

J. A. WETMORE.

ART OF COMPOSITION, PRINTING, OR THE LIKE.

APPLICATION FILED MAR. 16, 1896.

4 SHEETS—SHEET 1.

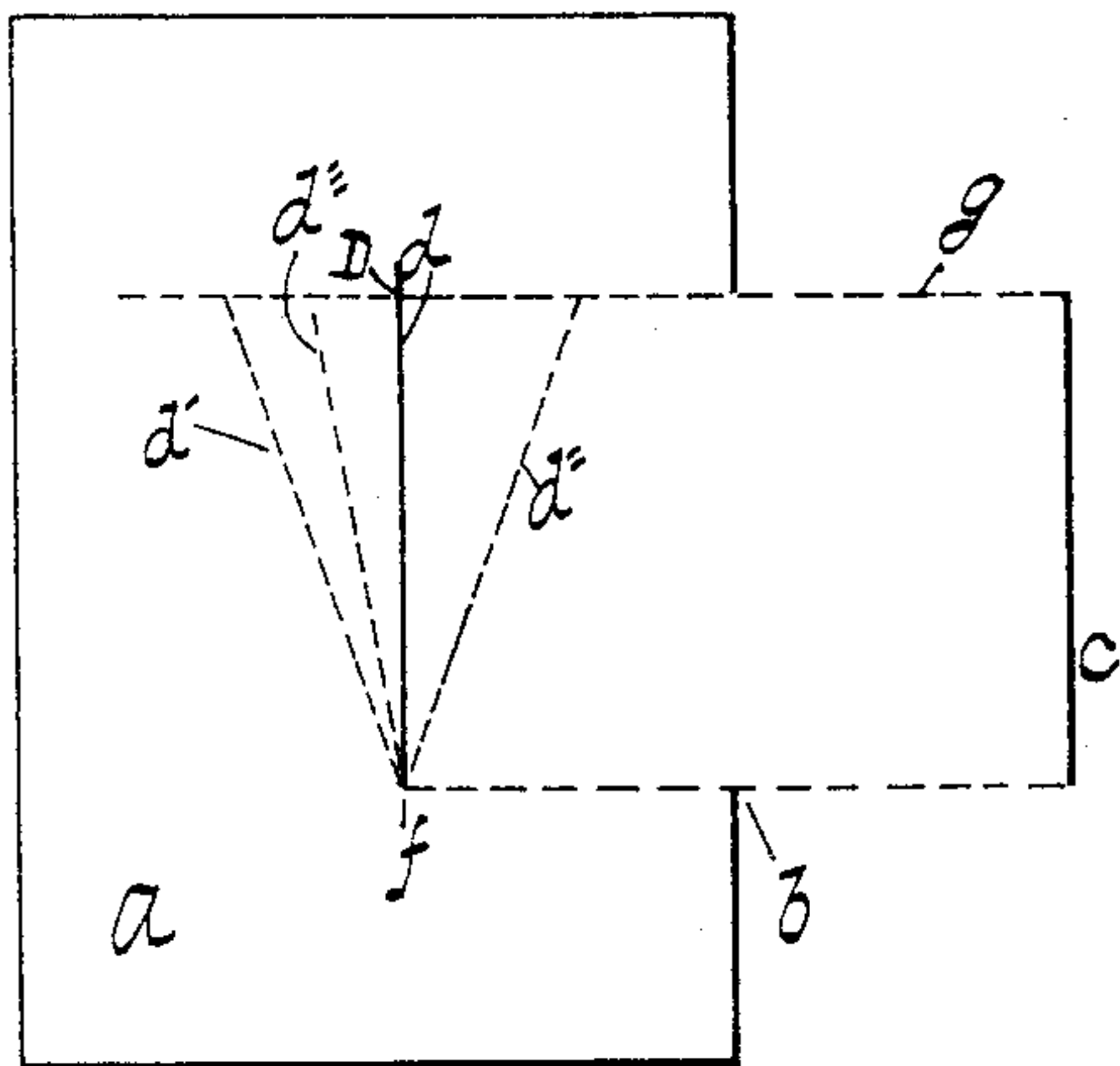


Fig. 1.

