April 22, 1941. R. C. McCLAY 2,239,532

FILM TEMPO PUNCH

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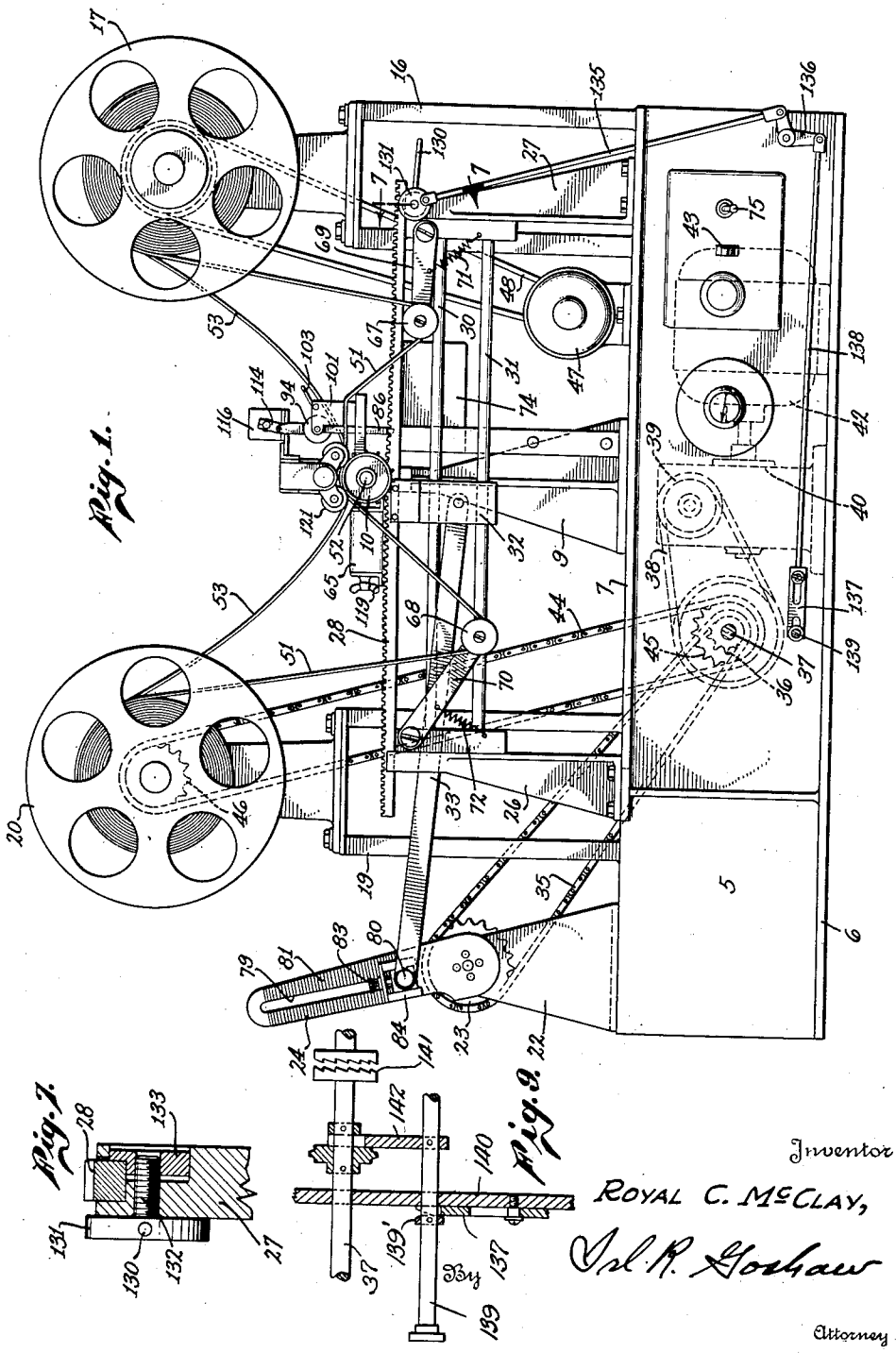


Fig. 1.

Fig. 2.

Fig. 3.

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Fig. 8.

