

Nov. 26, 1940.

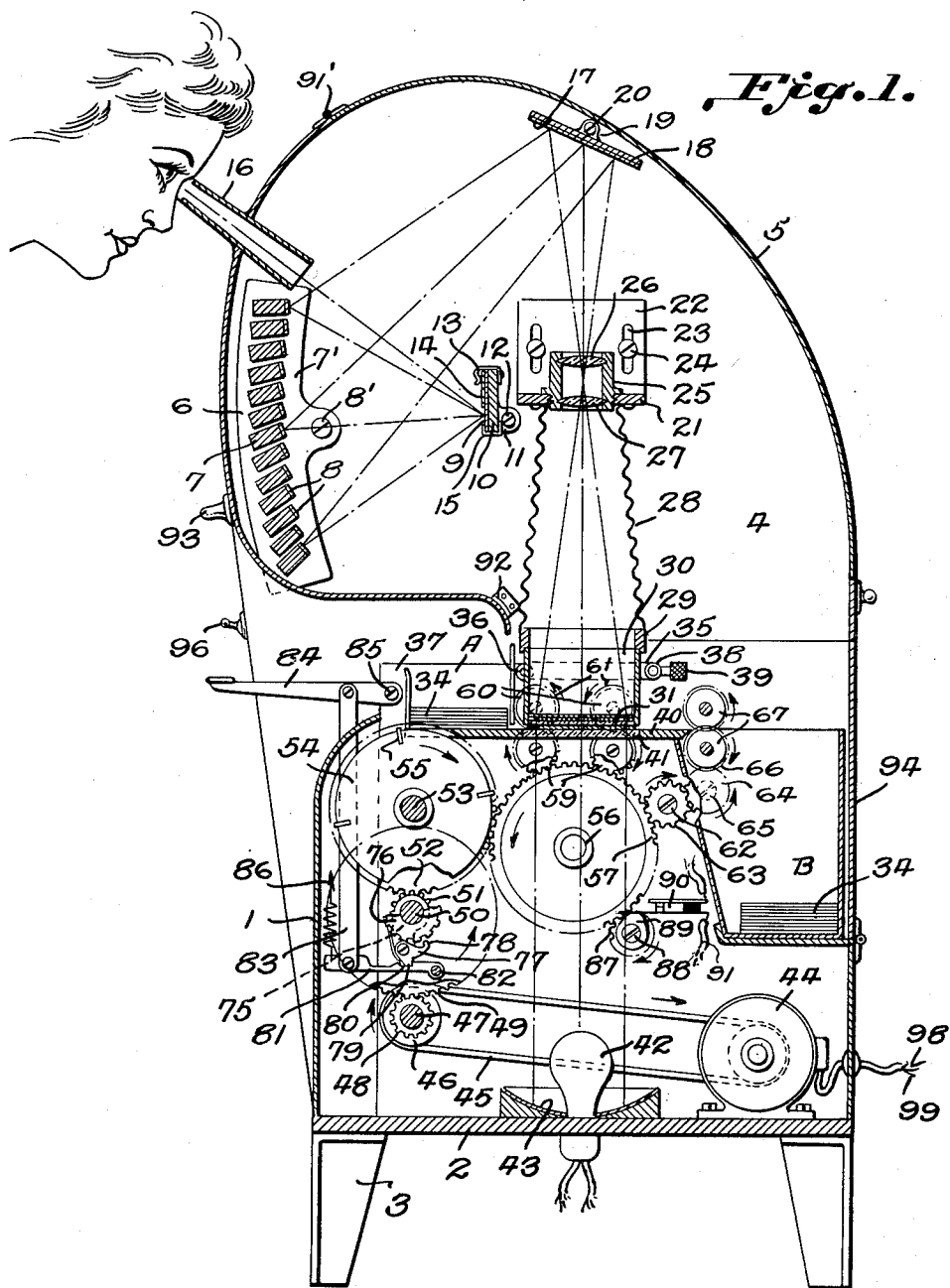
H. E. ROBISON

2,223,334

RECORD INTERPRETING PROJECTOR

Filed May 5, 1939

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 2.

