J. W. BILLINGS.

AUTOMATIC INTERMITTENT PROJECTING MACHINE.

APPLICATION FILED NOV. 27, 1916.

1,321,003.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

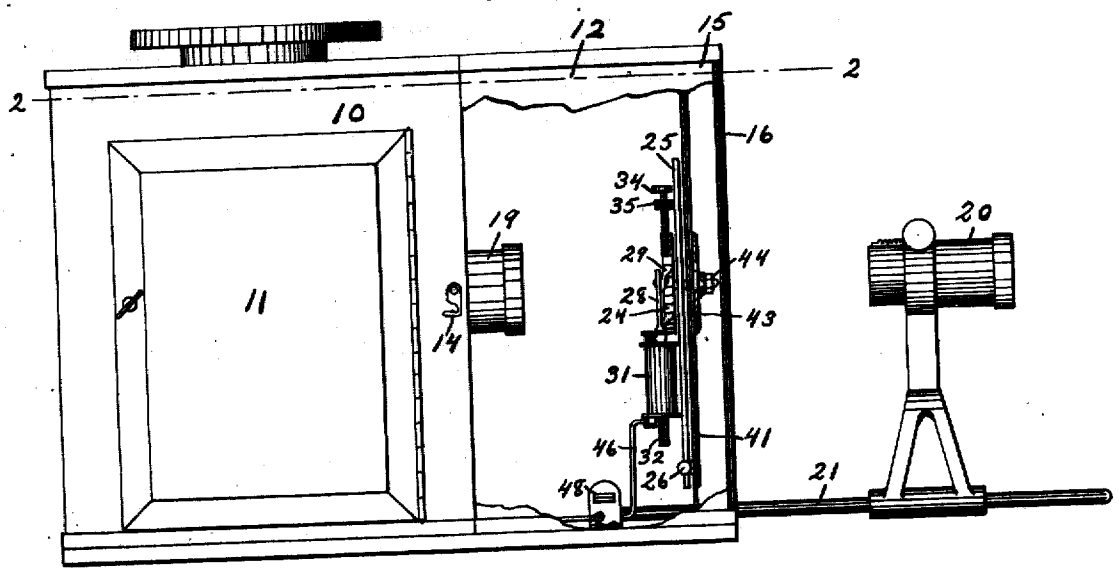
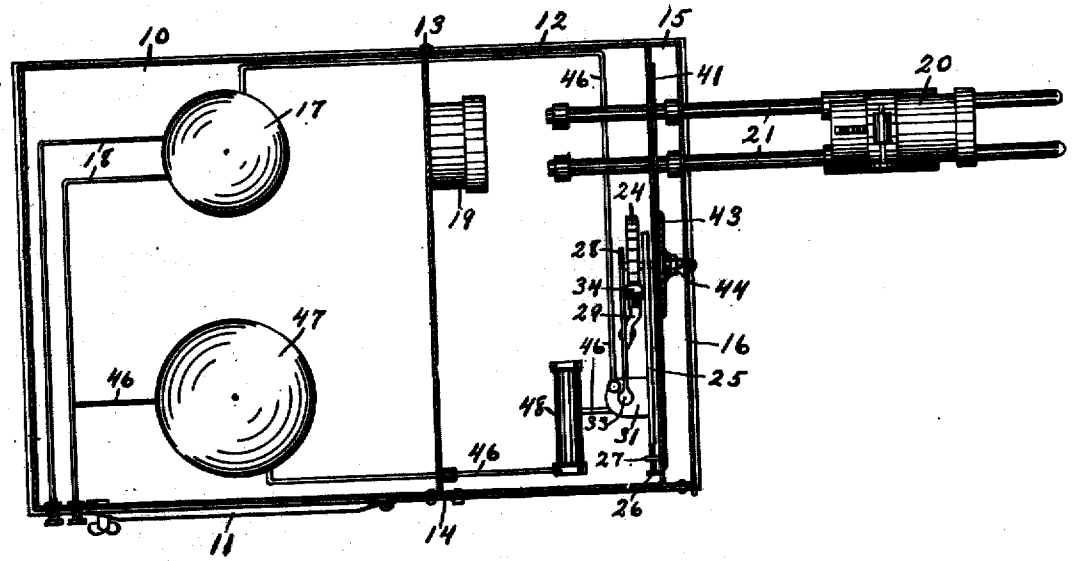


