April 20, 1943. C. R. OESCH 2,317,107

EDUCATIONAL DEVICE

Filed June 15, 1942 2 Sheets-Sheet 1

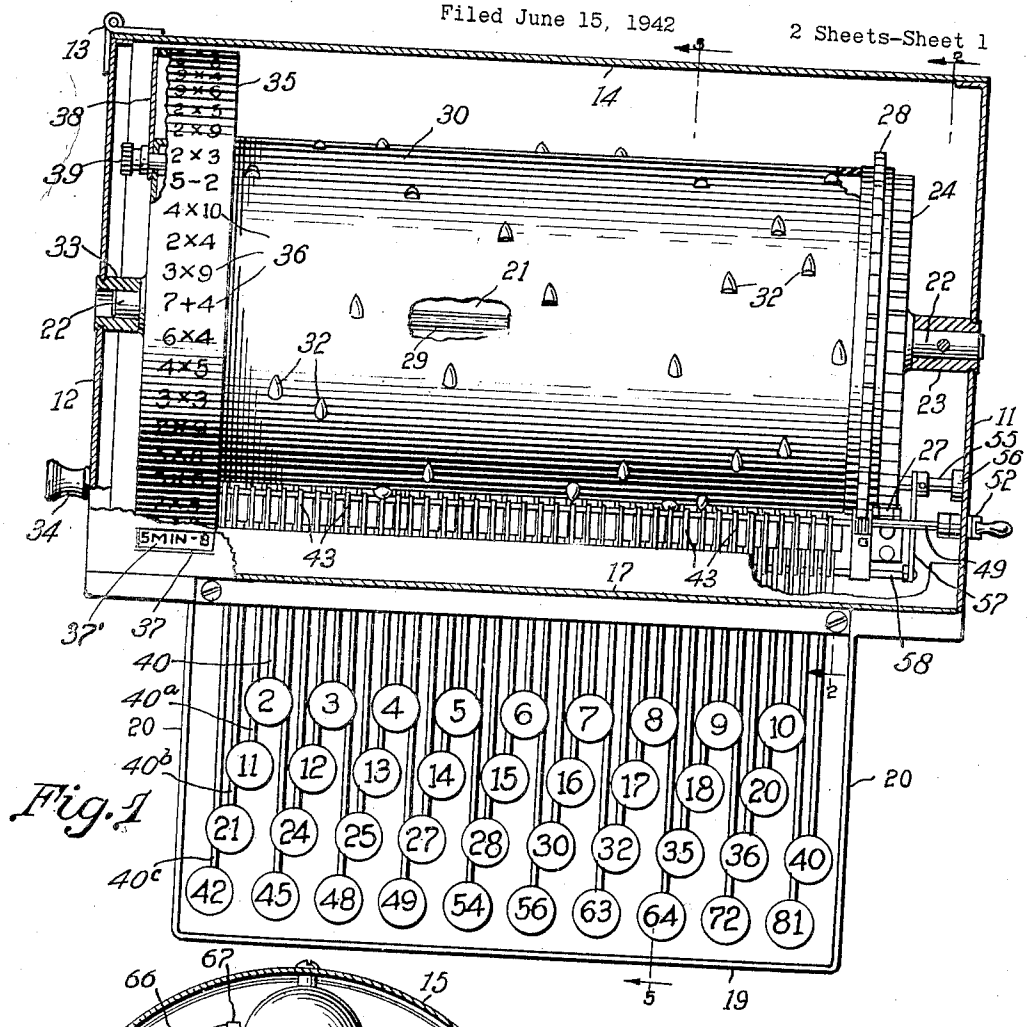


Fig. 1

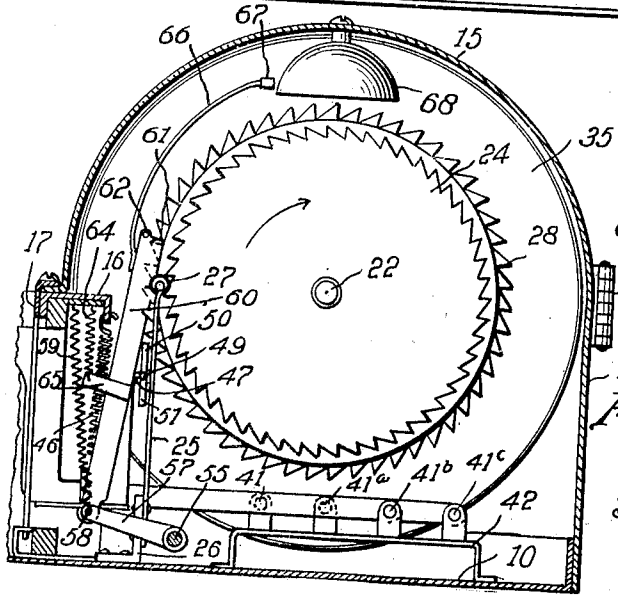


Fig. 2

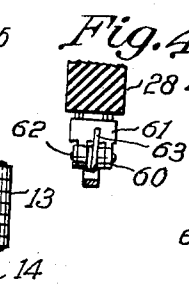


Fig. 4

