

No. 805,459.

PATENTED NOV. 28, 1905.

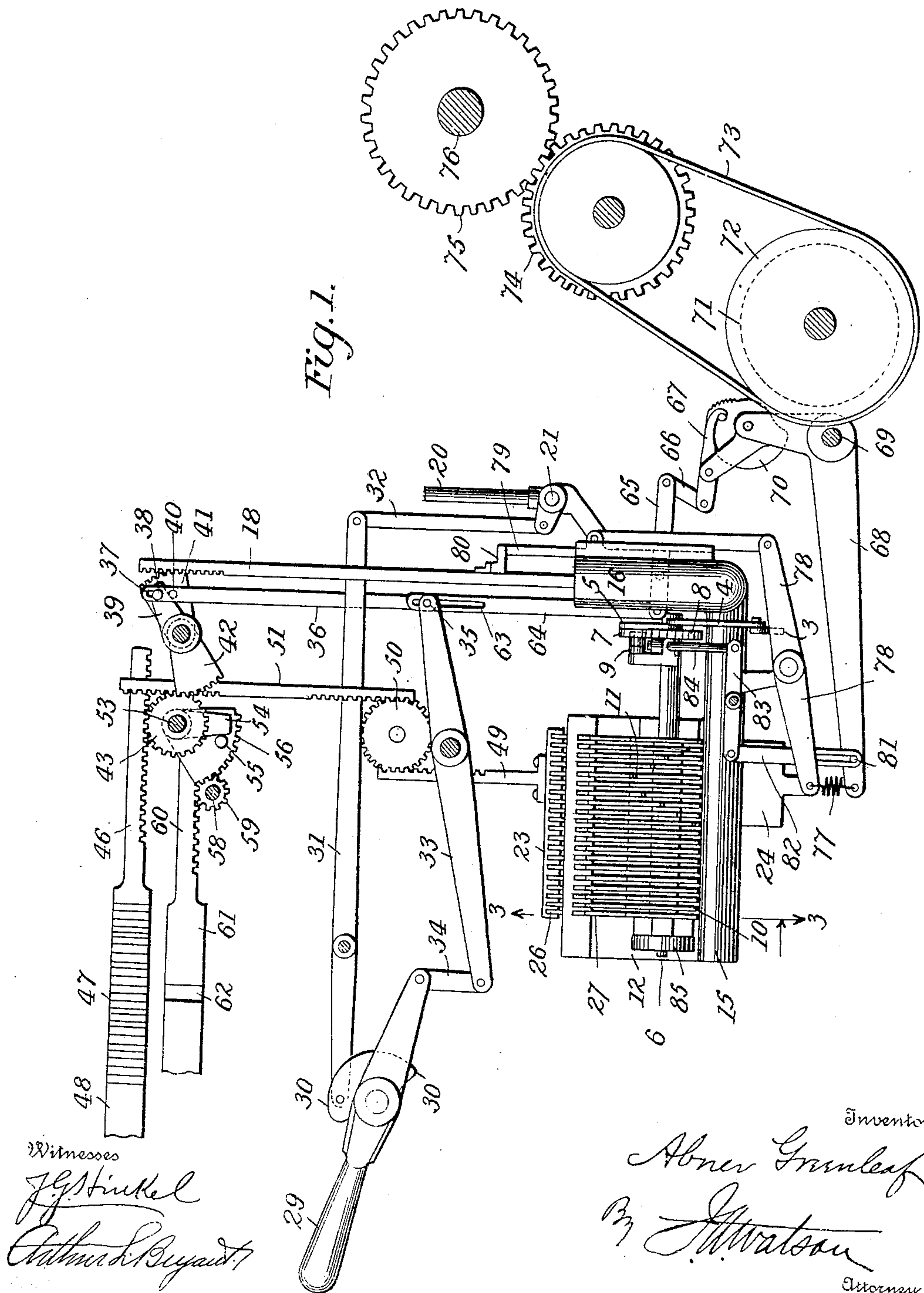
A. GREENLEAF.

JUSTIFYING MECHANISM FOR COMPOSING MACHINES.

APPLICATION FILED JUNE 13, 1903.

4 SHEETS—SHEET 1.

Fig. 1.



