No. 607,046. Patented July 12, 1898.

F. A. JOHNSON.

TYPE JUSTIFYING MACHINE.

(Application filed Mar. 17, 1897.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

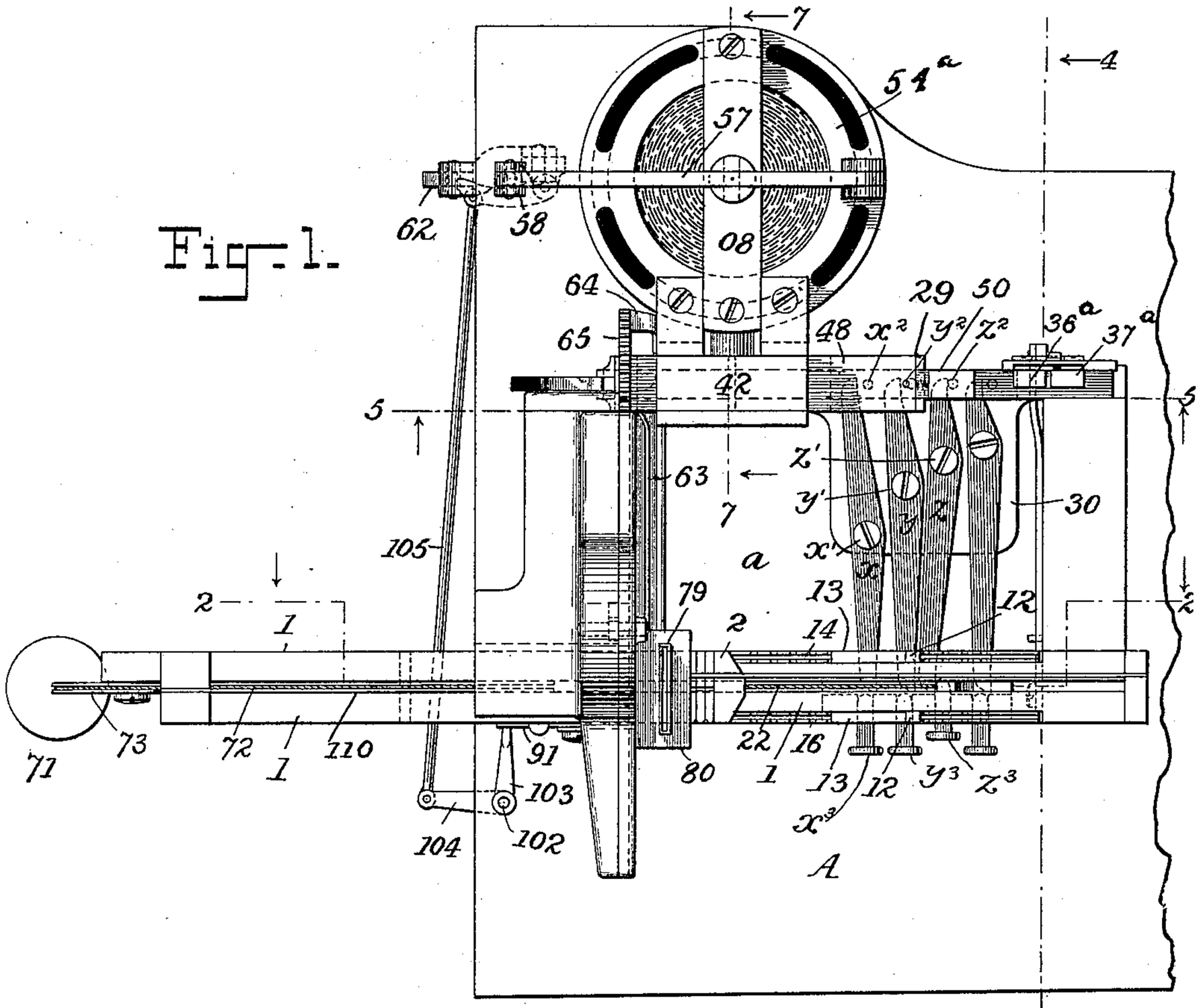
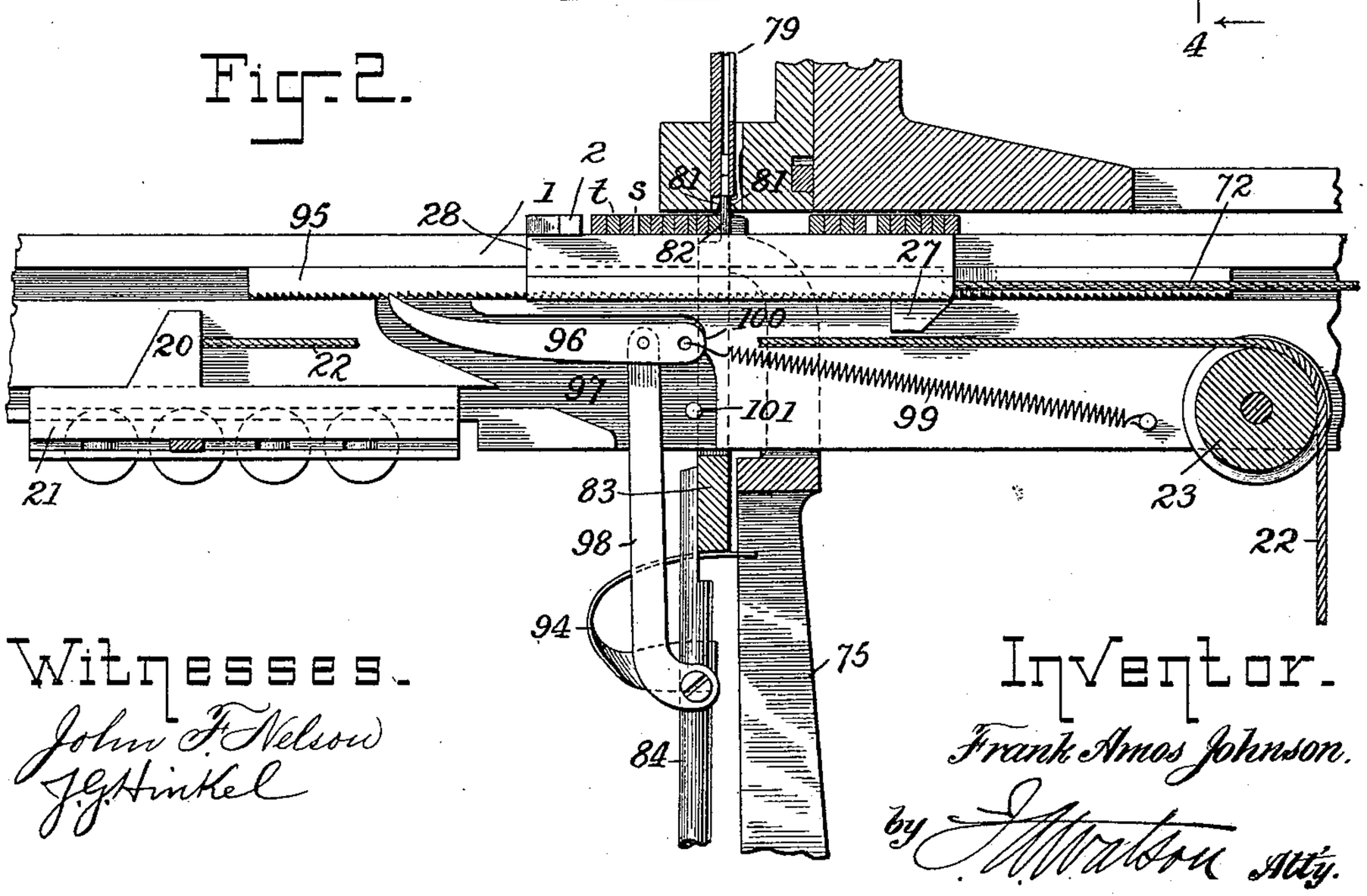


