PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvement in Electric Toy Locomotives with Electric Reversing Gear.

We, WALDEMAR SCHWARZENHAUER, of Eltersdorf bei Erlangen, Bavaria, Germany, German subject, and BING-WERKE vorm. GEBRUDER-BING A.G., of Blumenstrasse 16, Nurnberg, Germany, a German Joint Stock Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In connection with electric toy railways it is generally usual to make the motor conveniently reversible by employing an electric changing switch which varies the direction of the current in the armature or magnetic circuit. This reversing operation is ordinarily effected by hand. In recent times however constructions have been introduced, in which the controlling of the changing switch is effected electro-magnetically. These toy locomotives with automatic electric reversing gear have the advantage over the locomotives with hand operated gear that they can be controlled during the journey and also from a distance, whereby playing therewith is made particularly charming. In these automatic electric reversing arrangements the reversing is mostly effected by means of a special electro magnet, which is energised simultaneously with the introduction of the current.

The object of the present invention is to dispense with this special electromagnet and to employ the field magnet of the motor itself for this purpose. This is effected according to this invention by separating the iron of the field magnet at a place transversely to the direction of the lines of force, that is dividing this magnet into two pieces which, when it is energised act electro magnetically. The tensional forces arising are then transmitted by suitable means to the electric changing switch of the motor.

One example of carrying the invention into effect is shown in the drawings in which

Figure 1 is a side elevation of the driving and reversing device of an electric toy locomotive with the side removed.

Figure 2 a plan of the locomotive.

Figures 3 and 4 two circuiting arrangements.

Figures 5 and 6 the devices, which serve for adjusting the locomotive to run in one direction only.

The tri-polar armature 1 rotates between a lower fixed pole piece 2 and an upper pole piece 3 that is movable around a pin 4. The pole pieces are divided for the purpose of ensuring better magnetising. The movable left part of the upper pole piece 3 is provided with a pin 5 which engages in a slot 6 of a two arm switch lever 7. The switch lever 7 rocks on a screw-pin 8, an intermediate ring 9 determining the distance from the side 14. On its right downwardly bent arm it carries a switch 12 pivotally mounted on a pin 10 and abuts against a nose 11. On the right near the upper pole piece 3 a roller A with a wheel 15 having four teeth is mounted between the sides 13 and 14. On the roller A three brushes *a*, *b* and *c* wipe, which serve for reversing the current. Spring strips a^1 and c^1 are provided which press on and serve to brake the roller A to prevent it over-running. To the left of the armature 1 is positioned a magnetic coil 16 having a fixed iron core 17 between the left ends of the pole pieces 2 and 3.

The armature shaft 25 is mounted in V shape supports 19 and 20, on the sides 13 and 14 by means of screws 18 and 8. The support 19 further supports the contact sleeves 22 carrying the slide or con-

tact carbons 21 to which sleeves the connecting wires of the brushes *a* and *c* of the roller A are connected by means of screws 23 and 24. In the support 20 the transmission wheels for driving the wheel axle are mounted. The transmission of the power from the armature shaft 25 to the shaft of the left travelling wheels 26 is effected for example by two pairs of tooth wheels.

The current is taken from the middle rail 28 of the track by two slide or contact shoes 27, whilst the current is led off through the carriage frame over the travelling wheels 26 and the outer rails 29.

The changing of the direction of travel is effected by reversing the current in the armature. When the circuit is closed a powerful magnetic field is produced in the magnetic coil 16 and attracts the movable pole 3. The movement of the pole 3 is transmitted through the bent switch lever 7 around the pivot 8 first to the switch 12 and through this to the roller A by means of the wheel 15. The weight distribution of the switch 12 is so regulated that when this is in its positions of rest it lies always against the stop 11 of the switch lever 7. The switch lever 7, the switch 12 and the movable pole 3 are shown in the position of rest by dot and dash lines in Figure 1. The fully drawn lines represent the said parts during the working.