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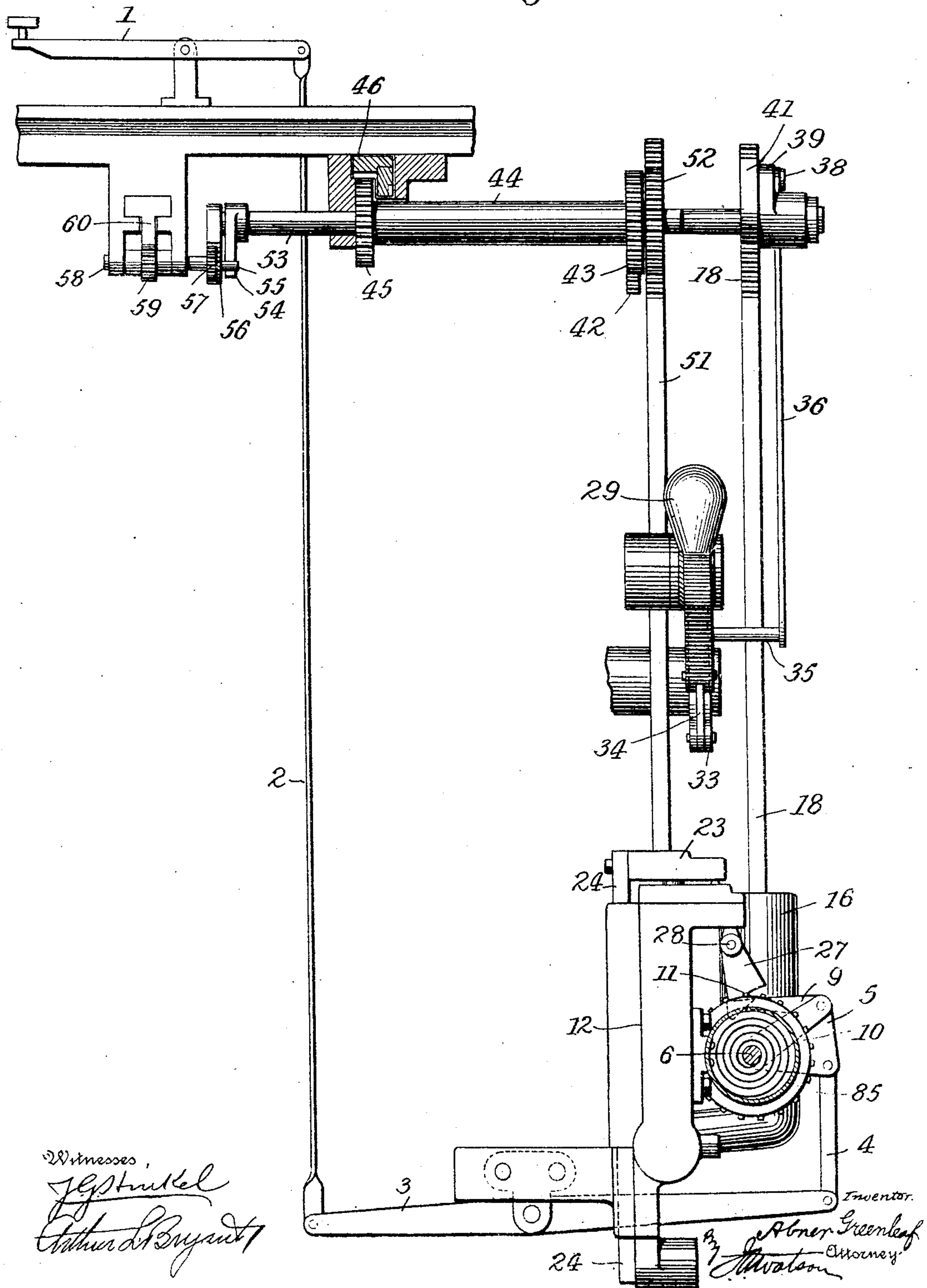
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4 SHEETS—SHEET 2.

Fig. 2.





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4 SHEETS—SHEET 3.

