

March 30, 1937.

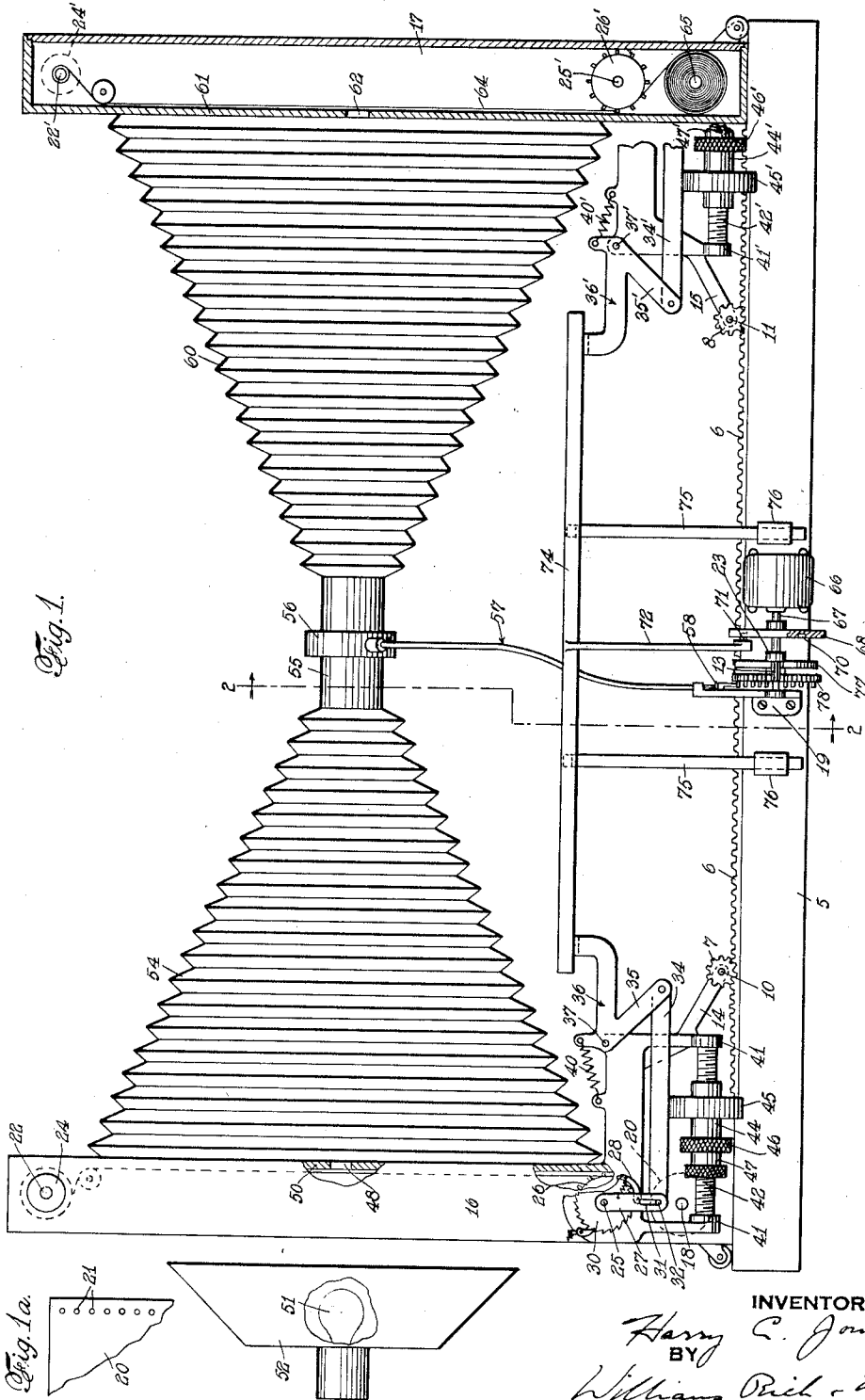
H. C. JONES

2,075,201

LINE SPACING MACHINE

Filed May 4, 1934

2 Sheets-Sheet 1



March 30, 1937.