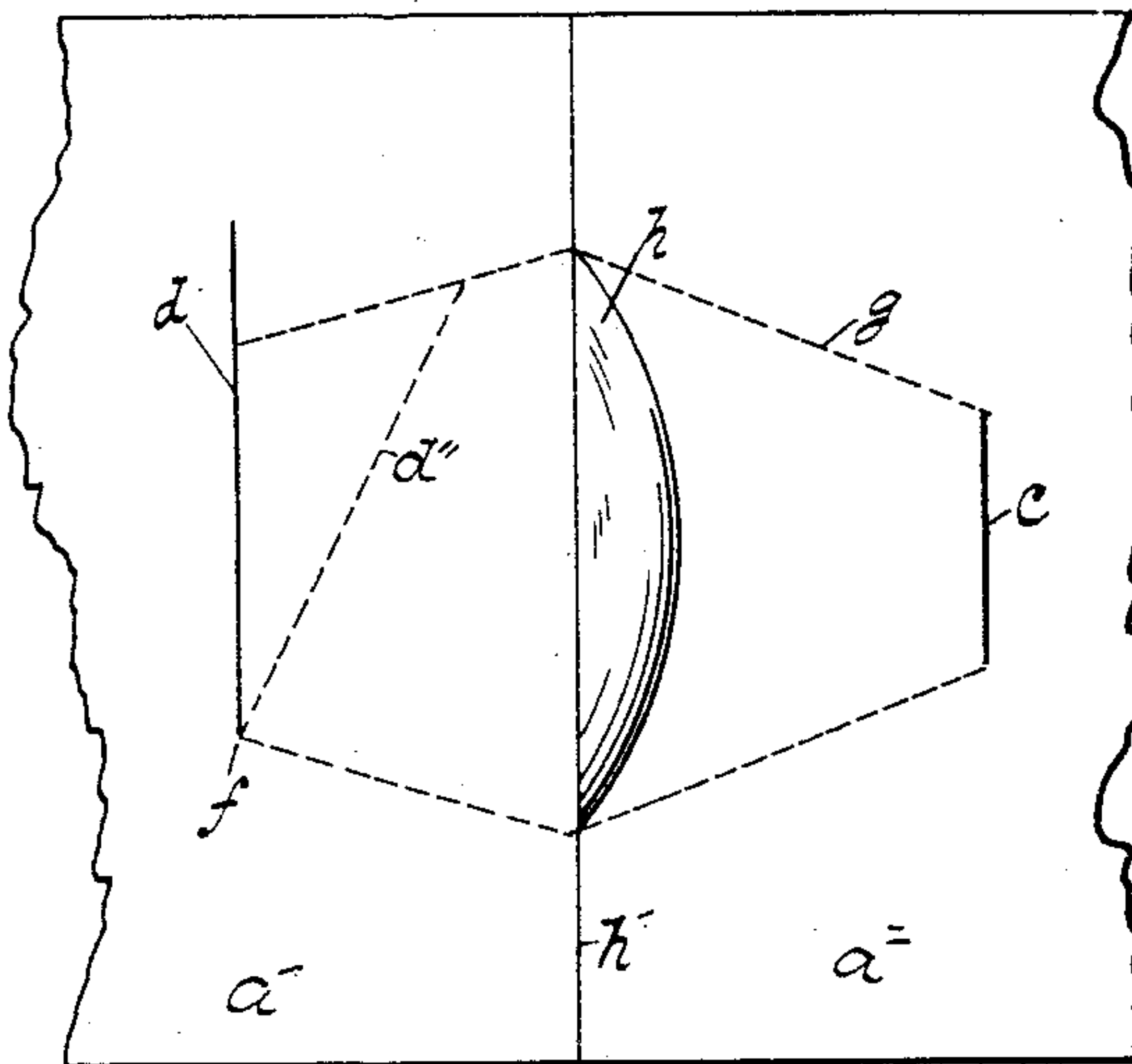


Fig. 2.

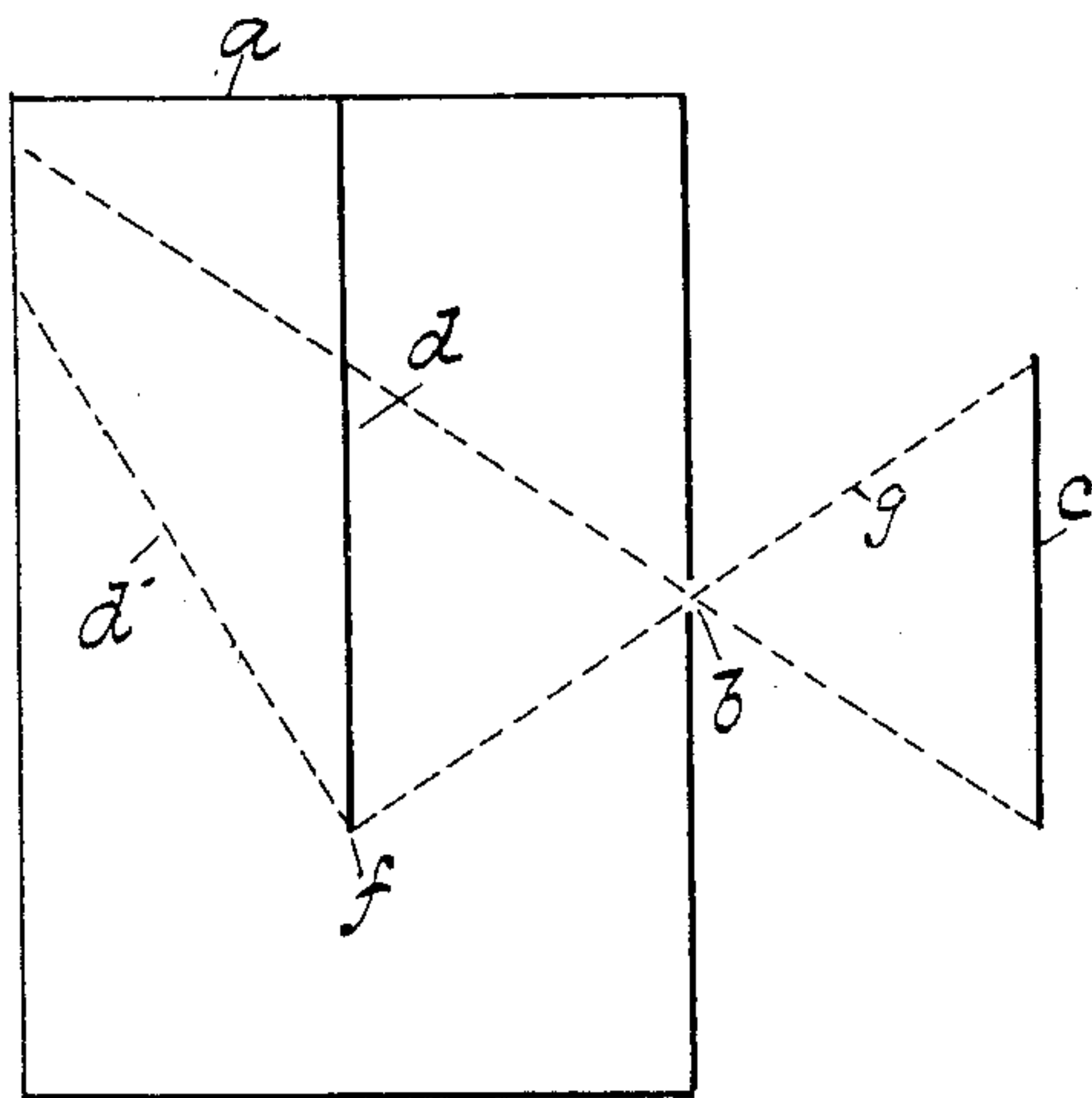


Fig. 3.