Fig. 2.



Witnesses.
John F. Nelson
J. J. Hinkel

Inventor.
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(No Model.) 5 Sheets—Sheet 2.

Fig. 3.

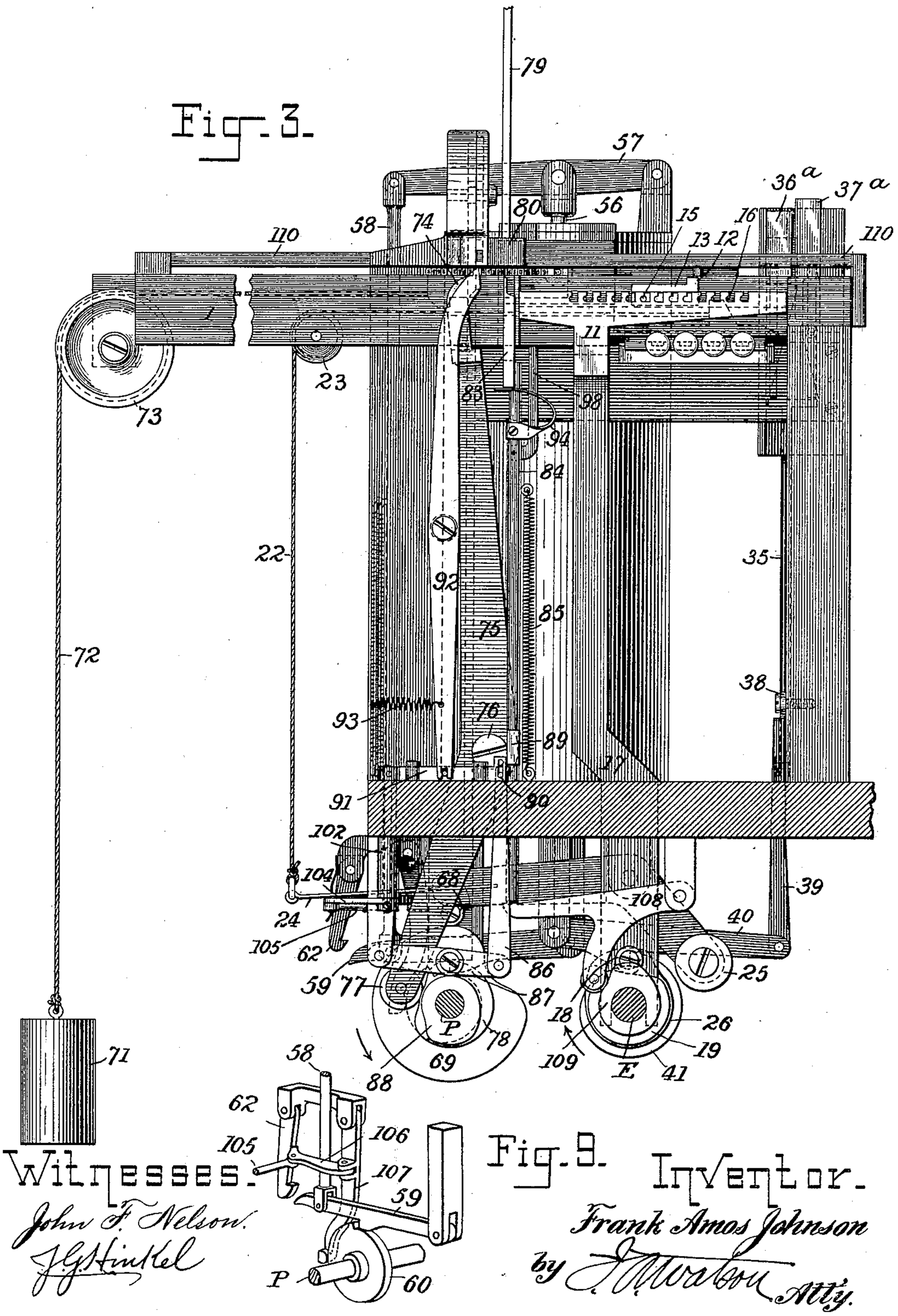

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Fig. 9.

