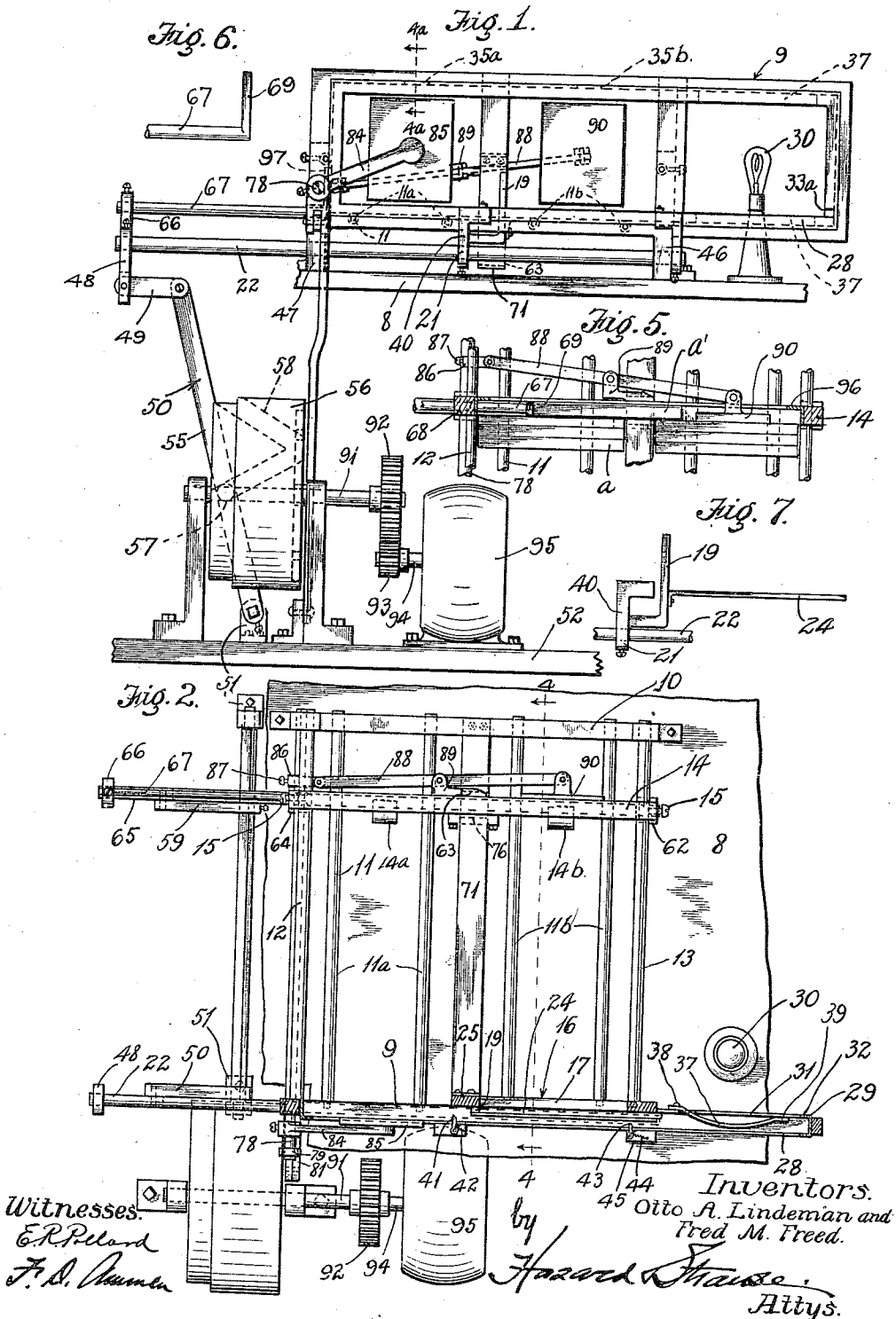


O. A. LINDEMAN & F. M. FREED.
 DISPLAY APPARATUS.
 APPLICATION FILED MAR. 12, 1910.

995,359.