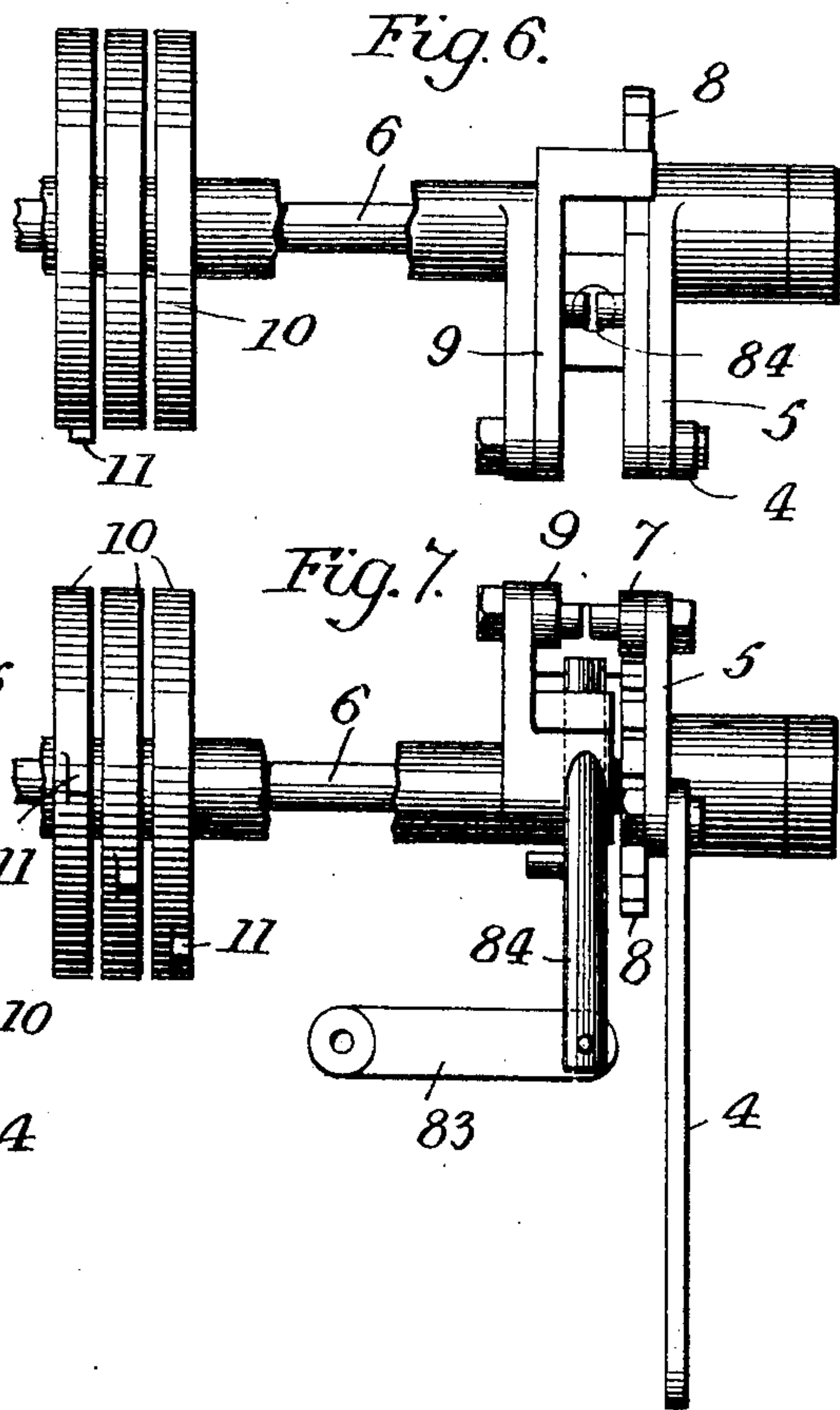
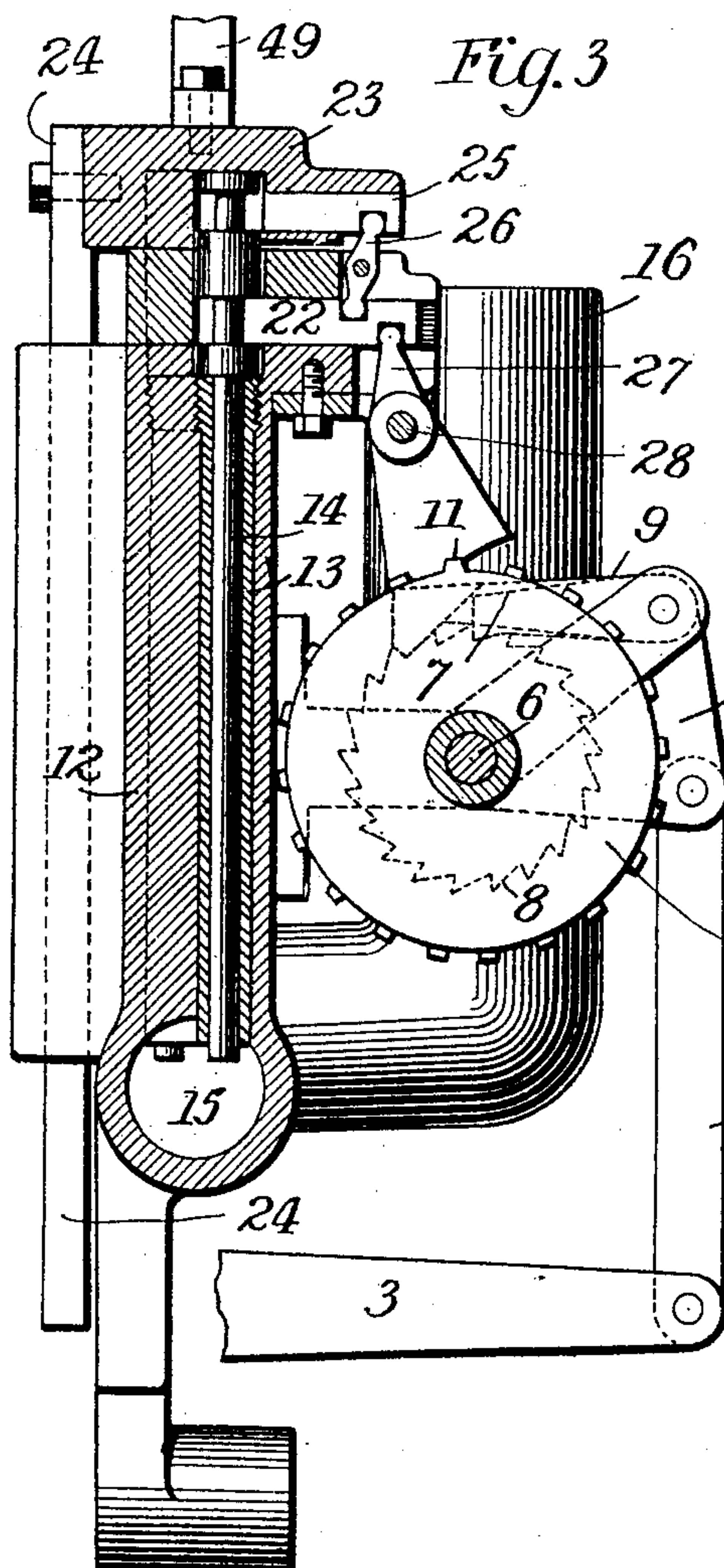