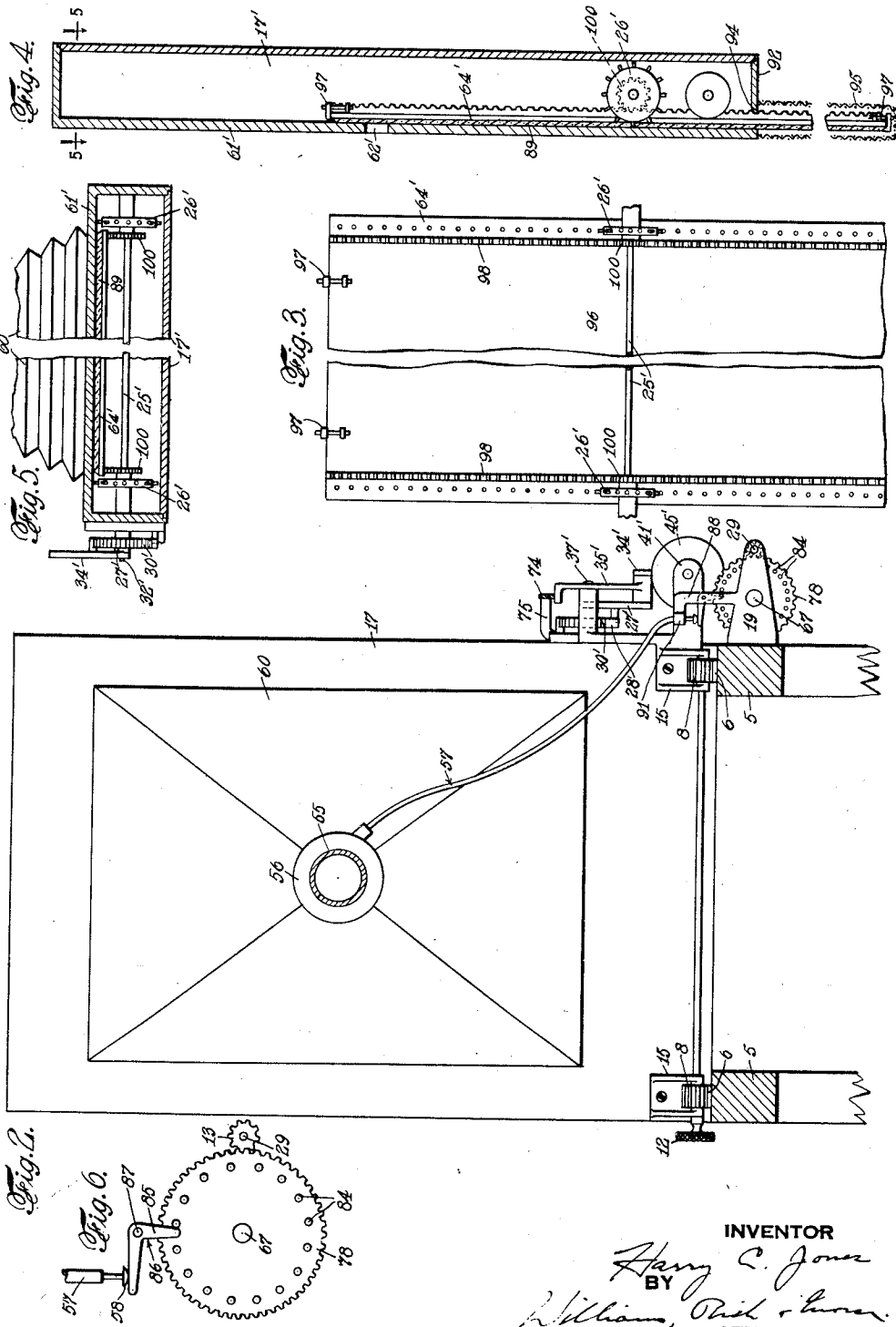
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2 Sheets-Sheet 2



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2,075,201

LINE SPACING MACHINE

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Application May 4, 1934, Serial No. 723,845

12 Claims. (Cl. 88—24)

This invention relates to line spacing machines, and is adapted for use in an auxiliary capacity with relation to the machine which is disclosed in my copending patent application Serial No. 723,467, filed May 2, 1934, and which includes the feature of effecting line justification during a typewriting operation; as well as in a similar capacity with relation to a similar machine for which I am about to file an application for United States Letters Patent, identified as Serial No. 733,012, filed June 29, 1934, and which includes the feature of effecting line justification while carrying out a typing operation photographically.