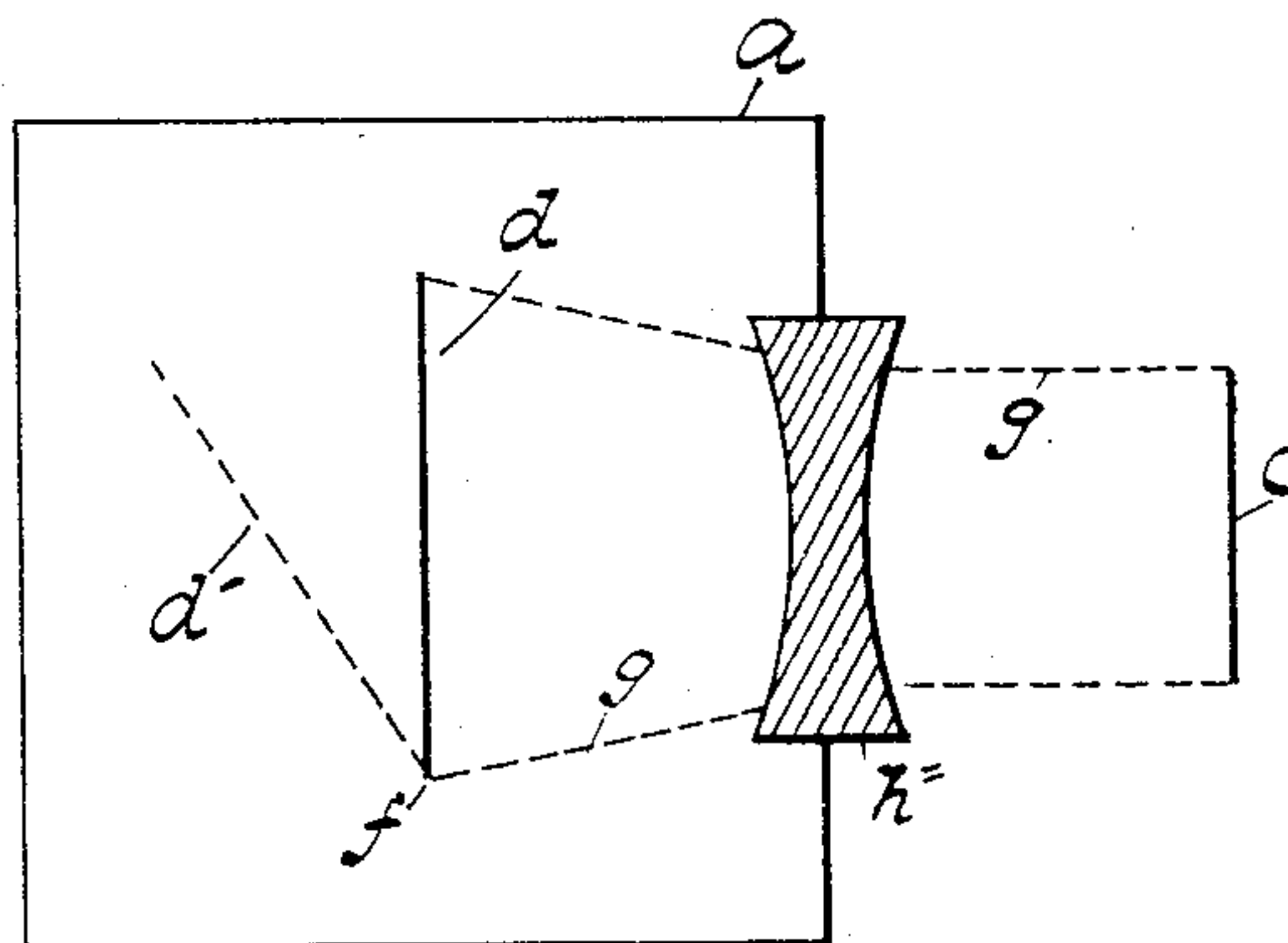


Fig. 4.

A LINE OF TYPE WRITTEN MATTER TO BE PHOTOGR.

Fig. 4^a.

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4 SHEETS—SHEET 2.