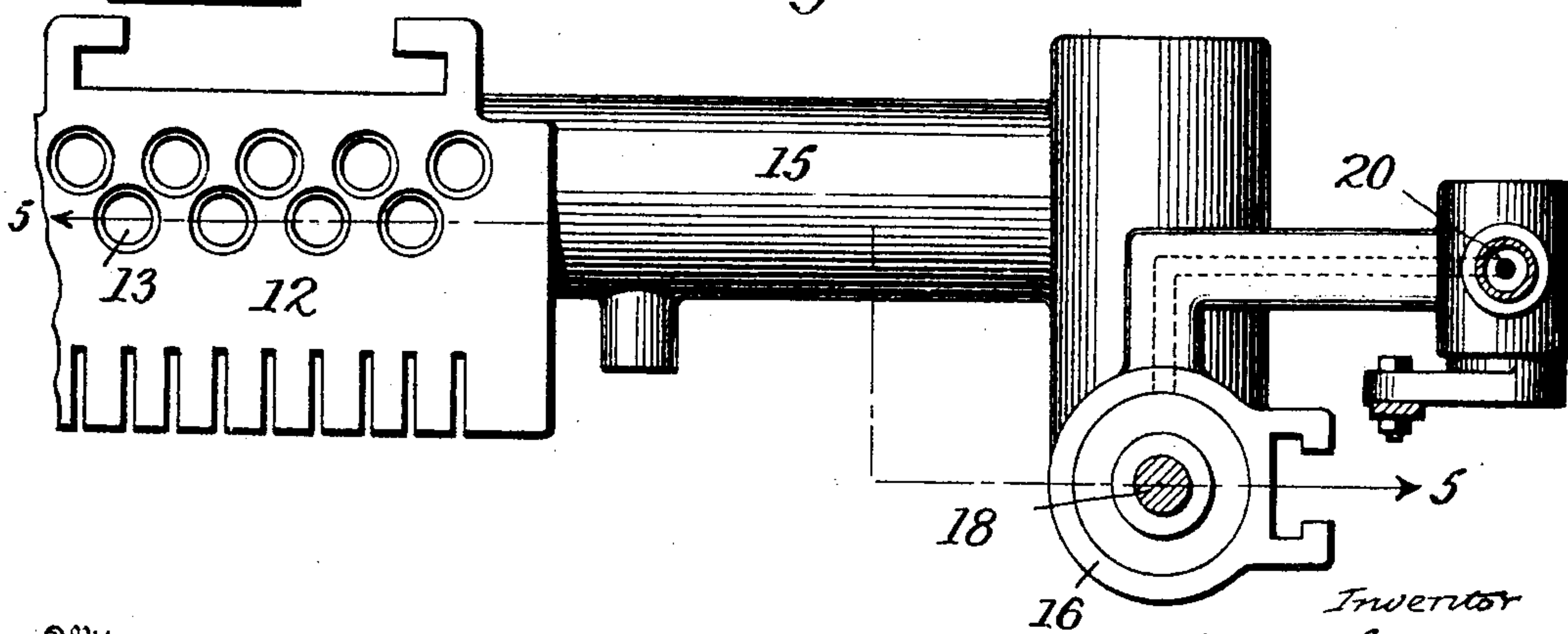