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

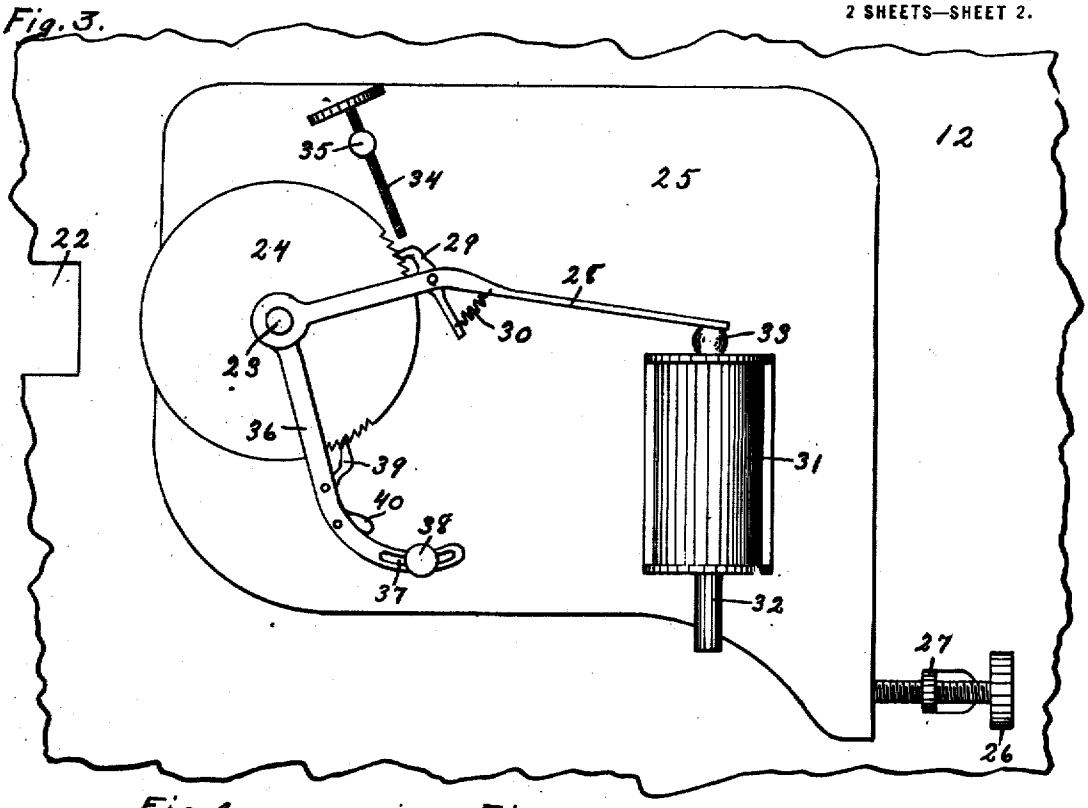


Fig. 4.

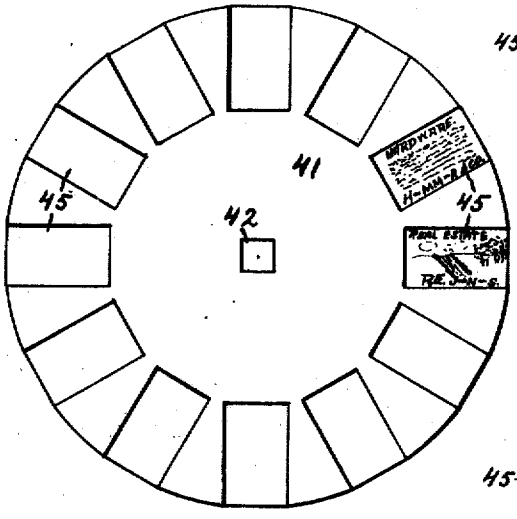


Fig. 5.

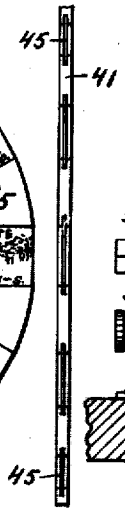
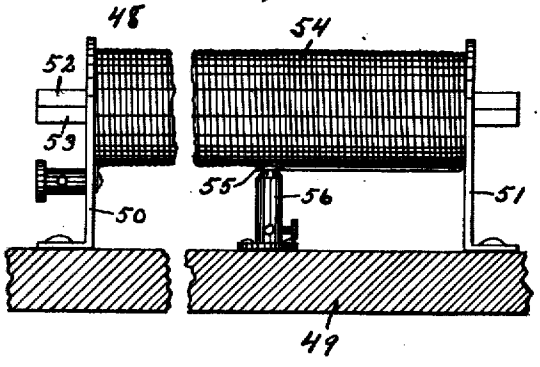


Fig. 6.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC INTERMITTENT PROJECTING-MACHINE.

