 93, hereinafter described. The frame 35 is guided in position upon the main frame by pendent rods 35′, which project through suitable apertured lugs 35″, formed on said frame. Vertical movement is imparted to the frame 35 by levers 62, which are pivoted on the main frame, as at 61, and to two lugs 64 on the frame 35 at 63. The rear ends of the levers 62 are pivotally connected to vertical link-rods 66, which rods are in turn pivotally connected to levers 68, pivoted, as at 99, upon the base of the main frame and connected at their forward ends by a cross pedal-bar 70. When the operator depresses the bar 70, the frame 35 will be elevated and move the parts into the positions above described.

As the frame 35 moves upward it also elevates the shaft 52, and as the toggle-levers 53 and 54 remain unbroken because of the plate 57 the frame 4 is moved forward to bring the work into engagement with the drills and is held up as long as pressure is exerted upon the pedal-bar 70. It will be seen that when the operator removes his foot from said pedal-bar the frame 35 will immediately descend and the pattern-table and frame 4 be lowered to their normal positions. (Shown in Fig. 2.) When in these positions, the handle 38 is operated and the work fed forward for the next cutting operation. The table 58 is at the same time released and is turned by hand to bring the proper pattern thereon into coöperative relation with the stylus-point 80′.

In order that the segments 10 may be prevented from turning upon the shaft 9, I provide the frame 4 with a stop-plate 92, against the upper edge of which the segments rest when the shaft 9 is placed in position.

In Fig. 8 I have shown a slightly-modified form of clamping and spacing plates to be used when disks or wheels 11 are to be engraved. These clamping and spacing plates 11′ and 11″ are substantially like the plates 12′, 12‴, and 13 except that instead of being segmental they are cylindrical.

I have described above the devices for carrying the work to be cut and the pattern by which the movements of the cutters or drills are governed, and I will now describe in detail how the movements of the stylus 80 in relation to the characters 58′ result in movements in any horizontal direction of the drills or cutters.

The stylus 80 is rigidly connected at its upper end to what might be termed a "universally-movable block" 81, in that this block is free to be swung or oscillated in any direction by said stylus. The block is indirectly hung or supported in position by trunnion-bolts 86, adjustably mounted in pendent lugs 87 of the crown 2 and locked in position by lock-nuts 87′. The trunnion-bolts are squared at their outer ends, so that they may be more readily adjusted to take up any wear, and are formed on their inner ends with semispherical heads 86′, which project into similarly-shaped sockets 84′, formed in a rectangular frame 84, as best shown in Figs.

1 and 2. The frame 84 is provided with trunnion-bolts 83, similar to the bolts 86, but extending at right angles thereto. The semispherical heads of these bolts 83 project into semispherical sockets 81′, formed in the universally-movable block 81, and thus the block 81 may swing from side to side by turning on the bolts 83 as a pivot and may swing from front to rear through the mediation of the frame 84, which turns on the bolts 86 as a pivot. In order to communicate this universal movement of the block 81 to the horizontally-moving carriage carrying the drills, the following device is provided: A rectangular frame 85 is located just below the frame 84 and is connected to the block 81 by trunnion-bolts 82, similar to the aforesaid bolts 86. This frame 85 is in turn connected to lugs 76, mounted upon a horizontally-movable frame 71, by trunnion-bolts 96. Thus the frame 71 has a universal connection with the block 81.

It will be seen from the above that when the stylus 80 is moved the block 81 follows this movement and in turn imparts movement to the sliding carriage or frame 71. This latter carriage can only move in horizontal directions and is supported by side flanges 78, formed thereon and projecting into horizontal guiding-channels 79, formed in the standards 1. The extent of angular movement of the block 81 is of course small as compared with the angular movement of the stylus 80, and in the universal connections which transmit this movement to the carriage 71 there is enough free play of the bolts within their respective sockets to permit the slight movement of the carriage 71 in the horizontal plane without jamming of the surfaces, whereas if there were no free play of the bolts in their sockets and the extent of movement of the carriage 71 was of any considerable extent the carriage would tend to rise above the horizontal plane in the arc of a circle, since it would swing upon a fixed pivotal point as a center, and thereby free movement to any extent in a horizontal plane would be prevented. The frame 71, as best shown in Fig. 1, is provided with journal-lugs 71′, in which is journaled a transverse shaft 74, carrying a belt-wheel 75, which may be connected to any suitable source of power by a belt having a suitable take-up for the slack in the belt caused by the movement of the carriage 71, which belt construction is old and well known in the art. The shaft 74 carries a series of beveled pinions 73, which mesh with beveled pinions 73′, mounted upon the upper ends of a series of drill-spindles 90. These spindles are journaled in two spaced horizontal flanges 88 and 89, formed on the carriage 71, by means of journal bushings 88′ and 89′. (Best shown in Fig. 9.) The lower portion of the spindle 90 is formed with an annular flange 90′, which engages a bearing-washer 88″, mounted under the flange 89. This flange and washer forms an end thrust-bearing for the drill-spindle. The spindle is held in position and prevented from dropping by securing and locking nuts 89″, mounted thereon above the flange 89. The lower end of the spindle 90 is screw-threaded to receive an internally-screw-threaded cap 95. The drill-bit 93 passes through the drill-spindle 90 and is secured rigidly therein by a soft-metal or split conical plug or nipple 94, which is applied in a conical socket formed in the lower end of the spindle and through which the drill-bit passes. When the cap 95 is screwed upon the lower end of the spindle 90, it forces the plug 94 upward, which action results in the plug being jammed tightly into connection with both the drill-spindle and the drill-bit to lock the two together. This locking, however, is not sufficiently rigid to cause the breaking of the bit should it become jammed or wedged in any manner in the work which it is operating. The lower end of the bit projects through a suitable aperture 96 formed in the cap 95.