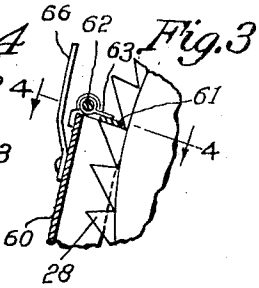


Fig. 3

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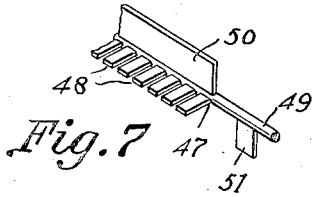


Fig. 7

Fig. 5

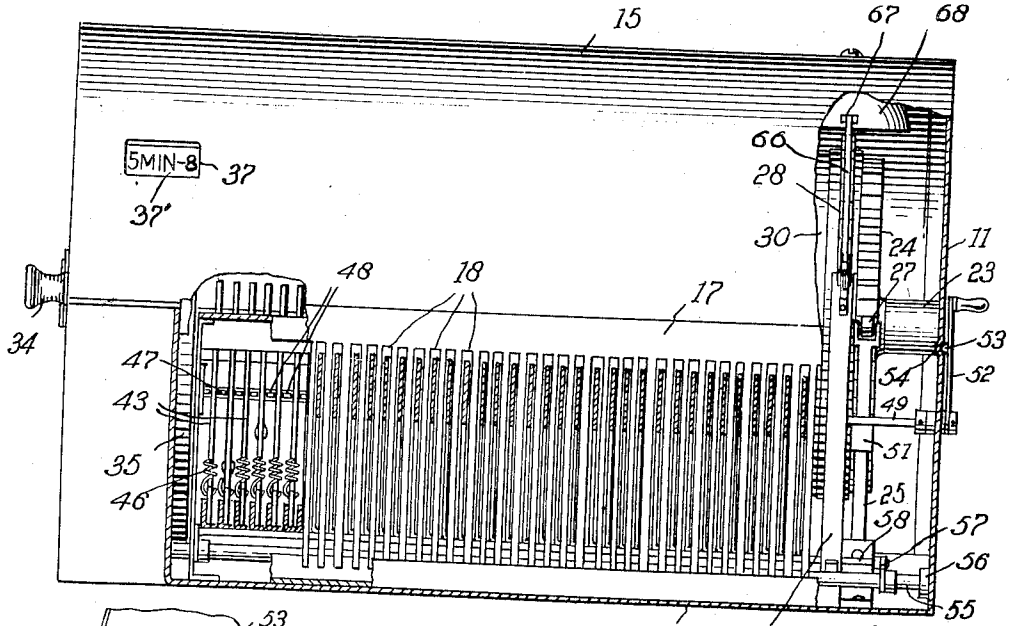


Fig. 6

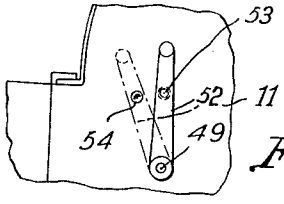


Fig. 8.

