

March 15, 1932.

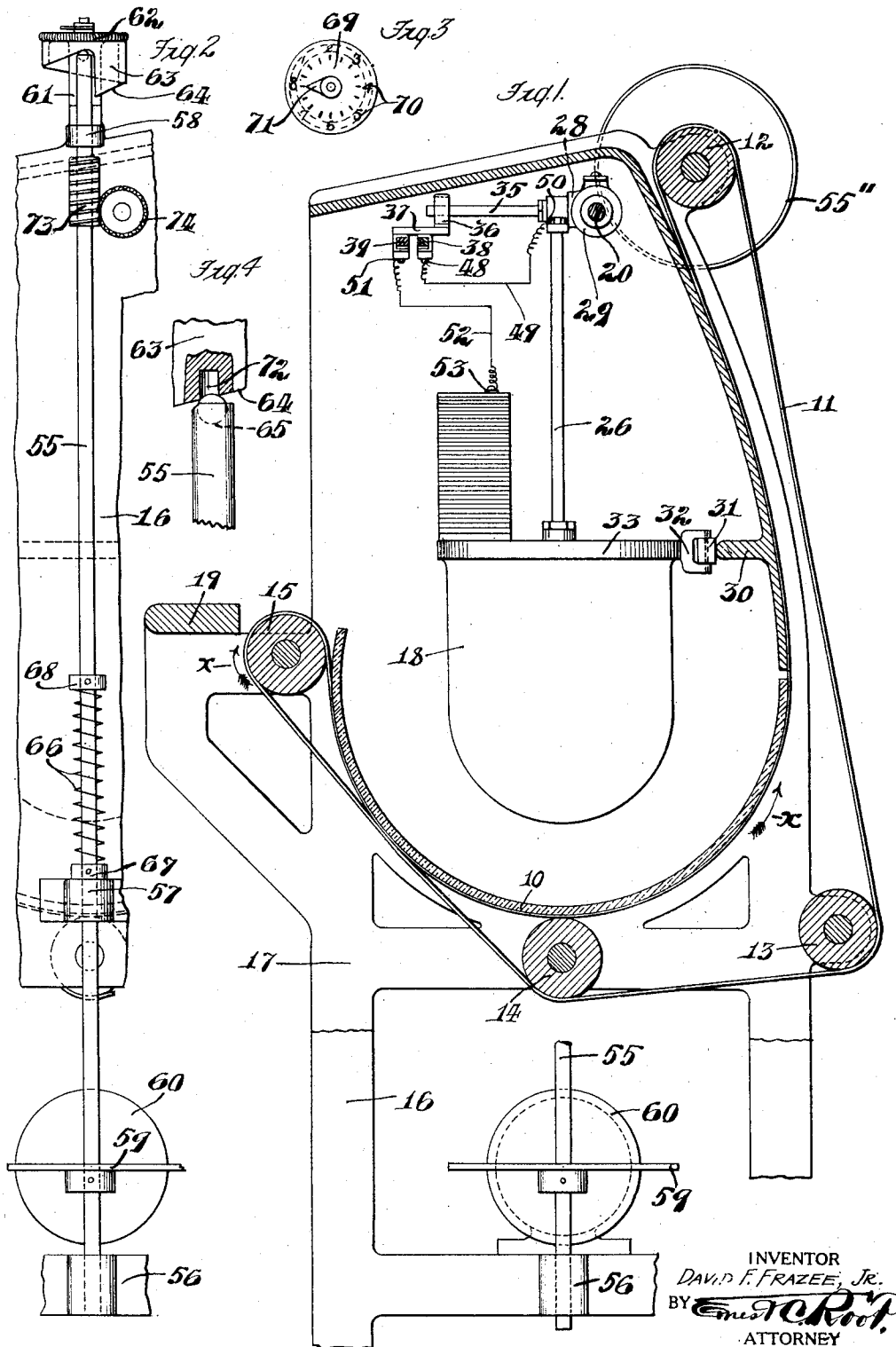
D. F. FRAZEE, JR

1,849,368

PHOTOGRAPHIC PRINTING APPARATUS

Filed Nov 9, 1928

2 Sheets-Sheet 1



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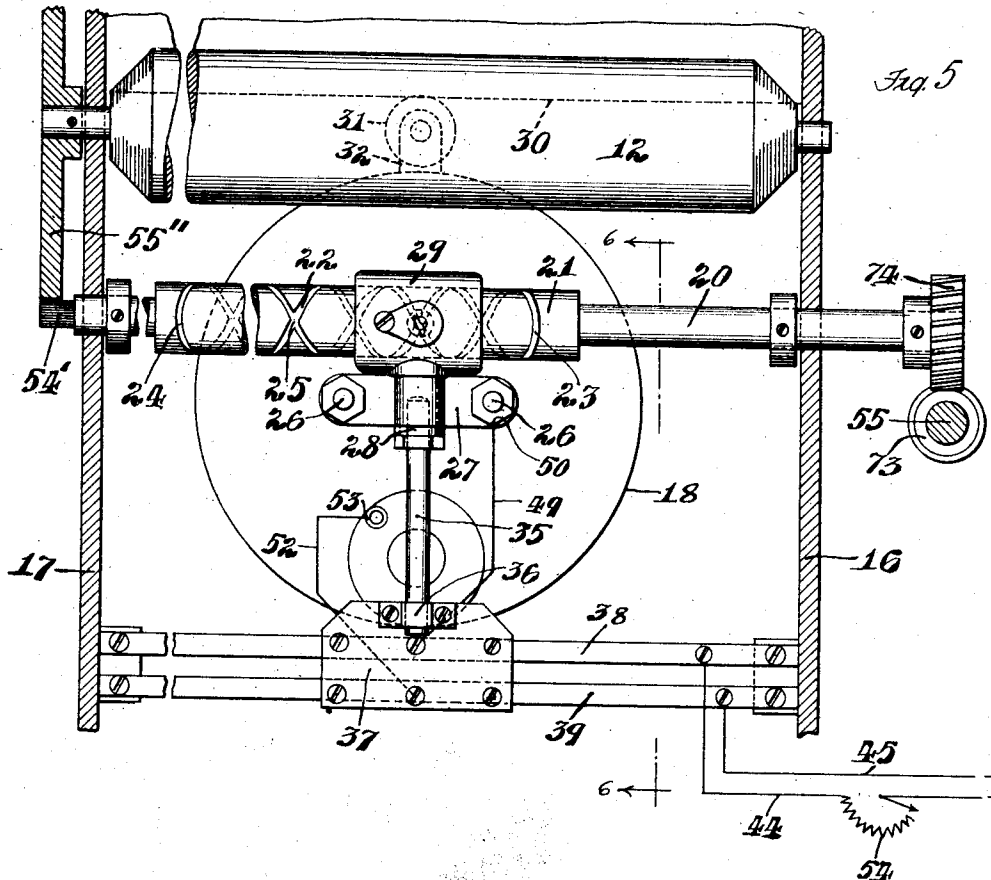
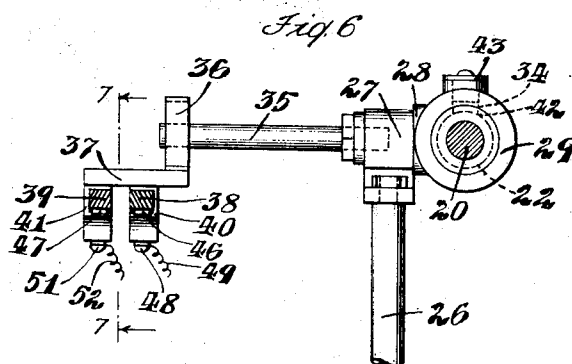
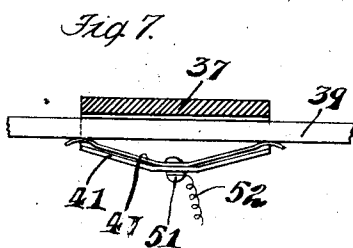
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PHOTOGRAPHIC PRINTING APPARATUS

Application filed November 9, 1928. Serial No. 318,221.

My invention relates to photographic printing apparatus, more particularly to that type of such apparatus wherein reproduction is accomplished through the medium of electric-light and wherein the lamp or device constituting the source of electric light is mounted for movement relatively to the means for operatively conducting the sensitive paper and the original tracing or subject-matter to be reproduced thereon.

The invention, by way of example, is illustrated as embodied in a continuous reproducing apparatus of the kind having an endless covering apron arranged to convey the sheet of sensitive paper and accompanying original tracing or subject-matter across the face of a horizontally disposed glass printing platen.