Patented June 13, 1911.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

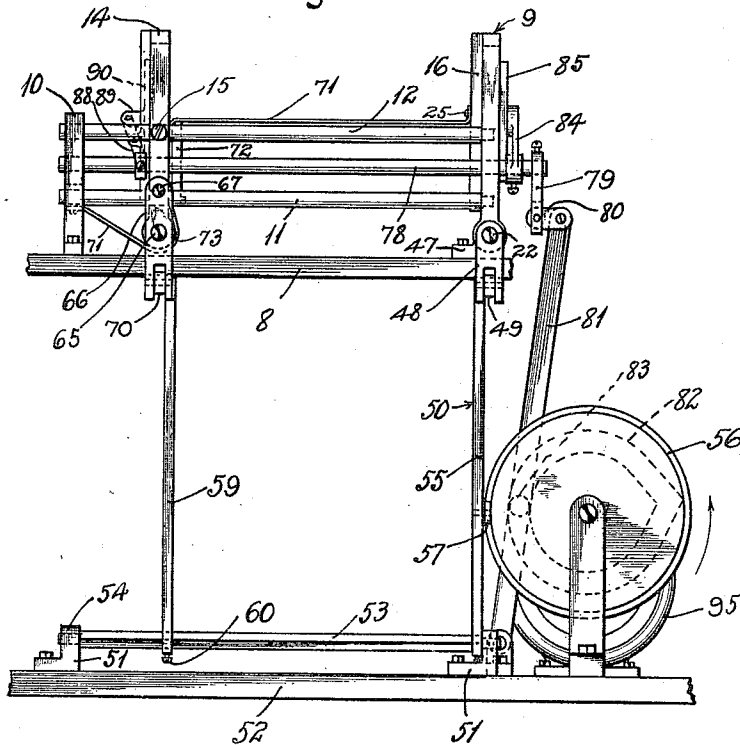


Fig. 4.

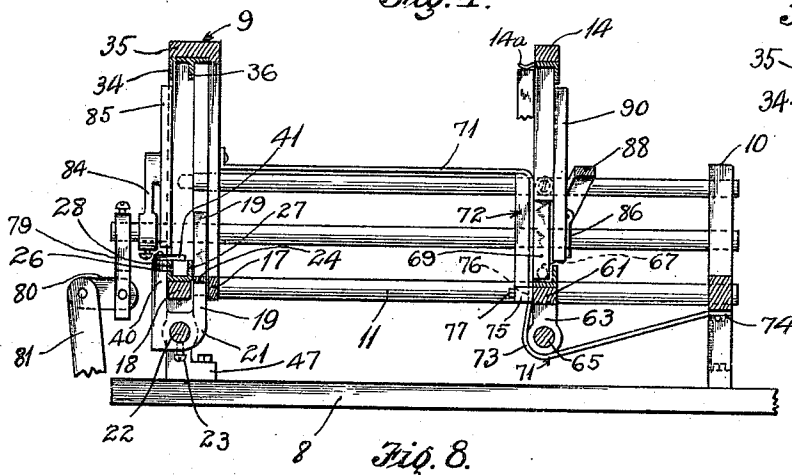


Fig. 4a.

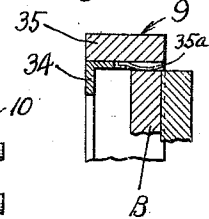


Fig. 8.

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UNITED STATES PATENT OFFICE.

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DISPLAY APPARATUS.

995,359.

Specification of Letters Patent. Patented June 13, 1911.

Application filed March 12, 1910. Serial No. 548,860.

To all whom it may concern:

Be it known that we, OTTO A. LINDEMAN and FRED M. FREED, citizens of the United States, residing in Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Display Apparatus, of which the following is a specification.

This invention relates to a display apparatus and particularly to a device of this class which is adapted to guide and hold a plurality of negative plates or photographs and which operates to expose the said plates or photographs in succession.

The object of this invention is to simplify the construction of the mechanism and to construct the device so that it may be operated with a greater or less number of plates as may be desired.