In the machines above mentioned which include the feature of effecting line justification, no provision is made for effecting what may be termed column-justification, as for example, where the length of a column of subject-matter exceeds a definite column length with respect to which justification is to be effected, or, as for example, where the length of a given column of subject-matter falls short of a definite column length with respect to which column-justification is to be effected.

An object of the present invention is to provide an improved machine which is simple in construction, accurate in operation and by which column-justification may be expeditiously carried out regardless of whether such justification is of a positive or of a negative character.

Another object of the invention is to provide means whereby a line or a plurality of lines of the subject-matter of the original may be rendered ineffective with relation to the final or justified copy, as when substitutions are to be made for such line or lines, while at the same time providing on that copy sufficient space to later accommodate such line substitutions as are required.

Other objects and advantages of the invention will become apparent from the following description when taken in connection with the accompanying drawings, in which—

Fig. 1 is a side elevation of a machine embodying the invention; Fig. 1A is a fragmental view showing a sheet of transparent or translucent paper adapted for the reception of typed subject-matter; Fig. 2 is a sectional view taken on line 2—2 of Fig. 1; Fig. 3 is a fragmental view in elevation of a modified form of translating support for a print-receiving element; Fig. 4 is a vertical sectional view of a housing adapted for the reception of the support shown in Fig. 3; Fig. 5 is a horizontal sectional view taken on line 5—5 of Fig. 4 and showing the relation of that housing to its associated light shield or bellows, and Fig. 6 is a

view showing on an enlarged scale certain elements of the shutter actuating and control means appearing in Figs. 1 and 2.

In the present form of the invention, there is provided a suitable support which includes a pair of horizontally disposed rails 5, carrying a pair of racks 6, adapted to cooperate with pairs of pinions 7 and 8 secured, respectively, to adjusting shafts 10 and 11, each of which shafts is provided at one end with a thumb wheel 12. The shafts 10 and 11 are journaled in pairs of brackets 14 and 15, respectively, the brackets 14 being carried by a vertically disposed light-tight magazine 16, which is mounted for horizontal adjustment on the rails 5, and the brackets 15 being carried by a similar magazine 17, which is also mounted for horizontal adjustment on the rails 5.

Supported for movement with the magazine 16, is a horizontally disposed shaft 18, adapted to receive a roll of transparent or translucent material 20, such as paper, bearing typed subject-matter to be justified in column formation and provided at its longitudinal margins with perforations as shown at 21 in Fig. 1A, the material 20 being hereinafter referred to as a print-producing element or negative. One end of the negative 20 is connected to a take-up roller 22, journaled in the upper end of the magazine 16 and with which is associated a suitable spring, not shown, carried within a housing 24, the purpose of such spring being to maintain the negative taut and to wind it onto the take-up roller as it is released from the roll carried by the shaft 18. It will be understood, of course, that the strength of the take-up spring just mentioned may be sufficient to maintain the negative taut and wind it onto the take-up roller 22 without causing displacement of the negative except as it is released from its source of supply in a manner hereinafter more particularly described.