Fig. 4.



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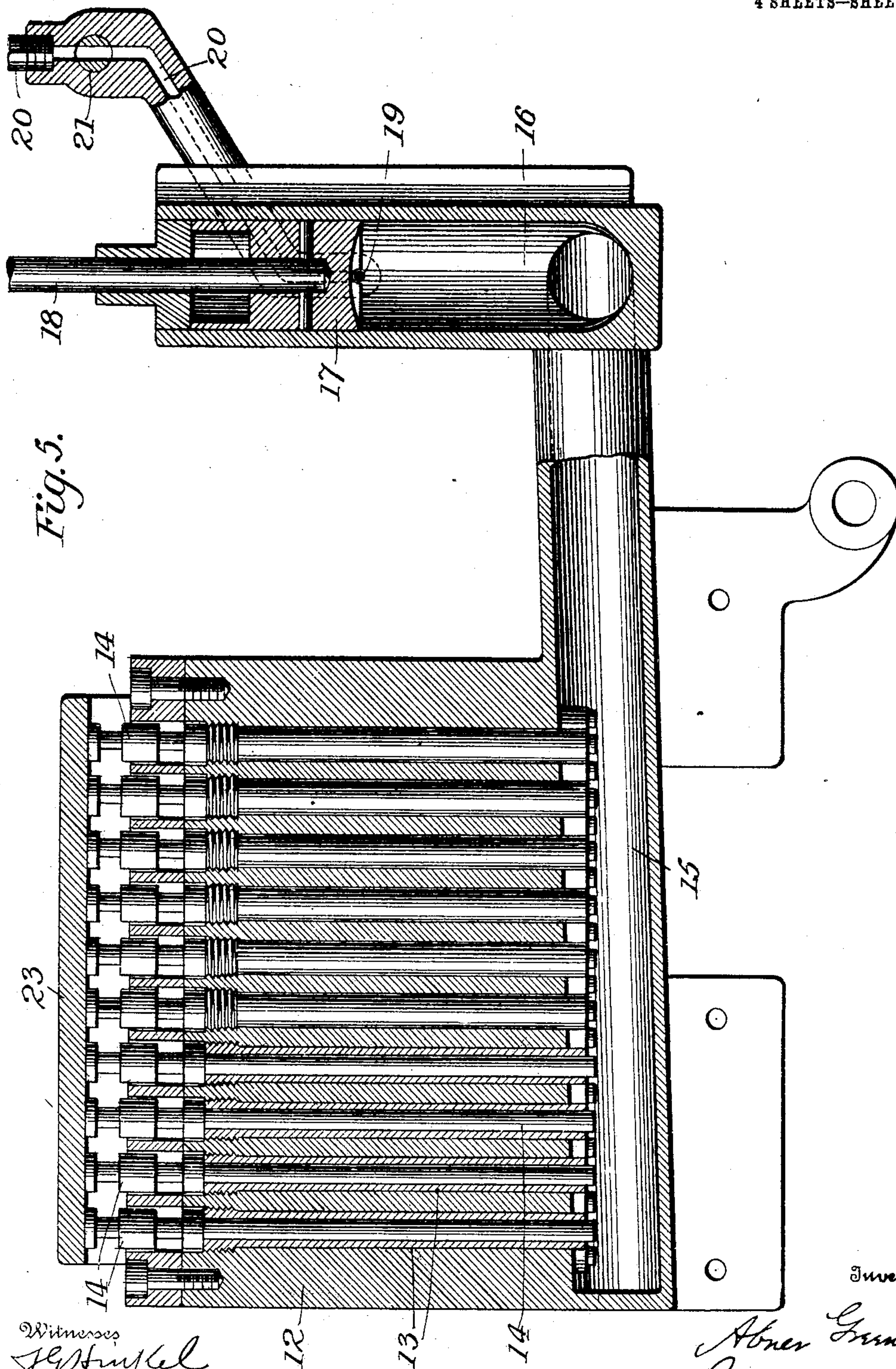


Fig. 5.

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# UNITED STATES PATENT OFFICE

ABNER GREENLEAF, OF BALTIMORE, MARYLAND, ASSIGNOR TO MERGENTHALER LINOTYPE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## JUSTIFYING MECHANISM FOR COMPOSING-MACHINES.

No. 805,459.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed June 13, 1903. Serial No. 161,344.

*To all whom it may concern:*

Be it known that I, ABNER GREENLEAF, a citizen of the United States, residing at the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Justifying Mechanism for Composing-Machines, of which the following is a specification.

This invention consists in a mechanism for effecting the justification of lines of composition in composing-machines, such as type-setting, type-casting, and linotype machines.

