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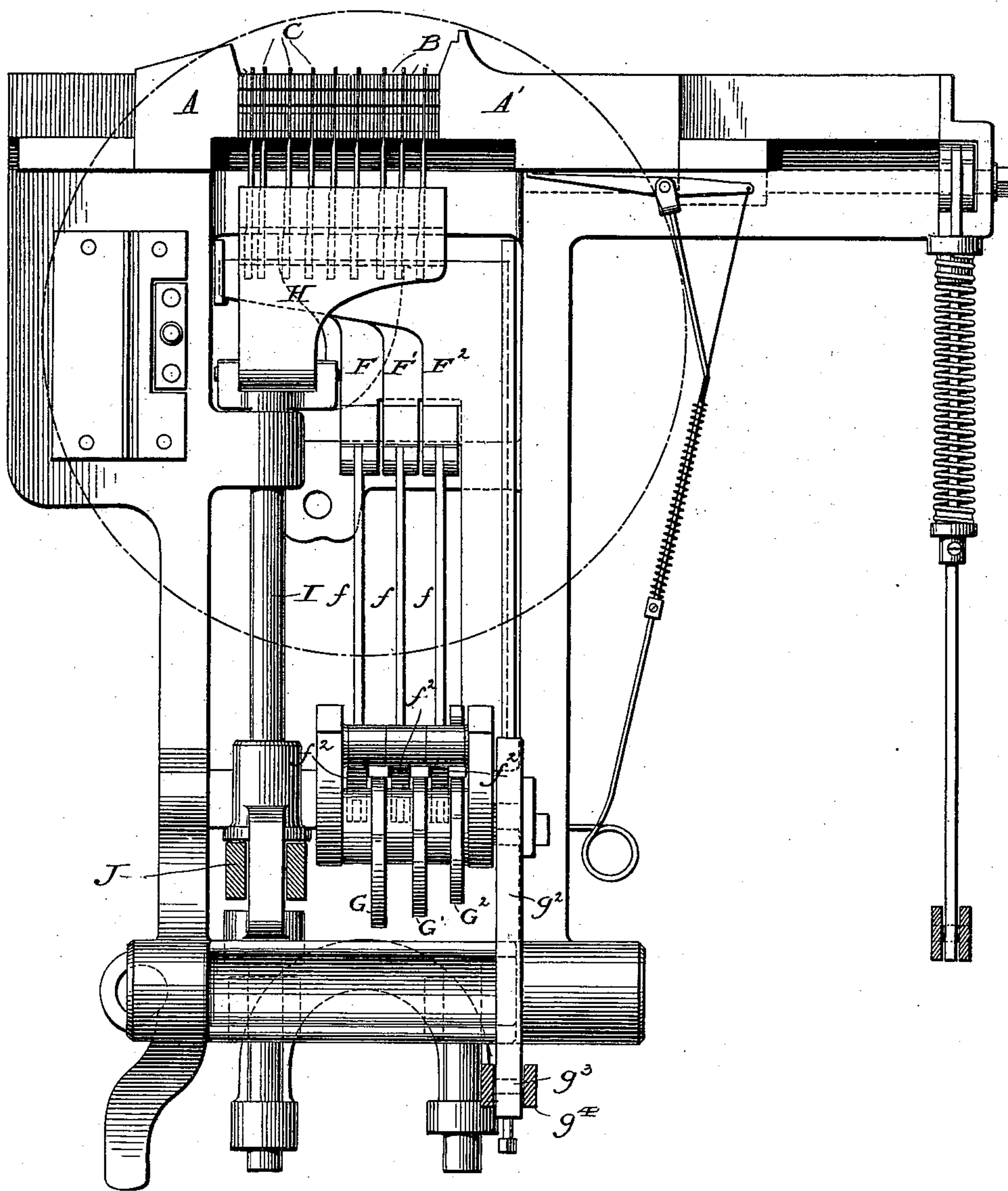
6 Sheets—Sheet 1.

0. MERGENTHALER & C. MUEHLEISEN.
LINOTYPE MACHINE.

No. 565,485.

Patented Aug. 11, 1896.

Fig. 1.



Witnesses

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(No Model.)

6 Sheets—Sheet 2.

O. MERGENTHALER & C. MUEHLEISEN.
LINO TYPE MACHINE.

No. 565,485.

Patented Aug. 11, 1896.

Fig. 2.