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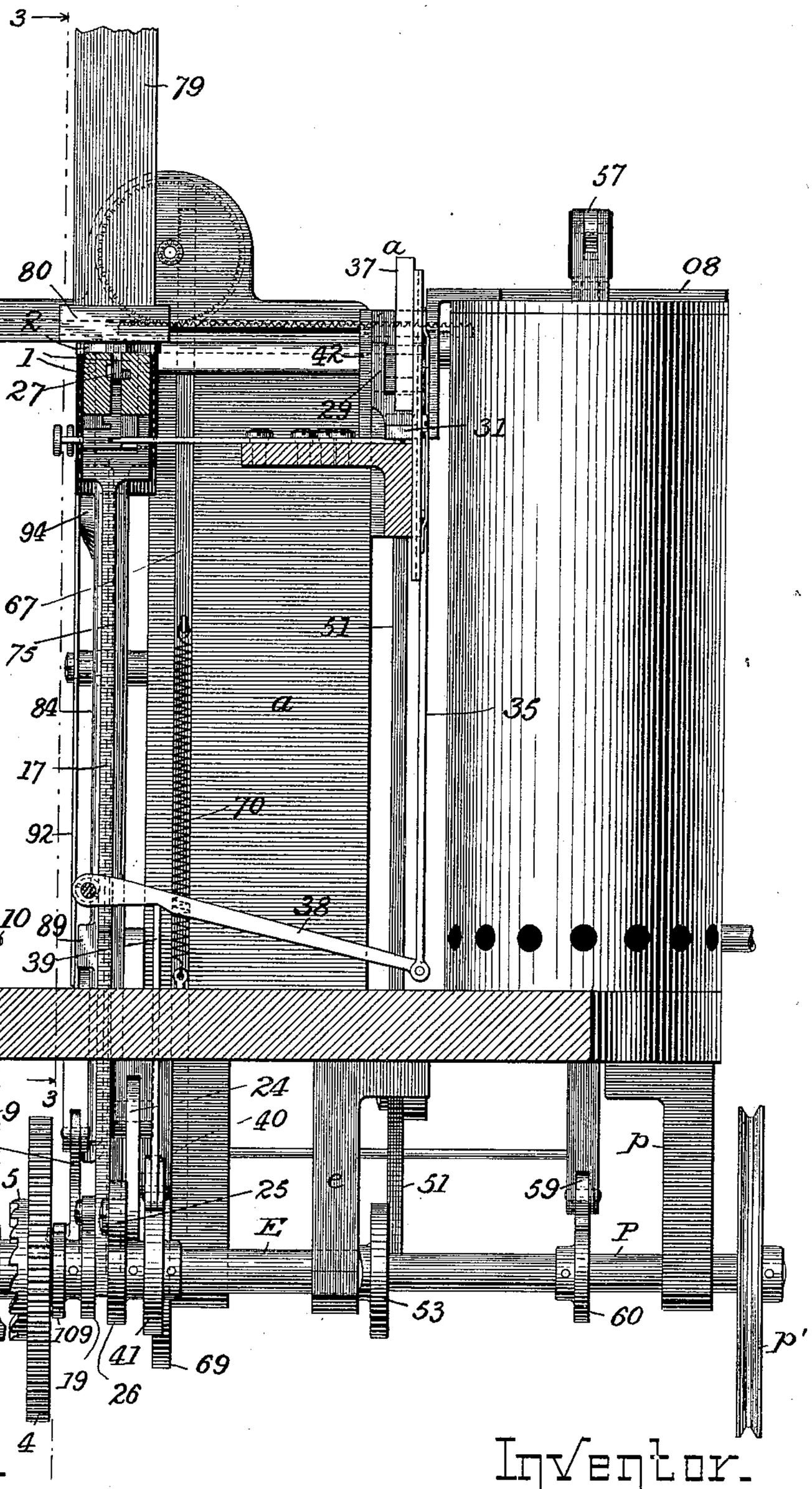
(No Model.) 5 Sheets—Sheet 3.

Fig. 4.



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(No Model.) 5 Sheets—Sheet 4.

Fig. 5.