The invention will be described as applied for casting justifying-spaces which are usable for justifying lines of printers' type; but it will be understood that it is applicable to all classes of composing-machines.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus embodying the invention. Fig. 2 is a front view of part of the apparatus shown in Fig. 1. Fig. 3 is a view partly in section on the line 3 3 of Fig. 1. Fig. 4 is a plan view of the justifier-cylinders. Fig. 5 is a section on the line 5 5, Fig. 4. Figs. 6 and 7 are details of the ratchet-and-pawl mechanism.

Referring to the drawings, Fig. 2, the space-key 1 is connected by link 2, lever 3, and link 4 with an arm 5, which is loose on shaft 6. The arm 5 carries a pawl 7, which moves a ratchet-wheel 8 one tooth or unit each time the space-key is depressed. A suitable holding-pawl 9 is provided for the ratchet-wheel. The ratchet-wheel 8 is fast on shaft 6, and on the shaft is a series of disks 10, Figs. 1 and 3, each disk being provided with a single tooth 11 and said teeth being arranged spirally about the shaft 6. The purpose of these teeth will be explained further on.

Adjacent to the shaft 6 is a block or casting 12, in which is mounted a series of small cylinders 13, all of exactly the same diameter. In the cylinders 13 are closely-fitting pistons 14. The lower ends of the cylinders open into a tubular reservoir 15, and the pistons preferably project into said reservoir when they are in their lowest or normal position. The reservoir 15 communicates with a large cylinder 16, in which there is a piston 17, connected with the piston-rod 18. The piston 17 is shown in Fig. 5 in its highest position. Below the lower end of the piston-rod, as shown in Fig. 5, is an outlet 19, communicating with

the upwardly-extending pipe 20, in which there is a valve 21. The reservoir 15 and the cylinder 16 and stand-pipe 20 are normally filled with suitable liquid, such as oil or glycerin, and the piston 17 is normally in its highest position, as shown in Fig. 5. When in this position, any air or gas in the liquid will naturally pass out of the opening 19 and up the stand-pipe. The upper wall of the reservoir 15 is inclined to the horizontal, so that air and gas will not stand or be trapped in it.

Each of the pistons 14 is normally locked in its lowest position by a bolt 22, Fig. 3, which engages a neck near the upper end of the piston. Above the pistons 14 is a universal bar or head 23, which is connected to a slide 24, having a movement parallel with the movement of the pistons 14. On the under side of the head 23 are a series of sliding bolts 25, each adapted to slide into engagement with a second neck on its corresponding piston 14, thus locking the piston to the head 23. The bolts 22 and 25 of each piston are connected by a rocking lever 26 in such manner that when the bolt 22 is withdrawn from the piston the bolt 25 is engaged with it, thus freeing the piston from bolt 22, which locks it in stationary position, and locking it to the head so that they must move together. Each bolt 22 is engaged with the upper end of a lever 27, pivoted on a rod 28. The lower end of each lever 27 coöperates with one of the disks 10, and for this purpose it is provided with two curved surfaces corresponding to the periphery of the disk and an intermediate notch to receive the tooth on the disk. This engagement of the disk and lever is similar to the well-known "Geneva-stop" movement.

The operation of the device thus far as described is as follows: Each time the space-key is operated in composing a line the ratchet-wheel 8 is rotated one tooth, carrying with it the shaft 6 and the disks 10. It is presumed that the parts stand in their normal position before commencing each line of composition, in which position all of the pistons 14 are down to their lowest limit and are locked by the bolts 22. When the shaft 6 is turned for the first space, one of the levers 27 is rocked and the corresponding piston 14 is unlocked from its stationary position and locked to the head 23. It follows that a number of pistons 14 corresponding to the number of word-



spaces in a line will be released from their stationary position and locked to the head 23 and that the remaining pistons will be locked in their stationary lowest positions. If now  
 5 the valve 21 be closed and the piston 17 depressed, the released pistons 14 will be raised, together with the head 23, and as they are all locked to the same part they will rise an equal distance. It will be evident that the amount  
 10 of upward movement of the head 23 will be inversely as the number of pistons moving with said head—that is, for a given downward movement of the piston 17 there will be a given upward movement of the head 23 if one piston  
 15 14 be released. If two pistons 14 be released, the movement of 23 will be one-half as great. If three pistons 14 be released, the movement of 23 will be one-third as great, &c. The teeth on the disks 10 are so arranged that  
 20 one of the middle pistons 14 is first released. The pistons on opposite sides thereof are alternately released afterward, thus distributing the pressure on the head 23 uniformly. To economize space as much as possible, the  
 25 pistons 14 are arranged in two rows, as shown in Fig. 4. It will be evident that the apparatus illustrated in Figs. 3, 4, and 5 is adapted to divide the shortage of a line by the number of word-spaces in the line, the shortage  
 30 being represented by the movement of the piston 17, the number of word-spaces being represented by the number of pistons 14 released, and the quotient being represented by the movement of the head 23. For convenience of construction the cylinders 13 are  
 35 made much smaller than the cylinder 16, thus imparting to the head 23 a movement greater than the actual quotient above referred to, but proportional to the quotient. If the pistons  
 40 14 and 17 were exactly of the same diameter, the movement of 23 would be exactly the quotient of the movement of 17 divided by the number of active pistons 14.

