Feb. 18, 1941. D. BROIDO 2,232,652

APPARATUS FOR PRODUCING PERFORATED STATISTICAL RECORDS AND THE LIKE

Filed Oct. 10, 1938 2 Sheets-Sheet 1

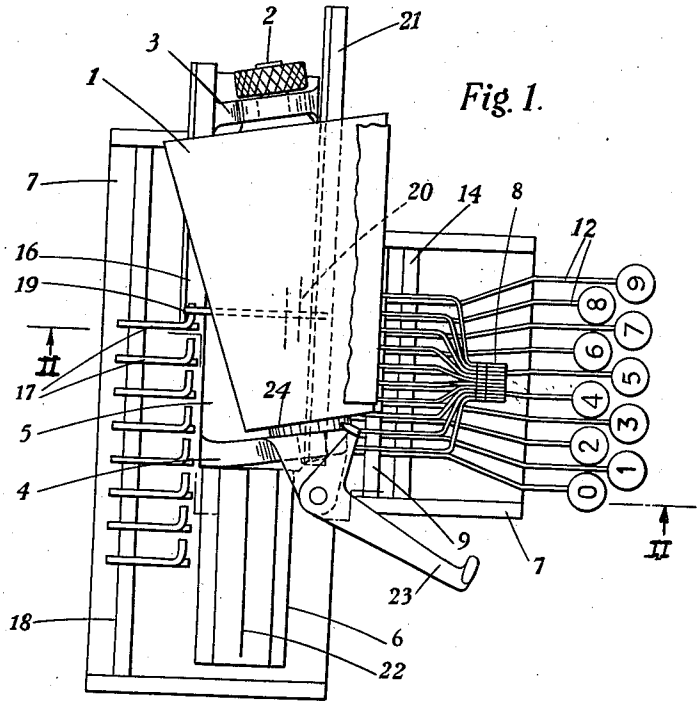



Fig. 1.

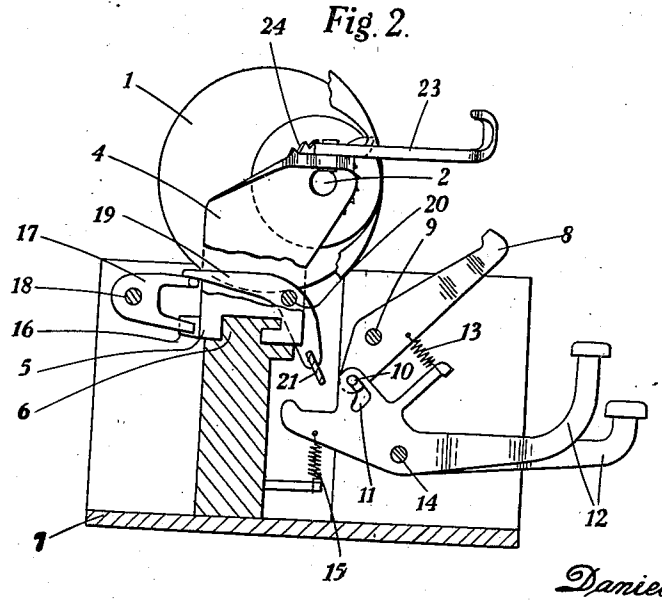



Fig. 2.

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Fig. 3.

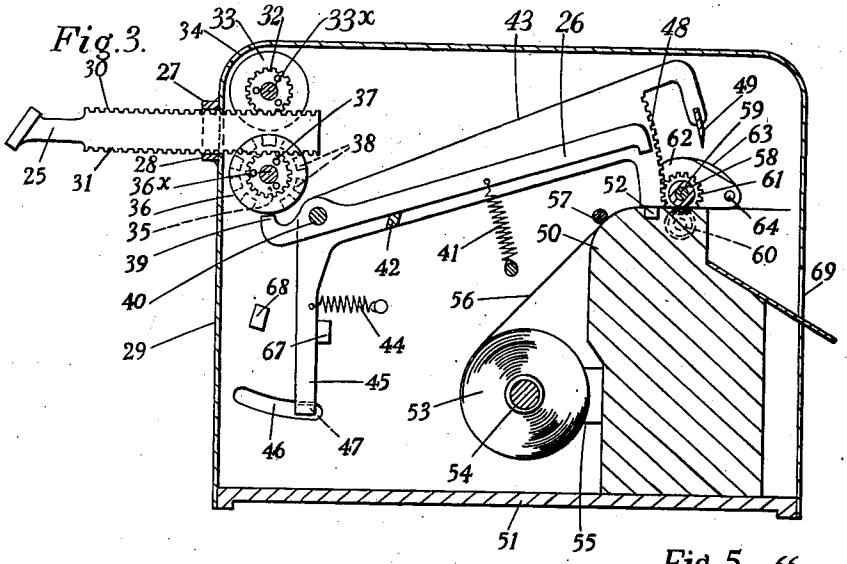



Fig. 5.