My invention has for its general object the provision in a printing apparatus of the type referred to and in a manner as hereinafter set forth, of a simple, compact and efficient construction of means whereby an electric lamp will be automatically and continuously moved backwards and forwards in relation to the conveying apron and in such relation thereto that the rays from the lamp will be applied to fix in the usual manner upon the conveyed sheet of sensitive paper a reproduction of the original tracing or subject-matter.

The invention has for its special object the provision of operating means including a simple rotary screw shaft arranged to afford a support for the electric lamp and arranged at the same time to constitute a propulsive force for giving to the electric lamp continuous alternating-directional travel.

A further object of the invention is the provision in conjunction with the means for mechanically moving the electric lamp continuously in alternating directions, of a simple trolley device by which to furnish the moving lamp with current from live electric bars, so as to avoid the use of long unwieldy conducting wires, cumbersome to manage and accommodate in a small space and which unless adequately accommodated will cast shadows upon the prints.

A further object of the invention is the

provision in a printing apparatus of the character described of a simple cam action driving control adapted to be manipulated so as to operate instantly the screw shaft and consequently the electric lamp, at a great variety of speeds.

A still further object is the provision of a printing apparatus in which the aforesaid rotary screw shaft is arranged to constitute a transmission element for the operation of the endless conveying apron as well as for the operation of the electric lamp, so that through the manipulation of the cam action driving control the operation both of the conveying apron and of the electric lamp will be simultaneously controlled.

Other objects will appear hereinafter.

The invention consists in the construction, arrangement and combination of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which:

Fig. 1 represents an end view partially in vertical transverse section of a photographic printing apparatus embodying my improvements;

Fig. 2 represents a fragmentary end elevation of the printing apparatus, showing the cam action driving control including the spring-urged driving shaft with associated friction disks;

Fig. 3 represents a top plan view of the cam action turn thimble, showing the change-speed dial thereon and associated index;

Fig. 4 represents a fragmentary detail, partly in section, illustrating the cooperating relation between the ball of the driving shaft and a seat on the cam action turn thimble;

Fig. 5 represents a plan view of the printing apparatus, partly in section and more or less diagrammatic in character, showing the means for propulsively supporting the electric lamp, also the trolley device and wiring connections and as well the connections for operating the driving roller for the conveying apron;

Fig. 6 represents a cross-section taken on the line 6-6 of Fig. 5; and

Fig. 7 represents a longitudinal section through the trolley device, this view being taken on the line 7—7 of Fig. 6.

My improvements, in the present instance, are illustrated by way of example as embodied in a continuous photographic printing apparatus of the horizontal type, comprising a curved glass printing platen 10 and an endless covering apron 11 which is supported on suitable rollers 12, 13, 14 and 15, said printing platen and rollers being suitably supported in horizontal position by and between suitable end frames or standards 16 and 17 forming part of the framework of the apparatus. The apron 11 is supported by the rollers so as to serve as an endless conveyor for carrying the sheet of sensitive paper (not shown) and accompanying original tracing or subject-matter (not shown) transversely about the outer face of the printing platen in order that the rays of light from the electric lamp 18 may be employed in the usual way to reproduce the image of the original tracing or subject-matter upon the sensitive paper. In the illustrative embodiment, the roller 15, located adjacent the feed table 19 at the front of the machine, comprises a feed roller, while the roller 12, located at the upper rear portion of the machine, constitutes the driving roller by which the endless conveyor is moved in the direction indicated by the arrows *x*.

The improvements of my invention in their preferred form of construction as illustrated in the accompanying drawings include for the support and propulsion of the lamp 18 a shaft 20, suitably supported for rotation in the end frames or standards 16 and 17 near the top ends thereof in relatively close proximity to the driving roller 12; and said shaft between the end frames is provided with an enlarged cylindrical portion 21 in which is furnished an endless spiral groove 22 made with terminal reversing curves 23 and 24 and with its windings suitably intercrossed as at points 25. Suitable pendent members 26 support the lamp 18 from a bracket 27 mounted on a holder 28 projecting forwardly from a sleeve-like head-piece 29 upon the enlarged cylindrical portion 21. The lamp is thus suspended from the shaft 20, but off-center with respect thereto, and it is shown as being maintained and steadied in the desired position with relation to the printing platen and as well to the run of endless apron passing about the face of the same, by means of a horizontally extending guide 30 against which turns a roller 31 carried by a suitable bracket 32 on the top 33 of the lamp. If desired, the bracket 32 may be constructed for adjustment so that the operative position of the lamp with respect to the matter to be reproduced may be varied at will.