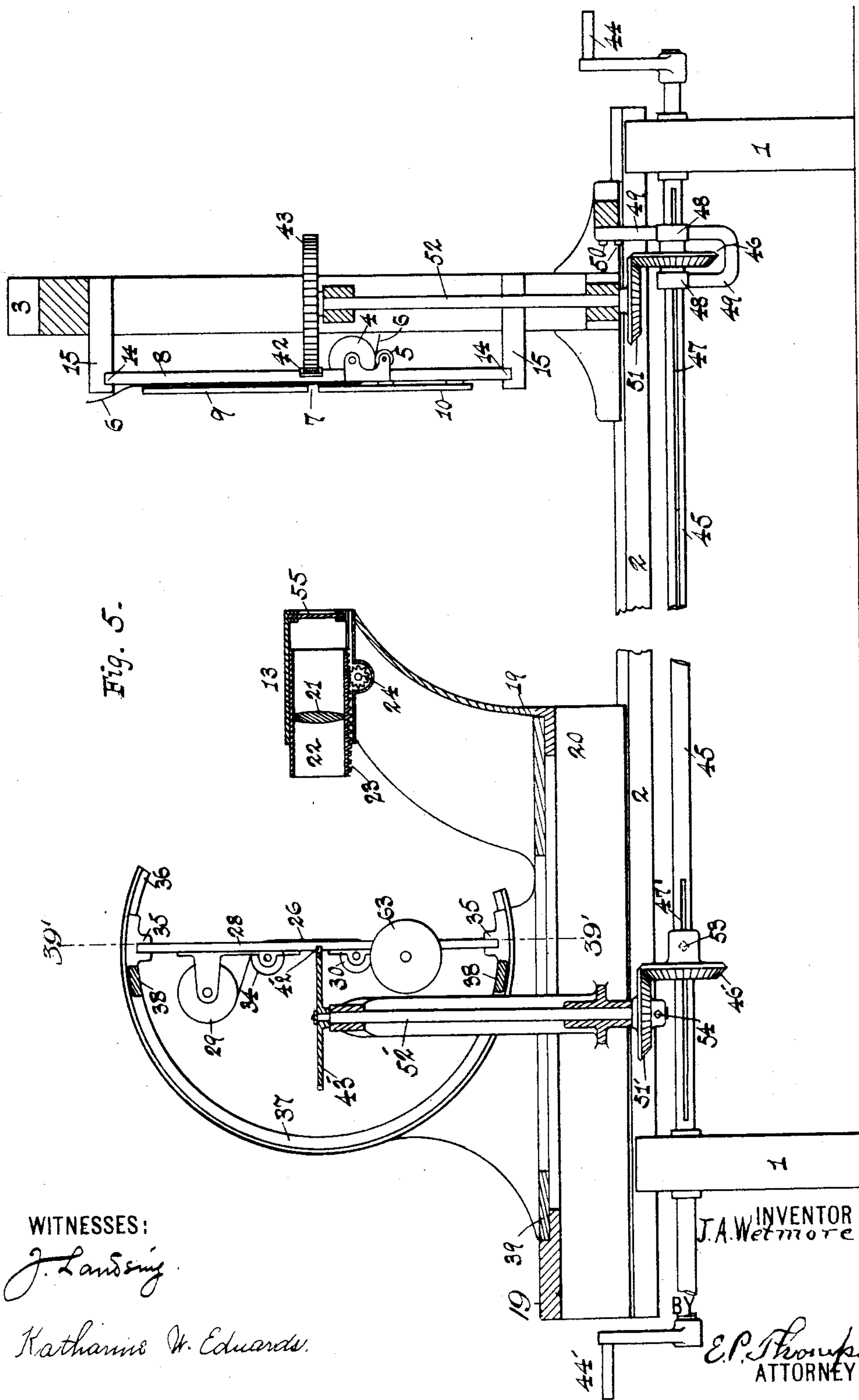


Fig. 5.

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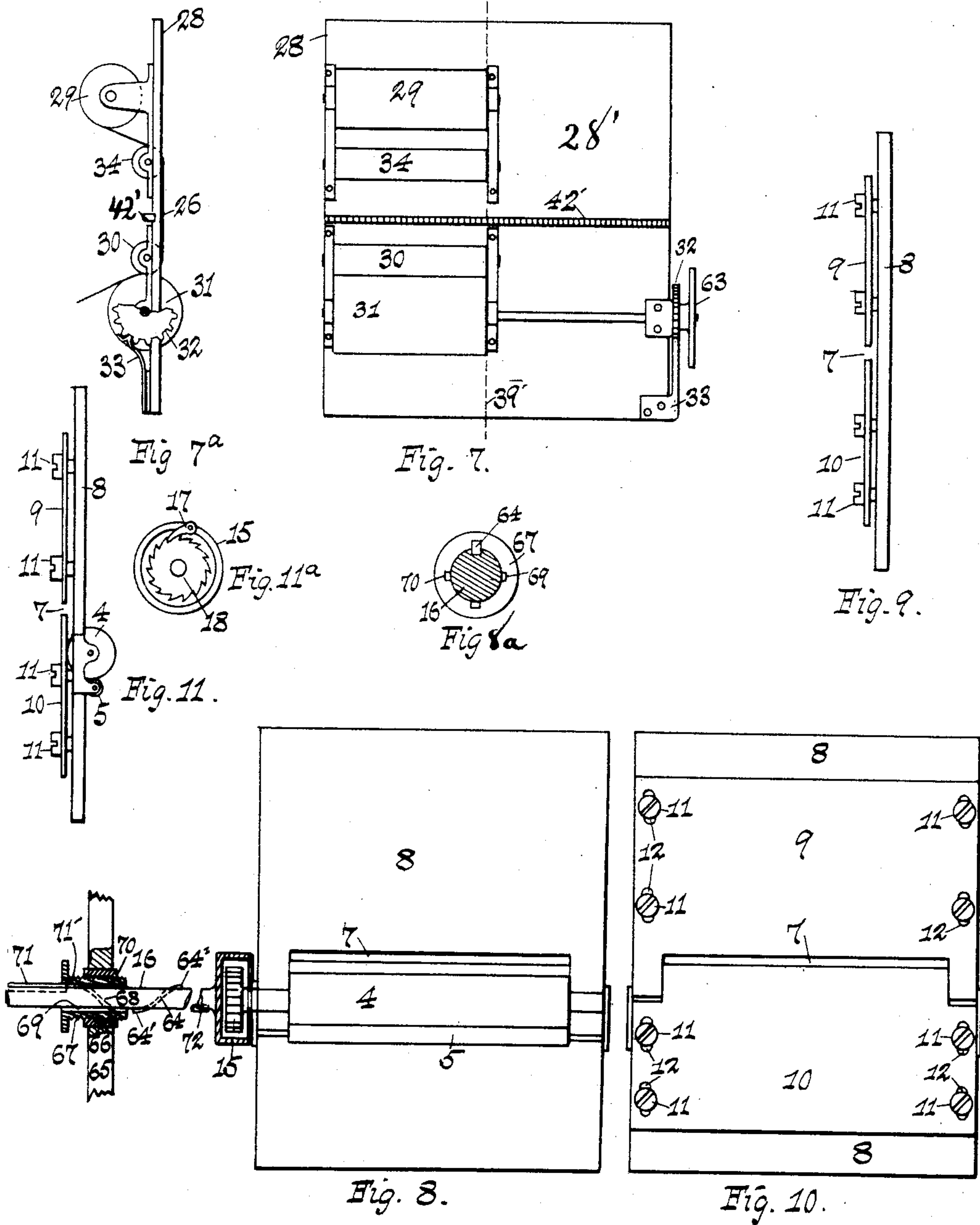
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

JEAN A. WETMORE, OF BROOKLYN, NEW YORK.