In the annexed drawing which fully illustrates our invention, Figure 1 is a front elevation of the frame and the mechanism of a machine constructed according to our invention. Fig. 2 is a plan of the parts shown in Fig. 1, the forward part of the mechanism being shown in section. Fig. 3 is an elevation showing the left side of the mechanism as viewed in Fig. 1. Fig. 4 is a vertical section taken on the line 4-4 of Fig. 2. Fig. 4^a is a vertical section on the line 4^a-4^a of Fig. 1. Fig. 5 is a horizontal section taken near the rear end of the mechanism, illustrating a part of the means for advancing the plates in the magazine. Fig. 6 is a side elevation showing the end of a push rod which advances the plates at the rear end of the magazine illustrated in Fig. 5. Fig. 7 is a side elevation showing the construction of the corresponding device at the forward end of the magazine. Fig. 8 is a front elevation of a guide for the flexible bar which separates the two banks of plates from each other.

Before proceeding to a detailed description of the mechanism, it may facilitate the disclosure to state that the mechanism operates to support the plates in the magazine in two sets or banks disposed along the side of each other. In one of these banks the plates are being fed forwardly and in the other bank they are being fed rearwardly. The plates on the bank which are moved forwardly are advanced one at a time into a lateral position to expose them in suc-

cession. After being exposed they are withdrawn and returned to the magazine.

Referring now particularly to the parts, 8 represents a bottom or floor of the case or box in which the mechanism is held. In this case there is mounted a forward fixed frame 9 and a rear fixed frame 10. These frames are disposed parallel with each other and are connected at a low level by a cradle formed of four cradle bars 11 which are disposed parallel with each other and in a horizontal plane. As shown in Figs. 2 and 5, these bars are arranged in pairs, the bars which form the left pair being indicated by the numeral 11^a, while the bars which form the right pair are indicated by the numeral 11^b. The frames 9 and 10 are connected at their ends by guide bars 12 and 13. The bar 12 being disposed to the left and guide bar 13 being disposed at the right.

Mounted to slide on the guide bars 12 and 13 on the cradle bars 11 we provide an adjustable frame 14. The ends of this frame are adapted to be secured to the guide bars 12 and 13 by set screws 15 as shown. The bars 11^a and 11^b form a bed for supporting all the plates.

The forward frame 9 is formed on its upper side with a U frame 16 having a cross bar or sill 17 in which the forward ends of the cradle bars 11^b are attached, as indicated in Fig. 4. Adjacent the sill 17 the lower bar 18 of the forward frame 9 is cut away so as to form a gap or opening. Into this gap or opening a dog 19 projects upwardly, the lower portion of this dog being secured to the block 21, which is attached to a push rod 22 by a set screw 23, as shown. This construction is shown in detail in Fig. 7. On its forward face the dog 19 has a horizontal arm 24 attached thereto which bridges the gap between the bar 17 and the bar 18, and the upper face of this arm is flush with the bar 17 so that a plate sliding across the sill can slide onto the arm 24 and be supported thereby. As indicated in Fig. 2, in the normal position of the dog 19 its forward edge is in alinement with the inner edge 24 of the left leg 25 of the U frame. On the bar 18 opposite the bar 17, a U-shaped guide channel 26 is formed, which has a flange 27 on its inner side, and this flange 27 forms a stop for each plate as it comes forward through the U frame 16.

The outer side of the channel 26 is formed by a flange 28, which extends continuously throughout the entire length of the bar 18.

As shown in Fig. 2, the frame 9 has a
5 projecting extension or exposing holder 29,
and behind this exposing holder, a lamp 30
may be placed when transparencies are being
used as plates. The lower part of this
extension is formed with an upwardly projecting
10 inner flange 31 and the aforesaid
flange 28 runs out into the extension, as
shown. In addition to this, the end of the
extension is formed with a vertical flange
32 at the rear side, and a vertical flange at
15 the forward side. Corresponding to the
flange 28 there is provided a flange 34 on
the upper edge of the extension and this
flange 34 extends continuously along the
upper edge of the upper bar 35 of the
20 frame 9.