Journalled in the lower end of the magazine 16 is a horizontally disposed shaft 25, to which are secured a pair of sprocket wheels, one of which is indicated by the numeral 26, the teeth of the sprocket being adapted to enter the perforations 21 of the negative as it is delivered from the roll carried by the shaft 18. Supported by the shaft 25 for relative movement thereon, is a ratchet arm 27, to which is pivotally connected a spring tensioned pawl 28, adapted to cooperate with a ratchet wheel 30, secured to the shaft 25. The outer end of the ratchet arm 27 is provided with an elongated slot 31, adapted for the reception of a pivot pin 32, carried at one end of an actuating link 34, the other end of which is pivotally con-

connected to one arm 35 of a bell-crank lever 36. The bell-crank lever 36 is pivotally supported, as at 37, on a frame member 38, carried by and movable with the magazine 16, the bell-crank lever 5 being normally held in its position shown in Fig. 1 by a tension spring 40, one end of which is connected to the bell-crank lever and the other end of which is anchored to the frame member. Carried by the lower ends of a pair of arms 41 depending from the frame member 38, is a stationary screw-threaded shaft-like rod 42, on which is mounted for longitudinal adjustment an internally screw-threaded hub 44, carrying an adjusting disc 45, the hub 44 being provided with a 10 thumb wheel 46, by which it and its associated disc may be moved to various positions of adjustment longitudinally of the shaft-like rod. Also carried by the shaft-like rod 42, is a locking nut 47, by which the hub 44 and its associated adjusting disc 45 may be locked in any position of adjustment on the shaft-like rod 42.

From the foregoing, it will be appreciated that by moving the adjusting disc 45 to one position or another on the shaft-like rod 42 the effective fulcrum length of the ratchet arm 27 may be varied 25 to control the extent of intermittent motion of the shaft 25, in response to operations of the bell-crank lever 36 by means hereinafter more particularly described. For example, if the adjusting disc 45 is positioned to the left of its position shown in Fig. 1, the extent to which the pin 32 moves toward the center of rotation of the shaft 25 as the bell-crank lever 36 moves in a clockwise direction as viewed in Fig. 1 will be decreased, with the result that the extent of movement of the ratchet arm 27 will be similarly decreased; whereas if the adjusting disc 45 is moved 30 to the right of its position shown in Fig. 1, the extent to which the pin 32 will move toward the center of rotation of the shaft 25 as the bell-crank lever 36 is rotated in a clockwise direction will be increased. Thus, it will be seen that in order to decrease the extent of movement of the negative 20, the release of which from the roll is controlled 35 by the ratchet wheel 30, the adjusting disc 45 is moved to the left with reference to its position shown in Fig. 1, whereas a movement of that disc to the right from its position shown in Fig. 1 will effect an increased movement of the negative in response to each operation of the bell-crank lever 36. It will be understood that the extent to which the negative 20 is to be intermittently moved is dependent upon the spacing between the lines of subject-matter thereon, each movement 40 of the negative being adapted to effect registration of a line of its subject-matter with a light slot 48, formed in and extending transversely of the rear wall 50 of the magazine 16, the slot being located in front of a suitable source of light, such as a lamp diagrammatically indicated by the numeral 51 and shown in association with a reflector or housing 52.

Carried by the magazine 16 at the rear thereof, is a light-excluding bellows 54, connected at its outer end to a housing 55, within which is carried a suitable optical system, not shown, and with which is associated a light shutter, indicated as a whole by the numeral 56, the light shutter being of standard form and adapted for operation 45 through the medium of a Bowden wire 57, the reciprocating element of which, at its free end, is provided with a button 58, adapted for cooperation with a shutter actuating mechanism, hereinafter more particularly described. The housing 55 is also connected to the outer end of a light-exclud-

ing bellows 60, which is similar to the bellows 54 and is connected to the rear wall 61 of the magazine 17 in a proper relation to a light slot 62, formed in that wall and corresponding to the slot 48 hereinbefore described.

The magazine 17 is adapted to receive a print-receiving element 64, such as a roll of sensitized paper, carried by a horizontally disposed shaft 65, the sensitized paper being provided at its margins with a series of perforations such as those 10 provided in the negative 20 and indicated in Fig. 1A by the numeral 21, the perforations of the sensitized paper 64 being adapted to receive the teeth of a pair of sprockets 26', corresponding to the sprockets 26 hereinbefore described. The sprockets 26' are secured to a shaft 25', which is journaled in the magazine 17 and corresponds to the shaft 25 hereinbefore described. The shaft 25' is intermittently actuated through the instrumentality of means constituting a duplication of 20 the actuating means hereinbefore described in connection with the shaft 25; and for that reason and with the view to obviating the necessity for duplication of description, such elements of the latter actuating means as are herein shown and as constitute duplicates of the corresponding elements of the first actuating means are indicated by corresponding reference characters which are primed. Moreover, it is to be noted that the take-up mechanism for the sensitized paper 64 is a duplication of the take-up mechanism for the negative 20 in that it includes a take-up roller 22', adapted to be rotated in a counter clockwise direction, as viewed in Fig. 1, by means of a take-up spring, not shown, which is housed within a suitable housing 24', corresponding to the housing hereinbefore described in connection with the take-up spring for the take-up roller 22.