ART OF COMPOSITION, PRINTING, OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 791,062, dated May 30, 1905.

Application filed March 16, 1896. Serial No. 583,313.

To all whom it may concern:

Be it known that I, JEAN A. WETMORE, a citizen of the United States, and a resident of the city of Brooklyn, county of Kings, and State of New York, have invented new and useful Improvements in the Art of Composition, Printing, or the Like, of which the following is a specification.

The invention relates to a process for the re-
production of printed or written lines of read-
ing matter, photographically, by such steps
that the photographed lines shall be justified
and the heights of all or part of the charac-
ters of the lines equal, greater, or less than of
the corresponding dimensions of written or
printed matter. The utility of such a proc-
ess is apparent when ordinary type-written
matter is compared with the reading-columns
usually found in books and periodicals. In
the former the lines are, in view of the na-
ture of the type-writer, of different lengths,
and the letters are, conveniently and usually,
of but about two sizes, whereas it is custom-
ary in books and periodicals to produce lines
which are not only of the same length, but in
those lines some of the words or figures or
characters and sometimes only one or two
words or characters are greatly enlarged or
diminished for the purpose either of empha-
sizing particular words or of indicating a dif-
ferent language or something of that kind.
My invention not only includes the apparatus
for obtaining such results, but the combination
of steps for carrying out the process, both
generically and specifically.

Figures 1, 2, 3, 4 are views in diagram of ap-
paratus for illustrating the principles of my
method for justifying the lengths of the lines
of type-written matter. They are all shown
in elevation, and any one is a modification of
the other. Fig. 4^a is a line of type-written
matter. Fig. 5 is an elevation of the whole
apparatus with parts broken away here and
there. Fig. 6 is a similar view, except that
it is a plan. Fig. 6^a is an end view of the
track. Fig. 7 is an elevation of a detail taken
from Figs. 5 and 6. The figure shows the
means for propelling the photographic paper.
Figs. 7^a and 8^a are detail views of parts of
the mechanism. Fig. 8 is an elevation of a

detail of that shown in Figs. 5 and 6. This
figure shows the means for feeding the type-
written paper. Fig. 9 is an end view of a
portion of that seen in Fig. 8. Fig. 10 shows
the opposite side of the apparatus seen in
Fig. 8. Fig. 11 is an end view of the con-
struction of a detail that is seen in Figs. 5
and 8 and is identified by reference-letters.
Fig. 11^a is an end view of pawl and ratchet.

Referring particularly to Figs. 1, 2, 3, 4, *a* is a box-camera or simple box having an open-
ing *b*. *c* is a sheet of paper having the lines
to be justified and photographed. *d* is the pho-
tographic paper to receive the image and pho-
tograph of the lines indicated in Fig. 4^a. If
either the photographic paper or the line
forming the object be tilted, then the image
will be of a different length from the origi-
nal. To illustrate, the paper *d* is indicated
by a dotted line *d'* as tilted to the left and
by a dotted line *d''* as tilted to the right. In
either case the image will be longer than line
c. The pivot of tilting is at *f*. In Fig. 1 the
rays of light *g* are reflected or transmitted
from the object *c* in parallel directions, while
in Fig. 2 the rays of light *g* diverge and are
refracted by the plano-convex lens *h*, and
therefore the letters are enlarged or reduced
in the photograph according to the distance
of the paper *d* from the lens *h*.

Fig. 3 illustrates the use of a pin-hole
camera. In Fig. 4 a double-concave lens is
employed for obvious reasons. *h'* is a parti-
tion separating the apartments *a'* and *a''*.

Referring particularly to all figures suc-
ceeding Fig. 4, 1 represents what may be
termed "ties" or "sleepers" for supporting
the connecting-rails 2 of a small railway-track
for carrying a movable carriage not provided
with wheels, but so constructed as to slide
backward and forward over the track. For
this purpose the rails 2 are parallel to each
other, as indicated in end view of Fig. 6^a.
They are double beveled on their upper sides.
The carriage for sliding on this track is
formed, essentially, of a three-sided frame 3,
whose purpose is to carry a sheet of lines of
reading matter to be photographed. The sheet
is numbered 6 and it is intended to feed
against the roller 5. Inasmuch as only one

line is to be photographed at a time, the opening for exposing the line to the camera is correspondingly narrow, and it is indicated by the numeral 7. It should be noticed that the
 5 two rollers and the paper and certain other elements hereinafter named are all carried by a plate or board 8, for the reason that this plate is adapted to certain movements in several directions and the paper 7 must follow these same
 10 motions. 9 and 10 are plates which are adjustable to vary the width of the slot 7, and they serve also as guides for the paper which is propelled by the rollers 4 and 5. The plates 9 and 10 are fastened to the plate 8 by the screws 11.
 15 These screws 11 pass through slots 12, by which the plates 9 and 10 are adjustable to and from each other, the said slots belonging to the plates 9 and 10. The plates 9 and 10 should in every instance be opaque. If the sheet of
 20 paper 6 is white, with black letters, then the plates 9 and 10 should be white on the side exposed to the camera, while if the line to be photographed is made of white letters on a black sheet then the visible surface of the
 25 plates 9 and 10 should be black. For convenience in this matter I may have one surface of the plates white and the opposite one black. The plate 8 is subject to two motions only, one being, with the carriage 3, backward
 30 and forward with respect to the camera, which is hereinafter described as located at 13, and the other in a direction at right angles to the above-named directions. To this end the plate 8 is supported at its upper and lower edges in
 35 grooves 14 in arms 15, extending outward from the frame 3, so that the plate 8 may be moved backward and forward for the ultimate object of exposing to view a portion of the line
 40 instead of a whole line in that case where the whole line is not to be photographed simultaneously, but where it is to be photographed a portion of a line at a time either continuously successively or successively intermittently. The backward and forward movement
 45 of the carriage 3 for the purpose of moving the paper 6 to and from the camera is accomplished by hand.