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UNITED STATES PATENT OFFICE

2,317,107

EDUCATIONAL DEVICE

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Application June 15, 1942, Serial No. 447,051

6 Claims. (Cl. 35—22)

The invention relates to a mathematical test machine to facilitate the teaching of arithmetic and more particularly to a device to be operated by the student so that tests in arithmetic may be carried out in an interesting and instructive manner.

An object of the invention is to provide a machine comprising a cylinder having thereon a plurality of simple mathematical problems arranged to be successively displayed through a window in the housing of the machine, a plurality of keys similar to typewriter keys being provided and so arranged that the cylinder will be rotated to display the next problem only when the key designated by the proper answer to each problem is depressed.

A further object is to provide a machine of this character with means for operating a bell or other signal by depression of any key excepting the correct key.

A still further object is the provision of such a machine in which the cylinders may be easily and quickly changed so that a great variety of mathematical problems may be worked out upon the machine.

Another object of the improvement is to provide a roll upon which the cylinder is detachably mounted, pawl and ratchet means being provided for operatively associating the cylinder to the keys, means being provided in the machine for rendering all of the pawls inoperative so that the cylinder may be removed from the roll and replaced by another cylinder.

A further object of the invention is to provide an apparatus of this character in which each cylinder in its initial position upon the machine indicates the time limit for operation of the machine to complete the mathematical problems upon the cylinder, and also indicates the proper key to be operated to rotate the cylinder to starting position.

Another object is the provision of such a machine with a novel ratchet and pawl mechanism for ringing a signal bell when an incorrect key is depressed.

Still another object of the improvement is to provide a machine of this character having a comb for separating the various key operated pawls which rotate the cylinder, means being provided for oscillating the comb so as to hold all of the pawls away from the cylinder and simultaneously locking the roll against rotation in order to remove and replace the cylinder.

A further object of the invention is to provide a new and useful mathematical test apparatus so constructed and operated as to be interesting to children particularly and to encourage them to learn mathematical problems.

The above objects together with others which will be apparent from the drawings and the following description may be attained by constructing and operating the improved machine in the manner illustrated in the accompanying drawings in which—

Figure 1 is a top plan view of a machine embodying the invention, parts being broken away for the purpose of illustration;

Fig. 2, a section taken on the line 2—2, Figure 1;

Fig. 3, a fragmentary sectional elevation of the improved pawl and ratchet mechanism for ringing the signal bell when the wrong response is made;

Fig. 4, a section taken on the line 4—4, Fig. 3;

Fig. 5, a transverse sectional view through the machine taken on the line 5—5, Fig. 1;

Fig. 6, a section taken substantially on the line 6—6, Fig. 5;

Fig. 7, a fragmentary perspective view of a portion of the oscillating comb for spacing the pawls and locking them in inoperative position; and

Fig. 8, a detail elevation of the lever for operating said comb.

Similar numerals refer to similar parts throughout the several views.

The machine may include a housing comprising a bottom wall 10, side walls 11 and 12, the latter preferably being removable or hinged as shown at 13 to the back wall 14 which may be extended upward and forward to form a semi-cylindric top wall 15, the forward end of which may be connected to the transversely disposed channel frame member or bar 16 to which is connected the front partition wall 17 vertically slotted as indicated at 18 to permit operation of the key bars as will be later described.

The bottom wall 10 may be extended a distance forwardly of the slotted wall 17 and terminate in the upturned front wall 19 and side walls 20 forming an open topped housing for the keys.

The roll 21 may be journaled upon the shaft 22 one end of which is fixed within the elongated bearing sleeve 23 carried by the side wall 11.

A ratchet wheel 24 is formed upon or fixed to this end of the roll and is engaged by a pawl comprising the spring arm 25 fixed to the housing as by the angle bracket 26 attached to the bottom wall 10, a roller 27 being carried upon the

free end of the spring arm 25 and adapted to cooperate with the teeth of the ratchet 24 to properly line space the operation of the roll.