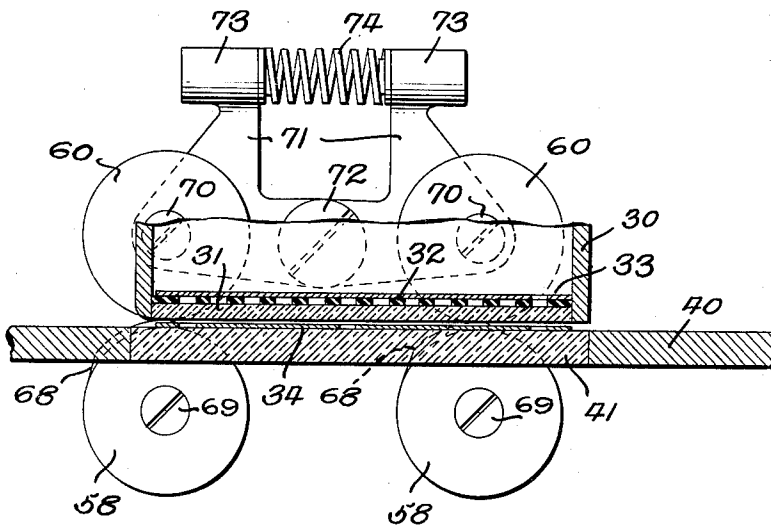


Fig. 3.

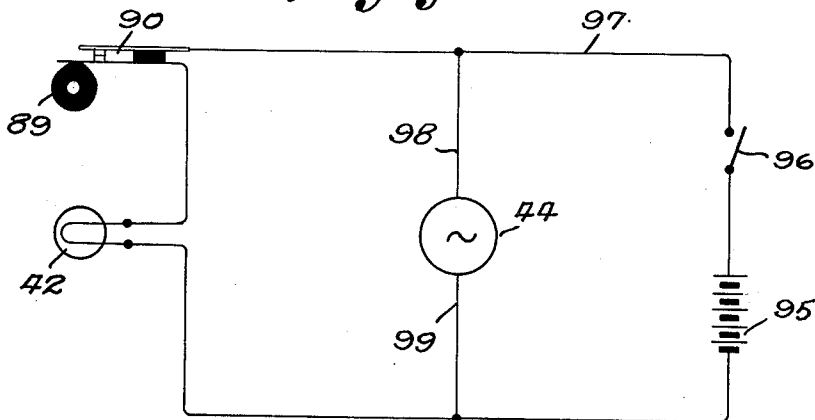
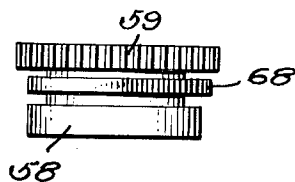