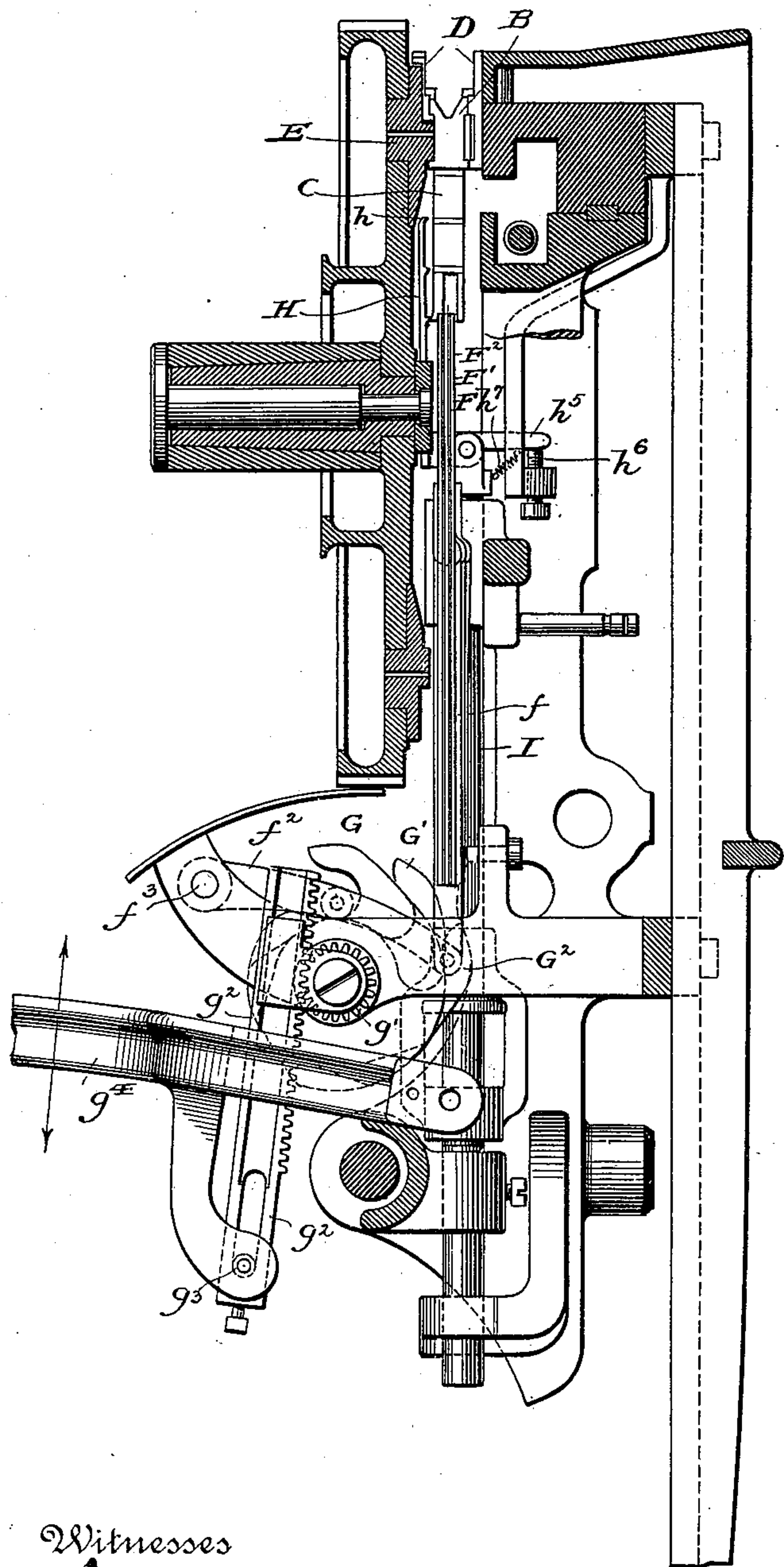
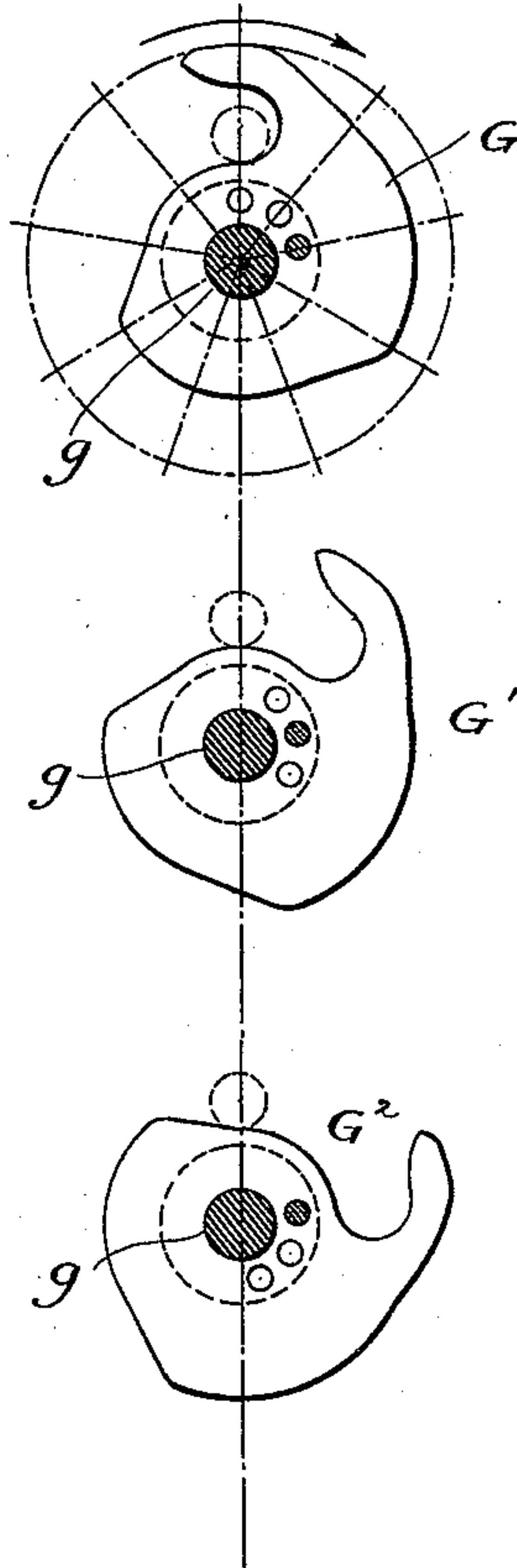


Fig. 3.



Witnesses

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(No Model.)

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Fig. 4.