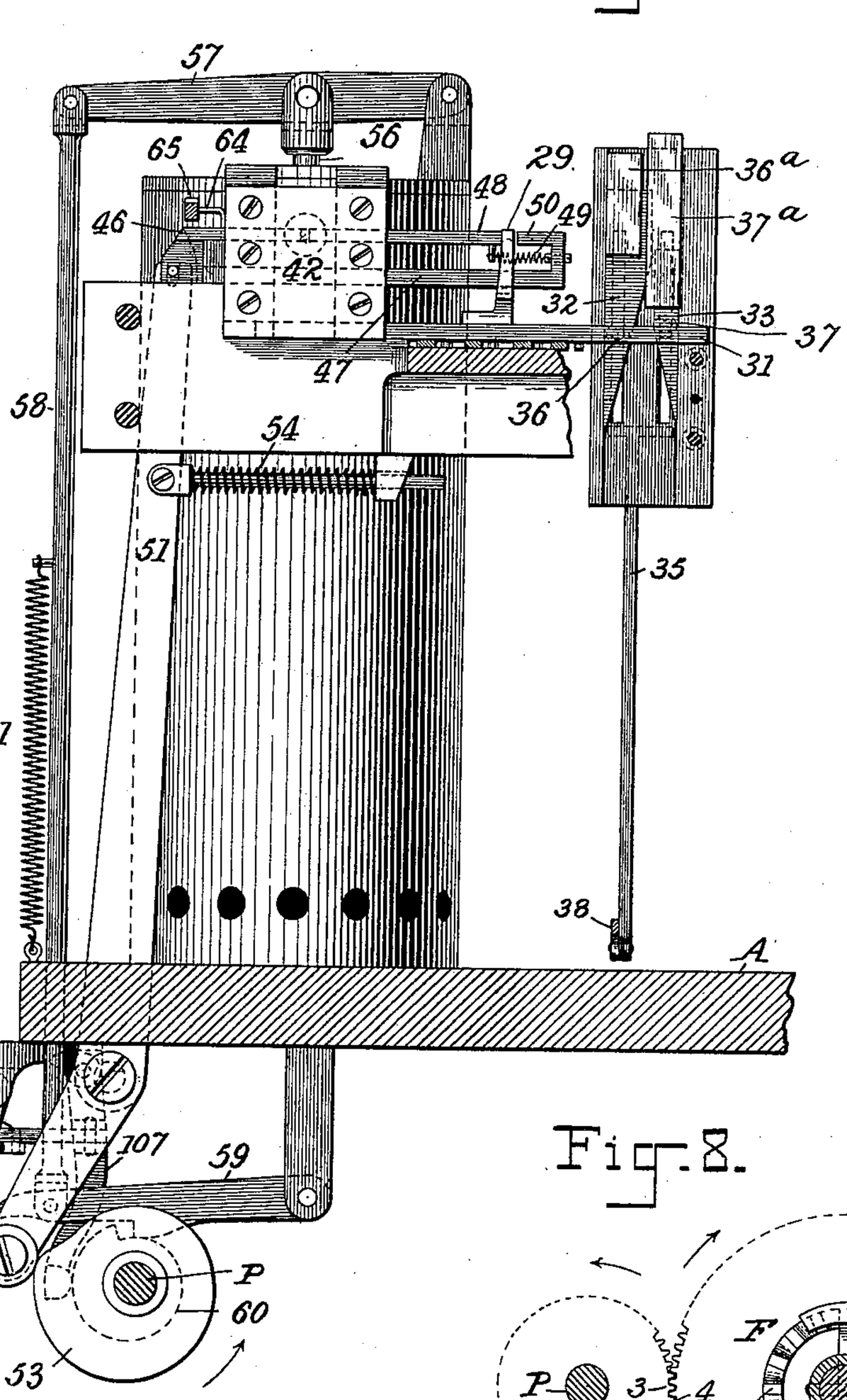
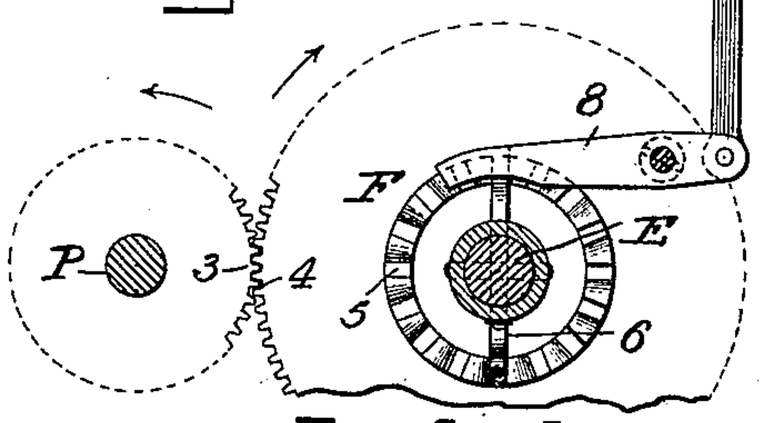


Fig. 8.



Witnesses.

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Patented July 12, 1898.

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TYPE JUSTIFYING MACHINE.

(Application filed Mar. 17, 1897.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 6.