Fig. 2a



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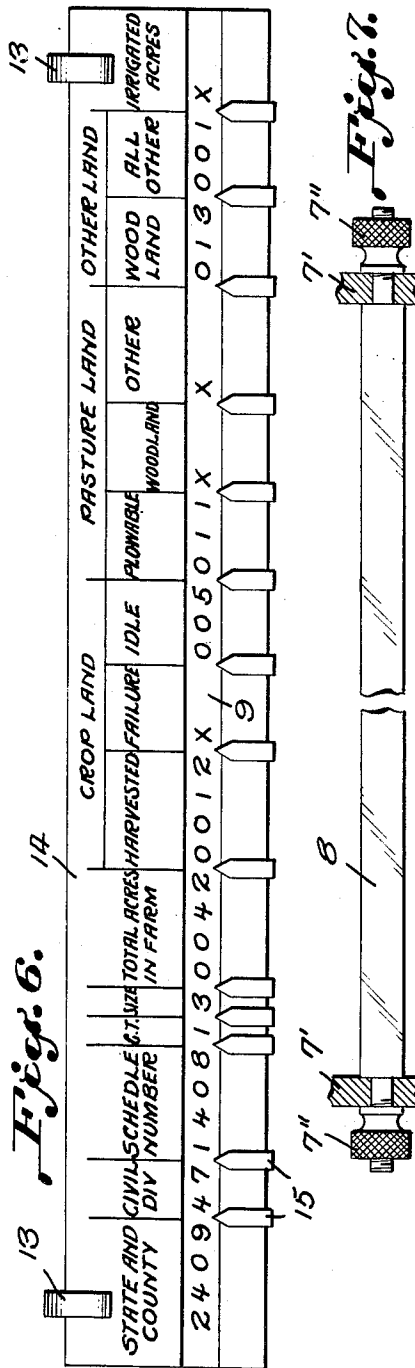
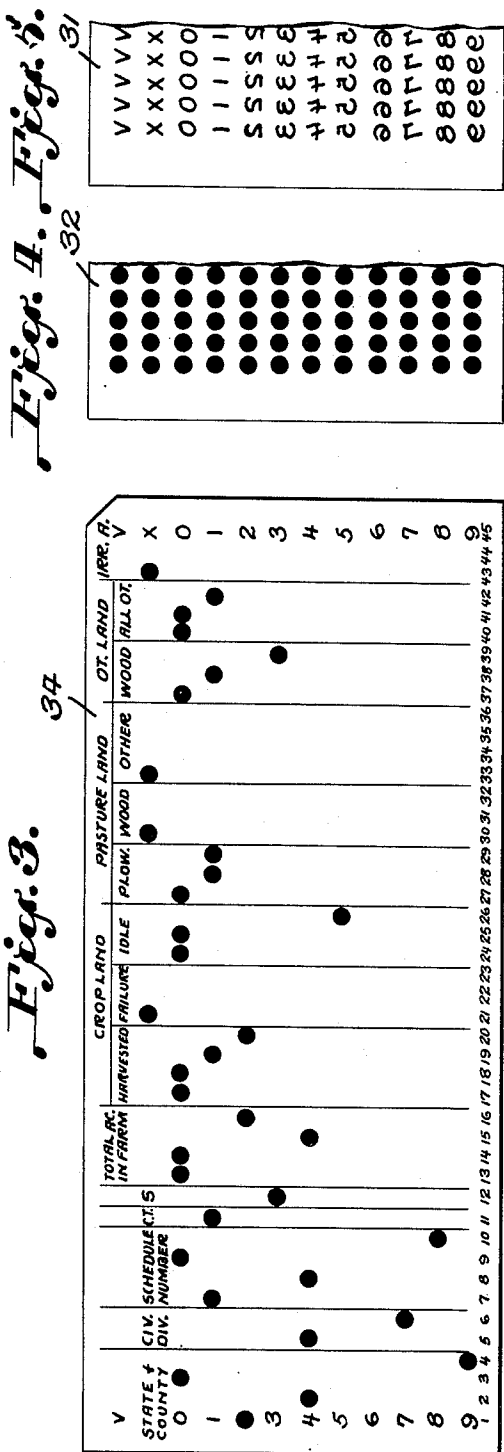
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,223,334

RECORD INTERPRETING PROJECTOR

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Application May 5, 1939, Serial No. 271,899

11 Claims. (Cl. 88—14)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a record interpreting projector.

The projector is designed primarily for displaying and analyzing numerical or other data represented by holes punched in tabulating records used in connection with statistical work, and accounting machines employing punched records, and for projecting this data upon a suitable screen in predetermined position, as for instance in alignment. When these holes are punched in a record such as a card, they are usually in staggered relation and represent different characters or designations. One object of this invention is to present the data in aligned position or in a single line upon a screen so located as to be readily visible to the operator.

Where, for instance, punched cards are used for statistical work, it is frequently necessary to check up on the tabulation from these cards in order to detect some unusual, questionable or unreasonable result, and my invention has important application in such situations, in that by its use the questionable record cards may be more readily examined for making the desired correction.

One method of making these corrections has been to compare the punched card with the original schedule from which the card was punched in the first instance, and in this manner find the extent of the error. This method is slow and troublesome. In the present arrangement instead of handling the cards manually one by one, they are placed in a hopper and run through the machine one by one until the questionable card appears, which is a card relative to which there is a supposed discrepancy and which is manually removed from the card receptacle.