Opposite the flange 27 and opposite the
U frame 16 a flange 36 forms a stop for
the upper edge of each plate as it comes
through the U frame, but this flange does
25 not extend beyond the U frame. Behind
the flanges 28 and 34, leaf springs 37 are
attached, said springs being in the form of
bows having their convex sides disposed forwardly
and attached at one end only, as
30 shown at 38. Their free ends are formed
into shoes 39, which slide on either side of
the flange 31 at the bottom of the extension
frame and a similar flange at the upper edge
thereof. The function of these springs is
35 to force the plate forwardly when received
from the dog 19 so that the plate will be
forced against the flanges 28 and 34. In
this way, the plate will be held before the
lamp 30 and exposed to view.

As indicated in Figs. 1, 2 and 4 the block
21 has an upward extension or arm 40, and
on the upper end of this arm a feed pawl
41 is pivotally attached, this pawl projects
across the upper edge of the flange 28, and
45 it is held in a projecting position by means
of a spring 42 as indicated in Fig. 2 being
held against a suitable stop on its rear side,
as shown, this pawl 41 is disposed near the
left side of the U frame 16, opposite the
50 other side of the U frame 16 a similar pawl
43 is provided held back by a spring 44 attached
on the block 45, which block is attached
on the inner end of the push rod 22,
as indicated most clearly in Fig. 1. Adjacent
55 this point, the frame bar 18 is provided
with a foot 46 which formed a guide bearing
for the push rod, as shown. This foot is
attached to the upper side of the bottom 8 of
the case, as indicated. It should
60 be understood that the pawl 43 is arranged
like the pawl 41, so that it tends normally
to project across the upper edge of the
flange 28.

As shown in Fig. 1 the push rod 22 is
65 guided at its left side through a foot 47

similar to the foot 46 and it extends a considerable
distance toward the left. On its left end
there is attached a bracket 48 which extends
downwardly and has a horizontal link 49
70 secured thereto, as shown. This link 49
is attached to the upper end of the rock
frame 50, the lower edge of which is mounted
to rock upon suitable bearings 51 on the
lower floor 52 of the case. The construction
of this rock frame is shown in Fig. 3. It
75 comprises an axle bar 53 of angular form,
the ends of which are reduced to form necks
54 rotatably mounted in the bearings 51, as
indicated. On this axle bar 53 there is
mounted a main arm 55 which extends upwardly
80 adjacent to the face of the cam wheel 56,
and the side of this arm 55 is provided with
a roller 57 which runs in a cam slot 58 in
the face of the cam 56. This slot 58 has a
form which periodically rocks the
85 frame 50 inwardly and then returns it to its
normal position, in which it is shown in
Fig. 1. Opposite the main arm 55 there is
provided an auxiliary or adjustable arm 59
90 which is similar to the arm 55 but is adapted
to slide on the axle 53 so as to be secured
thereto in any adjusted position desired by
means of a set screw 60 placed in the lower
part of the arm 59, as shown in
95 Fig. 3.

Referring now to the adjustable frame 14,
this frame is of substantially rectangular form
and its lower bar 61 is provided with three
downwardly projecting bearing lugs 62, 63
100 and 64. The lug 62 is disposed at the right
side while the lug 64 is disposed at the left
and the lug 63 is disposed at an intermediate
point and in line with the vertical bar 25 of
the U frame 16. In these lugs 62, 63 and 64,
105 a guide bar 65 is mounted to slide longitudinally
and this guide bar extends outwardly the same
distance as the push bar 22. Its outer end is
provided with a bracket 66 which extends
upwardly as shown in Fig. 1. In the upper
110 part of this bracket 66 is attached the end of
a rear push rod 67, and the inner end of this
push rod is guided through the left bar 68 of
the adjustable frame as indicated in Fig. 5. The
end of this push rod 67, as indicated most
115 clearly in Fig. 6 is bent upwardly to form a
dog 69, which is adapted to engage the adjacent
edge of the rearmost plate lying adjacent to
the dog so as to enable the plate to be shoved
over from the adjacent bank of plates to the
120 other bank, as indicated in Fig. 5. This push
rod 67 is adapted to be actuated by a rock
frame 50 and for this purpose the upper end of
the rear arm 59 is connected by a link 70 to
125 the lower end of the bracket 66, as shown in
Fig. 3. From this arrangement it should be
understood that when the rock frame 50 rocks
inwardly the forward push rod 22 and the rear
push rod 67 will slide inwardly.
130