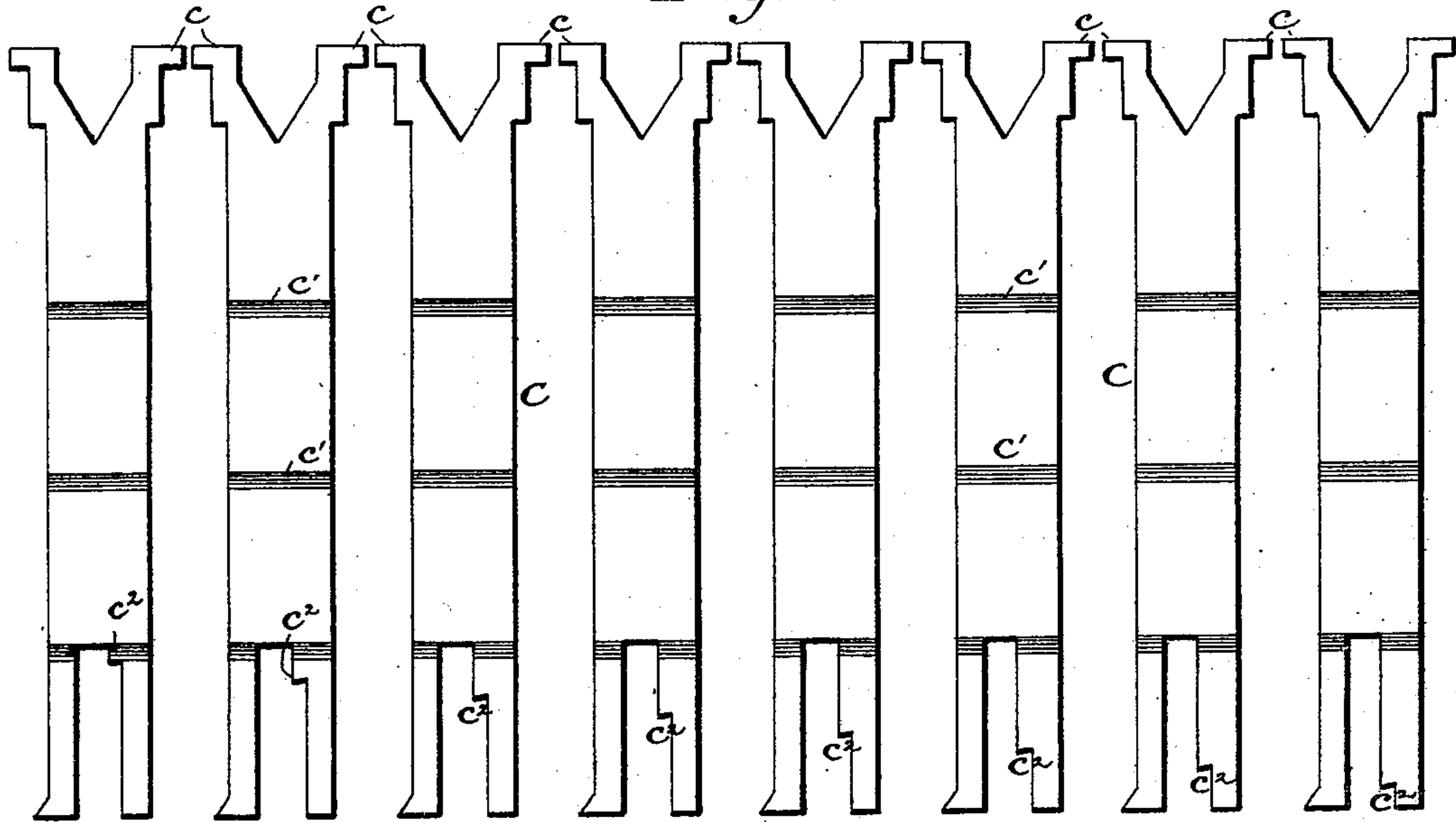


Fig. 5.

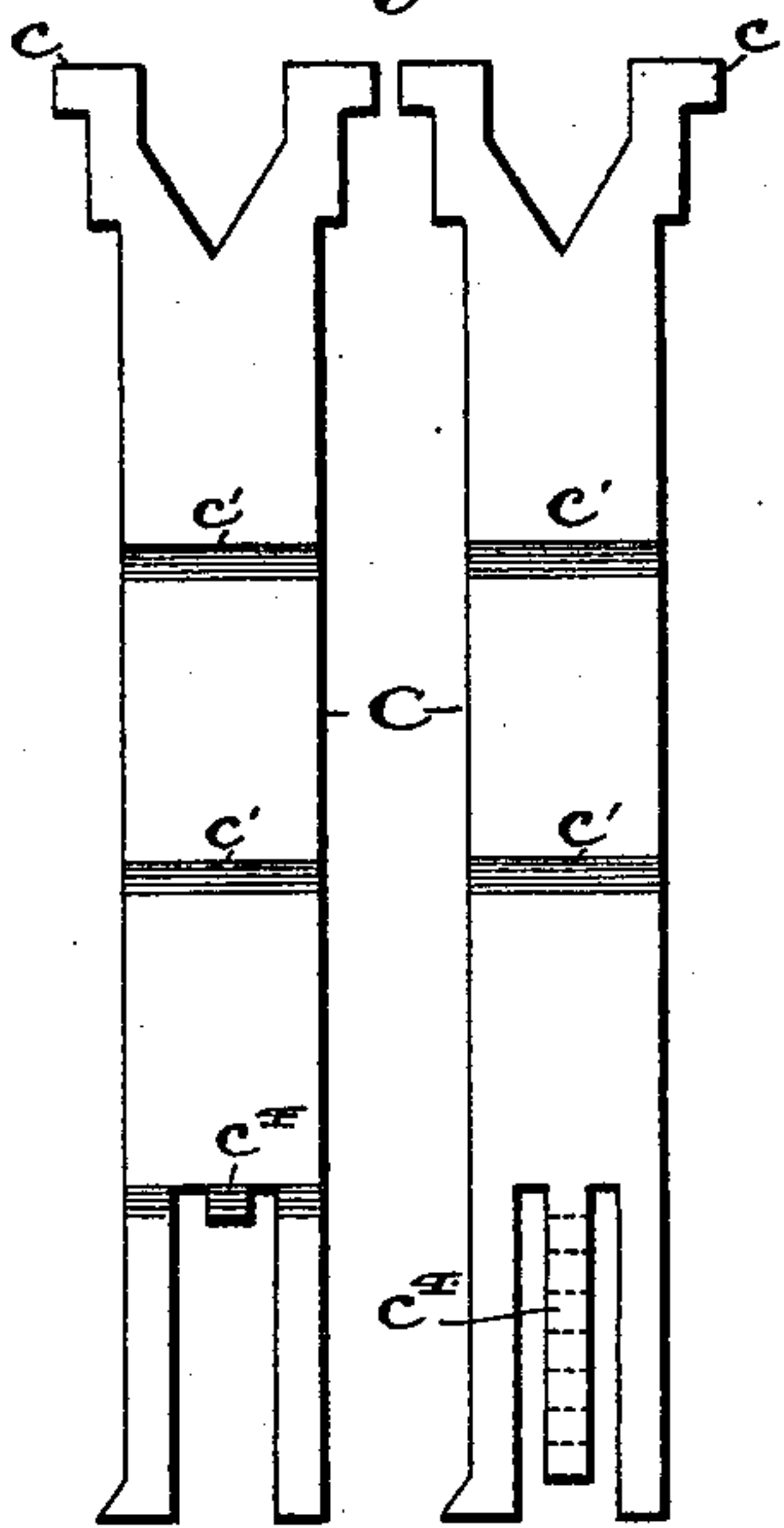
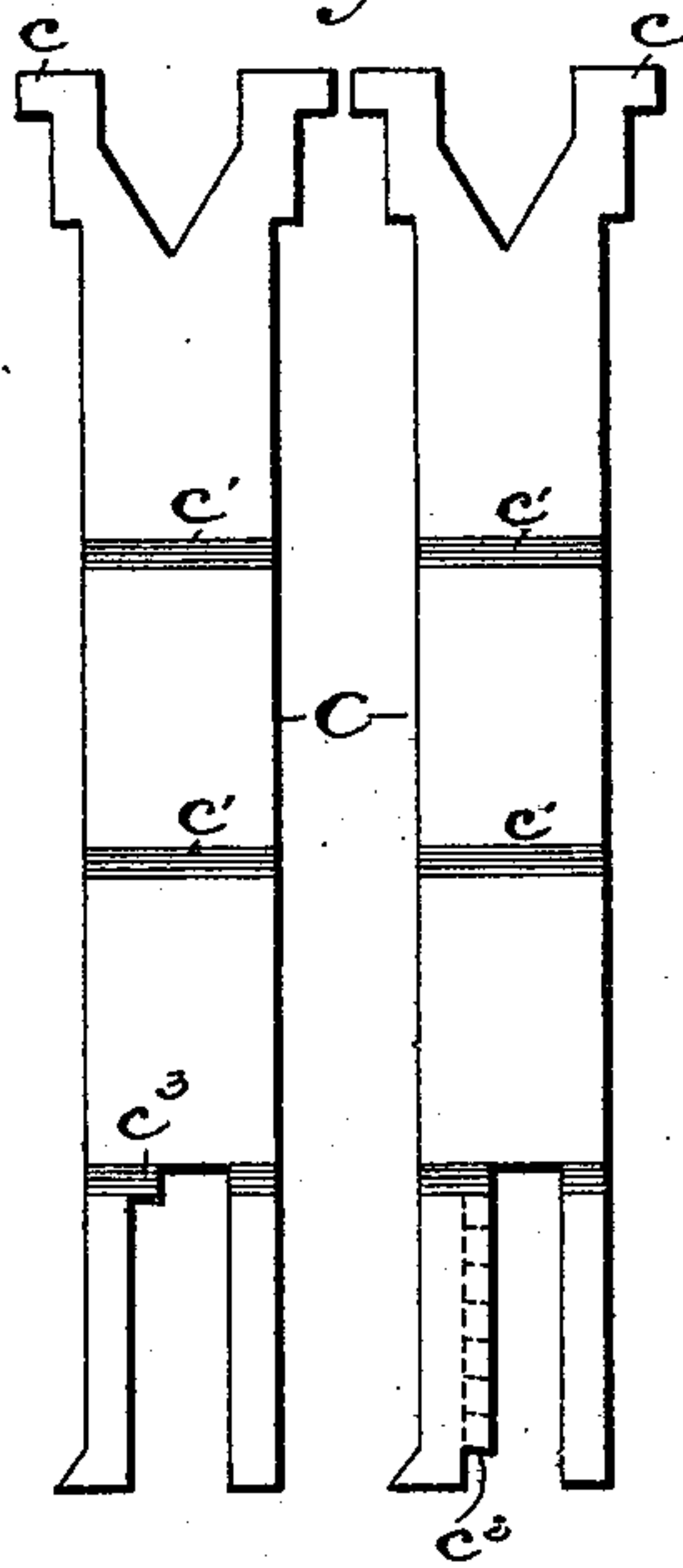