It sometimes happens that a card incorrectly punched in a particular field, as for instance where the value should be ninety-five, the card is erroneously punched with a value of "nine thousand five hundred." In such a situation I employ an opaque "masking" card punched solely in a field in which the error is known to be. In the above instance, the card is punched with a hole designating the "nine" digit in the thousand column. The cards are fed rapidly through the machine until the card in error appears, and when the faulty hole in the card registers with

the hole in the masking card, a flash will appear and inform the operator to stop the machine and remove the faulty card for correction.

The invention contemplates the use of a transparent or translucent plate having thereon characters corresponding to all the characters, or a selected group of characters on the card or record and in the same positions as those on the record. This plate I call the interpreter plate. The characters on the plate may be opaque on a transparent or translucent background, or the characters may be transparent or translucent on an opaque background, or opaque and transparent or translucent characters may be used in combination. To provide for handling different types of records, the interpreter plate is interchangeable. Where the projector is used solely for recording the presence or absence of perforations in particular positions on the record, the interpreter plate may be dispensed with entirely.

The invention still further contemplates the use of reflectors such as mirrors, lenses, or other conventional devices for bending and directing light rays so that the characters or perforations for the various positions on the record may be projected according to a predetermined pattern. For example: information appearing in a pattern of coordinate positions may be projected in horizontal alignment or pattern. The projected information may be exhibited visually, as illustrated, or it may be recorded by photography or by other conventional means. The screen may be provided with a heading that is a duplicate of that of the record to facilitate reading the reflected information.

The invention still further contemplates the masking of positions of the record, either preventing entirely the projection of information in designated positions of the record or coloring the projected images of such information by means of a light filter. The masking may be of any suitable opaque material, or colored transparent or translucent material, either separately or in combination, or said mask may be a single plate such as a card with holes punched in all positions, save those which are to be masked; or, it may be made up of adjusted sections.

In statistical work where a perforated card is used it is customary to entirely punch out the character that represents the information and it takes more or less ingenuity and experience to properly associate the punched-out character with the hole representing that particular character, and thus the chance of error is greatly enhanced. By the use of the interpreter plate

which I employ and which has a character corresponding to any one that has been punched from the record, the character corresponding to the one that has been punched will show through the hole in the card, thus restoring to the card, temporarily, the character that has been punched therefrom.

The invention further contemplates the provision of means for controlling the illumination through a switch, as shown and described, or this control may be effected by a shutter synchronized with the mechanism used for feeding the card or record into reading position, so that the light will only come on, or the image be projected when a card or record to be interpreted is at rest in the projector station.

In the drawings illustrating the invention—

Figure 1 is a central vertical section of the machine illustrating the driving mechanism and projecting means.

Figure 2 is an enlarged section through the projector station showing a card in position to be interpreted, the interpreter plate, a masking card, and a perforated opaque plate between the interpreter plate and masking card. There is also shown the means for feeding the cards through the machine.

Figure 2a is a detail view of the lower feed roll shown in Figure 2.

Figure 3 is a plan view of a sample punched card used in statistical work.

Figure 4 is a fragmentary plan view of the opaque plate showing the perforations therein which correspond to any possible position of the characters on the record.

Figure 5 is a similar view of the interpreter plate.

Figure 6 is a face view of the reading strip or screen upon which the interpreted data is reflected and displayed.

Figure 7 is a view of one of the mirrors used in reflecting the information on the record on to the screen according to the predetermined pattern.

Figure 8 is a conventional electrical diagram including the motor, illuminating means and the control for said means.

Referring to the drawings, the numeral 1 designates a substantially rectangular housing having a base or bottom 2 to which legs 3 are attached to support the machine a suitable distance above its support. Attached to the housing are side panels 4 that extend to the top of the machine, there being, as intimated, a panel on each side. Suitably secured to the panels and spanning the space between them is a hood or canopy 5 made of opaque material and in which is contained in the front part thereof, a multiple reflector 6 constituting a secondary reflecting means made up of a plurality of separate cross bars 7 each having a mirror or reflector face 8 which, on each bar, extends substantially the entire length of the bar which is commensurate with the length of the reading strip or screen which is located centrally in front of the multiple mirror. The numeral 9 designates the screen which is mounted upon a cross bar 10 to each end of which is secured an ear 11 perforated for the passage of a set-screw 12 by which the screen may be adjusted at any desired angle. The cross bars 7 are adjustably mounted at their ends in plates 7', one at each side of the machine. The means for adjusting the bars 7 comprise thumb nuts 7'', as shown in Figure 7, and the whole reflector element is adjustable by means of clamp