The head-piece 29, within which the cylindrical portion 21 has turning fit, carries a key 34 slidably fitting the endless groove 22; and the holder 28 carries a forwardly pro-

jecting pin 35, the front end portion of which is loosely engaged in a retaining bracket 36 upwardly projecting from a trolley device 37 arranged to slide upon a pair of horizontal bars 38 and 39, which are suitably mounted between the end frames. By this arrangement, upon the continuous rotation of the shaft 20, the lamp, accompanied by the trolley device, is propelled continuously backwards and forwards in a horizontal plane, the terminal reversing curves 23 and 24 serving as means for alternating the direction of travel. The guide 30 against which the lamp travels owing to its off-center support, taken in conjunction with the trolley device 37 which is provided with depending brackets 40 and 41 partially embracing the bars 38 and 39 respectively, constitutes means for maintaining the lamp in the desired path of reciprocating travel and as well for holding the headpiece against turning upon the cylindrical portion under the propulsive force exerted against the key 34. With this simple construction and arrangement, the lamp is propelled steadily so as to subject the conveyed sheet of sensitive paper to a constant, uninterrupted amount of light. Preferably, the key 34, mounted loosely in the head-piece 29, has its inner end 42 curved in conformity with the curvature of the bottom of the endless groove 22 and it is operatively maintained in place by a removable cap-piece 43.

Through the provision of the trolley device, current may be supplied to the propelled lamp without the employment of long flexible wires, difficult and unwieldy of operative accommodation in the small space available therefor. To this end the bars 38 and 39 comprise conductors connected in circuit with any suitable source of electricity by wires as 44 and 45; and the trolley brackets 40 and 41, made of insulation, carry spring contacts 46 and 47 in sliding engagement with the respective bars 38 and 39. Spring contact 46 is secured to its bracket 40 by a binding post 48 which is connected by a wire 49 with the carbon terminal of the lamp at 50. The other spring contact 47 is secured in place on its bracket 41 by a binding post 51 which is connected by a wire 52 with the coil terminal of the lamp at 53. Manifestly, the wires 49 and 52, relatively short and thus connected between the trolley and the lamp to move therewith, do not require a turning frame or other device for their accommodation during the travel of the lamp, and being located above the top 33 of the lamp, cannot produce shadows upon the prints. A rheostat, as symbolized at 54 in Fig. 5, may be incorporated in the circuit of the lamp. The electric circuit may be traced from the source of supply through wire 45, bar 39, spring contact 47, binding post 51 and wire 52 to the coil terminal 53 of the lamp; thence returning through the carbon terminal at 50, wire 49,

binding post 48, spring contact 46, bar 38 and wire 44 to the source of supply.

According to an important feature of my invention, the parts are so arranged and combined that the rotary shaft 20 serves not only as the means for supporting and propelling the lamp, but also as the transmission element for operating the driving roller 12, so that the endless conveying apron 11 will at all times be moved at a definite desirable speed with respect to the travel of the lamp, which travel it will be observed is backwards and forwards transversely of the direction of movement of the apron, and also so that a single manually operated change-speed control will command simultaneously the rate of movement of the lamp and the apron. In the present instance, for transmitting motion to the roller 12 a pinion 54' on the shaft 20 is shown as engaged with a large gear wheel 55'' applied to the axis of the roller 12.

In the illustrative embodiment, the means for rotating the shaft 20 comprises a vertical driving shaft 55, suitably mounted for end-wise shiftable movement in bearings 56, 57 and 58 at the outer side of the frame end or standard 16. Fast on the lower portion of the shaft 55 is a horizontal friction disk 59. In suitable contact with the disk 59 is a vertical driving friction disk 60 which may be operated from an electric motor (not shown) or other suitable source of power. Arranged at the top of the end frame or standard 16 is a stud shaft 61 on which is centrally mounted a turn thimble 62 having a cylindrical body portion 63 whose cam-like edge 64 is adapted to engage and turn on a ball 65 seated in and protruding from the free top end of the driving shaft 55. Coiled about the driving shaft 55 is an expansion spring 66 which is imprisoned between a collar 67 rigid with the bearing 57 and a collar 68 fixed to the shaft 55, so that said shaft 55 will constantly be urged into a position in which the ball will engage the cam-like edge of the turn thimble.