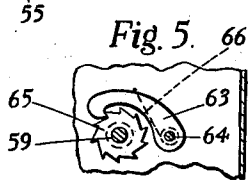
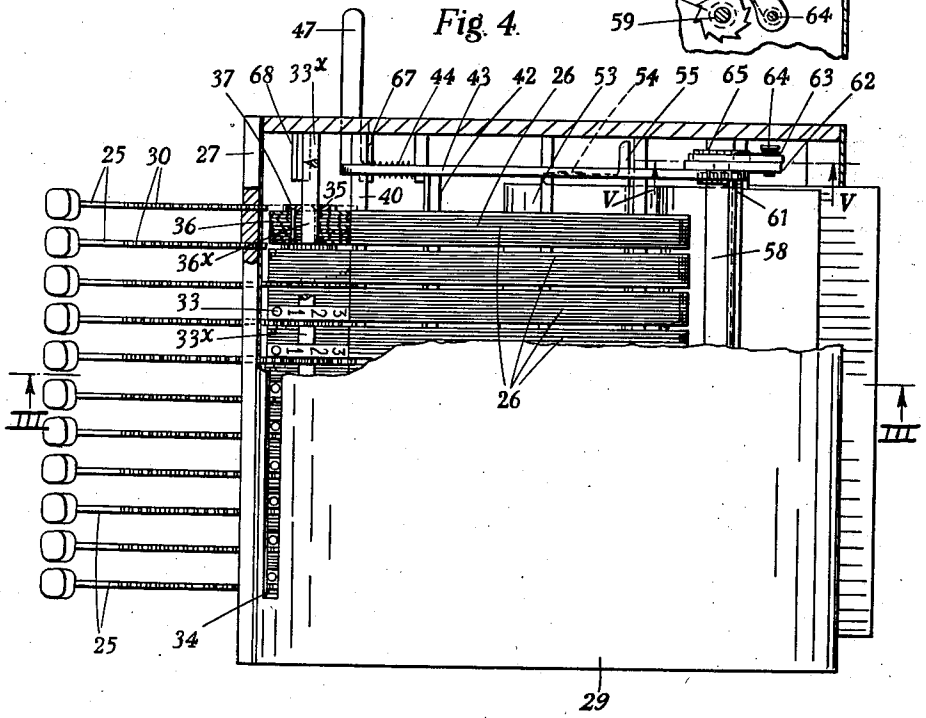



Fig. 4.




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# UNITED STATES PATENT OFFICE

2,232,652

## APPARATUS FOR PRODUCING PERFORATED STATISTICAL RECORDS AND THE LIKE

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Application October 10, 1938, Serial No. 234,286
In Great Britain October 29, 1937

14 Claims. (Cl. 164—112)

This invention relates to apparatus for producing perforated statistical records, control screens and the like, more particularly records and screens such as described in the specification to my pending applications, Serial Nos. 144,022 and 194,543.

In the known records of the Hollerith or Powers type, each number comprising one or more digits is represented by one or more perforations or slots arranged two-dimensionally, i. e. the record is divided into vertical digit areas which are sub-divided into horizontal numeral areas. Unlike this arrangement, the slots in the records described in the specification referred to above are arranged single-dimensionally, all slots representing one item being positioned along one line. These last records may be of rectangular, circular, or part circular, such as sectoral, outline, or they may be of cylindrical or part cylindrical form.

The object of this invention is to provide an apparatus adapted to perforate or punch single dimensional records in which each value of each denomination is recorded by punching a single area reserved for this value on the card.

In the accompanying drawings which illustrate this invention:

Figure 1 is a plan of one embodiment of the invention;

Figure 2 is a view partly in side elevation and partly in section on line II—II of Figure 1;

Figure 3 is a sectional side view on line III—III of Figure 4 of a further embodiment of the invention;

Figure 4 is a plan, partly in section, of the embodiment shown in Figure 3, and,

Figure 5 is a section on line V—V of Figure 4.