Formed upon or fixed to the roll 21 adjacent to the ratchet wheel 24 is another ratchet wheel 28 the teeth of which are directed oppositely to those of the ratchet 24.

The roll 21 is provided with a longitudinal groove 29 for properly locating the cylinder 30 thereon.

These cylinders may be formed of plastic or any other suitable material being hollow as best shown in Fig. 5 and of suitable diameter to have a sliding fit upon the roll 21, an internal longitudinal rib 31 being formed in the cylinder to be received in the groove of the roll.

Each cylinder has located around its periphery at properly spaced points a plurality of teeth or lugs 32 corresponding in number to the problems carried upon the roll and corresponding in position relative to each other and to the keys for operating the cylinder in a manner to be later described.

The opposite end of the shaft 22 is adapted to be received in bearing sleeve 33 carried by the hinged side wall 12 which may be provided with knob 34 for swinging the same upon its hinge 13 so as to remove the cylinder from the roll when it is desired to place a new cylinder in the machine.

An enlarged rim portion 35 may be formed upon this end of the cylinder and the various mathematical problems as indicated at 36 may be printed or otherwise displayed upon this enlarged rim portion in position to be successively displayed through the window 37 in the semi-cylindric top wall 15 of the housing.

Also, as indicated at 37', in Figs. 1 and 6, there is printed or otherwise displayed upon the enlarged rim portion 35 of each cylinder, a legend indicating the time limit within which the problems upon that cylinder should be completed and the key which should be operated to rotate the cylinder to starting position.

As shown in the views of the drawings above referred to, the particular cylinder shown carries, on its rim portion 35, a legend 37' indicating that the problems upon this cylinder should be completed within a time limit of five minutes, as indicated at "5 min." in Figs. 1 and 6, and that the 8 key should first be operated to start the operation of the cylinder, as indicated by the numeral "8" following said time limit indication.

This legend 37' is so positioned upon the enlarged rim 35 that it will be displayed through the window 37 when the cylinder is in the initial or starting position, that is the position in which each cylinder is placed upon the roll 21, with the groove 29, of the roll, and rib 31, of the cylinder at the exact top of the roll, as shown quite clearly in Fig. 5.

For the purpose of holding the cylinder against end motion upon the roll a link member 38 may be pivotally connected to the outer end of the roll as by the thumb screw 39 and adapted to engage over the end of the enlarged rim portion 35 of the cylinder to hold the same in proper position upon the roll as shown in Figure 1.

The key bars are located in four rows indicated at 40, 40_a, 40_b, and 40_c and are pivoted as shown at 41, 41_a, 41_b, and 41_c, respectively, upon a suitable bracket 42 mounted upon the bottom wall 10 beneath the roll.

Each key bar carries the upright pawl 43 having an angular extension 44 at its lower end pivoted as at 45 upon the corresponding key bar, a spring 46 connecting said angular extension of the pawl to the channel bar 16 so as to normally urge the upper end of the pawl toward the cylinder 30.

With this construction as a key is depressed the corresponding pawl will ride down over the corresponding tooth or lug 32 upon the cylinder 30 and as the key is released the spring 46 will raise the key bar back to normal position, the pawl 43 of said key bar engaging over the corresponding tooth 32 and rotating the cylinder 30, and the roll 21 upon which it is mounted, in the direction of the arrows shown in Figs. 2 and 5.

The line spacing pawl 25 cooperating with the ratchet wheel 24 will permit the cylinder to be rotated a distance equal to the length of one tooth 32 so that the next problem upon the enlarged rim 35 of the cylinder will be displayed through the window 37.

As shown in the drawings the roll is in the initial position and the eight key must be operated to start the roll.

For the purpose of properly spacing the pawls 43 a comb 47 is provided having the spaced teeth 48 adapted to be received between the pawls 43 and hold them in proper spaced relation relative to the teeth 32 upon the cylinder.