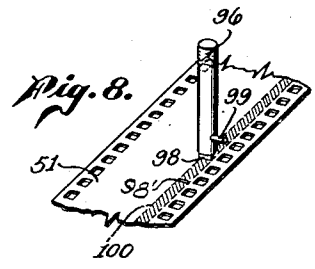
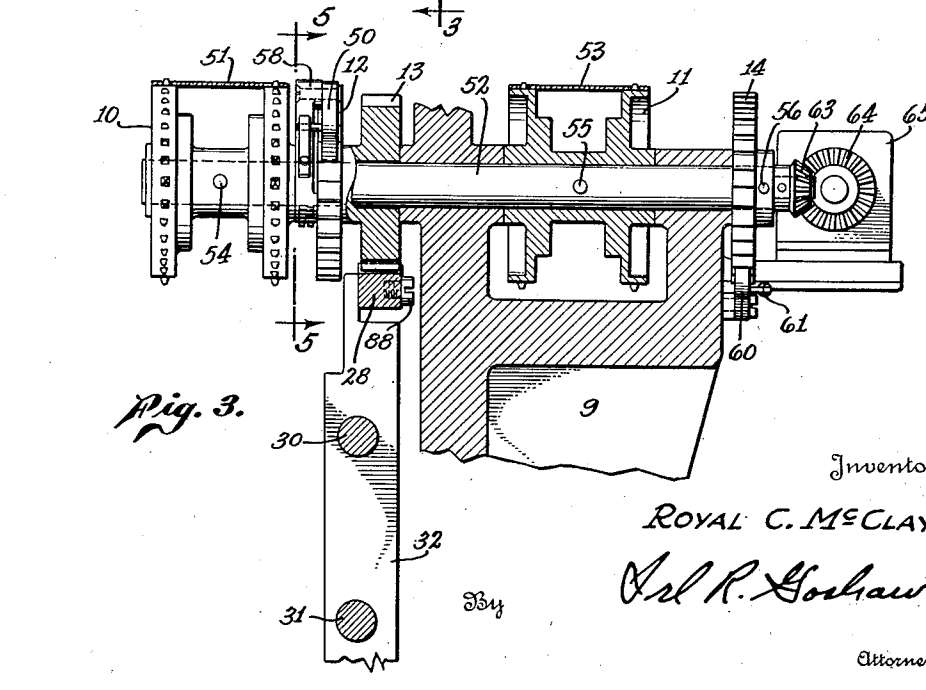


Fig. 2.

Fig. 3.



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FILM TEMPO PUNCH

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Fig. 4.