The next thing to be described in detail at this point is the mechanism for feeding the
 50 sheet of paper having lines e . The roller 5 is simply a pressure-roller for pressing the paper against the feed-roller 4. If it is intended to photograph the whole line simultaneously and then the next line and so on to the end of
 55 the page, the plate 8 is maintained stationary and the casing 15 or shaft 16 is turned around until the roller moves the circular distance of the spaces between the teeth on the ratchet-wheel 18. The ratchet-wheel 18 and the pawl
 60 17 engaging therewith are for use only in the case where a line is to be photographed a portion at a time; but where the whole line is to be photographed simultaneously it is only necessary to turn the roller 5 so as to expose one
 65 line at a time before the opening 7. Assum-

ing that one line is to be photographed at a time as a whole and the different lines successively, I will describe so much of the camera and its adjuncts as may be necessary to show
 70 how to carry out the operation.

The camera as a whole is numbered 13 and as a whole it is mounted upon a track as a foundation, and, furthermore, it is stationary. The support for it upon the track is a ring, whose rim is 19 and whose inwardly-projecting
 75 flange is 20. The lens-tube 13 is supported by the rim 19. The lens of the camera is indicated by 21. It is necessary, of course, to move the lens back and forward. Therefore it is carried in the inner tube 22 in a telescopic
 80 manner, which is fed by the rack 23, gearing into a pinion 24. The pinion may be turned backward and forward by the head 25 to accomplish the final and accurate adjustment of the focus. The paper for receiving the image
 85 is 26, and it is located directly in line with the lens 21, a shutter 55, and a slot 7. At least a portion of the paper at a time is thus in line on the right-hand side of the paper-support
 90 28. The paper goes from and passes to the left-hand side of the board 28, being fed from the supply-roller 29, passes out between the pressure-roller 30 and the propelling-roller
 95 31, on a portion of which are teeth 32 and a stop 33 normally pressing upon and between the teeth. The roller 34 is a guide-roller for directing the paper 26 from one side of the plate 28 to the other side.

The operation will now be described, assuming that the lines, like e , are all the same length. It is simply necessary to expose the first line through the opening 7. Next bring the plate
 100 28 so that the ground-glass plate 28' is in focusing line with the camera, obtained by sliding the plate 28 in given grooves 35. Now turn the head 25 until the image of the line is clear upon the ground glass. Now slide the plate 28 so that the paper 26 is brought into
 105 position to receive the image. Now open the shutter 55, which for the present purpose may be considered as accomplished manually, and after the proper period of exposure close the shutter. Turn the shaft 16 to propel the
 110 paper 6 in order to bring the next succeeding line before the opening. At the same time, later, or before turn the roller 31 to bring the paper 26 over the same predetermined distance to receive the new image and photograph the print upon opening the shutter 55,
 115 which should be closed again, and the same operation exactly repeated until every line has been photographed.

I will now describe the apparatus for reducing or increasing the height of the letters of a line without affecting the length. Some
 120 of the apparatus has necessarily already been described. The remaining details of this feature are as follows: 36 is an arc-shaped guide which has an arc-shaped sliding piece 37, which is provided with the aforementioned
 125 130

grooves 35 for retaining the plate 28, which passes diametrically across the circle of the arc. It is now evident that when the plate 28, carrying the paper 26, together with the slide 37, is rotated or inclined to the right or left by movable slides 37 the image of the letters upon the paper will become increased in height, assuming that the normal position of the plate 28 is vertical, as indicated in Fig. 5. If the normal position is considered as inclined, then the images will become diminished in height when the plate 28 is brought more and more to the vertical position. The slides 37 are pushed around by hand. The degree of increase or decrease in height is foreknown and predetermined by first placing the ground glass 28' to receive the images of the letters, as explained heretofore in reference to a different function of the apparatus. The two slides 37 are rigidly connected together at corresponding ends by bars 38, the upper one of which is seen clearly in Fig. 6.

One of the more essential functions of the apparatus, together with the construction by which the results are accomplished, will now be described. In type-written lines as produced by all ordinary machines the same are of different lengths. The margin on the left hand of the page is of equal width, but that on the right is very irregular, whereas in books and newspapers it has always been the custom to justify the lengths of the lines by lengthening the shorter ones and shortening the longer ones, so that the resulting lines should all be of the same length. My apparatus is adapted to produce photographs in which the lines are all of the same length from a sheet upon which the lines are of greatly varying lengths. To this end the movable support or carriage for the photographic paper 26 is a base-plate, which is rotary within the rim 19 and upon the flange 20 about an axis which intersects at right angles the projected shorter axis of the lens 21 and which coincides with the vertical line 39' of the photographic paper 26. The axis or line 39' is represented dotted in Fig. 7. It may be noticed that the principle of lengthening and shortening the lengths of the lines is the same as that employed for changing the height of the letters—namely, the projection of the image upon a more or less inclined surface for photographing paper, according to the desired degree of reduction or enlargement. The operation of this feature of the device may be carried on in the following manner: The image is obtained first, as already described, upon the ground glass 28'. The plate 28 is then moved in its own plane through the grooves 35 conveniently by hand. For this purpose the rack 42' is extremely thin, so that the upper and lower parts of the letters are seen for the purpose of adjusting the focus. The plate 28 is now moved so that the image will fall upon