I do not care to limit myself to any particular number of drills or cutters, as this number could be increased or decreased to any extent desired without departing from the spirit of this invention. In fact, numerous gangs of drills might easily be connected to the movable carriage 71, it only being necessary to mount the additional gangs of drills in horizontal slides connected by suitable links with the slide 71, so as to partake of its different horizontal movements. Further, I have shown a machine in the drawings as constructed for engraving numerals or characters; but it will of course be understood that any sort of pattern might be placed upon the pattern-plate 58 whether it be a numeral, letter, design or configuration, picture, bank-note, or bond pattern, or, in fact, any pattern which might be engraved in any way, as in all such cases it is desirable with one movement of the stylus or tracing-finger to engrave simultaneously a number of duplicate plates, wheels, segments, or the like. It will also be observed that while the stylus-point 80′ has considerable movement the points of the drill-bits 93 partake of a very small part of this movement and the engraving upon the work carried by the shaft 9 is therefore very much smaller than the pattern upon the plate 58. It results from this that the movement of the stylus 80 need not be extremely accurate, as any defective movement is reproduced in the drills to such a slight degree that it is not perceptibly transferred to the article being engraved.

Should it be desired for any reason to adjust the shaft 9 independently of its regular feeding operation, the plunger 24 is depressed by the finger-pin 24′ and the shaft is free to be rotated.

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

1. In an engraving-machine, the combination with an engraving element, a tracing element, means for operating the former element by the movement of the latter element, and a pattern-support; of an operating-lever for adjusting the pattern-support into coöperative relation with the tracing element; a work-support carried upon said pattern-support; and a second operating-lever for adjusting the work-support to carry the work into and out of coöperative engagement with the engraving element.

2. In an engraving-machine, the combination with an engraving element, a tracing element, means for operating the former element by the movement of the latter element, and a pattern-support; of an operating-lever for adjusting the pattern-support into coöperative relation with the tracing element; a work-support carried upon said pattern-support; a second operating-lever for adjusting the work-support to carry the work into and out of cooperative engagement with the engraving element; a feed mechanism for advancing the work upon the work-support; an operating-lever for operating said feed mechanism; and an adjustable connection between said lever and said feed mechanism capable of adjustment to permit the feed when both the pattern-support and the work-support are raised into operative position, but to prevent the feed when only the pattern-support is raised into operative position.

3. In an engraving-machine, the combination with an engraving element, a tracing element, means for operating the former element by the movement of the latter element, and a work-support; of a feeding device for advancing the work; a link connected with said feeding device and carrying an operating-frame; an operating-lever for actuating said feeding device; a bolt connected with said operating-lever and extending through said frame and capable of movement independent of said frame; and an adjustable nut carried by said bolt for engaging said frame and operating the feeding device at a predetermined point in the movement of said operating-lever.

4. In an engraving-machine, the combination with a cutter, of a movable work-holder including a shaft adapted to receive and retain the work, of a notched disk connected to said shaft, a series of feeding-pins arranged on said disk, a spring-pressed locking means for said disk, and a rocking frame carrying means whereby said disk is released from said locking means and fed forward.

5. In an engraving-machine, the combination with a cutter, of a vertically-movable carriage having a shaft arranged thereon, a disk connected to said shaft, a series of projections on the periphery of said disk, a series of pins extending laterally from said disk, a rock-frame arranged adjacent to said disk, a spring-pressed plunger in said movable carriage engaging the projections of said disk, a spring-actuated pawl on said frame whereby the disk is released from said plunger and moved forward when the frame is rocked.

6. In an engraving-machine, the combination with an engraving element, a tracing element, means for operating the former element by the movement of the latter element, and a pattern-support; of means for adjusting the pattern-support into coöperative relation with the tracing element; a work-support carried upon said pattern-support; means for adjusting the work-support to carry the work into and out of coöperative engagement with the engraving element; a feed mechanism for advancing the work upon the work-support; and an operating means for operating said feed mechanism constructed to actuate the feed when both the pattern-support and the work-support are raised into operative position but to prevent the feed when only the pattern-support is raised into operative position.

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

FREDERICK J. NUTTING.

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