Fig. 6.



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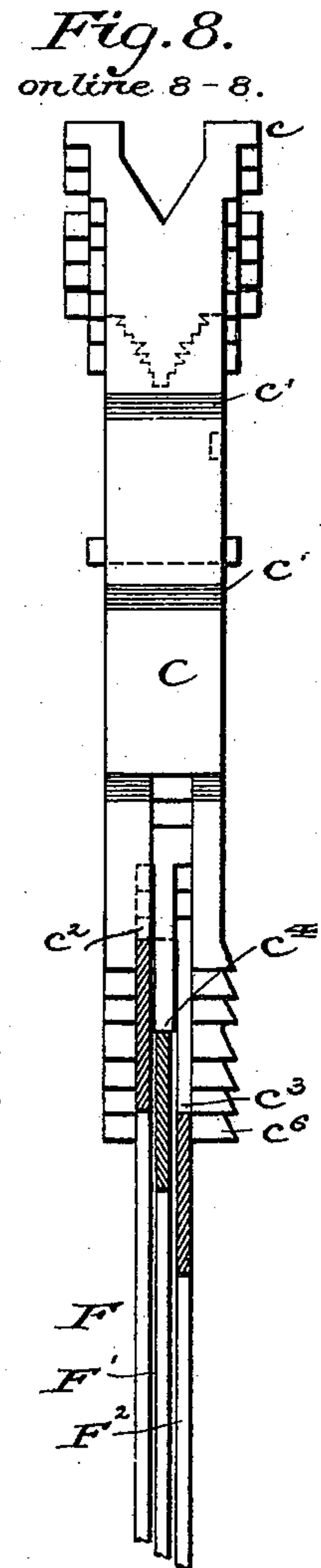
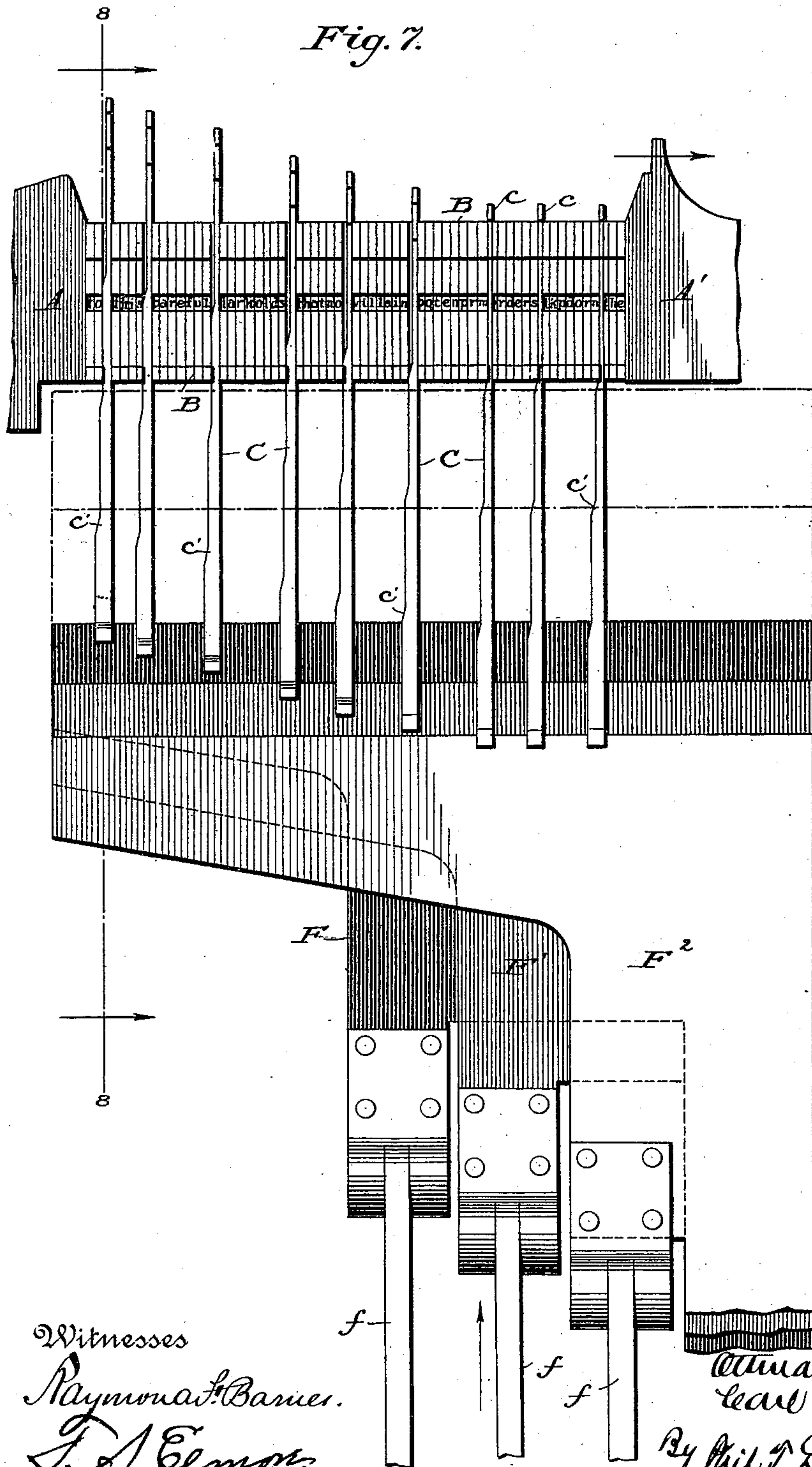
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