the paper 26 and so that the line 39' substantially coincides with the vertical axis of the circular support 39. The manipulation may now be better understood by special reference to Fig. 1 or Figs. 2, 3, and 4. Referring to Fig. 1, let it be supposed that the length of the lines to be photographed is that of the black line *c*. Let it be supposed, further, that this line *c* is the average length of all the lines of the given type-written matter. Let α'' be the normal position or normal inclination of the photographic paper. The result to be accomplished is the photographing of lines of different lengths, so that the lengths of the photographed lines may be equal; but at the same time all the lines photographed may be less or larger than the lines of the type-written matter. It is evident while referring to Fig. 1 that the image of the line upon the photographic paper in the position α'' will be the line *c*. Now if the line *c* is replaced by a slightly longer line the photographic paper should be inclined more or less toward the position α'' , so the image may be of the same length as that obtained at the position α'' . Conversely, if the line corresponding to *c* is shorter than the line *c* the photographic paper should be tilted to or toward the position α' , so that the image therefore will be the same length as the former two images. In the same manner the process is carried on by tilting the paper α more or less about the axis *f*, which corresponds to the line 39' along the edge of the photographic paper 26.

It is evident that it may be desired to simultaneously reduce or enlarge the height and the width of the letters, lines, or words. For example, the type-written matter might be and generally is larger than that used in printing subject-matter of books or newspapers. I will now explain the simple means by which such operation is accomplished, the same consisting merely in the arrangement of the frame 3 upon the rails 2, whereby the paper 6 may be moved to and from the camera. The only other adjustment is that of the tube 22, carrying the lens 21. By adjustment of these elements the photographic print may contain enlarged or reduced letters, words, or lines, and after these adjustments are accomplished the operation already described may be carried on as beforesaid.

I will now describe the means whereby a given line of stenciled, printed, or otherwise-formed words upon a given sheet 6 may be photographed in an entirely different manner from that accomplished by the apparatus as thus far described. The result to be accomplished is the photographing of a portion of a line at a time, commencing at the beginning of the line and continuing the process until the whole line is photographed. The apparatus is of such a nature that I can photograph the words intermittently in succession

or continuously from the beginning to the end of the line and by adjusting the opening 7 and by suitably proportioning the other parts of the apparatus can thus photograph several lines; but my special object is to photograph a line at a time and simultaneously justify their lengths.

The fundamental principle upon which the apparatus is based is apparent from the fact that when the transparent slide is moved into a projection apparatus or magic lantern the beginning of the picture is immediately visible upon the screen, and as the slide is fed farther and farther, either intermittently or continuously, more and more of the picture appears, and the said picture is clear and distinct from the beginning to the end of the movement.

The apparatus for carrying out the process consists of gearing for moving simultaneously and in opposite directions the papers 6 and 26 in a horizontal direction and maintaining them substantially at the same linear distance from each other when parallel to each other. For this purpose the plates 8 and 28 are provided, respectively, with racks 42 and 42'. Into each gear, respectively, spur-wheels 43 and 43'. The spur-wheels 43 and 43' are synchronously rotated from the manually-operated cranks 44 and 44' with intermediate gearing which consists of the following elements: The cranks 44 and 44' belong to and are fixed to the shaft 45, having beveled gear-wheel 46 at or near one end and another similar wheel, 46', at or near the other end. The latter, 46', is fixed to the shaft 45; but the former, 46, is movable along a portion of the length thereof, but is rotary therewith because of the key 47, arranged longitudinally along the shaft 45. The gear-wheel 46 is arranged, further, to travel with the carriage 3 by having collars 48 arranged on opposite sides of the wheel 46 and connected by the arm 49 to the frame 3 by screws 50, the collars having holes large enough to permit the shaft 45 and the key 47 to rotate therein. The wheels 43 and 43' are adapted to be turned by the wheels 46 and 46' because of the beveled gear-wheels 51 and 51' being connected thereto, respectively, by arbors 52 and 52'. The wheel 51 gears with the wheel 46, and the wheel 51' gears with the wheel 46'. The gear-wheel 46' is provided with a set-screw 53 and is movable along the shaft 45 and key 47', so that the wheel 46' may be placed in and out of the gear independently of the relative positions of the wheels 46 and 51. When the wheel 46' is in gear with the wheel 51' and handles 44 and 44' turned, the two plates 8 and 28 will be propelled synchronously and in opposite directions to each other. The wheel 46' may be adjusted by screw 53 and plates 8 and 28 to gear with the opposite side of wheel 51', so that the plates 8 and 28 will be driven back-

ward and forward in the same direction, which will be the operation when the lens 21 is omitted from the camera and when the image is formed by some other means than by a lens—as, for example, when formed by parallel rays, as in Fig. 1. The rays which are reflected from the white surrounding the black letters, for instance, will leave black images upon the photographic film 26. When the lens is used, however, the plate 8 and the plate 28 must move with the same speeds, but in opposite directions, the same being accomplished by having the wheel 46' in gear at the right-hand side of the wheel 51'. In Fig. 5 when the wheel 46' is out of gear with the wheel 51' the plate 28 may be moved back and forth directly by hand. It should be noticed that the rates of speed of the plates 8 and 28 need not necessarily be equal. The rates should be in proportion to the distances between the plates jointly with the distance from the lens 21 to the respective plates. I have not shown in the drawings all the different proportions; but I can show how any relative speed can be obtained. The wheel 51', it will be noticed, is provided with a set-screw 54, so that it may be removed and any size wheel substituted, so that a correct relative speed may be obtained. The different wheels will be marked to show the operator which wheels to use for given distances.