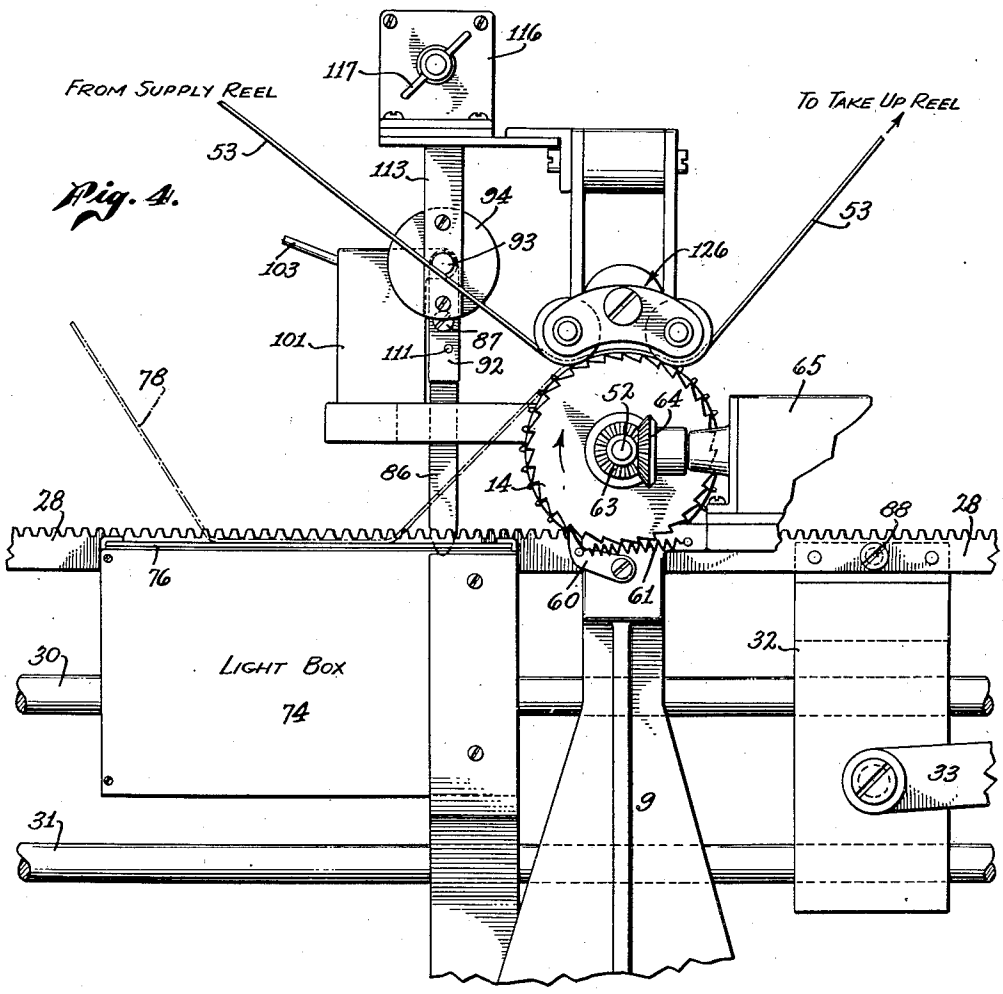


Fig. 5.

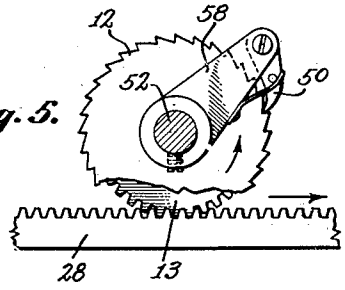
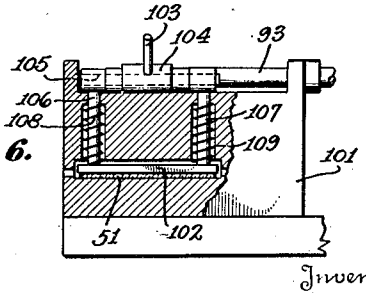


Fig. 6.



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UNITED STATES PATENT OFFICE

2,239,532

FILM TEMPO PUNCH

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Application October 24, 1938, Serial No. 236,826

15 Claims. (Cl. 164—89)

This invention relates to sound picture apparatus and particularly to apparatus for marking or punching film in a pre-arranged series or plurality of series to provide periodic impulses or beats similar to those obtained from the well-known metronome.

In co-pending application, Serial No. 125,861, filed February 15, 1937, there is disclosed and claimed a method of and means for obtaining a musical or sound accompaniment for a previously prepared motion picture. One of the steps described in this co-pending application is the production of impulses or beats for transmission to an orchestra or a conductor thereof to time the orchestra with the predetermined tempos which are to accompany the picture in accordance with the varying nature and action of the different sequences. To provide this tempo, a marked or punched film sound track is run through a sound reproducer and the impulses transmitted to the orchestra or conductor.

The present invention is directed to the apparatus for punching or marking the film in accordance with the prearranged tempo which is to be imparted to the musicians. The principal object of the invention, therefore, is to produce a series of impulses or plurality of series of impulses in accordance with the tempo of a prearranged musical score.

Another object of the invention is to punch or mark a motion picture film quickly and accurately, which, when run through a sound reproducer, will produce impulses in accordance with a certain tempo.

Another object of the invention is to provide a film marking device which can be readily changed or adjusted to provide marks on the film at periodic intervals over different portions thereof.

Another object of the invention is to provide a series of marks on the sound track portion of a motion picture film to represent beats in accordance with a previously arranged musical score, provision being made for editing the picture film itself simultaneously with the marking and to provide counters or markers for indicating the number of marks and length of film being marked.

Although the novel features which are believed to be characteristic of this invention are pointed out with particularity in the claims appended herewith, the manner of its organization and the mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings forming a part thereof, in which

Figure 1 is a front elevational view of the invention;

Figure 2 is a sectional view showing the punch portion of the apparatus of the invention;

Figure 3 is a cross-sectional view of the film advancing portion of the invention taken along line 3—3 of Fig. 2;

Figure 4 is a rear elevational view of the drive portion of the apparatus;

Figure 5 is a sectional view of the intermittent drive of the invention taken along the line 5—5 of Fig. 3;

Figure 6 is a sectional view of the pressure plate for the punch of the invention taken along the line 6—6 of Fig. 2;

Figure 7 is a sectional view of the locking arrangement taken along the line 7—7 of Fig. 1;

Figure 8 is a perspective view of the punch rod of the invention; and

Figure 9 is a sectional view showing the clutch release mechanism.