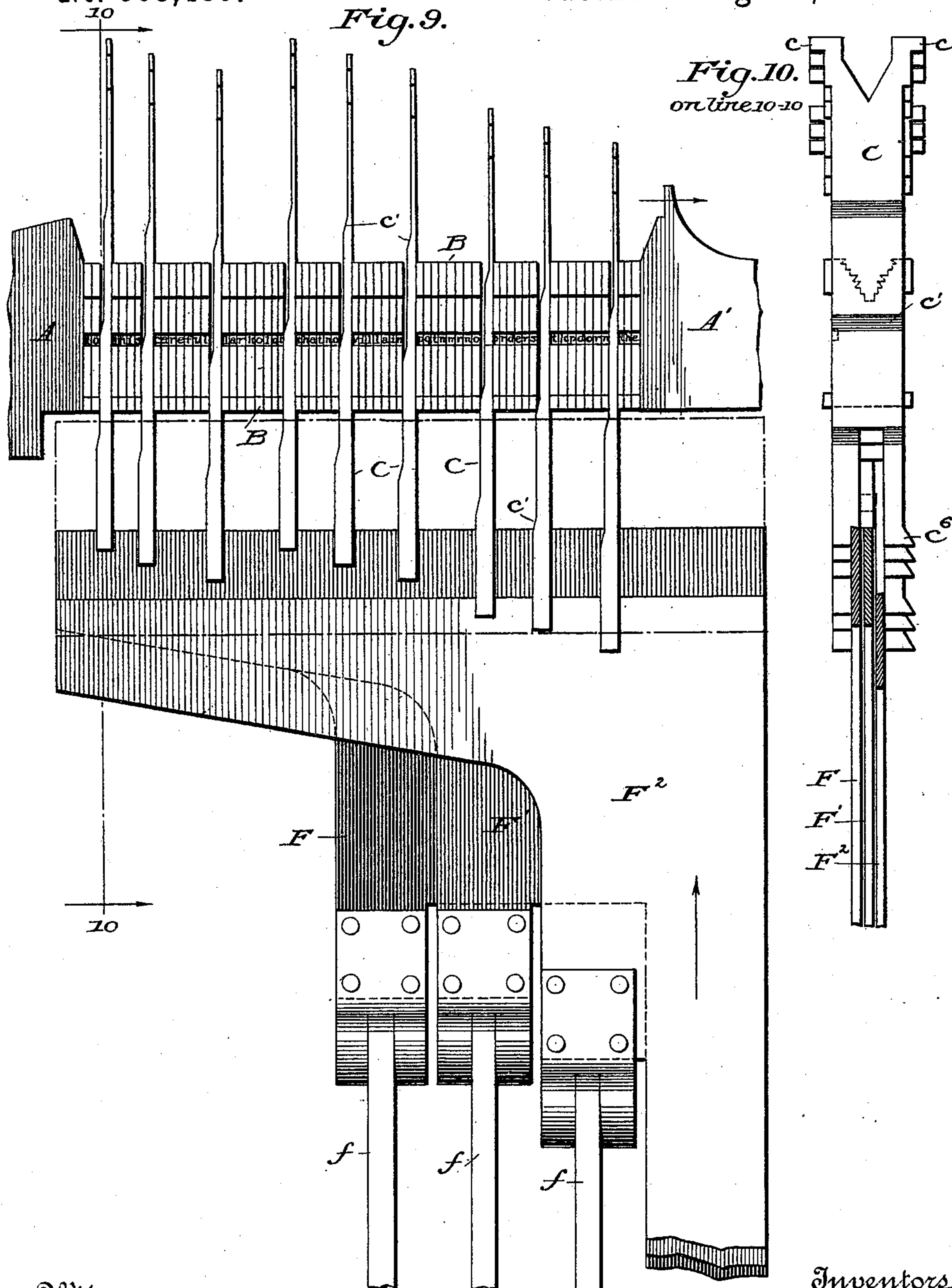
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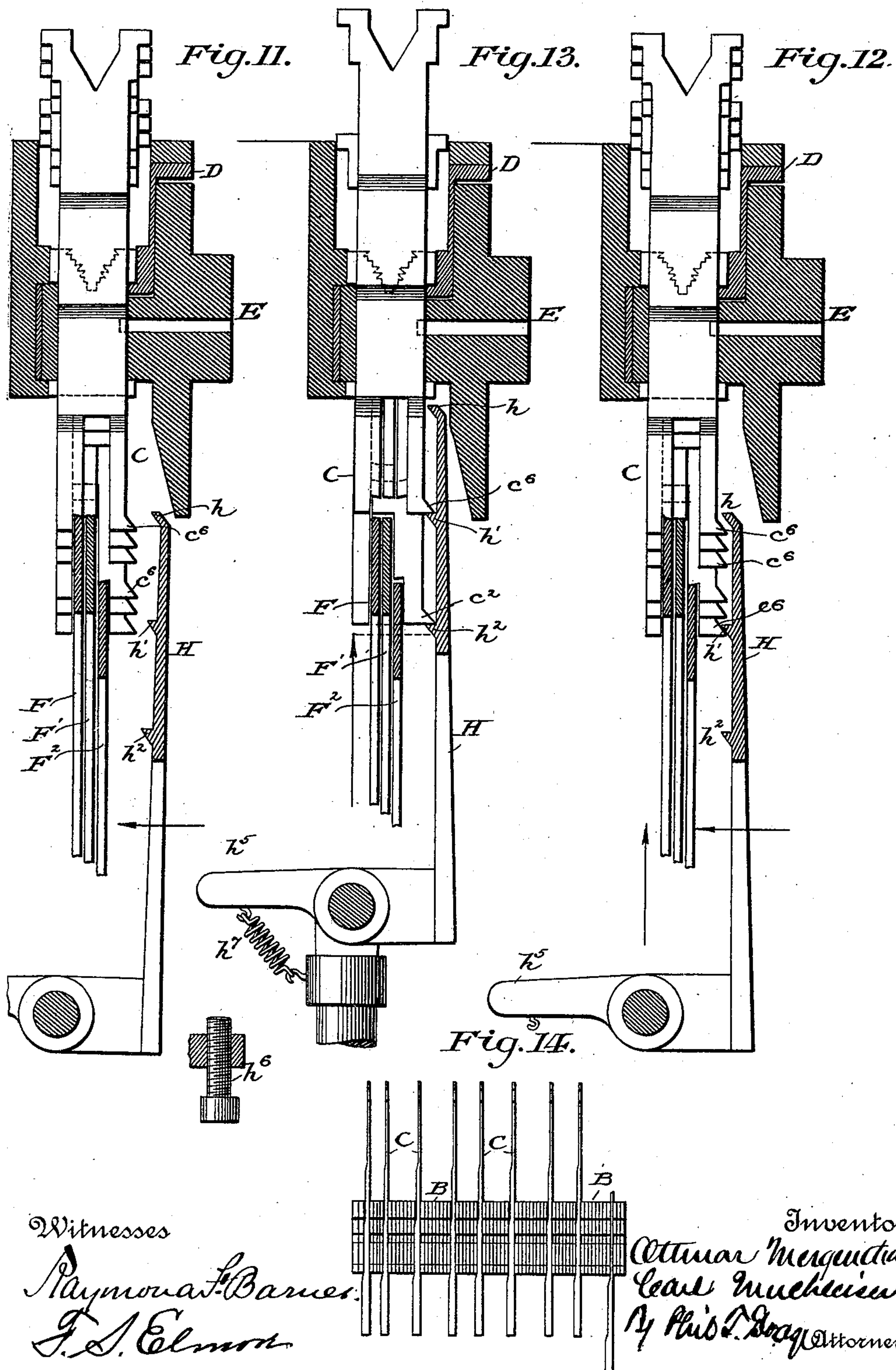
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6 Sheets—Sheet 6.