The justifier above described may be adapted  
 45 to any composing-machine, such as a type-setting, type-casting, or a linotype machine. In the present case it is illustrated in connection with mechanism for setting a mold to cast justifying-spaces.

50 Referring to Fig. 1, 29 indicates a lever which is rocked after the keys for selecting or indicating a line of composition have been operated. Connected with the lever is a cam 30, which rocks the lever 31 during the first  
 55 part of movement of lever 29 and holds said lever 31 stationary during the balance of said movement. The first movement of lever 31 through link 32 closes the valve 21, and thereafter said valve remains closed until the handle of lever 29 is again raised. To the inner  
 60 or rear end of lever 29 a second lever 33 is connected by link 34. The inner end of lever 33 carries a pin 35, which is pivotally connected to the lower end of a link 36. During the  
 65 first movement of the lever 29 and while the

valve 21 is being closed the link 36 moves down without effecting any operation. When the valve 21 is closed, the upper end of slot 37 in link 36 engages a pin 38 on an arm 39. The arm 39 then engages a pin 40 on  
 70 segment 41, which segment is in mesh with rack-teeth on the piston 18. As the piston moves down under influence of lever 29 the segment 42 is rocked upward, rotating a gear 43, fixed on a sleeve 44. The sleeve 44 carries a pinion 45, which meshes with a rack on  
 75 the slide 46, which compresses the line of matrices or type 47 against an abutment 48, and thus the movement of the parts 35 to 46, inclusive, and of the piston 17 and rod 18 is  
 80 proportional to the shortage of the line. The downward movement of the piston 17 produces an upward movement of the pistons 14, which have been locked to the head 23, and consequently the movement of the head 23 a  
 85 distance which is proportional to the quotient of the shortage divided by the number of word-spaces—that is, proportional to the justifying-space required for the line. The movement of head 23 is communicated, by  
 90 means of a rack 49, gear 50, and rack 51, to a pinion 52, which is fast on the shaft 53, upon which the sleeve 44 turns. Upon said shaft 53 is an arm 54, which engages a pin 55 on a sector-gear 56, which is loosely mounted on  
 95 the shaft 53. The sector-gear 56 is in mesh with a pinion 57 on a shaft 58, and on shaft 58 is a second pinion 59, which operates a slide 60, having rack-teeth. The movement of the slide 60 for each line will be equal to or  
 100 proportional to the justifying-space required for the line. As shown in Fig. 1, the slide 60 is integral with the body-piece 61 of a mold, and its movement regulates the mold-opening 62, in which justifying-spaces may  
 105 be cast. It will be evident to those skilled in the art that the justifying mechanism above described may be used in any of the well-known composing-machines by modifying the manner of applying it. After the body-piece  
 110 61 or the part controlling the justification for a line has been set by the downward movement of the handle 29 the handle is raised and the parts are restored to their initial or normal position, with the exception of the part 61 or  
 115 other part controlling the justifier. The operator is thus enabled to proceed with the composition of a new line immediately after setting the justifier for the preceding line. The means for restoring the parts to normal position are  
 120 as follows: After the justifier is set the handle 29 is raised to its uppermost position. This causes the pin 35 to engage the upper end of a slot 63 and raise a link 64, rocking a lever 65, which is connected by link 66 to a detent-  
 125 pawl 67. As shown, pawl 67 is mounted on an arm of an elbow-lever 68, pivoted at 69 to the main frame. In the short arm of the lever is pivoted a cam 70, which is normally held stationary by the pawl 67 and which has  
 130