Referring now to the drawings, in which like numerals identify the same elements, the apparatus is mounted on an I beam base having a vertical web 5, a lower horizontal flange 6 and an upper horizontal flange 7, upon the latter of which is mounted a centrally disposed standard 9 carrying film advancing sprockets 10 and 11 (see Fig. 3), ratchet wheels 12 and 14 and a pinion gear 13. Also mounted on flange 7 is an end standard 16 for supporting a pair of co-axially mounted supply reels, one of which is shown in Fig. 1 at 17. On a similar standard 19 is a pair of co-axially mounted takeup reels, one of which is shown at 20. On a fourth standard 22 is mounted a chain sprocket wheel 23 and a calibrated crank member 24. Two other standards 26 and 27 are shown on flange 7 positioned on either side of central standard 9 for supporting and guiding the ends of a gear rack 28. Supported by standards 26 and 27 and mounted parallel with rack 28 are two rods 30 and 31 for the purpose of guiding a crosshead 32 connected by a connecting rod 33 to crank 24. The crosshead 32 is riveted or bolted to the rack 28 so that rotation of the crank 24 imparts oscillatory linear motion to the rack 28.

Power is supplied to the crank 24 by a chain 35 on sprocket wheel 23 driven from a sprocket 36 on a shaft 37. The shaft 37 is driven by chain 38 connected to a sprocket 39 on a reduction gear box 40. The reduction gear box is connected to a motor 42 under control of a switch 43.

The takeup reels at 20 are driven from the same motor 42, a chain 44 being connected between sprockets 45 on the shaft 37 and a reel sprocket 46. For rewind purposes a motor 47 is provided and connected to the supply reels at 17 through a chain 48.

From the above, it is seen that energization of the motor 42 will rotate crank 24 and thus slide rack 28 back and forth on standards 26 and 27, while rotating the takeup reels. The operation of the rack, of course, advances the film intermittently, as will now be explained by referring to Figs. 3, 4 and 5. As shown in Fig. 3, the pinion gear 13 meshes with the teeth of rack 28 and is thereby rotated in opposite directions as the rack slides back and forth. In Fig. 5 is shown the ratchet wheel 12 with a cooperating pawl 50, the pawl being mounted on an arm 58 fixedly attached to a shaft 52 by a set screw. The ratchet wheel 12 is integral or fixedly attached to rotate with the pinion 13. Both ratchet 12 and gear 13 rotate freely on shaft 52. Fixedly attached to shaft 52, however, are film advancing sprockets 10 and 11 and ratchet wheel 14 by pins 54, 55 and 56, respectively. Thus, when the rack 28 moves to the right in Figs. 1 and 5, the pinion 13 and ratchet wheel 12 will be rotated in an anticlockwise direction, as shown by the arrow in Fig. 5. Moving the ratchet 12 in this direction rotates the pawl 50 and arm 58, thus rotating the shaft 52 and the sprockets 10 and 11 to advance film 51 on sprocket 10, and film 53 on sprocket 11 to the left. The film 51 is the film being punched and which has the sound track portion thereof made opaque while film 53 is the picture film for which the tempo track is being made.

Now continuing the ratchet operation, when the rack 28 is moved to the left, the pinion 13 and ratchet wheel 12 are rotated in a clockwise direction. This direction of rotation, however, does not impart any motion to arm 58 or shaft 52 because the pawl 50 slips over the teeth of the ratchet 12. To prevent any tightness of the pawl and ratchet mechanism from imparting any reverse motion to the shaft 52, however, a locking arrangement has been provided, as shown in Fig. 4, which comprises the ratchet wheel 14 and a cooperating pawl 60 mounted on standard 9 under tension of a spring 61. Since Fig. 4 is a rear view of the apparatus, it will be noted that when the rack is moved to the right in Fig. 4, which corresponds to a left movement in Fig. 1, tending to advance the film backwardly, the pawl 60 will lock the shaft 52 through the ratchet wheel 14 which is fixedly attached to shaft 52. Thus, as the crank 24 is revolved, intermittent rotation is imparted to sprockets 10 and 11, and the films 51 and 53 are correspondingly advanced from the supply to the takeup reels. The ratchet 14 usually has twice as many teeth or notches as ratchet 12 in order to obtain a more accurate stop. To count the number of feet of film advanced by the sprockets 10 and 11, bevel gears 63 and 64 connect shaft 52 to a footage counter 65 having a thumb adjustment 119 (see Fig. 2).