screws 8' carried by the panels 4 and passing through ears on the plates 7', the arrangement being such that the bars 7 are individually and collectively adjustable so as to vary the point of observation of the images reflected from reflecting faces 8 in any given adjustment of the bars.

At each end of the screen support 10 is a spring clip 13 for holding in place a card heading 14 which will bear headings corresponding to those appearing at the top of the card from which the data is to be interpreted. In the present instance the heading on the reading strip shown in Figure 6 corresponds with those headings shown in Figure 3.

Below the reading strip is the screen 9 which, as shown, is in the form of a long panel and carried by the lower edge of the screen is a plurality of shiftable clips 15 with pointer ends, the clips being adapted to be manually shifted back and forth along the edge of the screen to indicate the various fields or sub-divisions of the card to be interpreted.

Above the multiple reflector centrally supported in the canopy is an eye-piece 16 with the opening therethrough directed obliquely at the screen. This eye-piece will be shaped to comfortably accommodate the forehead of the observer and shade the eyes from above, below and at the sides, so as not to detract from the clearness of the image reflected.

Numeral 17 designates a mirror constituting a primary reflecting means and mounted on a suitable mounting 18 to which is secured at each end an ear 19 perforated for the passage of a clamp screw 20 by which the whole device may be adjusted with relation to the multiple reflector, and the image to be interpreted, the mirror extending substantially for the entire width of the machine. The numeral 21 designates a platform that extends from one side of the machine to the other and at each end it is provided with a plate 22 having therein elongated slots 23 for the passage of clamping screws 24, which screw into the side panels for securing the platform in any desired vertical adjustment. Mounted centrally on the platform is a lens holder 25 having therein, and suitably spaced apart, lenses 26 and 27.

Attached to the under side of the platform 21 and surrounding the lens holder is a conventional fan-shaped camera bellows 28 for the purpose of preventing any interference from outside light in the reflecting and projecting operations. The lower end of the bellows is attached to an elongated rectangular frame 29, the length and width of which is the same as the interpreter box from which the card is interpreted. This frame fits snugly over the upper edge of the interpreter box 30 in such a way that the bellows can be conveniently manually lifted from the box at such times as it might be necessary to have access to the inside thereof. The box 30 is fitted with a translucent or transparent plate 31 such as shown clearly in Figure 5, which plate will have also shown thereon characters or designations corresponding to those on the card to be interpreted. On the upper side of this interpreter plate 31 may be placed an opaque plate 32 provided with holes or perforations corresponding to every possible position of a character on the card to be interpreted. The plate 32 is not essential, but it serves to eliminate the light diffused by the interpreter plate 31 where the interpreter plate is transparent or translucent

throughout, or except for the opaque characters.

Referring to Figure 2, the numeral 33 designates a mask of opaque material. This mask may be opaque as stated, or it may be of colored transparent or translucent material, or a combination thereof, and provided with openings for all positions of the characters on the record, save those to be masked. The masked portions may be blocked out entirely by the opaque material, or modified by means of a colored transparent or translucent material acting as a light filter. A simple form of the mask 33 is that of a card of the form used for the record, which, save for the positions to be masked, is perforated in every possible position of a character on the record to be interpreted.

It is sometimes desirable to locate one or more record cards in a stack for examination and when a mask is used the cards are passed rapidly through the machine, and when any hole in an opaque masking card registers with a hole in the record card a bright flash is thrown on the reading screen. A flash in any position on the screen will indicate that a record card having a perforation in common with the mask has made its appearance. Two or more flashes simultaneously would indicate that the record card and mask have two or more perforations in common. Specific cards may be identified rapidly by the pattern of the flashes on the screen. When such a card has made its appearance the operator will stop the machine, and remove the card for examination.