a tendency to move into contact with the constantly-rotating roller 71, driven by pulleys 72, belt 73, and gears 74 75 from the drive-shaft 76. When the pawl 67 is withdrawn  
 5 from the pin on the cam 70, the cam rotates into contact with the roller 71 and the eccentricity of the cam causes it to rock the lever 68. When the cam has made a single revolution, it is again caught and held by the pawl  
 10 67. The end of lever 68 is connected by spring-link 77 with slide 24, which carries the head 23, and said head and the displaced pistons 14 are drawn down to their normal position. As these pistons 14 are drawn  
 15 down the piston 17 is forced up. To assist in moving the piston 17 to normal position, a rocking lever 78 is connected at one end to slide 24, and at the opposite end it is connected by a link with the slide 79, operating  
 20 under a toe or projection 80 on the piston-rod 18. The body-piece 61 may be returned to normal position by hand or any suitable mechanical means. A pin 81 on the lever 68 operates in a link 82, and when lever 68  
 25 reaches its lowest position link 82 is slightly drawn down, rocking a lever 83 and forcing up a slide 84, which raises the pawls 7 and 9 and releases the ratchet-wheel 8. A spring 85 on the shaft 6 returns said shaft to its normal or starting position, causing the bolts 22  
 30 to lock the pistons 14 in their lowest or normal position. The parts are thus all automatically returned to normal position and the composition of the succeeding line may be immediately commenced. The upward movement of the lever 29 opens the valve 21. The lever 29 is only momentarily held in its highest position, when it is ready to drop slightly to normal position, as shown in Fig. 1.  
 40 Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a justifying mechanism, the combination of a piston movable in proportion to the  
 45 shortage of the line, pistons movable in proportion to the justifying-space required for the line, and a duct between said pistons, for the purpose set forth.

2. In a justifying mechanism, the combination of a piston movable in proportion to the  
 50 shortage of a line, a series of pistons of uniform diameter movable in proportion to the justifying-space required, means for selecting one or more of said latter pistons equal in  
 55 number to the spaces in a line to be justified, and a duct connecting all of said pistons, for the purpose set forth.

3. In a justifying mechanism, the combination of a series of pistons of uniform diameter,  
 60 a common bar or head adapted to co-operate with said pistons, means for selecting and locking one or more pistons to said head depending upon the number of spaces in the line to be justified, and means for operating

the pistons in proportion to the justifying- 65 spaces required.

4. In a justifying mechanism, the combination of a series of pistons in communication with a common duct, means for locking said  
 70 pistons in normal position, a common bar or head coöperating with said pistons, means for unlocking a selected number of pistons, and means for locking said selected pistons to the common bar or head.

5. In a justifying mechanism, the combination of a piston movable in proportion to the  
 75 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for a line, and a common duct communicating with all of said pistons, the upper wall of said  
 80 duct being so arranged that air or gas occurring therein will always pass to a given point at which an outlet is located.

6. In a justifying mechanism, the combination of a piston movable in proportion to the  
 85 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for a line, a common duct communicating with all of said pistons, and an outlet for said duct provided with a valve. 90

7. In a justifying mechanism, the combination of a piston movable in proportion to the  
 100 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for a line, a common duct communicating with  
 95 all of said pistons, and a stand-pipe communicating with said duct.

8. In a justifying mechanism, the combination of a piston movable in proportion to the  
 105 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for a line, a common duct communicating with  
 100 all of said pistons, and a stand-pipe communicating with said duct and provided with a valve. 105

9. In a justifying mechanism, the combination of a piston movable in proportion to the  
 110 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for the line, means for locking the pistons of  
 110 said series in normal position, and means for unlocking any desired number of said pistons.

10. In a justifying mechanism, the combination of a piston movable in proportion to the  
 115 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for the line, means for locking the pistons of  
 120 said series in normal position, and a space-key and connections for unlocking any desired number of said pistons.

11. In a justifying mechanism, the combination of a series of pistons, a movable head or  
 125 bar, bolts sliding in stationary bearings adapted to lock said pistons in normal position, bolts sliding in bearings on said head or bar adapted to lock the pistons thereto, and a connection between the bolts which operate in conjunction with each piston.



12. In a justifying mechanism, the combination of a series of pistons, a common head or bar, means for locking the pistons in normal position, and unlocking means operated from  
5 a space-key comprising a series of teeth in staggered relation adapted to operate said bolts respectively, and devices for moving said series of teeth simultaneously.

13. In a justifying mechanism, the combination of a piston movable in proportion to the  
10 shortage of a line, a series of pistons movable in proportion to the justifying-spaces required for a line, a duct connecting all of said pistons, an outlet for said duct provided with a  
15 normally open valve, and means for closing said valve before the first-named piston is operated.

14. In a justifying mechanism, the combination of a piston movable in proportion to the  
20 shortage of a line, pistons movable in proportion

to the justifying-spaces for a line, a conduit connecting said pistons, and means for restoring said pistons to normal position after the justification of the line has been determined.

15. In a justifying mechanism, the combination of a piston movable in proportion to the  
25 shortage of a line, pistons movable in proportion to the justifying-spaces for a line, a conduit connecting said pistons, and power-operated means for restoring said pistons to normal position after the justification of the line  
30 has been determined.

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

ABNER GREENLEAF.

Witnesses:

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