1,321,003. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed November 27, 1916. Serial No. 133,541.

To all whom it may concern:

Be it known that I, JOHN W. BILLINGS, a citizen of the United States of America, and resident of Union, Hardin county, Iowa, have invented a new and useful Automatic Intermittent Projecting-Machine, of which the following is a specification.

The object of this invention is to provide an improved construction for a projecting machine in which a series of slides, plates, sheets or films are automatically and successively presented in position for projection by the projecting devices.

A further object of this invention is to provide improved means for automatically and successively projecting a series of images on a screen.

A further object of this invention is to provide an electrically controlled mechanism for automatically and intermittently presenting a succession of film members for projection of the images thereof.

A further object of this invention is to utilize a closed-circuit thermostat to alternately break and make a circuit through a resistance member and thereby intermittently energize a solenoid coil to actuate certain mechanical devices for stepping forward a film or slide carrier, and successively display items carried thereby.

A further object of this invention is to utilize the action of the armature of a solenoid coil to operate a film or slide carrier, said coil being balanced to a resistance member in a circuit alternately opened and closed, whereby said coil is energized by the impulse of the current entering said resistance member.

A further object of this invention is to provide an automatically intermittent projecting device which shall be simple and inexpensive of construction and operation, and practically noiseless in operation.

My invention consists in the construction, arrangement and combination of elements hereinafter set forth, pointed out in my claims and illustrated by the accompanying drawing, in which—

Figure 1 is a side elevation of my improved device, partly in section. Fig. 2 is a horizontal section on the line 2—2 of Fig. 1. Fig. 3 is a detail view on an enlarged scale of the mechanical means for operating the film or slide carrier and the solenoid coil for actuating said mechanical means, as well as the means for adjustably mounting said devices. Fig. 4 is an elevation of a film or slide carrier, and Fig. 5 is an edge view of the same. Fig. 6 is a detail elevation, partly in section, of the thermostatic circuit-breaker employed to control the operation of the device.

In the construction of the device as shown the numeral 10 designates a lamp housing preferably formed of sheet metal and provided with a hinged door 11 in one side. A fore housing 18 forms an extension of the lamp housing 10 and is hinged at 13 to one forward corner of said lamp housing, a hook 14 being provided at the opposite side to hold said fore housing in contact with the lamp housing. The fore housing 12 is open at its rear side, and access may be had thereto by releasing the hook 14 and swinging said housing away from the lamp housing, on the hinge 13. The fore housing 12 is formed with an integral, relatively short extension or film housing 15 at its forward side, which film housing is provided with a hinged door 16 in its front wall.

A projecting lamp 17 is mounted in the lamp housing, and is adapted to be illuminated through conductors 18 forming a circuit with a suitable source of electrical energy (not shown). A condensing lens 19 of common form is mounted in the front wall of the lamp housing in front of the projecting lamp 17, said members preferably being located at one side of the median line of said housing. A projecting lens 20 of any common or suitable construction is slidably mounted in front of the housings, in this instance being mounted on a track 21 formed of rods slidable and adapted to be telescoped within the base of the housing. In this manner the lens device 20 may be suitably located at the desired position in front of the housing, and the track may be compacted and positioned out of the way when the device is not in use. The front wall of the fore housing 12 is formed with a mat opening or slot 22 (Fig. 3) in alinement with the lenses 19, 20, and the front wall of the film housing 15 is provided with a similar opening (not shown).

A shaft 23 is mounted horizontally through and for rotation in the central portion of the front wall of the fore housing 12 and a ratchet wheel 24 is fixed to the projecting rear end portion of said shaft. An adjust-