Secured to each end of the interpreter box 30 is a bar 35 pivoted at 36 to side plates 37, there being one of these plates at each side of the machine. The rear ends of these bars 35 are connected by the cross bar 38 to which is centrally attached a knob 39 by which the box can be conveniently rocked on its pivots to gain access to the interpreter plate station, to change the interpreter plate as the exigencies of the case may require, and for other purposes.

Inserted in an elongated opening in the deck 40 of the housing is a similarly shaped transparent or translucent plate 41 through which the light from a suitable lamp 42 is projected with the help of the reflector 43, through the interpreter box and consequently through the card and interpreter plate in the box.

The numeral 44 designates a motor, that, through belt 45, drives pulley 46 on driving shaft 47, mounted in suitable bearings in the side plates 37 of the housing 1. This shaft carries a pinion 48 in mesh with a gear 49 mounted loosely on shaft 50 also journaled in bearings in the side plates 37. On shaft 50 is mounted a pinion 51 that meshes with gear 52 mounted on shaft 53, upon which is also mounted the feed drum 54 having inserted in its periphery a plurality of feed knives 55. The gear 52 is duplicated at the opposite end of the feed drum and just within the inner side of the side plate.

Mounted on a stud 56 and secured to a side plate 37 upon which the stud is mounted, is a gear 57 in mesh with the gear 52. Above the gear 57 are the lower feed rolls 58 on the ends of which are mounted gears 59 in mesh with the large gear 57. The numeral 60 designates the upper feed rolls which, like the lower ones, are provided with gears 61 meshing with the gears on the lower feed rolls, whereby all of the feed rolls are driven in unison.

Mounted on a stud 62 is an idler gear 63 in mesh with the gear 57 on one side, and on the

other with a similar idler 64 on stud 65, which idler in turn meshes with the gear 66 of the lower of two eject feed rolls 67.

The large gear 57 with described train of gears is duplicated on the opposite side of the machine to insure the even movement of the card through the machine.

Referring particularly to Figures 2 and 2a, it will be seen that the lower feed rolls 58 are each provided with a cam 68 which is offset from the periphery of the rolls and will at the proper time lift the upper rolls 60 off the card to free it and stop its motion. These rolls are so synchronized as to leave the card with its perforations in exact registry with the characters on the interpreter plate 31. The feed rolls 58 are mounted upon studs 69 supported on side plates 37 and the upper rolls 60 are mounted on studs 70, one on each arm 71, which arms are pivoted together at 72 on a stud also mounted in the side plate 37. Each arm has an extension 73 between which is interposed a coiled spring 74 against which the upper feed rolls yield to the pressure of the cams 68 on the lower rolls.

The operation of the machine may be continuous or intermittent as the exigencies of the case may require or make desirable. In connection with the gear 49 a single revolution clutch is provided, which comprises in part an arm 75 rigidly mounted on shaft 50 and a toothed wheel 76 fast to the loosely mounted gear 49. On this arm 75 is mounted a pawl 77 having a tooth 78 arranged to engage one or another of the teeth in the wheel 76, and a projection 79 arranged to enter a shouldered recess 80 in a lever 81 pivoted at 82 in one side plate 37. To the forward end of this lever is pivoted a link 83 whose upper end in turn is pivoted to a hand lever 84 whose rear end is pivoted at 85 to the side plate 37, there being a spring 86 tending to hold the clutch assembly in latched position. With the parts in the position shown in Figure 1, the motor and gear 49 may be running continuously without imparting any motion to the mechanism above the gear, but when the lever 84 is depressed the clutch latch is released permitting a single revolution of the clutch. However, if the lever is held depressed, the mechanism above the gear will be continuously operated and will feed the cards continuously, one by one, through the interpreter box under conditions where it is desirable to locate a certain card by the presence of a flash through a masking card which is, as intimated, used under these conditions. Now, when it is desired to interpret the information on the card the lever 84 is depressed and released immediately which will cause a single revolution of the clutch and feed one card from the hopper A to interpreting position. When the card has reached interpreting position it is desirable to initiate the illumination necessary to convenient and proper interpretation. Therefore I provide a pinion 87 loosely mounted on stud 88 and in mesh with the gear 57. Integral with this pinion is a cam 89 adapted to make and break circuit between two contact points carried by strips 90, to the terminals of which are attached conductors 91 leading to a suitable source of current, so that contact is made only temporarily or when the card is in stopped position for interpretation.