In order to move all of the pawls 43 away from the cylinder so that the same may be removed from the roll, and at the same time to hold the roll against rotation at this time, the comb 47 may be mounted to oscillate upon a shaft or rod 49 and provided with the upwardly disposed bar 50 and the depending finger 51.

An operating lever 52 may be fixed upon one end of the shaft 49 upon the outside of the side wall 11 and adapted to be rocked from the full line position to the dotted line position shown in Fig. 8 in order to swing the bar 50 against all of the pawls 43 and move them away from the cylinder and at the same time to swing the finger 51 against the pawl 25 and hold the same tightly engaged with the ratchet wheel 24; for the purpose of holding the parts in this position a projection 53 may be formed upon the inner side of the lever 52 and adapted to engage in an aperture or cavity 54 in the side wall 11.

For the purpose of giving a signal when any key excepting the correct one is depressed at any time during the operation of the machine a novel device is provided including a rocker shaft 55 which is journaled at opposite ends in suitable bearings 56 and provided with rocker arms 57 extending forwardly and connected as by the bar 58 adapted to be held in contact with the lower edges of all of the key bars as by the spring 59 connecting the bar 58 to the channel member 16.

A channel cross sectional shaped lever 60 is pivoted at its lower end upon the bar 58 and its upper portion straddles the teeth of the ratchet 28.

A hinged gate 61 is hingedly connected to the upper end of the channel lever 60 as indicated at 62 and normally urged down upon the top of the channel by the spring 63 as shown in Figs. 3 and 4.

A spring 64 is connected to the lug 65 upon the channel lever 60 and to the channel bar 16 for normally urging the channel lever 60 toward the ratchet wheel 28.

A spring wire 66 is connected at its lower end to the upper portion of the lever 60 and carries at its upper end a tapper 67 adapted to strike

the bell 68 which may be supported within the top wall 15 of the housing.

In the operation of the machine as the proper key is depressed the cylinder will be rotated in the direction of the arrows a distance of one tooth or lug 32.

As the key is depressed the key bar will cause the rocker frame 57—58 to move downward therewith pulling the lever 60 down the distance of one tooth upon the ratchet 28.

The hinged gate 61 will raise as the lever 60 moves downward and will then close beneath the tooth 28 over which it has passed and drop into position over the top of the next lower tooth on the ratchet 28.

Then as the key is released the cylinder will be rotated as the lever 60 rises to normal position.

However, if an incorrect key is depressed it will be seen that on the upward movement of the lever 60 the cylinder will not be rotated thus causing the upper end of the lever 60 to move out away from the cylinder as the gate 61 passes upward over a stationary tooth upon the ratchet 28.

As the lever 60 reaches the upward limit of its movement it will be thrown back into position against the ratchet 28, by means of the spring 64, causing the tapper 67 to strike the bell 68 and call the operator's attention to the fact that an incorrect key was depressed and the cylinder was not operated.

Since the cylinder is not rotated when an incorrect key is depressed, the same problem will remain displayed through the window 37 until the correct key is depressed.

From the above it will be seen that by practice this machine develops an instant response to number combinations so that the student seeing any number combination displayed through the window 37 will immediately depress the proper key.

For instance, assuming that the number combination 3×9 is displayed through the window 37, the student wlil instantly depress the key 27, and since the cylinder is so arranged that at this time the tooth or lug 32 thereon which is in line with the pawl of the key 27 is in position to be engaged by the pawl of said key, the cylinder will be operated and the next problem 7+4 will be displayed through the window 37 at which time depression of the key 11 will again operate the cylinder.

As a time limit is indicated for each cylinder the operator must know the correct answer to each combination as it appears through the window 37 or otherwise he will be unable to complete the series of problems within the time limit.

As shown in the drawings, each cylinder is arranged to present in order fifty number combinations, and as these combinations may be varied upon different cylinders the machine is capable of providing mathematical tests to suit the age or advancement of the pupil.