Referring now particularly to Figs. 4 and 5 to the rear side of the vertical bar 25 of the U frame 16 we attach a flexible dividing rail 71 which is in the form of a thin band, or tap of steel of similar durable material. This band extends rearwardly from the forward frame in a horizontal direction and passes over the upper edge of a guide shoe 72 illustrated in Fig. 8. This guide shoe guides the tape downwardly in a vertical direction at the adjustable frame and so that the tape passes in a loop 73 under the lug 63, which is rounded for this purpose. From the lug 63 the tape extends rearwardly inclining upwardly having its rear end attached at 74 to the under side of the rear frame 10. In this way the rail presents an elevated extension forward of the shoe 72 and a depressed extension to the rear of the shoe. The rear face of the guide shoe 72 is removed slightly from the plane of the forward side of the lower bar 61 of the adjustable frame and in the foot 75 of the shoe a vertical slot 76 is formed through which it passes downwardly. The foot 75 of the shoe projects laterally at each side and is secured to the bar 61 by suitable fastening devices 77, as shown. This arrangement for supporting the flexible rail 71 permits the adjustable frame to be moved forwardly or rearwardly to suit the number of plates, which are mounted in the machine. At the point where the rail passes between the banks of plates at the right, it will be observed that the tape is depressed under the adjustable frame so as to permit a lateral movement of the rearmost plate of the left bank under the action of the push rod 67, as indicated in Fig. 5.

At the left side of the machine a feed rod 78 is mounted, its ends being arranged to slide in the left ends of the frames 9 and 10. Its forward end projects from the forward frame, as indicated in Fig. 3, and is provided with a bracket 79 which projects downwardly, and to the lower end of this bracket a short link 80 is attached. This link 80 extends in a horizontal direction and its forward end is connected to a cam lever 81. This cam lever extends upwardly at the side of the cam 56 and the adjacent face of the cam 56 is provided with a cam slot 82 in which is received a roller 83 mounted on the side of the lever 81. From this arrangement, as the cam rotates the cam lever 81 will be rocked backward and forward. Adjacent to the bracket 79 the feed rod 78 is provided with a rigid arm 84 which projects out in front of the left end of the forward frame and to the end of this arm there is attached a feed plate 85 which may be of square form as shown. Near the rear end of the feed rod 78 and adjacent to the adjustable frame 14 the feed rod is provided with an adjustable collar 86, which is adapted to be secured by

means of a set screw 87, and to this collar 86 is attached by a loose pivot connection a feed lever 88, having its fulcrum on a bracket 89 attached to the frame near the middle thereof. The free end of the lever carries pivotally, a feed plate 90, which is supported at the right side of the adjustable frame and behind the right bank of plates, as indicated in Fig. 5. From this arrangement it should be understood that when the feed rod 78 slides rearwardly the plate 85 will push the left bank of plates rearwardly while the feed plate 90 will push the right bank of plates forwardly.

In order to drive the cam 56 the shaft 91 of the cam is provided with a gear wheel 92 which meshes with a pinion 93, and this pinion is mounted on the shaft 94 of a motor 95. This motor 95 may be an electric motor or it may be actuated by any other means.

Referring now again to Fig. 5 it will be observed that the rear side of the adjustable frame 14 is provided with a flange 96, which extends continuously around the rectangular opening in this frame and forms a rear stop to limit the backward movement of the banks of plates.

Referring to Fig. 1 it should be observed that when the rod 69 is in its normal position it withdraws into an opening indicated at 97 so that the forward face of the dog is substantially flush with the inner edge of the vertical bar 68 at the left of the adjustable frame.