ing plate 25 preferably is mounted parallel with and at the rear of the front wall of the fore housing 12, and is pivoted on the shaft 23. An adjusting screw 26 is threaded through a bearing 27 formed on the housing 12 and said screw engages and is adapted to adjust the position of the plate 25 by manual operation. A lever 28 is fulcrumed at one end on the projecting rear end of the shaft 23 and extends laterally across the plate 25. A pawl 29 is pivoted on the lever 28 and engages and is adapted to operate the ratchet wheel 24 at times, a spring 30 being provided between said pawl and lever to hold said pawl in engagement with said ratchet wheel. A solenoid coil 31 is mounted on and carried by the plate 25 and is formed with a hollow core through which an armature 32 is vertically movable, said armature being attracted and moved upwardly when the coil is energized by the passage of an electric current therethrough. The free end of the lever 28 overlies and is adapted to be moved upwardly by the armature 32, to the end of stepping forward or turning the ratchet wheel 24 one step through the action of the pawl 29. I have shown the armature 32 as formed with an enlarged head 33 adapted to engage the upper end of the coil 31 and limit downward movement of said armature, and said head preferably is connected with the free end of the lever 28 to prevent displacement of the parts. A stop screw 34 is threaded through a lug 35 carried by the plate 25, and said screw is adjustable toward or away from the pawl 29 to limit the movement of said pawl and insure proper action to move the ratchet wheel 24 one step and one step only at each impulse of the armature. A bar 36 is pivoted at one end on the shaft 23 and extends downwardly and laterally and is formed with a slot 37. An adjusting screw 38 passes through the slot 37 and is seated in the plate 25, by which the end of the bar 36 may be adjusted laterally of the vertical plane of the shaft 23. A detent 39 is pivoted on the bar 36 and engages the ratchet wheel 24, being held in position by a spring 40 secured to the bar and detent, and thus an adjustable timing or holding device is provided to properly position the ratchet wheel after each impulse. The stop 34 and timing device 39 may be separately adjusted by the means described, and the entire operating mechanism, including the coil 31, lever 28 and pawl 29, together with the stop and timing devices, may be adjusted together by operation of the screw 26 to adjust the position of the plate 25.

A film or slide carrier 41 (shown particularly in Figs. 4 and 5) is provided, and is formed with an aperture 42 in its center by which it may be removably mounted on the forward end of the shaft 23 for rotation with said shaft. A clamping plate 43 is mounted on the shaft 23 in front of the carrier 41, and a nut 44 is screwed on the end of said shaft and holds the plate carrier thereon. The carrier 41 preferably is disk shape and carries radially arranged films, slides, plates or sheets 45, each bearing printed or pictorial matter which it is desired to project upon a screen. The slides or plates 45 may be separately formed and removably and replaceably mounted in seats provided therefor in the carrier 41, as shown; or the carrier itself may be formed of transparent material such as celluloid and the items or things to be projected may be printed or otherwise impressed directly upon said carrier. The slides or plates 45 are adapted to be successively presented before the mat openings 22, for projection on a screen by the projecting devices, and such movement or succession of the objects to be projected is accomplished by the step-by-step rotation of the shaft 23 through the action of the armature, lever, and pawl and ratchet devices previously described.

Conductors 46 form a shunt circuit from the main circuit formed by the conductors 18, and in said shunt circuit is arranged a metal filament resistance lamp 47 mounted within the lamp housing 10. The conductors 46 extend within the fore housing 12 and are connected with the solenoid coil 31, whereby said coil is in the same shunt circuit with the resistance lamp or member 47. The solenoid coil 31 is wound to balance the resistance of the filament of the lamp 47, or so arranged that the resistance of the winding of the coil is equal to the resistance afforded by said resistance member, so that normally when the current is flowing through and has heated said resistance member the coil is not affected and is not energized. A thermostat, indicated generally by the numeral 48 and shown in detail in Fig. 6, is arranged in the shunt circuit of the resistance member 47 and the coil 31, and is mounted within the fore housing 12. The thermostat 48 comprises a base 49, heads 50, 51 carried thereby and supporting a core formed of two strips 52, 53 of metal having different expansive qualities, and a coil 54 surrounding said core, together with a contact member 55 carried by said core and contacting normally with a contact member 56 mounted on the base 49. The head 50 and the contact member 56 are provided with common means for securing end portions of the conductors 46, whereby the device is normally in and forms a part of the shunt circuit, which is normally closed, through said thermostat. When an electric current is permitted to flow through the shunt circuit formed by the conductors 46, and passes through the coil 54, the core of the thermostat is heated and caused to ex-

pand, and as the strips 52, 53 expand differently, and the strip 52 more than the strip 53, the core is bowed or bent upwardly in its central portions, its ends being held by the heads 50, 51, and the result is that the contact between the members 55, 56 is broken, thus breaking the circuit. Such breaking of the circuit causes a cooling of the coil 54 and core, and as the core cools it resumes its normal straight position, and the contact member 55 again comes into contact with the member 56, thus reëstablishing the shunt circuit. In this manner the circuit is alternately made and broken, thus alternately turning the current on and off relative to the resistance member or lamp 47. When the shunt circuit is closed through the operation of the thermostat, due to the small resistance of the unheated metal filament of the lamp 47, there will be a sudden rush of current, the amperage being sufficient to energize the solenoid coil to attract the armature and operate the mechanical devices. Since the resistance of the metal filament increases rapidly with the temperature, the current will decrease rapidly and the low amperage that thus results is not sufficient to energize the solenoid and the armature will be released prior to the breaking of the shunt circuit through the operation of the thermostat. As the solenoid coil is nicely balanced as to footage and turns of wire to correspond to the resistance afforded by the metal filament of the resistance lamp, it is apparent that the coil is energized only momentarily at each closing operation of the thermostat, or only long enough to give an upward impulse to the armature, and, its work having been accomplished, it is quickly deënergized irrespective and independently of the action of the thermostat.