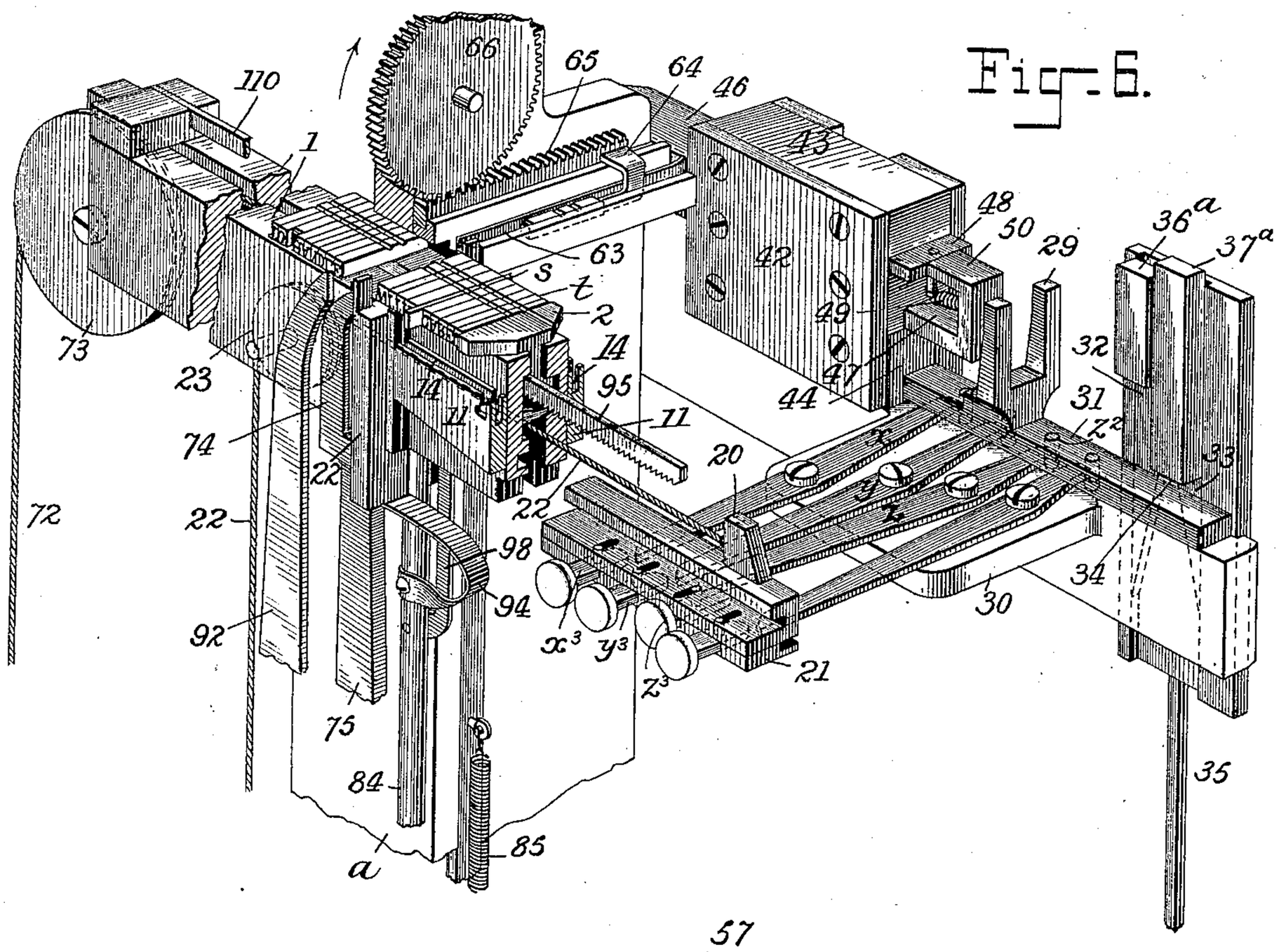
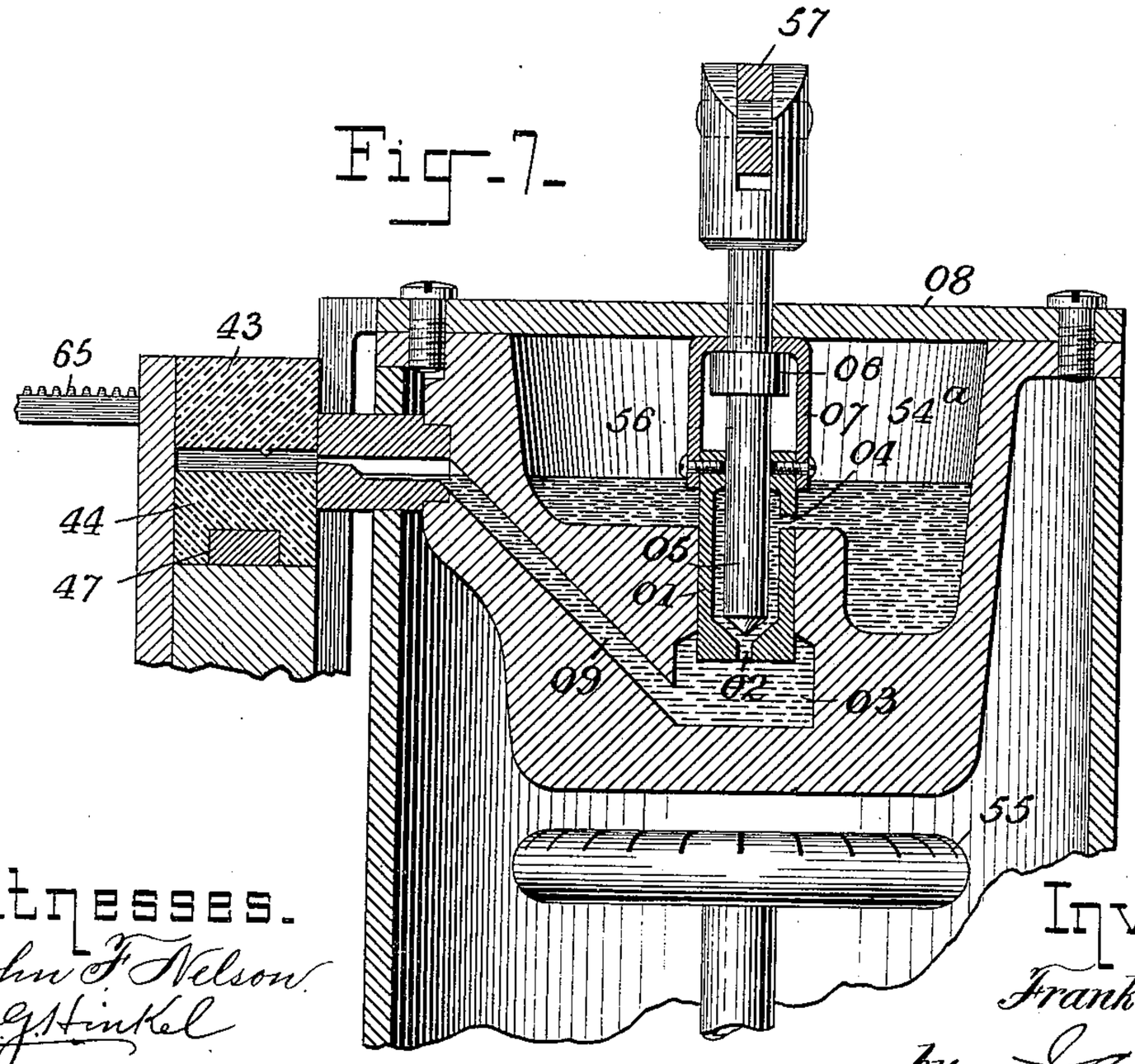


Fig. 7.



Witnesses.
John F. Nelson.
J. G. Hinkel

Inventor.
Frank Amos Johnson
by J. Watson Atty.

UNITED STATES PATENT OFFICE.

FRANK AMOS JOHNSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE JOHNSON TYPESETTER COMPANY, OF PORTLAND, MAINE.

TYPE-JUSTIFYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 607,046, dated July 12, 1898.

Application filed March 17, 1897. Serial No. 628,026. (No model.)

To all whom it may concern:

Be it known that I, FRANK AMOS JOHNSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Type-Justifying Machines, of which the following is a specification.

The present invention consists in improvements in justifying mechanism for type-setting machines.