To maintain a tension in the film 51 being punched, there are mounted on either side of sprocket 10 idler rollers 67 and 68 on arms 69 and 70, respectively, under tension of springs 71 and 72, the arms being mounted on standards 26 and 27. For viewing the pictures on the picture film 53 to check changeover points, etc., a light box 74 is provided, the lamp of which is under control of a switch 75. The box 74 has a ground-glass viewing top 76 on which the film 53 may be held by hand during stationary periods thereof, as shown by the dotted lines 78 in Fig. 4.

As stated above, the films are advanced intermittently a certain distance depending upon the amount of rotation of sprockets 10 and 11. The amount of rotation given to the sprockets, however, is dependent upon the position of the left-hand end of connecting rod 33 on the crank 24. To vary this position, the crank 24 is provided with a central groove or slit 79, along which the wrist pin 80 may be adjusted on a slidable block 84. The marks 81 shown on the crank represent corrugations, the crank being correspondingly marked along the edge thereof in frames and feet of film. The block 84 is locked in position in the groove by a nut on the wrist pin 80. For fine vernier adjustments of the film advance, a screw 83 slides the wrist pin 80 on a dovetailed slide mounted in the block 84. Thus, any length of advance of the film may be obtained within the capacity of the machine by adjustment of the connecting rod 33 on the crank 24 in accordance with the preselected tempo and the standard speed of advancement of the film through a reproducing machine, normally 90 ft. per minute. Thus, if there are sixty beats per minute required there should be sixty punches in 90 ft. of film. To produce this result the connecting rod 33 is positioned on crank 24 so as to advance the film 51 a distance of 1½ ft. for each revolution of the crank 24, since the film is punched once per revolution, as will now be described.

Referring now to Figs. 1, 2, 3 and 8, a vertical lever 86, rotatably mounted on a pin 87, is adapted to be contacted at its lower end by the head of a screw 88 (see Fig. 3) threaded into the rack 28. This screw causes the lever 86 to take three positions during one revolution of crank 24, the outer positions being shown by dotted lines 90 and 91 in Fig. 2. The pin 87 is attached to a bell crank 92 mounted on a shaft 93 carrying a disc 94. The other end of the bell crank is shown at 95 contacting the top of a punch rod 96 held out of punching position by spring 97. The end 98 of the punch 96 is elongated and has the form of a screw-driver tip 98 and, therefore, punches a slit as shown at 98' (see Fig. 8), a guide pin 99 maintaining the punch in position with respect to the opaque sound track portion 100 of the film 51. Operation of the punch downwardly, therefore, punches a long narrow slit in the sound track portion of the film, the passage of which through a light beam of a sound reproducer at 90 ft. per minute will produce an impulse or click.

The punch 96 is within a housing 101 which also encloses a pressure or gate pad 102 which may be open or closed by a handle 103 operating a cam 104 on a shaft 105 which carries the pad supporting rods 106 and 107 (see Fig. 6.) Springs 108 and 109 maintain the desired pressure on the film 51 intermittently pulled through the punch by sprocket 10 so that the film stops immediately when the sprocket 10 stops rotating. Pilot pins for holding the film during punching may also be provided. The plate 102 also serves as a film stripper for the punch 96.

The punch is operated when the lever 86 is moved to the left in Fig. 2 or at the time the film is stationary. The lever 86 operates the bell crank 92 when moved in this direction since, although rotatable on pin 87, when rotated to the left it contacts a pin 111 attached to crank 92. However, when lever 86 is moved to the right, it pivots about pin 87 and there is no

movement imparted to crank 92 except by spring 97 which returns the punch member 96 to its rest position. To count the number of punches placed in the film, an arm 113 is connected to the disc 94 and operates a lever 114 connected to a shaft 115 of a counter 116. The counter may be adjusted and set by means of a thumb-nut 117 (see Fig. 4).