Attention is called to the fact that the upper sides of the cradle bars 11 are all flush with the upper faces of the lower bars 18 and 61 of the frames 9 and 14. This arrangement enables the plates to be shoved on or off the ends of the cradle bars at the ends of the banks of plates.

As indicated in Fig. 4^a the bar 35 of the forward frame 9 is provided on its under and rear side with small leaf springs 35^a and 35^b. The spring 35^a projects over the upper edge of the foremost plate B in the left bank and acts as a detent to hold the plate up when the feed plate 85 is not in contact therewith. As indicated in Fig. 4^a, the spring 35^b performs a similar function with respect to the foremost plate of the right bank of plates, to prevent it from falling forward, when the dog 19 passes beyond the right edge of the bank, as it does in shifting the plate to be exposed out into the exposing frame. On the upper bar of the frame 14 similar spring detents 14^a and 14^b are provided which project forwardly and engage the upper edges of the rearmost plates of the banks so as to prevent them from falling rearwardly when left unsupported by other parts of the mechanism.

The general mode of operation of the machine will now be described.

Referring especially to Fig. 5, the plates

a are disposed in two banks, the left bank being supported on the cradle bars 11^a while the right bank is supported on the cradle bars 11^b. The two banks are separated by the flexible rail 71. The left bank of plates nearly fills the space between the flange 34 of the forward frame and the flange 96 of the rear frame there being a space equal to thickness of a plate at the forward end. The right bank of plates nearly fills the space between the rear flange 96 and the flange 27 so that the foremost plate is supported on the arm 24, which forms a part of the dog 19. In addition to this there will be a plate disposed at the right of the pawl 43 between this pawl and the right vertical edge of the forward frame, this latter plate being held against the flange 33, the flange 28 and flange 34 by the springs 37. As the cam 56 rotates the rock frame 50 is rocked toward the right and then toward the left. As the rock frame 50 moves toward the right, the pawls 41 and 43 advance toward the right and the pawl 41 moves to the normal location of the pawl 43 so as to engage the plate which normally lies between the two pawls 42 and 43, while the pawl 43 advances so as to engage the right edge of the plate which is exposed at the exposing holder. In order to enable the pawl 43 to engage the edge of this plate, the flange 33 is formed with a notch 33^a, as indicated in Fig. 1. At the same time, this forward movement of the push bar 22 through the operation of the dog 19 advances the foremost plate in the right bank so as to move it out into the exposing holder. This same inward movement of the rocking frame 50 moves the rear push rod 67 so that its dog 69 advances the rearmost plate of the left bank across the rear of the right bank of plates, as indicated in Fig. 5. The feed plate 90 is normally held withdrawn by the lever 88. This enables the plate a' , which is being shifted at the rear of the banks, to pass in front of the feed plate 90. In Fig. 2 the feed plate is shown in its withdrawn position and when the feed plate 90 is withdrawn in this manner the feed plate 85 is also withdrawn, as indicated in Fig. 2. On the return movement of the push bar 22, the pawl 41 slides a plate over in the rear of the feed plate 85 and the pawl 43 takes the plate that has just been exposed and moves it into position in front of the right bank of plates and in front of the flange 27. The feed rod 78 then moves rearwardly so that the feed plate 85 pushes the left bank of plates rearwardly to bring the rearmost plate against the flange 96. This movement is accompanied by a forward movement of the feed plate 90, which advances the entire right bank of plates so as to bring the foremost plate against the flanges 27 and 36. In this way when the machine is in opera-

tion it will be seen that the left bank of plates is constantly being fed rearwardly with a step by step movement through a distance equal to one plate and the right bank of plates is similarly fed forwardly, the push rod 67, working at the rear of the banks, periodically shifts the rearmost plate from the left bank to the right while the push rod 22 at the front is operating to push plates one by one out to the exposing frame and also withdrawing the plate which has just been exposed.