The actuating means for the Bowden wire 57 which controls the shutter mechanism 56, hereinbefore mentioned, includes an electric motor 66, which is suitably supported with relation to one of the rails 5 and to the shaft 67 of which is connected a cam disc 68. Formed in the disc 68 is an annular cam race or channel 70, adapted for the reception of a cam roller or pin 71, carried at the lower end of a reciprocatory link 72, secured at its upper end to an actuating arm 74, the opposite ends of which are disposed above and are adapted to cooperate with the bell-crank levers 36—36' to move them about their pivot points against the action of their associated springs 40—40'. The actuating arm 74 is secured to the upper ends of a pair of guide rods 75, which are slidably attached to one of the rails 5 by a pair of sleeves 76, within which the lower ends of the guide rods are adapted to reciprocate. Secured to the motor shaft 67, is a segmental gear 77, the relatively few teeth of which are adapted to periodically mesh with a pinion 13, adapted to cooperate with a disc-like spur gear 78, mounted for rotation on the motor shaft 67, which is journaled in a pair of brackets 19 and 23 secured to one of the rails 5 and within which are journaled opposite ends of the shaft 29 carrying the pinion 13. The disc-like gear 78 is provided with an annular group of control pins 84, which are disposed parallel to the axis of rotation of the gear and are adapted to be shifted longitudinally so that all or any number of them may be presented at one side or the other of the gear. These control pins, when positioned as shown in Figs. 1 and 6, are adapted to cooperate with the depending arm 85 of a bell-crank lever 86, which is pivotally connected, as at 87, to an upwardly extending arm 88, carried by the bracket 75

19, the other arm 90 of the bell-crank lever being disposed directly beneath the button 58, carried by the reciprocating element of the Bowden wire 57, hereinbefore described, the sheath for the reciprocating element of the Bowden wire being anchored to the arm 88, as shown at 91.

From the foregoing, it will be understood that as the motor 66 is operated, the actuating arm 74 is moved up and down under the action of the cam disc 68, with the result that the bell-crank levers 36—36' are simultaneously oscillated about their respective pivot points. As the bell-crank lever 36 is actuated, the negative 20 provided with typed subject-matter in line formation is moved upwardly to bring each successive line into registration with the light slot 48, it being understood that the extent of movement of the negative for each bell-crank operation is dependent upon the adjustment of the disc 45, which adjustment is determined, of course, by the line spacing peculiar to the subject-matter of the original. Likewise, the sensitized print-receiving material 64 is moved in response to operation of the bell-crank lever 36', the extent of movement being according to the line spacing desired in the finished copy and determined, of course, by the position of adjustment of the disc 45'. Pursuant to completion of simultaneous movement of the negative 20 and the print-receiving material 64, and while those elements are at rest, one of the pins 84 of the intermittently actuated disc-like gear 78 will so move the bell-crank lever 86 as to displace the reciprocating element of the Bowden wire 57 and thereby open and close the shutter 56 disposed intermediate the light shields 54—60, it being understood that for each shutter operation a line of subject-matter provided on the negative 20 will be photographically exposed with relation to the sensitized material 64. Thus it will be appreciated that regardless of what may be the line spacing of the original subject provided on the negative 20, any desired spacing between line exposures on the sensitized material 64 may be attained, with the result that a definite column length on the original may be shortened or lengthened, as desired, in the final copy. It will, of course, be understood that when conditioning the machine for operation the magazines 16 and 17 are adjusted longitudinally of the rails 5 to their respective proper focal positions, regardless of whether the reproduced subject-matter is to be of the same size as the original, or larger or smaller than the original.