When a new card is fed into the interpreting station, the card that has been interpreted passes out between rollers 67 from which it is received in the receiving hopper B.

Part of the front of the canopy is hinged as at 75

91', and for the lower edge of this is provided a stop 92 and a handle 93 by which the hinged portion may be conveniently raised to inspect the inside of the machine. A hinged door 94 is provided at the back of the machine which may be opened to gain access to the hopper B and closed to exclude unnecessary light.

In operation the rays of light from the lamp 42 pass through whatever perforations are available in the plates in the interpreting station and through the lenses in the holder 25 and from thence to mirror, 17, from which they are reflected to the multiple reflector 6 and upon the mirror faces 8 thereof, and from thence to the reading screen, there being in the multiple reflector a mirror face corresponding to each character in each vertical line on the record or card, and the individual mirrors are sufficiently long to cover the entire length of the card. In Figure 8 there is illustrated a wiring diagram which I may employ and in which the numeral 95 designates a source of current, one side of which is connected by a suitable conductor to the main switch 96 which controls, through wires 97 and 98, the motor 44 from which a wire 99 leads back to the source of current. Suitable wires as shown lead from the motor circuit to the lamp 42 and to the contact strips 90, the opening and closing of the lamp circuit being controlled as stated by the cam 89, as shown in Figure 1.

While I have stated it is highly desirable to present the interpreted data in a straight line from data that appeared in staggered form on the record, it is obvious that by the provision of a multiple reflector such as 6, I am enabled by the proper adjustment of the individual component parts of the reflector to display the interpreted data in any desired predetermined pattern. While I have shown the projection of the interpreted information in a predetermined pattern accomplished by means of a multiple reflector, in combination with a lens, it is apparent that I may obtain the same result by substituting prisms in the place of the multiple reflector and by placing the screen in appropriate positions relative to the reflector. It is to be understood that the arrangement of the various parts of the apparatus shown in the drawings is but one embodiment of my invention and I do not limit myself to the particular arrangement of these elements with respect to each other, and while I have shown the screen enclosed within the cabinet, it is obvious that by the use of suitable illumination, lenses and reflectors, the screen may be placed in any position desired, as for instance outside the cabinet and at a considerable distance therefrom.

The invention as heretofore intimated, is designed primarily for interpreting statistical data punched in tabulated records such as cards, and, for displaying this information according to a predetermined pattern, and masking such parts as may be desired for analysis of the data, but it is obvious that the record may be of a different sort, as for instance, a photographic film or other material where the data is represented by a pattern of opaque, transparent and translucent areas.

I have shown means for illuminating the record from below, but obviously such record may be illuminated from above the record and the information may be projected and displayed according to a predetermined pattern represented by characters on opaque records, masking such portions as may be desired. For instance, where

it is desired to record only certain data from a table, this data alone may be projected and displayed in a convenient arrangement on a screen.

In some cases where it is desirable to detect a particular light-passing area in a record, I may dispense with the interpreter plate, lens and reflectors, and employ merely the masking plate with openings in positions corresponding to those in the record through which a flash of light from the illuminating source can pass only when the openings in the mask and record come into registry.

I claim:

1. In a machine for reflecting images through light passing areas arranged in staggered relation in a record, an interpreter plate having characters thereon corresponding to those represented by said light passing areas, means for projecting the images of the characters on the interpreter plate, a source of illumination, primary reflecting means arranged to receive said images, a secondary reflecting means arranged to receive the images from the primary means, the reflectors of the secondary means being individually adjustable relative to each other and to the primary means and to the record, whereby the images on the reflectors of the secondary reflecting means may be projected for visual observation in a straight line or other predetermined pattern.

2. The invention as claimed in claim 1 characterized in that the primary reflecting means is also adjustable relative to the secondary reflecting means and to the record.