O. MERGENTHALER & C. MUEHLEISEN.
LINOTYPE MACHINE.

No. 565,485.

Patented Aug. 11, 1896.



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UNITED STATES PATENT OFFICE.

OTTMAR MERGENTHALER AND CARL MUEHLEISEN, OF BALTIMORE, MARYLAND, ASSIGNORS TO THE MERGENTHALER LINOTYPE COMPANY, OF NEW YORK, N. Y.

LINOTYPE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 565,485, dated August 11, 1896.

Application filed July 1, 1893. Serial No. 479,370. (No model.)

To all whom it may concern:

Be it known that we, OTTMAR MERGENTHALER and CARL MUEHLEISEN, of Baltimore city, State of Maryland, have invented a new and useful Improvement in Linotype-Machines, of which the following is a specification.

This invention has reference more particularly to linotype-machines in which a series of matrices assembled temporarily in line, together with intermediate spaces, are presented across the face of a mold in which a slug or linotype is cast or otherwise formed against them, so that it will bear on its face the characters to print a line or a series of words.

The invention has reference particularly to improved means for spacing out the composed line of matrices to a predetermined length after the manner of the "justification" commonly effected in hand composition.

In carrying the present invention into effect use is made of a series of long space-bars, each increasing in thickness step by step from one end toward the other, so that each bar presents several sections or spaces differing in thickness, each section having parallel opposite faces.

Mechanism is provided for advancing the spaces step by step endwise through the composed line and for effecting this adjustment of a portion only of the spaces at one time. This is done in order that the line may be lengthened a short distance at each action and so that it will be possible in every case to introduce into the line just that additional space which is necessary to bring it to the predetermined length. The length of the line, that is to say, the elongation by the justification, is limited by jaws or abutments between which the matrices are seated. It frequently happens in practice that the space remaining to be filled in the line is less than the amount which would be added by the advance of all the stepped spaces. By advancing a portion of the spaces only at a time, as above indicated, we avoid the difficulty which would otherwise arise and secure accurate justification and substantially uniform spacing in all cases.

In the accompanying drawings we have

represented a form of embodiment which is especially adapted for use in connection with a Mergenthaler linotype-machine of the class represented in Letters Patent of the United States No. 436,532, dated September 16, 1890; but it is to be understood that the invention is also applicable in connection with any other machine in which type-matrices or type-dies of any form are assembled temporarily in line and the line thereafter justified.

It is also to be understood that although we have represented those details of construction which we consider best adapted to meet the practical requirements the parts may be varied in form and arrangement to a very great extent without in fact changing, essentially, the mode of action or passing beyond the limits of our invention.

Referring to the accompanying drawings, Figure 1 is an inside face elevation of the vise mechanism of a Mergenthaler machine by which the line of matrices is supported against the mold, together with a line of matrices in position therein in connection with our justifying mechanism. Fig. 2 is a vertical section on the line 2 2 of Fig. 1, showing also the mold in position behind the matrices. Fig. 3 is a detailed view showing the cams for operating the three slides for advancing the space-bars. Fig. 4 is a view showing in side elevation the spaces of one group or series. Fig. 5 is a similar view of the first and last spaces of the second group, the intermediate steps being indicated by dotted lines. Fig. 6 is a similar view of the first and last spaces of the third group. Fig. 7 is a rear elevation of the vise containing a composed line of matrices with three spaces of each series therein, the first slide being advanced one step, the second slide in the act of rising, and the third slide at rest. Fig. 8 is a vertical section on the line 8 8 of Fig. 7. Fig. 9 is a view of the parts represented in Fig. 7 with the spaces advanced until the line is full, or, in other words, until justification is completed. Fig. 10 is a vertical section on the line 10 10 of Fig. 9. Figs. 11, 12, and 13 are vertical sections through the vise, the mold, and the attendant parts shown in Fig. 7, showing the action of the second justification in advancing the spaces to their final positions in the

line. Fig. 14 is an elevation of the line of matrices and spaces as they appear on the completion of the justification.

Referring to the drawings, A and A' represent the two vise jaws or abutments between which the line of matrices B and the spaces C are assembled and by which the length of the line is limited. One or both of these jaws are movable horizontally, the operating mechanism being, however, of such character as to hold them firmly at the predetermined distance apart at the close of the justifying action, so that all lines produced in the machine may be of equal length. The matrices are sustained by shoulders on their upper ends resting in a yoke or support D, (see Fig. 2,) whereby they are maintained in exact alignment in front of the mold E, so that they lie across and close its front face, presenting their characters opposite the mold, so that the slug or linotype formed therein will have the characters produced on its front edge by the matrices.