In practical use a film carrier is mounted on the shaft 23 as described, and the slides or plates 45 are moved successively into position for projection of their images, by the action of the devices above described. Each image remains on the screen for a sufficient length of time to accomplish the object sought, such length of time being determined by the frequency of the operation of the thermostat 48. The device so constructed and operated is particularly adapted for the projection of advertising matter in a store, store window, theater or other public place, and will operate indefinitely without attention and at a very small expense. As often as desired the carrier 41, or the slides thereon, may be removed and replaced by others. Any desired form of films or plates may be employed bearing the printed or pictorial matter to be displayed, and any form of carrier may be employed therefor.

The device so constructed permits and provides a continuously lighted projecting lamp, and the entire apparatus is operated by a single service cord.

I claim as my invention—

1. In a projecting machine have a film member mounted for rotation, projecting devices, mechanical means for imparting step-by-step rotary motion to said film member, an electric circuit, and a solenoid coil in said circuit having an armature adapted to actuate said mechanical means; a controlling mechanism comprising a thermostat arranged in said circuit adapted to alternately break and make the circuit, and a metal filament resistance lamp in said circuit and adapted to rapidly decrease the current therethrough after each impulse and thus deënergize said solenoid previous to the breaking of said circuit through the action of the thermostat.

2. In a projecting machine having a film member mounted for rotation, projecting devices, a main electric circuit connected with said projecting devices, mechanical means for imparting step-by-step rotary motion to said film member, and a solenoid coil having an armature adapted to actuate said mechanical means; a controlling mechanism comprising a shunt circuit connected with said main circuit, a thermostat arranged in said shunt circuit adapted to alternately break and make the same, said solenoid also being in said shunt circuit, and a metal-filament resistance lamp in said shunt circuit and adapted to rapidly decrease the current therethrough after each impulse and thus deënergize said solenoid previous to the breaking of said shunt circuit through the action of the thermostat.

3. In a projecting machine having a film member mounted for rotation, projecting devices, an electric circuit, mechanical means for imparting step-by-step rotary motion to said film member, and a solenoid coil in said circuit having an armature adapted to actuate said mechanical means; a controlling mechanism comprising a thermostat arranged in said circuit adapted to alternately break and make the circuit, and a metal-filament resistance lamp in said circuit adapted to rapidly decrease the current therethrough after each impulse and thus deënergize said solenoid previous to the breaking of said circuit through the action of the thermostat, the resistance of said solenoid being balanced to correspond to the resistance of said resistance lamp.

4. The combination of an electro-magnet in circuit, a thermostat arranged in and adapted to alternately make and break said circuit, and a metal-filament resistance member in said circuit adapted to be rapidly heated after said circuit is closed, thus increasing the resistance sufficiently to deënergize said magnet prior to the breaking of

the circuit through the action of the thermostat.

5. The combination of an electric circuit, an electro-magnet in said circuit, a thermostat in and adapted to alternately make and break said circuit, and a metal-filament resistance member in said circuit, said electro-magnet having its windings nicely balanced to correspond to the resistance of said resistance member, whereby after the circuit is closed by said thermostat the resistance of said resistance member is rapidly increased and the magnet deënergized after a very brief time and prior to the breaking of the circuit through the action of said thermostat.

6. The combination of an electric circuit, a device to be operated continuously thereby, a shunt circuit connected with said main circuit, an electro-magnet in said shunt circuit adapted to actuate a second device intermittently, a thermostat in and adapted to alternately make and break said shunt circuit, and a metal-filament resistance lamp in said shunt circuit adapted to be rapidly heated after said circuit is closed, thus increasing the resistance sufficiently to deënergize said magnet prior to the breaking of the circuit through the action of said thermostat.

Signed by me at Grinnell, Iowa, this 16th day of November, 1916.

JOHN W. BILLINGS.

Witnesses:
S. H. CROSBY,
HAROLD L. BEYER.