3. In a machine for reflecting images through light passing areas arranged in staggered relation in a record, an interpreter element having characters thereon corresponding to those represented by the light passing areas in the record, a source of illumination, means for projecting the images of the characters on the interpreter element, primary reflecting means arranged to receive said images, secondary reflecting means arranged to receive the images from the primary means, comprising a plurality of reflectors adjustable relative to each other and to the primary means and to the record, whereby images on said reflectors may be projected for observation in a straight line or other predetermined pattern, and means for collectively adjusting said reflectors whereby in any given adjustment of them the point of observation of the images may be varied.

4. In a machine for reflecting images through light passing areas arranged in staggered relation in a record, an interpreter plate having characters thereon corresponding to those represented by said light passing areas, means for projecting the images of the characters on the interpreter plate, a source of illumination, primary reflecting means arranged to receive said images, a secondary reflecting means arranged to receive the images from the primary means, the reflectors of the secondary means being individually adjustable relative to each other and to the primary means and to the record, whereby the images on the reflectors of the secondary reflecting means may be projected for visual observation in a straight line or other predetermined pattern, and a reading screen arranged to receive the images reflected by the secondary reflecting means.

5. The invention as claimed in claim 4 characterized in that the reading screen is provided with adjustable pointers to indicate the various fields or subdivisions of the record to be interpreted.

6. In a machine of the character described, in

combination, a record having light passing areas, an interpreter element having characters thereon corresponding to those represented by said light passing areas, a source of illumination, a lens for projecting the images of the characters on the interpreter plate, a reflecting mirror to receive and reflect the images projected by the lens, a plurality of reflectors adjustable relative to each other and to the record and so positioned relative to the mirror as to bend the projected light rays independently from predetermined areas of the interpreter element whereby the projected image may be presented for visual observation or other purposes, in any predetermined pattern, and a masking element consisting of opaque material provided with transparent areas corresponding to those light passing areas in the interpreter element desired for observation.

7. In a machine for interpreting data represented by holes punched in a record, in combination, a source of illumination, an interpreter element having characters thereon corresponding to those punched from the record, a lens for projecting the images of the interpreter element, an adjustable reflecting mirror in such relation to the projecting lens as to receive and bend the projected light rays, a reflector comprising a plurality of reflectors adjustable relative to each other and to the record and also to the reflecting mirror for bending said rays, and a reading screen positioned to receive said bent rays in a pattern according to the adjustment of said adjustable reflectors.

8. In a machine for interpreting data represented by holes in a record, in combination, a record receiving station, a control for feeding records to said station, either consecutively or interruptedly, a source of light so arranged that its light passes through said station, a masking element of opaque material in said station and having light passing openings therein corresponding to particular light passing areas of the record, and means for controlling said light source in accordance with the advancement of the record to illuminate the openings in the

masking element only when the openings in said element come into registry with the openings in the record.

9. In a machine for interpreting data represented by holes punched in a record, a record receiving station, means for feeding the record to said station, either consecutively or interruptedly, an interpreter element in said station having characters thereon corresponding to those represented by the light passing areas of the record, a source of illumination, control means for timing the illumination in synchronism with the advancement of the record so that there is illumination only at time of registry of the light passing areas of the record and the interpreter element, and reflecting means in such relation to said source of illumination that the particular characters represented by the record are reflected for further record.

10. In an apparatus for reading data represented by holes punched in a record, an interpreter plate having characters thereon corresponding to those punched from the record and adjacent to the record, a source of illumination for illuminating said characters, and a plurality of reflectors so positioned angularly relative to each other and to the interpreter plate that images received by said reflectors from the interpreter plate are projected from said reflectors for visual observation in a straight line.

11. In an apparatus for reading data represented by holes punched in a record, an interpreter plate having characters thereon corresponding to those punched from the record, a source of illumination for illuminating said characters, a plurality of reflectors so angularly positioned relative to each other and to the interpreter plate that the images received by the reflectors from the interpreter plate are projected for visual observation in a straight line, and means for feeding the record into position of registry between the holes therein and the characters on the interpreter plate, so as to select the characters on the interpreter plate corresponding with the holes in the record.

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