Special attention is called to the adjustable construction of the machine, that is, the adjustable frame which can be moved rearwardly or forwardly so as to enable the machine to operate with a small number or a large number of plates. This is a highly advantageous feature, for one set of plates can be quickly substituted for another and the machine will continue to operate with the same efficiency whatever be the number of plates in the substituted set.

Having described our invention what we claim as new and desire to secure by Letters Patent is:

1. In a machine of the class described, in combination, a fixed forward frame, a fixed rear frame, a cradle connecting said fixed frames and adapted to support the plates in two banks, an adjustable frame sliding along said cradle between said fixed frames, a member extending longitudinally from said adjustable frame to said forward fixed frame and guiding the adjacent side edges of said plates, means for advancing the plates from one of said banks one at a time to expose the same, means for shifting the plates laterally between said banks at said forward frame, and means for shifting the plates laterally between said banks at said adjustable frame.

2. In a machine of the class described, in combination a fixed frame, an adjustable frame adapted to recede from or approach said fixed frame, means for supporting plates in two banks at the same level between said frames, a member having a longitudinally disposed elevated extension between the said frames and separating the said banks of plates, means for advancing plates from one of said banks one at a time to expose the same, means for shifting the plates laterally between said banks beyond said extension, and means for giving the plates of each of said banks a periodical feeding movement.

3. In a machine of the class described, in combination, a fixed frame, an adjustable frame, means for supporting plates in two parallel banks extending from said fixed frame to said adjustable frame, a feed plate adapted to engage the foremost plate of one of said banks, a second feed plate adapted to engage the rearmost plate of the other

bank, means for periodically actuating said feed plates to move said banks bodily, means for advancing plates one by one laterally from one of said banks to expose the same, means for returning each plate after exposure, to the other bank, and a flexible member connecting said frames and separating said banks of plates.

4. In a machine of the class described, in combination, a fixed frame, an adjustable frame, means for supporting plates in two banks, a flexible rail connecting said frames and separating said banks of plates, said rail being guided on said adjustable frame so that it may be paid out as said frames are separated further to accommodate a greater number of plates, means for shifting the plates one by one from one of said banks to the other, and means for exposing said plates one at a time.

5. In a machine of the class described, in combination, a pair of fixed frames, an adjustable frame mounted therebetween and adapted to recede or advance toward either of said fixed frames, means for supporting plates in two banks between one of said frames and said adjustable frame, a flexible band attached to said fixed frames, means for guiding said flexible band on said adjustable frame so as to hold said band at an elevated point between said banks and so as to depress said band at the rear of said banks, means for shifting the plates one by one from one of said banks to the other at the rear thereof, and means for exposing the plates one by one.

6. In a machine of the class described, in combination, a forward frame having an extension forming an exposing holder, an adjustable frame, means for supporting plates in two banks between said frames, one of said banks being adjacent to said exposing frame and the other of said banks being remote therefrom, means for advancing the plates one by one from said adjacent bank into said exposing frame, means for returning said plates one by one from said exposing frame to said remote bank, means for shifting the rearmost plate of said bank to the rear of said adjacent bank, and means for periodically feeding said adjacent bank forwardly and said remote bank rearwardly.

7. In a machine of the class described, in combination, a fixed forward frame, a fixed rear frame, an adjustable frame mounted between said fixed frames, means for supporting a plurality of plates arranged in two banks between said forward frame and said adjustable frame, said forward frame having an exposing extension at one side thereof, means for shifting the plates from one of said banks one by one into said exposing extension, and means for returning said plates one by one to the other bank, and feeding means for shifting said banks

bodily through a space equal to the thickness of one of said plates.

8. In a machine of the class described, in combination, a forward fixed frame, a rear fixed frame, an adjustable frame mounted between said fixed frames, means for supporting two banks of plates between said forward frame and said adjustable frame, said forward frame having an exposing extension, means for advancing the foremost plate of the bank adjacent to said exposing extension into said exposing extension, means for advancing the exposed plates in front of said adjacent bank and into position before the bank remote from said exposing extension, a feed plate disposed adjacent to the forward plate of the bank remote from said exposing extension, a second feed plate adjacent the rearmost plate of the bank adjacent to said exposing extension, means at the rear of said banks for shifting the plates one by one from the bank remote from said extension to the bank adjacent thereto, and means for actuating said feed plates to feed said banks.