Now the arrangement of these parts is such that when the turn thimble is in the position shown in Fig. 2 with the ball engaging the high zone of the edge 64, the disk 59 will be approximately at the central region of the disk 60 where substantially no motion is transmitted. As the thimble is turned on the stud 61, the driving shaft 55 is depressed against the influence of spring 66 and the disk 59 is moved towards the circumference of the disk 60, it being obvious that the speed of rotation of the disk 59 will constantly increase as it is moved towards the circumference of the driving disk 60. The top of the turn thimble is preferably provided with a dial plate 69 containing speed numerals 70 indicative of desirable changes or rates of speed, and fast on the stud 61 is an index 71 with which any selected speed nu-

meral may be brought into alinement by turning the thimble. For each of the speed numerals 70, a ball seat 72, as shown in Fig. 4, is provided in the edge 64 of the turn thimble. Manifestly, the turn thimble will be maintained in the position in which the ball engages a seat. A suitable worm gear 73 on the shaft 55 is arranged to engage a suitable gear 74 on the shaft 20, whereby to rotate the last mentioned shaft. With this construction and arrangement, the rate of movement of both the lamp and the conveying apron may be instantly commanded through the manual turning of the thimble 62.

The operation of the invention will be understood from the foregoing detailed description, taken in connection with the accompanying drawings; and it will be apparent that I have produced a novel, simple and compact construction which embodies the features of advantage enumerated in the statement of invention and the foregoing description. While I have illustrated and described my invention in association with a curved printing platen, it is to be understood that the invention may be used in connection with a non-curved platen, and further that by making provision for properly maintaining the sensitive paper and original tracing or subject-matter upon the endless conveying apron, the use of a printing platen may be eliminated entirely.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A photographic printing apparatus comprising a lamp, a reversing screw constituting substantially the sole support for the lamp and adapted by its rotation to propel the lamp backwards and forwards along the length of the screw, means for rotating the screw, and means for maintaining the lamp against turning with the rotation of the screw so that the lamp will be forced to move in a straight line backwards and forwards along the screw by which it is supported and propelled.

2. A photographic printing apparatus comprising a lamp, a rotary device arranged to afford a support for the lamp and at the same time to provide propelling means for propelling the lamp continuously backwards and forwards along the rotary device, and a trolley device arranged to move with the lamp and connected therewith by electric conductors, said trolley device being arranged to

maintain the lamp against turning with the rotation of the rotary device so that the lamp will be forced to move in a straight line backwards and forwards along the rotary device.

5 3. In a photographic printing apparatus, the combination with a lamp and a rotary screw shaft supporting the lamp and adapted, when rotated, to propel the lamp backwards and forwards along the screw shaft,
10 of a driving shaft adjustably geared directly to said screw shaft and longitudinally shiftable to different power receiving positions to be operated at different speeds for operating said screw shaft at different speeds, and a
15 cam action setting thimble engaging said driving shaft and adapted to be moved to various positions to shift said driving shaft longitudinally to various power receiving positions, whereby to control the speed of said
20 screw shaft and hence the rate of propulsion of said lamp.

4. In a photographic printing apparatus, the combination with a lamp and a rotary screw shaft supporting the lamp and adapted,
25 when rotated, to propel the lamp backwards and forwards along the screw shaft, of a driving shaft adjustably geared directly to said screw shaft and longitudinally shiftable to different power receiving positions
30 to be operated at different speeds for operating said screw shaft at different speeds, a cam action setting thimble engaging said driving shaft and adapted to be moved to various positions to shift said driving shaft
35 longitudinally to various power receiving positions so as to control the speed of said screw shaft and hence the rate of propulsion of said lamp, and a trolley device arranged to move with the lamp and connected therewith by
40 electric conductors, said trolley device being arranged to maintain said lamp against turning with the rotation of said screw shaft so that said lamp will be forced to move in a straight line backwards and forwards along
45 said screw shaft.