In their construction and mode of action the foregoing parts may all, with the exception of the spaces, be identical with those described in Mergenthaler patent before referred to.

The mechanism for selecting and assembling the matrices and spaces, for placing them in position in front of the mold, and for distributing them after the casting operation may all be of the character shown in the Mergenthaler patent or of any other suitable construction and arrangement.

In carrying our invention into effect we first provide a series of space-bands such as shown in Figs. 4, 5, 6, 9, &c., each consisting of a thin bar or blade of a length several times as great as that of the matrices and each having at the upper end ears c , by which they are suspended in place in the line of matrices during the course of composition and until justification is effected. Each of these space bars or bands increases in thickness step by step from one end toward the other. They are preferably made flat on one side and with all of the steps on the opposite side, the thickness increasing from one step or section to the next gradually or by an inclined surface c' to facilitate the entrance of the thicker sections into the line between the matrices.

We may provide any suitable number of spaces to suit the requirements of the individual machine and the length of the lines to be produced. We provide these spaces in groups or series, according to the number used. In the drawings there are three groups, those of the first group (shown in Fig. 4) being provided in the lower end with a notch containing a tooth or shoulder c^2 , each bar of the group having its tooth in a distinctive position, that is to say, at a different distance from the lower end than the tooth of any other bar in the same group. The shoulders or teeth of this first group are at the rear sides of the notches. The third group are similar

to those just described, except that their notches or shoulders c^3 are at the forward instead of the rear sides of the notches, as shown in Fig. 6, this figure showing only the first and last bars of the series. The intermediate bars will have their teeth located at the respective levels indicated by dotted lines on the right-hand bar in said figure.

The second or intermediate series of bars differ from the others in that their shoulders or teeth c^4 , one on each bar, are located in the middle of their notches, as shown in Fig. 5. This figure represents only the first and last bars of this series, which will comprise the same number of bars as the other series. The position of the teeth of the respective intermediate bars in this series is indicated by the dotted line on the right-hand bar in Fig. 5. The teeth or shoulders C^2 C^4 , &c., differently located on the spaces, are in effect variant selecting devices, enabling the operating mechanisms to distinguish between spaces of different groups or series.

When the composed line containing a series of spaces is assembled in the vise in front of the mold, as shown in Figs. 1 and 2, the upper and thin ends of the spaces will stand in the line, while their lower notched ends will project below the matrix-line, as shown in the several figures.

To effect the justification, it is necessary to lift the spaces through the line, each to such extent as to advance its next thicker space or section into the line.

We provide in the frame of the vise, below the position occupied by the matrix-line, three vertically-moving slides F, F', and F², each extending under the entire length of the line, but lying one forward of another in such position that when raised each slide will act upon the shoulders or teeth of the space-bars in one group and push them upward through the line without effecting the bars of the other group, which remain at rest. The slide F lifts the bars of the first group, shown in Fig. 4, the slide F' the bars of the second group, shown in Fig. 5, and the slide F² the bars of the third group, shown in Fig. 6. In order to get the desired result, we first lift one slide so as to advance the corresponding spaces the distance of one step or section, then advance the second and third slides one after the other in like manner. After all the slides have thus been advanced one step the action is repeated a second and, if need be, a third time, so that all of the spaces are advanced through the line a greater or a less distance, according to the space to be filled and the position of the shoulders of the respective spaces in the line. The slides F F' F² are connected, respectively, by intermediate links f to three independent levers f^2 , each mounted upon a horizontal pivot f^3 on the vise-frame. Three cams G, G', and G² (shown in detail in Fig. 3) are fixed on a common shaft g in the vise-frame, and this shaft is provided at one end with a pinion g' , acted upon by a rack-bar g^2 ,

having its ends slotted to receive an operating-stud g^3 on a vertically-vibrating lever g^4 , operated by a spring or any other suitable means. This lever corresponds to the lever p^{12} in the Mergenthaler patent before mentioned and may be operated in the same way. When the lever rises, it causes the rack-bar to turn the cams $G G' G^2$, which latter in turn lift successively the several slides F , F' , and F^2 and the space-bars of the respective groups with which the slides engage. The cams are so shaped and so timed, that is to say, placed in such relation to each other on their common axis, that the continued rotation causes them to again lift the slides and spaces in succession each another step, and, if the rotation is continued, a third step in like manner. When the line is completely filled, it will become impossible to introduce additional spaces, and further advance of the spaces will be stopped by one of the shoulders or steps entering partly into the lower end of the matrix-line.

In order to complete the justification and insure the tight closing of the line in front of the mold, it is necessary that the spaces whose shoulders are entered between the matrices but are not advanced far enough to close the mold shall be forced forward until the partly-entered step or section is fully within the line and up high enough to close the mold. For this purpose we provide an additional vertically-moving plate or pusher H , carried by the upper end of a sliding rod I , which is lifted at suitable times by a lever J to a predetermined and constant height, its movement being equal only to the length of one step on the bands or spaces. As shown in Figs. 1, 11, 12, and 13, this pusher-plate H extends across the entire line of spaces and is provided at different heights with a series of horizontal ribs or shoulders h , h' , and h^2 , adapted to engage with the forwardly-projecting shoulders c^6 at the lower ends of the space-bars.

When the slide rises, its ribs engage the space whose section is only partly entered into the line and all of those that have entered fully but are not far enough advanced to close the mold and forces them forward to complete the introduction of the step or section. It is to be understood that this secondary justification is only to insure or complete the introduction of the sections or spaces which have already been partially entered into the line, and that the shoulder on each space is not brought under the action of the teeth in part H unless the step or shoulder is partly entered into the line. This pusher H is held out of action until after the preliminary justification has been effected by means of a finger h^5 on its lower end, which rests normally on a screw or stop h^6 , (see Fig. 2,) fixed in the vise-frame.

It will be understood that the slide stands normally in its lowest position, as shown in Fig. 2. When it rises into action, its finger is lifted from the screw h^6 , allowing the slide

to tip forward into engagement with the space-bars under the influence of the spring h^7 . (Shown in Figs. 2 and 13.)

It will be observed that while the slides F , F' , and F^2 act only on spaces of the respective or corresponding groups the final slide H acts on all the spaces which have steps or sections partly advanced into the line, and this whether they belong to the same or different groups. Owing to the difference in the height of shoulders on the several bars in the same group, their lifting-blade will lift them, respectively, through the line different distances, or, in other words, so that no two spaces of the same group will stand at the same height during the preliminary justification. As a result of this advance of the different bars in the one group different distances, space is added to the line one by one bar at a time. In other words, one space-bar has a thicker step or section thrust into the line before the corresponding step or section of the next bar is entered into the line. The object of this action is of course to increase the length of the line step by step to a very slight extent at each action.