To facilitate the description and illustration of the invention, I have shown it as applied to the machine embodied in my Patent No. 584,362, dated June 15, 1897, granted on application, Serial No. 613,973, filed November 30, 1896. In said application there is illustrated and described a complete type-setting machine having a justifying mechanism which cuts the justifying-spaces from a continuous strip of metal and inserts them in the assembled lines in lieu of temporary spaces, which are placed between the words by the assembling mechanism.

In the present application several improvements in justifying mechanism are embodied, some of which are of general application in justifiers and others of which are applicable especially to justifiers for type-setting machines.

In the accompanying drawings, Figure 1 is a plan view of a portion of a type-setting machine sufficient to illustrate the present invention. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a front elevation, partly in section, on the line 3 3 of Fig. 4. Fig. 4 is a section on the line 4 4 of Fig. 1. Fig. 5 is a section on the line 5 5 of Fig. 1. Fig. 6 is a perspective view showing the relative positions of a number of the parts. Fig. 7 is a section on the line 7 7 of Fig. 1. Fig. 8 is a section on the line 8 8 of Fig. 4, and Fig. 9 is a detail.

Any suitable assembling mechanism may be utilized in connection with the present invention—for instance, that shown in my patent before mentioned. For the purpose of the present specification it will be assumed that lines of type *t*, provided with temporary spaces *s*, slightly longer than the type and of normal thickness, are placed on ways 1 ahead of a follower 2, which follower transfers the type along the ways to the justifying mechanism. In the patent referred to I have described mechanism for assembling type and temporary spaces and transferring the assembled lines onto ways in front of the follower and also mechanism for justifying and for transferring the justified lines along the said ways to the galley. The present specification will be limited to the intermediate mechanism necessary for removing the temporary spaces and inserting final or justifying spaces as the type are being transferred from the assembling mechanism to the galley.

The mechanism is mounted on a suitable base or table A, parts being supported by a standard *a*. Beneath the base is a power-shaft P, supported in hangers *p*, and an escape-shaft E, supported in hangers *e*. The power-shaft is driven continuously by a pulley *p'*, and the escape-shaft is driven intermittently by means of the clutch F, constructed as follows: On the power-shaft is a pinion 3, which meshes with a gear 4, running idly on the escape-shaft. On one face of the gear 4 is a crown-ratchet 5, and mounted in a transverse slot in the shaft E is a pawl 6, which when released is drawn into engagement with the ratchet-wheel by means of a spring 7, Figs. 4 and 8. The pawl is normally held out of engagement with the ratchet-wheel by means of the stop-arm 8, which is kept in the path of the pawl by a spring 9. As shown, the pawl is released by means of a key 10, connected to the stop-lever 8. When the key is depressed, the pawl 6 springs into engagement with the constantly-moving ratchet-wheel, and the escape-shaft is thereby carried around with the wheel. Upon releasing the key the stop-arm, which is provided with a cam-surface, throws the pawl out of engagement with the ratchet, and the escape-shaft instantly stops. The several cams are mounted upon the power-shaft and the escape-shaft.

When a line of type temporarily spaced and of approximately the proper measure is in position on the ways in front of the follower 2, the line-key is depressed momenta-

rily and the escape-shaft is permitted to make one revolution. The first operation is the measurement of the line, which is effected automatically as follows: Upon a vertically-movable yoke 11, which embraces the ways 1, is mounted an abutment consisting of a pair of stops 12. These stops are attached to adjustable blocks 13, which fit in grooves 14 in the sides of the yoke and are held against longitudinal movement by pins 15, which engage transverse notches 16 in the yoke. The yoke 11 is carried by a sliding rod 17, which is moved vertically by a roll 18, resting upon a cam 19 on the escape-shaft. As soon as the said shaft starts the abutments are raised above the ways, and they are held in this position to intercept the line until after the measurement of the line is effected. The line is pressed forcibly against the abutment 12 by means of a compacting-head 20, Figs. 2 and 6, carried on a block 21, which slides in grooves in the lower part of the ways 1. The compacting-head is drawn to the left after the abutment rises by means of a cord 22, passing over pulley 23 and connected to the flexible lever 24, which is operated by a roll 25 and cam 26. When the cord 22 is drawn down, the compacting-head 20 engages a projection 27 upon the slide 28, which carries the follower-head, Figs. 2, 4, and 6, and draws the follower over, thus compacting the line between the follower and the abutment 12. This operation measures the line. The measurement of the line is transferred to a gage 29, the position of which determines the width of the final spaces. It will be evident that this width depends upon the number of word-spaces in the line as well as upon the total variation of the line from the desired length or column measure. In other words, the total amount required to be added to or subtracted from the line must be divided by the number of word-spaces in the line in order to set the gage for the production of justifying-spaces of equal length. This division is accomplished by means of a series of levers $x\,y\,z$, &c., pivoted to a stationary part 30 by means of pivots x' y' z', &c., arranged, respectively, at one-half, one-third, one-fourth, &c., of the lengths of the levers from their rear ends. The said rear ends engage a series of pins x^2 y^2 z^2, &c., upon a slide 31, carrying the gage, when the levers are rendered operative. In order to render a lever operative, push-pins x^3 y^3 z^3 are carried by the compacting-slide 21. These pins correspond to the number of word-spaces in the line. As shown, they are adapted to be operated by hand; but in practice it will be advisable to use mechanism for setting one of them automatically after the composition of each line.