The film 51 is threaded on the sprocket 10 and maintained in contact therewith by pad rollers 121 and 122 which are released for threading purposes by means of a cam 123 operated by a handle 124. The film 53 is also held on the sprocket 11 by means of a similar pad roller assembly 126.

It often occurs that during the punching process or after a certain number of punches have been made to provide a certain tempo, it becomes necessary to stop the machine and adjust the crank 24 or inspect the picture and punches. At these times the machine may be locked against movement by means of a lever 130 (see Fig. 1) which turns a disc 131 (see Fig. 7). The disc 131 is actually the head of a screw 132 which passes through one portion of the standard 27 and is threaded in a movable guide portion thereof 133. Thus, turning of the screw 132 will tighten the rack 28 in its groove on standard 27 and lock the apparatus. To prevent an attempt to actuate the apparatus when the rack 28 is locked, a linkage system comprising a rod 135 connected to the disc 131 and to a bell crank 136 operates a forked element 137 connected to a rod 138. The fork of the element 138 slides over a clutch shaft 139 which must be pushed rearwardly to connect the motor with the driving gears. With the yoke member 137 in its left-hand position, the clutch cannot be operated to transmit power from the motor to the mechanism. Furthermore, should the clutch be in engagement when the rack 28 is locked, the movement of the fork member 137 to the left will release the clutch since it wedges between a collar 139' on the clutch shaft 139 and a fixed member 140 thus disengaging a clutch 141 through a connecting member 142 (see Fig. 9).

From the above description read in connection with the drawings, it will be noted that a tempo punch is provided which will simultaneously progress a pair of films intermittently from supply reels to take up reels a given amount each period of movement; punch one of the films at desired intervals; count the punches and measure the film footage punched, and which may be adjusted to provide any distance desired between punches. The device also provides an editing or observation medium for the picture film being simultaneously progressed through the apparatus and a safety feature for preventing damage to the apparatus or any movement thereof during stoppage. It is to be understood that film 51 may be punched without using the picture film. That is, the punch will function when only the film to be punched is used.

Thus, from a previously prepared chart of the different tempos required for the sequences of a motion picture, a tempo track may be quickly and easily prepared to accompany the entire picture during the rendition of a musical and sound score.

I claim as my invention:

1. In combination, a plurality of film reels, one of said reels supplying film to another of said reels, means for intermittently advancing said film from one of said reels to the other of said reels, means for punching said film during the stationary periods of advancement thereof, said intermittent advancing means for said film including a rack, means for oscillating said rack, movement of said rack in one direction advancing said film, and means actuated by said rack when said rack moves in the other direction for operating said punching means.

2. In combination, a sprocket adapted to advance a film thereover, a gear adapted to rotate said sprocket in one direction only, a rack adapted to rotate said gear in two directions, a rotating crank for imparting oscillatory motion to said rack, means for rotating said crank, and means operated by said rack during one direction of movement thereof for punching said film.

3. A combination in accordance with claim 2 in which a connecting rod is provided for connecting said rack with said crank, the end of said connecting rod being adjustable on said crank to vary the amount of oscillatory motion imparted to said rack.

4. In combination, a sprocket adapted to advance a film thereover, a gear adapted to rotate said sprocket in one direction only, a rack adapted to rotate said gear in two directions, a rotating crank for imparting oscillatory motion to said rack, means for rotating said crank, and a punch for punching said film during stationary periods thereof after advancement by said sprocket, said punch being operated by said rack.

5. A device for making a periodic series of punches in a film comprising a film sprocket mounted on a shaft, a gear rotatable on said shaft and adapted to be rotated in two directions intermittently, means for connecting said gear to said sprocket during one direction of rotation of said gear, means for intermittently rotating said gear, said means being adjustable to vary the amount of rotation of said gear in each direction, and means operated by said last-mentioned means for punching said film and counting said film punches during rotation of said gear in the other direction.

6. A device for making a periodic series of punches in a film comprising a plurality of film sprockets mounted on a common shaft, a gear rotatable on said shaft and adapted to be rotated in two directions, means for connecting said gear to said sprockets during one direction of rotation of said gear, means for viewing a film during the stationary period thereof, means for imparting oscillatory motion to said gear, said means being adjustable for varying the amount of rotation of said gear in each direction, means for punching said film during rotation of said gear in one direction, and means for counting the punches made in said film and for indicating the number of feet of said film which has been punched.