In the embodiment of the invention illustrated in Figures 1 and 2, an apparatus for punching single-dimensional records or control screens comprises a conical platen 1 provided with a cover or surface of hard rubber or other suitable material, which may be substituted, said platen being secured upon a shaft 2 mounted at each end in bearings 3 and 4 provided on a carriage member 5 at such an angle that the front portion of the platen 1 is parallel to the longitudinal axis of the carriage, said carriage being slidably mounted on a bed 6 secured to a main frame 7. A series of punching hammers 8 are rockably mounted on a shaft 9 secured to the main frame 7, the lower ends of each of said hammers being provided with a pin 10 adapted to engage and slide within an inclined slot 11 formed adjacent the inner end of each of a series of levers or keys 12 arranged in the manner of typewriter keys, said pins 10 being maintained at the upper or inner ends of their respective slots by suitably disposed springs 13 so that the hammers are clear of the platen 1. The keys 12 are rockably mounted on a shaft 14 also secured to the main frame 7, said keys being maintained in an approximately level position by means of suitably disposed springs 15.

The carriage 5 is provided with a stop member 16 adapted to coact with a series of stops 17 adjustably mounted on a shaft 18, said stops being adapted to be released in turn by a release lever 19 pivotally mounted at 20 on the carriage 5, said lever being provided with a release bar 21 extending the full length of the carriage. The carriage is drawn against the stops 17 by a spring loaded wire or tape 22 in the manner of a typewriter carriage.

A record blank of paper or other suitable material is placed in the apparatus and maintained against the platen by means (not illustrated) also similar to those usually employed on a typewriter, and on depressing a key 12 the corresponding hammer 8 is caused to swing forward against the platen 1 and punch a slot in the record. When the pin 10 on the lower end of the hammer reaches the lower end of the slot 11 in the key, the spring 13 connected between the hammer and key causes the hammer to swing backwards, thereby clearing the record, but the key continues its downward movement until a projection thereon touches the said release bar 21 and causes the release lever 19 to disengage the adjustable stop 17 with which the stop member 16 on the carriage 5 happens to be coacting, thereby permitting the carriage to move against the next stop. This operation is repeated until all the digits of the number are punched; thereupon the carriage is moved back to its original position and the platen turned a certain amount again in the manner, and by the means, usually employed on typewriters, such as by the bell-crank-lever 23 engaging a toothed wheel 24 on the axle of the platen, the record being thereby moved into the next working position.

The number of keys is made equal to the highest number of numerals in, or possible values of, any one denomination; for instance, ten keys are required for the decimal system or twelve keys for pennies etc.

An apparatus according to this invention adapted to perforate records of rectangular shape would be provided with a cylindrical platen disposed with its axis parallel to the carriage.

According to another embodiment of this in-

vention, illustrated in Figures 3, 4 and 5, a key 25 and a series of hammers 26 are provided for each denomination, one hammer for each numeral or possible value of the denomination in question. Each key 25 is adapted to slide horizontally in bearings 27, 28 in a fixed frame or casing 29, and is furnished on its top and bottom edges with rack teeth 30, 31, the upper rack being adapted to mesh with a pinion wheel 32 secured to an indicator wheel 33, mounted on a shaft $33^x$, said indicator wheel being provided with numerals around its periphery, so that the position of each key 25 is indicated by the particular numeral on the corresponding indicating wheel which is displayed through a suitable slot 34 in the casing 29. The lower rack 31 of each key is adapted to mesh with a pinion 35 rigidly fixed to a series of selector discs 36 by means of rivets 37. Said discs, mounted on the shaft $36^x$, are each furnished with a circumferential notch 38, said notches being circumferentially displaced with respect to each other. The arrangement is such that a numeral (five for instance) on the indicating wheel 33 is displayed through the window 34 when the notch on the fifth selector disc 36 is turned downwards towards a locking arm 39 on a punching hammer 26, one of which is provided for each selector disc 36. The punching hammers 26 are rockably mounted upon a fixed shaft 40, and are drawn by individual springs 41 downwardly against a retaining bar 42 carried at each end upon bracket members 43, rockably mounted on the fixed shaft 40, and maintained in an elevated position by a string spring 44, one end of which is attached to a downwardly extending member 45 of one of the bracket members 43, the lower end of which is bent at right angles and extends outwards through an arcuate slot 46 in the casing 29 to form an operating handle 47; the free end of each bracket member 43 is furnished with a gear segment 48, and a guillotine blade 49 is carried between extensions from said free ends.