5. In a photographic printing apparatus, a lamp and rotary screw shaft adapted to impart alternating-directional travel thereto, in combination with a shiftable driving shaft
50 geared to said screw shaft, speed bearing means coacting with the shiftable driving shaft, said driving shaft being longitudinally shiftable and adapted when shifted in one direction to obtain increased speed from the
55 speed bearing means for driving the screw shaft at increased speed, a spring arranged to urge the shifting of said driving shaft in one direction, and a cam action setting thimble engaging a ball on said driving shaft and
60 adapted to be turned for shifting said driving shaft in the direction opposite to the urge of said spring, whereby through the control of the shifting of said driving shaft by said
65 thimble to control the speed of said screw

shaft and hence the rate of travel of said lamp.

6. In a photographic printing apparatus, the combination of an endless apron arranged exteriorly to a housing-platen for movement, a lamp, a holder for the lamp supporting the lamp within the housing-platen, a rotary shaft comprising a transmission element common to said holder and apron for the simultaneous operation of the same, said
70 rotary shaft including within the housing-platen a propelling screw portion directly supporting said holder, whereby, on rotation of said rotary shaft, to cause movement of
75 said holder and lamp backwards and forwards along said screw portion, driving means for moving said apron from the rotation of said rotary shaft, and means within the housing-platen engaging said holder to
80 prevent any turning of said holder and supported lamp with the rotation of said screw portion.

7. In a photographic printing apparatus, a rotary device adapted to support and propel a lamp, a spring urged endwise shiftable
90 shaft shiftable geared with said device and adapted when shifted in one direction to be operated at increased speed, a thimble having a cam-like flange cooperating with the free end of said shaft, said flange having
95 seats therein, and a ball in the free end of said shaft in contact with said flange adapted to engage said seats, said thimble being mounted for manual turning to vary at will the position of said shaft whereby to control
100 the speed of said rotary device.

8. A photographic printing apparatus comprising a frame structure and a printing platen defining a longitudinal travel space, a lamp in said space in relation to said platen,
105 means for supporting and propelling the lamp to cause it to travel lengthwise of the space backwards and forwards therein, embodying a rotary transmission shaft and bar means arranged in spaced parallel relation
110 longitudinally of the space and within the space, a lamp holder by which the lamp is suspended directly on said shaft and guided by said bar means, said shaft and holder having an endless screw connection therebetween whereby the holder and lamp are given
115 alternating reciprocating movement by the rotation of the shaft in one direction, said holder and bar means having a sliding connection therebetween to prevent any turning of the holder with the rotation of the shaft.

9. A photographic printing apparatus comprising a frame structure and a printing platen defining a longitudinal travel space, a rotary screw shaft in the travel space, extending longitudinally thereof, a lamp within the space in relation to the platen, suspended for its support directly from said screw shaft and so as to be propelled thereby continuously forwards and backwards by the
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continuous rotation of the screw shaft in one direction, means with which the lamp has sliding engagement for maintaining the lamp steady and against turning with the rotation of the screw shaft, driving means for the screw shaft, and a manually controlled setting thimble for regulating said driving means.

10. A photographic printing apparatus having, with a rotary endless screw and lamp fixture suspended for its support therefrom for movement in a path backwards and forwards along the screw by the rotation of the screw, guide bar means disposed parallel to the screw, and means between the fixture and bar means, movable with the fixture and along the bar means for preventing lateral swinging of the suspended fixture and thereby to retain the fixture in a position in which it will move in a straight line in its path backwards and forwards along the screw.

11. A photographic printing apparatus comprising in combination with an endless rotary screw and a lamp fixture suspended for its support therefrom for movement in a path backwards and forwards along the screw by the rotation of the screw, guide bars for the fixture disposed parallel to the screw, one on either side of the path of movement of the fixture, and means carried by the fixture on either side thereof for movement along the bars to prevent lateral swaying of the suspended fixture to keep it in a position in which it will move in a straight line in its path backwards and forwards along the screw.

12. A photographic printing apparatus comprising a lamp, a rotary device arranged to afford a support for the lamp and at the same time to provide propelling means for propelling the lamp in a path backwards and forwards along the rotary device, a trolley device arranged to move with the lamp and connected therewith by electric conductors, a guide for the trolley device, said guide and trolley device being in a position to one side of the suspended position of the lamp to prevent lateral deviation of the lamp from its path at that side, and means with which the lamp has engagement at the opposite side to prevent lateral deviation of the lamp from its path at such opposite side.

In testimony whereof, I have signed my name to this specification.

DAVID F. FRAZEE, Jr.