The operation of measuring the line and setting the gage is as follows: Assuming that the line has four words, and therefore three word-spaces, the push-pin z^3 is pressed in, as shown in Fig. 6. The line-key 10 is then depressed, the escape-shaft starts, the abutments 12 are raised, the flexible lever 24 draws down the cord 22, and the compacting-head is drawn against the follower, thus compacting the line between the follower and the abutment. The parts are so arranged that the movement of the compacting-head corresponds to the amount to be added to or subtracted from the line in order to bring it to the desired measure. This total variation produces in the instance under consideration a movement of the gage equal to one-third of the movement of the compacting-head due to the location of the fulcrum of the lever z, which is operated upon by the push-pin z^3. When the gage is set in the above-described manner, it is immediately locked by a pair of wedges 32 33, which engage a projection 34 on the back of the gage-slide. These wedges are normally supported by a rod 35, having a T-shaped head, and immediately after the gage is set by the lever the rod 35 is dropped, permitting the wedges to fall by gravitation. The wedges have pins 36 37, which are engaged by the T-head, the pin 36 on the right-hand wedge being situated so that its wedge 33 takes effect first, thus preventing the gage-slide being drawn away from the lever before it is locked. The wedges are weighted by blocks 36^a 37^a. The wedge-lifter 35 is operated by a lever 38, rod 39, lever 40, and cam 41. When the escape-shaft is at rest, the wedges are down. As the shaft begins to revolve the wedges are raised. The gage is then set, and the wedges again drop to lock the gage before the shaft comes to rest.

Space-casting mechanism.—The spaces are cast in a mold 42, consisting of upper and lower parts 43 44 and a divided body-piece forming the two sides of the mold-cavity. The two parts of the body-piece are relatively adjustable. One part 46 is rigidly connected to a body-slide 47, which extends through an opening in the lower part of the mold. The movable part 48 of the body-piece is connected to the end of the body-slide by a spring 49, which normally draws it against a projection 50 upon the end of the body-slide. The gage 29 is forked, and the body-slide passes between its prongs. When the slide is moved to the right, the body-piece 48 abuts against the gage and is drawn away from the projection 50, thus decreasing the mold-opening between the parts 46 and 48, the width of the opening depending upon the position of the gage. The body-slide is operated by means of a lever 51, having on its lower end a roll 52, which is pressed against a cam 53 on the power-shaft by means of a spring 54.

In the rear of the mold is a melting-pot 54^a of ordinary construction, provided with a burner 55 and pump 56. The pump-plunger is operated by a lever 57, connecting-rod 58, and lever 59, resting on a cam 60, the rod 58 being normally drawn down by a spring 61. It is necessary that the pump be operated only when a space is required in the line, and to accomplish this the lever 59 when raised

is latched up by a spring-pressed hook 62. At the proper time this hook is withdrawn and the pump operated by the spring 61, as will be hereinafter explained.

The pump consists in a hollow plunger O′, fitting in the bottom of the melting-pot and having an opening O^2 to a well O^3 below the plunger and a second opening O^4 communicating with the metal in the pot 54^a. Within the plunger is the pump-rod O^5, which passes through the top of the plunger and is connected with the lever 57. This rod is provided with a collar O^6, which engages a yoke O^7, connected with the plunger, and draws the plunger up when the rod is raised. The plunger is prevented from being drawn too far by a stout bar O^8, extending across the top of the pot. A channel O^9 leads from the well O^3 to the mold. When the plunger is being raised, the metal runs freely through it into the well, Fig. 7. When the pump-rod is depressed, however, it first closes the lower aperture in the plunger and then depresses the plunger, injecting the metal forcibly through the channel O^9 into the mold. After the space is cast the body-slide moves to the left and the part 48 carries the space out of the mold to a position opposite a channel 63, through which the space is carried from the mold into the assembled line of type. The space is transferred through the channel by means of a finger 64 upon a rack 65, which is operated by a gear 66, vertical rack, and slide 67, said slide having a roll 68 resting on a cam 69. The slide 67 is normally drawn down by a spring 70.

The devices for substituting the final for the temporary spaces are as follows: The line is drawn to the left continually by a weight 71 and cord 72, passing over a pulley 73 at the end of the way 1. As the line is moved to the left under the influence of the weight 71 the projecting temporary space encounters the prongs of a parting-fork 74 on the constantly-vibrating push-back lever 75, which is pivoted at 76 and has a roll 77, bearing upon the cam 78 of shaft P, Figs. 3 and 6. The parting-fork 74 moves to the left and then pushes the spaces and the type at the right of the fork to the right, thus parting the line opposite the transfer-channel 63 and under a space-receiving magazine 79, connected to a block 80 above the ways. The temporary spaces are pushed into the channel by an elevator, hereinafter described, and retained by spring-detents 81. Directly below the magazine 79 is an elevator 82, attached to the slide 83, the elevator proper consisting of prongs between which the type may pass, but which are close enough together to engage the ends of the temporary spaces. The elevator is operated by a rod 84, which is normally drawn down by a spring 85. After a space has been pushed back by the parting-fork 74 into position over the elevator the elevator is raised by means of the pawl 86, connected to a lever 87, having a roll which rests on a cam 88. The pawl 86 usually passes idly up and down at the left of a projection 89 upon the elevator-rod 84, being guided by a pin 90, which enters a slot in the pawl, the pin being connected to a horizontal slide 91. The elevator is only raised when the slide 91 is moved to the right, carrying the pawl 86 into line with the projection 89. The slide 91 has a pin engaging the lower forked end of the trigger-lever 92, the lower end of the lever and the slide being normally drawn to the left by a light spring 93, Fig. 3. The upper end of the trigger-lever normally extends to the right of the left-hand position of the parting-fork 74, and hence when the parting-fork moves to the left the temporary space against it will move the trigger-lever to the left and throw the slide 91 to the right, thus bringing the pawl 86 into line with the elevator-rod and operating the elevator. There is a yielding connection between the elevator-rod 84 and the elevator proper, which, as shown, consists of a spring 94. This connection prevents the elevator from being damaged in case a space should for any reason refuse to enter the space-magazine.

In order to relieve the line from the pressure of the follower while the space is being ejected, I provide a ratchet 95 on the follower-slide, which ratchet is temporarily engaged and held by a pawl 96 while the elevator is in operation. The pawl is located in a recess 97, cut in the side of the ways, and it is operated by a link 98, connecting the pawl with the elevator-rod 84. The rear end of the pawl is normally drawn to the left by a spring 99, Fig. 2. The left end of the recess against which the pawl bears is formed with a shoulder 100. When the elevator is lowered, the rear end of the pawl strikes a pin 101 and the forward end is withdrawn from the ratchet. As the elevator rises the rear end of the pawl engages the shoulder 100, and the forward end is immediately thrown up into engagement with the ratchet. The further upward movement of the elevator-rod carries the pawl into a horizontal position and raises it over the shoulder 100, thus moving the ratchet to the right and drawing the follower slightly away from the type.