When the first or approximate justification is completed, it will generally happen that all the bars in the line will have their steps or shoulders fairly entered between the matrices except the last bar or the one having the highest shoulder. It is this remaining bar, the side shoulder of which is lodged or partly entered in the lower end of the line, and those which are not far enough advanced to close the mold that the slide H is required to advance fully into the line.

The final justification requires only the crowding into the line of one step or space, the increased thickness of which will always be admitted to the line, owing to the elasticity of the latter.

Although we have represented the spaces in each group with their shoulders arranged in regular order, each below the next, it will be observed that no special order or arrangement of the spaces is required. It is immaterial in what order the spaces are inserted in the line. All the spaces, whether of the same or of different groups, may be introduced at random—that is to say, without reference to their order of succession.

We do not claim herein, broadly, mechanism for advancing stepped spaces successively and predetermined distances through the line, such mechanism, broadly, being the subject-matter of an application of Ottmar Mergenthaler, Serial No. 327,079. Said prior mechanism differs, however, materially in its construction and operation from that herein described, in which, broadly speaking, the spaces are divided into groups and the stepped spaces are advanced unequally in the line and thereafter are advanced simultaneously in their adjusted relations, which last feature, however, is not broadly claimed in this case.

It will be noted that we employ in the present mechanism unitary or solid stepped spaces, that is to say, spaces that are made in one piece or the parts of which are so united that the space is moved bodily at each adjustment, as distinguished from spaces composed of sections arranged to slide in relation to each other.

Having thus described our invention, what we claim is—

1. In combination with a line of matrices, a series of stepped space-bars seated therein, said bars belonging to different groups, and means for positively advancing said bars endwise through the line step by step, those of one group at a different time from those of another group.

2. In a justifying mechanism and in combination with a line of matrices, assembled side by side, means for limiting the length of the line, a series of stepped space-bars located in the line, said bars provided with variant selecting devices, and means for advancing the bars endwise through the line, those of the different forms successively, and thereafter repeating the action.

3. In a justifying mechanism, the combination of a series of matrices, a series of stepped space-bars, belonging to two or more groups or series, means for advancing the spaces of the groups successively, one step at a time, and means for finally advancing the bars positively to insure the full entrance of the steps partly entered in the line.

4. In a justifying mechanism the combination of a line of matrices, a series of stepped space-bars consisting of two or more groups or series, those of the different groups having shoulders or teeth in different positions, and a series of slides acting to advance the space of the respective groups.

5. In a justifying mechanism, a series of space-advancing slides, and operating devices whereby said slides are advanced successively one step each, and thereafter advanced in like manner another step each.

6. In a justifying mechanism a series of space-bands thicker at one end than the other, consisting of groups or series, those of each group having shoulders or teeth distinguishing them from those of the other groups.

7. A series of space-bars of increasing thickness from one end to the other, the bars provided with teeth or shoulders in different positions, substantially as described and shown.

8. In a justifying mechanism and in combination with stepped spaces having variant forms, the series of space-operating slides, their operating-levers, and lever-operating cams, substantially as described.

9. In a justifying mechanism, and in combination with the space-operating slides F F' &c., the slide H and the series of space-bars having variant teeth.

10. In a justifying mechanism, a series of unitary stepped space-bars, means for ad-

vancing said bars, less than the entire number in the line at a time, to enter their proper steps in the line, and means thereafter acting on all the spaces in the line to insure the full entrance of the previously-entered steps.

11. In a justifying mechanism and in combination with a series of unitary stepped spaces, a series of pushers acting to advance the various spaces step by step through the line to enter their proper steps therein, and a plate or carrier finally acting on all the spaces in the line to insure the seating of their previously-entered steps fully within the line.

12. In a justifying mechanism, a series of stepped spaces and means for adjusting the same endwise through the line to enter their appropriate steps therein, in combination with a movable plate or carrier having a series of lips or shoulders adapted to engage all the spaces in the line whereby said carrier is enabled to advance all of the entered steps fully into the line, whatever the position of the spaces in relation to each other and to the line.

13. In a justifying mechanism, the combination of a composed line of type, stepped spaces, means for inserting the thin ends of the spaces in the line, means for advancing the spaces unequally to set their shoulders or steps out of line, and means for thereafter advancing the series of spaces simultaneously through the line in their adjusted relations whereby they are caused to act successively in lengthening the line.

14. In a justifying mechanism, the combination of a composed line of matrices, stepped spaces, means for inserting the thin ends of the spaces in the line, means for advancing the spaces endwise so that they present their shoulders at different distances from the line, means for adjusting the adjusted spaces simultaneously that they may successively enter their steps in the line to increase its length and means for finally advancing the spaces until each carries its entered step fully into the line to fill the space between the adjacent matrices.

15. In combination with a line of matrices and stepped spaces therein, means for adjusting the spaces through the line successively and unequally, and means for thereafter advancing the adjusted spaces simultaneously and until their entered steps are advanced equally into the line to complete the justification and filling of the line.

16. In combination with a line of matrices and stepped spaces therein, means to limit the length of the line, means for adjusting the spaces successively and unequally through the line, means for further advancing the spaces simultaneously in their adjusted relations to each other, and means for finally advancing the entered steps fully into the line that they may fill the space between the matrices and thus insure the closing of the mold.

17. In a justifying mechanism, a pusher for adjusting the spaces, arranged to positively move different distances to give variant positions to the spaces.

5 18. In a justifying mechanism, the combination of the following elements, a line of matrices and stepped spaces therein, means to limit the elongation of the line, pushers to advance the successive spaces through the
10 line different distances, means for urging the adjusted spaces farther through the line in

their adjusted relations, and means for finally advancing the spaces until their previously-entered steps are carried fully into the line.

In testimony whereof we hereunto set our 15 hands, this 30th day of March, 1893, in the presence of two attesting witnesses.

OTTMAR MERGENTHALER.

CARL MUEHLEISEN.

Witnesses:

THOS. M. DOBBIN,
WILLIAM H. BERRY.

It is hereby certified that the assignee in Letters Patent No. 565,485, granted August 11, 1896, upon the application of Ottmar Mergenthaler and Carl Muehleisen, of Baltimore, Maryland, for an improvement in "Linotype-Machines," should have been described and specified as *The Mergenthaler Linotype Company, of New York, N. Y., a corporation of New Jersey*, instead of "the Mergenthaler Linotype Company, of New York, N. Y.;" and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 18th day of August, A. D., 1896.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.