7. A film punching apparatus comprising a base, means on said base for supporting a rack, means on said base for imparting an oscillatory motion to said rack, a gear meshing with said rack and adapted to be rotated in two directions during oscillations of said rack, a shaft for said gear, a sprocket for advancing film and fixedly mounted on said shaft, ratchet means interposed between said gear and said sprocket for connecting said gear to said sprocket when said ratchet is moved in one direction and said gear is rotated in one of said directions, to advance said film ratchet means for maintaining said shaft stationary when said gear is rotated in the other of said directions, punching means, film punch counting means, and means for actuating said punching and counting means when said rack is moved in the other direction.

8. A film punching apparatus comprising a sprocket fixedly mounted on a shaft, a gear rotatably mounted on said shaft, a rack meshed with said gear, a rotatable crank, a connecting rod interconnecting said crank with said rack for imparting oscillatory motion thereto, means interconnecting said gear and said sprocket during rotation of said gear in one direction, means on said crank for varying the amount of oscillation of said rack during rotation of said crank, and a punch mechanism actuated by said rack when moved in one certain direction.

9. A film tempo punch comprising a film sprocket, means for feeding to and taking a film from said sprocket, means for intermittently rotating said sprocket in one direction, means having oscillatory linear motion, means for intermittently interconnecting said last-mentioned means with said sprocket, a film gate adjacent said sprocket through which film is pulled by said sprocket, a pressure pad adapted to maintain said film under tension between said sprocket and said gate, a punch element passing through said pressure pad, and means interconnecting said punch element and said oscillatory means and adapted to actuate said punch element during movement of said oscillatory means in one direction.

10. A film tempo punch comprising a film advancing sprocket, a film punch adjacent said sprocket through which said film is pulled by said sprocket, oscillatory means having rectilinear motion, means for interconnecting said sprocket with said last-mentioned means, said interconnecting means adapted to impart rotary motion to said sprocket in one direction only, a crank, means interconnecting said crank with said oscillatory means for movement thereof, means interconnecting said last-mentioned means and said crank for varying the amount of rectilinear motion imparted to said oscillatory means for advancing varied amounts of film through said film punch, and means interconnecting said oscillatory means with said film punch for actuation thereof when said oscillatory means is moved in one direction.

11. A film tempo punch comprising a sprocket, means for intermittently rotating said sprocket in the same direction, a punch mechanism adjacent said sprocket for punching predetermined tempo indications in a selected portion of said film, and means for varying the amounts of rotation between a series of intermittent rotations of said sprocket to provide indications of a certain tempo over a certain predetermined length of said film determined by the number of rotations in a series of rotations of said sprocket, and indications of a different tempo over another predetermined length of said film determined by the number of rotations in another series of rotations of said sprocket.

12. A film tempo punch comprising a sprocket, means for supplying a film to said sprocket, means intermediate said supply means and said sprocket for producing predetermined tempo indications in a selected portion of said film, means for intermittently rotating said sprocket the same amount for each of a series of rotations and in the same direction to advance said film intermittently through said last-mentioned means for producing indications of one tempo along a predetermined length of said film, and for rotating said sprocket the same amount for each rotation but a different amount from that of each rotation of said first series of rotations for producing indications of another tempo along a subsequent predetermined length of said film.

13. A device for making a periodic series of punches in a film comprising a film sprocket, a gear on said sprocket adapted to be reversed in rotation intermittently, means for connecting said gear to said sprocket during one direction of rotation of said gear to advance said film, means for punching said film during rotation of said gear in the other direction when said film is stationary, and means for varying the amount of rotation of said gear, means for indicating the number of feet of film advanced by said sprocket, and means for indicating the number of punches punched in the film.

14. A film punching apparatus comprising a plurality of sprockets, each of said sprockets being adapted to advance a film, means for intermittently rotating said sprockets and advancing both of said films simultaneously, means for punching one of said films, and means for viewing the other of said films, the punching of said one film and the viewing of said other film being simultaneous and intermittent with the simultaneous advancement of both of said films.

15. A film punching apparatus in accordance with claim 14 in which means are provided for counting the film punches made in said one film, said counting means being actuated simultaneously with the punching of said one film.

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