The shutter does not form an essential part of the invention, and yet it is very necessary as a part of the apparatus, and it is important to notice how I provide automatic means for opening and closing the shutter, which is numbered 55, at the right time. The plate 28 has a rod 56 extending to a suitable distance and provided with two pins 57 and 58 upon opposite sides of the rod 59, pivoted at 60 and crossing the rod 56. The pivot 60 is rigid with the stationary rod 59, measured from the pivot 60, and pivoted at the joint 61 to the shutter-rod 62, so that when the rod 59 is turned upon its pivot 60 the shutter is opened or closed. In Fig. 6 the shutter 55 is shown open and the plate 28 is in the position where the film 26 is partially exposed, or at least beginning to be exposed, and likewise the plate 8 is beginning to move to bring the letters of the line within range of the camera. When the plate 28 arrives at its limit or that position where the image of nearly the whole line has been chemically registered on the film, it strikes the rod 59 and moves it, and thereby causes the shutter 55 to close. Now the thumb-screw 63 is turned while the shutter 55 is still closed, so that this new surface of the sensitive film may be ready to be exposed for another line of images, and in the manner already described the other line of characters is fed so as to appear at slot 7. The next operation already described is carried on where-by the ground-glass plate 28' is brought into

focus, so that the line, which may be longer or shorter than the former one photographed, may be justified as to its length by tilting the plate 28 to the right angle by turning around more or less the rotary plate 39, it being supposed that the shutter is again opened, so that the light may form images upon the ground-glass plate. The means for opening the shutter at the proper time for exposing the ground-glass plate 28' is the pin 57, which is so located upon the rod 56 that the shutter 55 will begin to be opened and continue to open by the motion of the pin 57. Now it must be understood that when the sheet 26 is moving in a backward direction the shutter 55 must be closed or else the film will be blurred. In view of the directions pointed out the shutter 55 will remain closed while the sheet 26 is being moved back to its normal position. There are no retractile springs for the rod 59, and therefore the friction at the pivots maintains the shutter at the position where it is brought by the action of either one of the pins 57 and 58. It should be remembered that the means for moving the plates 8 and 28 have already been described, and therefore in the description about the shutter the plates 8 and 28 have been moved by the action of the hand upon the cranks 44 or 44'.

30 An important detail feature of the apparatus involving my invention is the means for automatically feeding the object-paper 6 each time the same arrives at or near the end of its transit, in that case where a portion of a line is photographed and then another portion, and so on to the end either intermittently or continuously. The shaft 16 is equipped with a helical guide or screw-thread 64 of a very long pitch. 65 represents a suitable support for the nut 66, into which is screwed in an adjustable manner a screw nut or tube 67, which is provided with a helical groove 68 and two diametrically opposite longitudinal grooves 69 and 70. The groove 69 is common to the groove 68 for a very short portion of the length, and the groove 70 is common with the groove 68 for a short portion of its length. The nut or tube during the operation of the device is stationary. The shaft 16 is likewise provided with a longitudinal key or guide 71 in line with one end of the thread 64 and with a second guide-key 72 in line with the other end of the thread 64. The location of the guides 71 and 72 is such that when the shaft 16 travels lengthwise the end 64' of the key 64 will be entering, while the end 71' of the guide 71 is leaving, the groove 70. The guide 72 is so located that its end 72' will be at the end of one of the grooves at the same time that the end 64' of the thread 64 is about at the end of another groove. Let it be assumed now by reference to Fig. 8 particularly that the plate 8 is traveling to the left. When the end 64' of

the thread 64 arrives at the tubular nut 70 it will enter the groove 68, which is common to the groove 69 because it is guided by the key 71, which is traveling out of the groove 70. As soon as and during the time that the plate 8 is moved to the left the thread 64 will enter and travel through the groove 68, and at the same time the shaft 16 will rotate in a manner of a screw with a long pitch passing through a nut with an equal pitch. The object of the key 72 is similar to that explained with reference to the key 71, and therefore no further detail explanation need be given at this point. The rotation of the shaft 16 causes the rotation of the roller 4 and the feeding of the paper 6, so as to expose the next page to be photographed from the opening. The rotation of the shaft 16 is communicated to the roller 4 through the ratchet-wheel 18, which is loose upon the shaft 16, in conjunction with the pawl 17, carried by the casing 15, which is fixed upon the said shaft. In view of this pawl-and-ratchet mechanism the roller 4 will not rotate when the thread 64 passes through the groove 68 in a direction opposite to that already alluded to. Consequently the paper will not be fed back when the plate 8 is returned to the original position at the beginning of the process of photographing another line of letters or other characters. Fig. 8^a shows the straight grooves 69 and 70 as not beginning in the same part of the circle as the grooves for the curved key 64.

I claim as my invention—

1. In the art of composition, printing, or the like, the improvement that consists in optically and individually altering the images of successive portions of the text or matter to be treated and photographically fixing the images so altered.

2. In the art of composition, printing, or the like, the improvement that consists in optically and individually altering the images of successive portions of the text or other matter to be treated and photographically fixing and reassociating the said portions, thereby justifying or otherwise arranging said matter at will.

3. In the art of composition, printing or the like, the improvement that consists in optically justifying the images of successive lines in whole or part to the required length and photographically fixing the said images and reassociating them to form a justified column or columns.

4. In the art of composition, printing, or the like, the improvement that consists in optically altering the vertical and horizontal dimensions of the images of successive portions at will of the text or matter to be treated and fixing and reassociating the said images, when so altered, whereby the said matter may be reportioned at will.

5. In the art of composition, printing, or the like, the improvement that consists in optically altering the lengths of the images of any lines

or portions of the matter to be treated from a given vertical line or axis and altering the vertical dimensions of such images from given horizontal lines or axes at will, substantially
5 as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in pres-

ence of two witnesses, this 13th day of March, 1896.

JEAN A. WETMORE.

Witnesses:

M. H. DUMONT,
K. W. EDWARDS.