9. In a machine of the class described, a forward frame, means for supporting a bank of plates to the rear of said frame, means for feeding said bank of plates forward, said frame having a stop adapted to limit the forward movement of the foremost plate of said bank, said frame also having an exposing extension, a dog adapted to engage the edge of the foremost plate of said bank, means for actuating said dog to advance said plate laterally into said exposing extension, and means for withdrawing said plate from said exposing extension.

10. In a machine of the class described, a forward frame, means for supporting a bank of plates to the rear of said frame, means for feeding said bank of plates forward, said bank having a stop adapted to limit the forward movement of the foremost plate of said bank, said frame having an exposing extension, a dog adapted to engage the edge of the foremost plate of said bank, means for actuating said dog to advance said plate laterally into said exposing extension, means for withdrawing said plate from said exposing extension, said stop forming a guide for guiding the plate remote from said exposing extension across the front of said bank, and means for returning the plate to the remote end of said bank after exposure.

11. In a machine of the class described, in combination, a forward frame, means for supporting a bank of plates to the rear of said forward frame, said frame having an exposing extension projecting therefrom, said frame having a bar forming a guide for the lower edge of the foremost plate of said bank and having a stop limiting the forward movement of the foremost plate of

said bank, means engaging the edge of the said foremost plate remote from said extension and adapted to advance the same into said extension to expose the plate, means
 5 for engaging the outer edge of the exposed plate after exposure, and adapted to advance the same into position before said bank, means for advancing the plate from its position at the said bank, and means for
 10 returning the plate thereafter to the rear of said bank.

12. In a machine of the class described, in combination, a fixed forward frame, a fixed rear frame, guide bars connected to
 15 said fixed frames, an adjustable frame mounted on said guide bars, means for supporting plates in two banks between said forward fixed frame and said adjustable frame, a forward push rod guided adjacent to said
 20 forward frame and adapted to advance the foremost plate of said bank laterally therefrom, means for holding said plate when advanced to expose the same, a rear push rod guided through said adjustable frame
 25 and adapted to shift the rearmost plate of one of said banks to a position behind the other of said banks, and means for returning the exposed plate.

13. In a machine of the class described,
 30 in combination, a forward fixed frame, a rear fixed frame, an adjustable frame mounted between said fixed frames, means for supporting plates in two banks between said forward frame and said adjustable
 35 frame, a flexible band attached to said forward frame at an elevated point and attached to said rear frame at a depressed point, means on said adjustable frame for guiding said flexible band from a high level
 40 to a low level, means for advancing the plates one by one from one of said banks to

expose the same, means for returning said plates to the other bank, and means for shifting plates between said banks.

14. In a machine of the class described in
 45 combination, a pair of frames, means for supporting a plurality of plates arranged in two banks between said frames, means for shifting the plates one by one from one
 50 one of said banks laterally so as to expose the same, means for returning the plates after exposure one by one to the other bank, means for feeding one of said banks in one
 55 direction, means for feeding the other of said banks in the opposite direction, means for shifting plates one by one from one of the banks to the other, and detent means at the ends of said banks adapted to support the end plates of said banks.

15. In a machine of the class described in
 60 combination, a forward fixed frame, an adjustable frame opposite thereto, plates arranged in two banks between said frames, springs on the upper portions of said frames adapted to engage the end plates of said
 65 banks, means for shifting the plates one by one from one of said banks to expose the same, means for returning each plate after exposure to the other bank, means for feeding
 70 one of said banks forwardly and the other of said banks rearwardly periodically, and means for shifting plates one by one between said banks at the rear end thereof.

In witness that we claim the foregoing we have hereunto subscribed our names this
 75 1st day of March, 1910.

OTTO A. LINDEMAN.
 FRED M. FREED.

Witnesses:

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