The free ends of the hammers 26 are arranged above a platen 50 secured to a base plate 51, a recess 52 being provided in said platen where each of the hammers are adapted to strike same, and said recesses may be filled with interchangeable pieces of suitable material. A reel of paper 53 is mounted on a shaft 54, supported in brackets 55, and the paper strip 56, pulled from the reel 53, is supported on the surface of the platen 50, and is maintained in close contact with said surface by means of a roller 57 and an india-rubber feed roller 58, secured on the shaft 59, said feed roller 58 coacting with a roller 60 disposed on the underside of the paper strip 56. A pinion 61, adapted to mesh with the gear segment 48, is rotatably mounted on the shaft 59. A plate 62 is rigidly secured to the pinion 61, and a pawl 63 is pivotally mounted on a pin 64 carried by said plate, said pawl being maintained in engagement with a ratchet wheel 65 rigidly mounted in the shaft 59 by a spring 66.

In the operation of the machine as above described, when it is desired to punch a line of slots representing a number, the keys 25 are pushed inwardly until the desired digits appear behind the slot 34, and then the operating handle 47 is pulled from against the stop 67 towards and against the stop 68, causing the bracket members 43 and the retaining bar 42 to descend and release the hammers 26. Only that one selected hammer in each denomination group which has its locking arm 39 below the notch 38 in its selector disc 36 can, however, move, and these hammers therefore descend and simultaneously punch a line of perforations in the record or paper strip 56. Downward movement of the bracket members 43 also causes the guillotine blade 49 to descend and cut off a previously punched record, which is allowed to fall out through a suitable opening 69 in the casing. When the handle 47 is released, the bracket members 43 are raised by the spring 44, and, by means of the gear segments 48, pinions 61, ratchet 65 and pawl 63 and feed roller 58 and coacting roller 60, the paper is moved to expose a fresh unperforated portion for the next operation. At the same time the retaining bar 42 lifts the hammers 26 into their original positions.

The embodiment last described enables the number which is to be represented by a punched record to be set up on the indicating wheels and verified before punching is effected, thereby minimizing the possibility of punching an incorrect record.

It will be understood that the guillotine blade may be made easily removable, or thrown out of action, should it be desired to punch continuous records.

What I claim is:

1. In apparatus for producing statistical records, control screens, and the like, in combination, a platen on which the blank record is to be laid, means to step the platen transversely to present denominational groups of digit areas, a plurality of punching members, all having similarly shaped punching heads and disposed side by side in a single line transversely of the record blank, key-operated means for selectively operating the punching members to perforate the record with indentically shaped perforations in relevant digital positions stepped in denominational groups across the record blank, each digital value of each denomination being recorded by punching a single digital area reserved for this digital value on the card, so that the recorded information is determined by the relative positions of the perforations in a single line across the record, and means for longitudinally line-stepping the record relatively to the punching members.

2. In apparatus according to claim 1, a carriage on which the platen is rotatably mounted, a bed on which the carriage is slidably carried, means for constantly urging the carriage to move across the bed in one direction, adjustable stops provided to stop movement of the carriage at predetermined places, key means for selectively operating the punching members, each key being operatively associated with a single punching member, means associated with the keys for releasing one of said stops when a key is operated, and means for rotating the platen to bring the record into successive working positions.

3. In apparatus according to claim 1, key means for selecting the punching members to be operated, each key being operatively associated with a plurality of punching members, of which only one at a time is to be released.

4. In apparatus according to claim 1 a plurality of groups of punching members, means for normally holding the punching members in inoperative position, key means for selecting for release not more than one punching member of each group, and releasing means for releasing said punching members selected for release.

5. In apparatus according to claim 1, a plurality of groups of punching members, means for

normally holding the punching members in inoperative position, a separate key means associated with each group of punching members for selecting for release not more than one punching member of each group, indicating means operatively associated with each key means for indicating the punching member selected for release, and means for releasing said punching members selected for release.

6. In apparatus according to claim 1, a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate key means associated with each group of punching members for selecting for release not more than one punching member of each group, indicating means operatively associated with each key means for indicating the punching member selected for release, and means for releasing said punching members selected for release comprising a group of notched discs operatively associated with each key means, each notched disc of a group co-operating with a punching member of a corresponding group of punching members.

7. In apparatus according to claim 1 a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate slidable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the key to indicate through a window the punching member selected for release, means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the said punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc.