I claim:

1. A machine of the class described including a housing having a sight opening, a cylinder rotatable within said housing, the cylinder having a series of indicia constituting problems around one portion of its periphery in position to be successively displayed through said sight opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, movable pawls operated by said keys, means for normally holding the pawls in contact with the cylinder, and a series of longitudinally and circumferentially spaced lugs upon said cylinder for engagement with said pawls for intermittently rotating the cylinder, said lugs being so located that in any position of the cylinder only the pawl of the key bearing the answer to the problem displayed through said sight opening will be in operative position relative to one of said lugs.

2. A machine of the class described including a housing having a sight opening, a cylinder rotatable within said housing, the cylinder having a series of indicia constituting problems around one portion of its periphery in position to be successively displayed through said sight opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, movable pawls operated by said keys, means for normally holding the pawls in contact with the cylinder, and a series of longitudinally and circumferentially spaced lugs upon said cylinder for engagement with said pawls for intermittently rotating the cylinder, said lugs being so located that in any position of the cylinder only the pawl of the key bearing the answer to the problem displayed through said sight opening will be in operative position relative to one of said lugs, signal means, and means operated by the operation of any other of said keys for causing operation of said signal means.

3. A machine of the class described including a housing having a sight opening, a cylinder rotatable within said housing, the cylinder having a series of indicia constituting problems around one portion of its periphery in position to be successively displayed through said sight opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, and cooperating means upon the cylinder and keys for causing intermittent rotation of the cylinder only by operating the key bearing the answer to the problem displayed through said sight opening, a ratchet wheel upon said cylinder, a channel cross-sectional shape lever associated with said ratchet wheel so that the teeth of the ratchet wheel move through the channel as the cylinder is rotated, means for moving the lever tangentially from and toward the ratchet wheel by operation of any of said keys, a signal, and a hinged gate upon the lever cooperating with the ratchet wheel for operating said signal by operation of any key other than the key bearing the answer to said problem.

4. A machine of the class described including a housing having a sight opening, a roll rotatable within said housing, a cylinder removably mounted around the roll, interengaging rib and groove means on the roll and cylinder, a series of problems around one portion of the periphery of the cylinder in position to be successively displayed through said sight opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, and cooperating means upon the cylinder and keys for causing intermittent rotation of the cylinder only by operating the key bearing the answer to the problem displayed through said sight opening.

5. A machine of the class described including a housing having a sight opening, a roll rotatable within said housing, a cylinder removably mounted around the roll, interengaging rib and groove means on the roll and cylinder, a series of indicia constituting problems around one portion of the periphery of the cylinder in position to be successively displayed through said sight

opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, movable pawls operated by said keys, means normally holding the pawls in contact with the cylinder, a series of longitudinally and circumferentially spaced lugs upon said cylinder for engagement with said pawls for intermittently rotating the cylinder, said lugs being so located that in any position of the cylinder only the pawl of the key bearing the answer to the problem displayed through said sight opening will be in operative position relative to one of said lugs, and means for simultaneously moving said pawls away from the cylinder and holding the roll against movement to permit removal of the cylinder from the roll.

6. A machine of the class described including a housing having a sight opening, a roll rotatable within said housing, a cylinder removably mounted around the roll, interengaging rib and groove means on the roll and cylinder, a series of indicia constituting problems around one portion of the periphery of the cylinder in position to be successively displayed through said sight opening as the cylinder is rotated, a plurality of keys each having thereon the answer to one of said problems, movable pawls operated by said keys, means normally holding the pawls in contact with the cylinder, a series of longitudinally and circumferentially spaced lugs upon said cylinder for engagement with said pawls for intermittently rotating the cylinder, said lugs being so located that in any position of the cylinder only the pawl of the key bearing the answer to the problem displayed through said sight opening will be in operative position relative to one of said lugs, a ratchet wheel fixed upon the roll, a line spacing pawl engaging said ratchet wheel, a comb journaled within the housing and having spacing teeth located between said key pawls, a bar fixed upon said comb between the cylinder and said key pawls, a lug fixed upon said comb adjacent to the outer side of the line spacing pawl, and means for rocking said comb to cause said bar to move the key pawls away from the cylinder and to cause said lug upon the comb to hold the line spacing pawl tightly engaged with the ratchet wheel.

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