Should the original contain, for example, a line of subject-matter, reproduction of which is not desired, the shutter 56 may be rendered ineffective with respect to that line by moving the pin 84, corresponding to that line, to a position such that it will project from the right of the disk-like gear 78, as viewed in Fig. 1, where it is rendered ineffective with respect to the bell-crank lever 86. Such displacement of the pin 84, however, does not alter the intermittent movement of the negative 20 or the intermittent movement of the sensitized material 64. Inasmuch as the print-receiving material 64 is moved despite the fact that the shutter 56 is maintained inactive under the assumed conditions, space is afforded on the sensitized material for the substitution, by exposure pursuant to a given exposure-run, of a line of subject-matter in lieu of the unexposed line of the original. Although the foregoing example assumes obliteration of only a single line, it is obvious that as many lines, regardless of their position on the original, may be

deleted as are desired, the only requisite being that pins 84 corresponding, respectively, to the lines to be deleted shall be moved to an inoperative position with relation to the bell-crank lever 86.

Although the description of the operation of the apparatus thus far assumes a transparent or translucent negative 20, it is obvious that the subject-matter may be carried on an opaque medium and reproduced in the manner described, without disturbing the various elements of the machine except for removing the bellows-like shield 54 so as to permit light, as for example from an artificial source, to strike the subject from the right as viewed in Fig. 1.

Instead of employing a roll-form of negative 20 or a roll-form of sensitized material 64, a flat sheet-like negative or a flat sheet-like print-receiving element may be employed. Because of the substantial identity of the means making possible the use of a negative and of a print-receiving element, both in flat form as contrasted with roll form, illustrations of only one such means is here deemed necessary, and it is illustrated in Figs. 3 to 5 as for use with a print-receiving element.

Referring particularly to Figs. 3 to 5, it will be noted that the bottom wall 92 of the magazine 17' is provided with an opening 94, with which is associated a depending bag-like shield 95 of suitable material, such as cloth or the like. The opening 94 and the bag-like shield 95 are adapted to accommodate a vertically movable mat 96, to the face of which is attached, by clamps 97 or other suitable means, a glass plate 89, beneath which is held a flat sensitized print-receiving element, such as a sheet of paper 64', corresponding to the material 64 hereinbefore described. To the rear of the mat 96, there are attached a pair of racks 98, which are adapted to mesh with the pair of pinions 100, carried by the shaft 25', the intermittent operation of which is effected by the bell-crank lever 36' in the manner hereinbefore described.

As to the operation of the modified form of the invention shown in Figs. 3 to 5, no description is deemed necessary, in view of the description of the operation of the apparatus shown in Fig. 1, other than to mention perhaps that the mat 96 is so translated step by step as to move definite print-receiving areas into registration with the light slot 62' of the magazine 17', the extent of intermittent movement of the mat 96 being determined by the position of adjustment of the disc 45'.

From the foregoing description of the forms of the present invention, it will be appreciated that either a transparent or an opaque subject-bearing material may be employed, and that a true copy of the subject-matter may be reproduced in final form on either a transparent or an opaque copy-bearing medium, the line spacing of which may be the same as, or greater than or less than the line spacing peculiar to the original in order to meet varying requirements.

Aside from the modifications herein shown and described, it will be understood that other changes may be made without departing from the spirit of the invention or the scope of the following claims.

1. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, 75

- means for moving the first element and the second element intermittently, means operable pursuant to said movements for exposing the second element with reference to a line of subject-matter on the first element, and means for varying the extent of intermittent movement of the first element including a ratchet wheel, a movable pawl engaging the wheel, and means for adjusting the stroke of the pawl.
- 10 2. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, means for moving the first element and the second element intermittently, means operable pursuant to said movements for exposing the second element with reference to a line of subject-matter on the first element, and means for varying the extent of intermittent movement of the second element including a ratchet wheel, and means for adjusting the movement of the wheel.
- 15 3. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, means for moving the first element and the second element intermittently, means operable pursuant to said movements for exposing the second element with reference to a line of subject-matter on the first element, adjusting means for varying the extent of intermittent movement of the first element, and adjusting means for varying the extent of intermittent movement of the second element, said adjusting means being operable independently of each other.
- 20 4. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, means for moving the first element and the second element intermittently, and means selectively operable for exposing the second element with reference to predetermined lines of subject-matter on the first element comprising a series of spaced shutter-controlling members selectively movable into and out of shutter-controlling position.
- 25 5. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, means for moving the first element and the second element simultaneously and intermittently including a motor and means for operatively connecting the motor to said elements, and means selectively operable pursuant to and with relation to certain of said simultaneous movements for exposing the second element with reference to lines of subject-matter on the first element corresponding to said certain movements including a series of similar members movable selectively and independently of each other into and out of their respective operative positions.
- 30 6. A line spacing machine for photographically reproducing subject-matter in line formation, a print producing element carrying subject-matter in line formation, a print receiving element adapted to receive the lines of subject-matter, means for moving the first element and the second element simultaneously and intermittently, means selectively operable pursuant to and with relation to certain of said simultaneous movements for exposing the second element with reference to lines of subject-matter on the first element corresponding to said certain movements, said selectively operable means including shutter-actuating means comprising a rotatable element, and a plurality of pins corresponding to the lines of subject-matter on the first element and adapted to be selectively positioned in shutter controlling position.
- 35 7. In a machine of the character described, means for tensioning and holding flat a flexible sheet of copy, a second means for tensioning and holding flat a flexible light sensitive sheet, means for advancing the sheets simultaneously and intermittently through respective predetermined distances, means for varying the relative distance through which said sheets are advanced, and means mechanically connected to the advancing means for simultaneously exposing spaced corresponding areas of said sheets successively, including a shutter, a wheel provided with adjustable pins, and a bell-crank-lever movable by the pins and mechanically connected to the shutter.
- 40 8. In a machine of the character described, a normally closed shutter, and means for simultaneously opening the shutter and for moving a sheet across the shutter including a motor, intermittently operating means actuated by the motor for moving the sheet including a pawl, means for adjusting the stroke of the pawl, and a ratchet wheel operated by the pawl, and an operative connection between the motor and the shutter for actuating the shutter.
- 45 9. In a machine of the character described, means for intermittently moving a pair of sheets, means for varying the extent of the movement of each of said sheets, means for exposing successive transverse areas of one of the sheets to a corresponding area of the other sheet, and selective means for rendering the exposing means inoperative when predetermined areas of the sheets are arranged in position for exposure including a series of spaced pins each movable into and out of operative position.
- 50 10. In a machine of the character described, means for moving a member into position to expose a predetermined area thereof, including a ratchet wheel, a pawl engaging the wheel and means for varying the stroke of the pawl, means controlled by the moving means for exposing said area, and means for controlling the operation of the exposing means.
- 55 11. In a machine of the character described, means for moving a pair of members into position to expose corresponding areas thereof, and means for varying the extent of the movement of said members comprising a pivoted lever for each of said members, a reciprocatory member connected to and operating said pivoted levers, a second pair of levers each pivoted at one end thereof to an end of one of said pivoted levers, an adjustable fulcrum for each of said second pair of levers, and means for operatively connecting the other end of each of said second pair of levers to the first-mentioned pair of members respectively whereby movements of said reciprocatory member, said pivoted levers and said one end of each of said second pair of levers is constant while the movement of said other ends of said second pair of levers is variable and dependent on the adjustment of said fulcrum.
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12. In a machine of the character described,
means for moving a member into position to ex-
pose a predetermined area thereof including a
continuously rotatable member, a reciprocatory
5 member reciprocated by said rotatable member,
a pivoted lever connected to and operated by said
reciprocatory member, a second lever connected
at one end to and operated by the pivoted lever,
means having a variable movement operatively

connecting the other end of said second lever to
said first-mentioned member, and means for
varying the movement of said other end of said
second lever to vary the movement of said con-
necting means, said last-mentioned means in-
cluding an adjustable fulcrum for said second
lever. 5

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