8. In apparatus according to claim 1 a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate slidable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the said key to indicate through a window the punching member selected for release, releasing means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc, means for preventing operation of the selected punching members until such time as all the punching members to be operated for one line of the record have been selected, means for ensuring a simultaneous operation of all the selected punching members in one line and for returning the punching members to the initial position after they have been operated, and means for feeding forward the record after each stroke of the punching members.

9. In apparatus according to claim 1 a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate sildable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the said key to indicate through a window the punching member selected for release, releasing means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc, means for preventing operation of the selected punching members until such time as all the punching members to be operated for one line of the record have been selected, said means comprising a retaining bar to support the punching members and pivotally mounted side brackets between which the retaining bar is carried, means for ensuring simultaneous operation of all the selected punching members in one line and for returning the punching members to the initial position after they have been operated, the said means comprising a handle connected to the side brackets and adapted on operation to swing the side brackets around their pivotal connections, and thereby to lower and raise the retaining bar, and means for feeding forward the record after each stroke of the punching members.

10. In apparatus according to claim 1 a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate slidable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the key to indicate through a window the punching member selected for release, means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc, means for preventing operation of the selected punching members until such time as all

the punching members to be operated for one line of the record have been selected, said means comprising an electro-magnet acting on the said punching members and means for intermittently energising and deenergising said electro-magnet whereby the selected punching members are simultaneously operated and retracted after operation, and means for feeding forward the record after each stroke of the punching members.

11. In apparatus according to claim 1 a web of material constituting the blank record, a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate slidable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the key to indicate through a window the punching member selected for release, means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc, means for preventing operation of the selected punching members until such time as all the punching members to be operated for one line of the record have been selected, means for ensuring simultaneous operation of all the selected punching members in one line and for returning the punching members to the initial position after they have been operated, and means for feeding forward the web of material constituting the blank record, said means comprising a feed roller, a roller coacting with the feed roller, and a ratchet mechanism for actuating the feed roller during the return stroke of the punching members.

12. In apparatus according to claim 1 a web of material constituting the blank record, a plurality of groups of punching members, means for normally holding the punching members in inoperative position, a separate slidable key associated with each group of punching members for selecting for release not more than one punching member of each group, an indicating drum arranged to be rotated by the sliding movement of the key to indicate through a window the punching member selected for release, means for releasing the punching member selected for release, the means for normally holding the punching members in inoperative position and the releasing means comprising a group of notched discs operatively associated with each slidable key, each notched disc of a group co-operating with a punching member of a corresponding group of punching members and arranged relatively thereto so that in the inoperative position the punching member is held against movement by contact with the unnotched periphery of the disc, whilst in the operative position, after selection by the key, movement of the said punching member is permitted by reason of the notch in the disc, means for preventing operation of the selected punching members until such time as all the punching members to be operated for one line of the record have been selected, said means comprising a retaining bar to support the punching members, and pivotally mounted side brackets between which the retaining bar is carried, means for ensuring simultaneous operation of all the selected punching members in one line and for returning the punching members to the starting position after they have been operated comprising a handle connected to the side brackets and adapted in operation to swing the side brackets around their pivotal connections and thereby to lower and raise the retaining bar, and a guillotine carried on the side brackets adapted to sever each record from the web of material when the next succeeding record is punched.

13. In apparatus for producing statistical records, control screens, and the like, in combination, a platen on which the blank record is to be laid, means to step the platen transversely to present denominational groups of digit areas, a plurality of punching members, all having similarly shaped punching heads and disposed side by side in a single line transversely of the record blank, and key-operated means for selectively operating the punching members to perforate the record with identically shaped perforations in relevant digital positions stepped in denominational groups across the record blank, each digital value of the full denominational sequence of digits of each denomination being recorded by punching a single digital area reserved for this digital value on the card, so that the recorded information is determined by the relative positions of the perforations in a single line across the record.

14. In apparatus for producing statistical records, control screens and the like, in combination, a platen on which the blank record is to be laid, means to step the platen transversely to present denominational groups of digit areas, a plurality of punching members, all having similarly shaped punching heads and disposed side by side in a single line transversely of the record blank, and key-operated means for selectively operating the punching members to perforate the record with identically shaped perforations in relevant digital positions stepped in denominational groups across the record blank, each digital value of the full denominational sequence of digits of each denomination being recorded by punching a single digital area reserved for this digital value on the card, so that the recorded information is determined by the relative positions of the perforations in a single line across the record, and means for longitudinally line-stepping the record relatively to the punching members.

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