While the line is parted and the temporary space is being removed, the final space is being cast and inserted in the opening in the line. To effect this at the proper time, the slide 91 is connected by means of suitable devices with the latch 62, so that at the proper moment, when the mold-opening is opposite the nozzle of the melting-pot, the latch is withdrawn and the pump operated, thus injecting the molten metal into the mold. The newly-cast space is immediately moved out of the mold and through the transfer-channel into the line, as heretofore described. The connections between the slide 91 and the latch 62 consist of a shaft 102, having two arms 103 104 and a connecting-rod 105. The connecting-rod operates a pivoted arm 106 upon a cam-lever 107, which is operated by

the cam 60, Figs. 1, 3, and 5. The arm 106 is normally held out of line with the hook 62 by the connecting-rod 105. Each time the trigger-lever is operated, however, the arm is thrown into line with the hook, and during the revolution of the power-shaft the hook is disconnected from the lever 59 and the pump is operated.

After the line is measured it is desirable that the pressure of the line upon the abutment 12 should be relieved while the abutment is being withdrawn in order to prevent the possible disarrangement of the end type. To accomplish this end, lever 108, operated by a cam 109 on the escape-shaft, engages the lower end of the elevator-rod 84 and raises said rod during the time when the abutment-slide is being lowered. This operates through the pawl 96 and ratchet 95 to relieve the pressure of the measuring-head upon the line. As this operation takes place before the line reaches the elevator the raising of the elevator can do no harm. As shown, the type are guided on the ways by rods 110, which engage their nicks.

The operation has been described in detail in connection with the foregoing specification and need be only briefly recapitulated. The line of type and temporary spaces are measured between the follower and the abutment, and at the same time the gage is set by means of the proper justifying-lever and locked by the wedges. The elevator-rod is then raised by lever 108, the follower is moved back to relieve the pressure upon the abutment, and the abutment is withdrawn from the path of the line. The follower is then released and the line is carried along by the weight 71 until the first temporary space engages the push-back lever. As this lever moves forward or to the left the line follows it, and when it again moves backward it parts the line and pushes the space into position over the elevator. The trigger-lever starts the elevator, which rises and pushes the temporary space into the magazine 79. At the same time the trigger-lever releases the pump-rod and a space is cast and transferred into the opening in the line. This takes place before the elevator moves down. The follower is then released and the line again moves forward until the next temporary space engages the push-back lever.

What I claim, and desire to secure by Letters Patent, is—

1. In a justifying device for composing-machines, a series of levers having their fulcra at varying distances from their ends comprising a lever for each possible number of word-spaces in a line, and means operated by said levers for determining the widths of justifying word-spaces.

2. In a justifying device for composing-machines, a gage for determining the width of justifying-spaces, and a series of levers for setting the gage, the fulcra of the levers being at varying distances from their ends.

3. In a justifying device for composing-machines, a gage for determining the width of justifying-spaces, a series of levers adapted to operate on the gage and having their fulcra at varying distances from their ends, and means for measuring a line of type and operating a selected lever in accordance with the measurement.

4. In a justifying device for composing-machines, a gage for determining the width of justifying-spaces, a series of levers adapted to set the gage, means for selecting a lever corresponding to the number of spaces in the line, and means for measuring a line of type and operating the selected lever in accordance with the measurement.

5. In a justifying device for composing-machines, the combination of the ways, the abutment movable transversely to the ways, the follower, the compacting-head, the levers, devices carried by the head for operating the levers, and the space-gage adapted to be set by said levers.

6. In a justifying mechanism for composing-machines, the combination with ways, a means for moving a line of type along said ways, of a mold having a divided body-piece forming two sides thereof, a gage operating on one part of said body-piece whereby it is set relatively to the other, means for moving both parts of said body-piece, and means for transferring spaces from the mold to the ways.

7. In a device for casting spaces, the combination with a mold having upper and lower fixed sides, of slide 47, divided body-piece one part of which is fixed to the slide and the other part relatively movable and connected by a spring, and the gage for setting the relatively-movable part.

8. The combination with the ways and the follower, of an elevator, and means for retaining the follower while the elevator is in operation.

9. The combination with the ways and the follower for moving type along said ways, of an elevator, and means for relieving the pressure of the follower upon the type while the elevator is in operation.

10. The combination with the ways, the follower, and the ratchet connected to the follower, of the elevator, and the pawl connected to the elevator and arranged to engage the ratchet when the elevator is raised.

11. The combination with the ways, the follower and the ratchet connected with the follower, of the elevator, the pawl, and the link connecting the pawl with the elevator, said pawl being operated to engage the ratchet and move back the follower when the elevator is raised and to release the ratchet when the elevator is lowered.

12. The combination with the ways, the follower, and the abutment movable transversely to the ways, of means for relieving the pressure of the follower upon the type while the abutment is being withdrawn.

13. The combination with the typeways and the space-receiving magazine, of a space-elevator, and means for operating the elevator with a yielding pressure.

14. The combination with the typeways and the space-receiving magazine, of a space-elevator, a cam for operating the elevator, and a yielding connection between the cam and the elevator proper.

15. In a justifying device for composing-machines, a gage for determining the width of the justifying-spaces, and a series of levers for setting the gage, the fulcra of the levers being fixed and arranged at one-half, one-third, one-fourth, &c., of the length of the levers from the ends thereof.

16. In a justifying device for composing-machines, a space-casting mold having a movable wall, a series of levers, the fulcra of the levers being at varying distances from their ends, connections whereby the movable wall of the mold is adjusted by said levers, and means for measuring the line of type and operating the selected lever in accordance with said measurement.

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

FRANK AMOS JOHNSON.

Witnesses:
GILLISON A. LOTT,
FRANK H. MASSEY.