If the current is interrupted, the iron core 17 of the coil 16 loses its power of attraction and releases the movable pole 3. A spring 30 carried by a bridge 34 presses down the switch lever 7. At the same time the lever 7 raises with its left side extension the pin 5 and therewith the pole 3. In the downward movement of the right side part of the switch lever 7 the switch 12 is carried downwards. It moves freely on the pin 10 and the nose 31 can ride over a tooth 32 of the wheel 15, without the wheel 15 being rotated. When the nose 31 has passed the top of the tooth 32, the switch 12 drops back again into its normal position (see Figure 1 position shown by dot and dash lines). The lower part of the switch 12 lies against the stop 11 of the lever 7 and retains that position, when by introduction of the electric current the movable pole 3 is attracted by the iron core 17 of the coil 16 and the right part of the switch lever 7 that is connected with the pole 3 through the pin 5 and the slot 6 and is pivoted around the pin 8 is again raised with the switch. The nose 31 of the switch 12 engages under a tooth 32 of the wheel 15 and rotates this and the roller A to the extent of 90° in the direction of the hands of a watch. The motor is reversed and the direction of travel changed.

On the roller A for the electric control of the motor three brushes *a*, *b* and *c* wipe, which are conductively connected in a suitable manner with the screws 23, 24 and the coil 16 of the motor. The form, number and distribution of the actuating segments can be seen from the illustrations of the roller A (Figures 3 and 4). The roller in its complete rotation moves through four positions, two of which are intended for the forward running and two for the reverse. The four contacts I, II, III and IV are in electrically conductive connection with the shaft of the roller A and this in turn with the wheels 26 of the vehicle. The rest of the slide surface of the roller A is covered with a four tooth insulated metal plate V and is placed by means of the three brushes *a*, *b*, *c* alternately in conductive connection with the armature 1 or the coil 16.

In Figure 3 (position for forward running) the current takes the following path. Middle rail 28, sliding piece 27, coil 16, brush *b*, contact plate V, brush *c*, armature 1, brush *a*, contact I to the wheel 26 and to the outer rail 29.

By a fresh introduction of the electric current the wheel 15 with the roller A is rotated to the extent of 90°. Thereby the brushes *a* and *c* change their contacts I and V for the contacts V and III (Figure 4) and the current in the armature flows in the reverse direction. The brush *b* retains the contact V.

In Figure 4 (position for reverse running) the current takes the following path. Middle rail 28, sliding piece 27, coil 16, brush *b*, contact block V, brush *a*, armature 1, brush *c*, contact III to the wheel 26 and to the outer rail 29.

Thus every introduction of the electric current or downward movement of the pole 3 causes a movement of the switch lever 7 therewith a turning of the wheel 15 and of the roller A to the extent of 90° and a reversing of the motor.

If now it be desired that the locomotive shall run only in one direction, the same direction of travel can be established either by a short introduction of current twice or by moving a bolt 35, that engages against a pin 33 and holds the movable pole 3 on the iron core 17 (see Figures 5 and 6). The bolt 33 is carried through an eye 36 and through a slot 37 in the stand or frame of the locomotive to the side 13. A spring 40, which is made in one piece with the spring 30 and is carried on the bridge 34 can engage in notches 38, 39 whereby the bolt 35 is

held in its two end positions. The position of the bolt 35 drawn in complete lines shows the fixed position of the pole 3 on the iron core 17. The position of the bolt 35 drawn in dot and dash lines shows how it releases the pin 33 and therewith the movable pole 3, so that this brings about a reversing each time the electric current is introduced. Then when the curent is switched off the spring 30 cannot act.

The keeping of the locomotive in the same direction of travel by two short introductions of current is greatly favoured, as the train first jolts backwards a short distance and then goes on forwards. This is very remindful of actual railway travelling.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Improvement in electric toy locomotives with electric reversing gear, the distinguishing feature being that a part or a number of parts of the magnetic frame are separated transversely to the direction of the lines of force and arranged movably to the whole magnet in such a manner that the tensional magnetic forces arising between the different parts when the motor is put in circuit are utilised for controlling switch devices of the motor.

2. Improvement in electric toy locomotives with electric reversing gear, the distinguishing feature being that one pole piece of the magnetic frame is arranged so as to be movable around a pin and when the circuit is closed operates, by means of a nose on a spring influenced switch lever, with an engaging wheel that is carried on the shaft of an actuating roller.

3. Improvement in electric toy locomotives with electric reversing gear as claimed in Claim 1 or 2, the distinguishing feature being that the switching or engaging devices are locked for the reversing by means of a bolt that is movable by hand and fixes the movable pole on the iron core.

4. The improved electric toy locomotive with electric reversing gear constructed substantially as described with reference to the annexed drawings.

Dated this 5th day of August, 1924.

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Agents for the Applicants.

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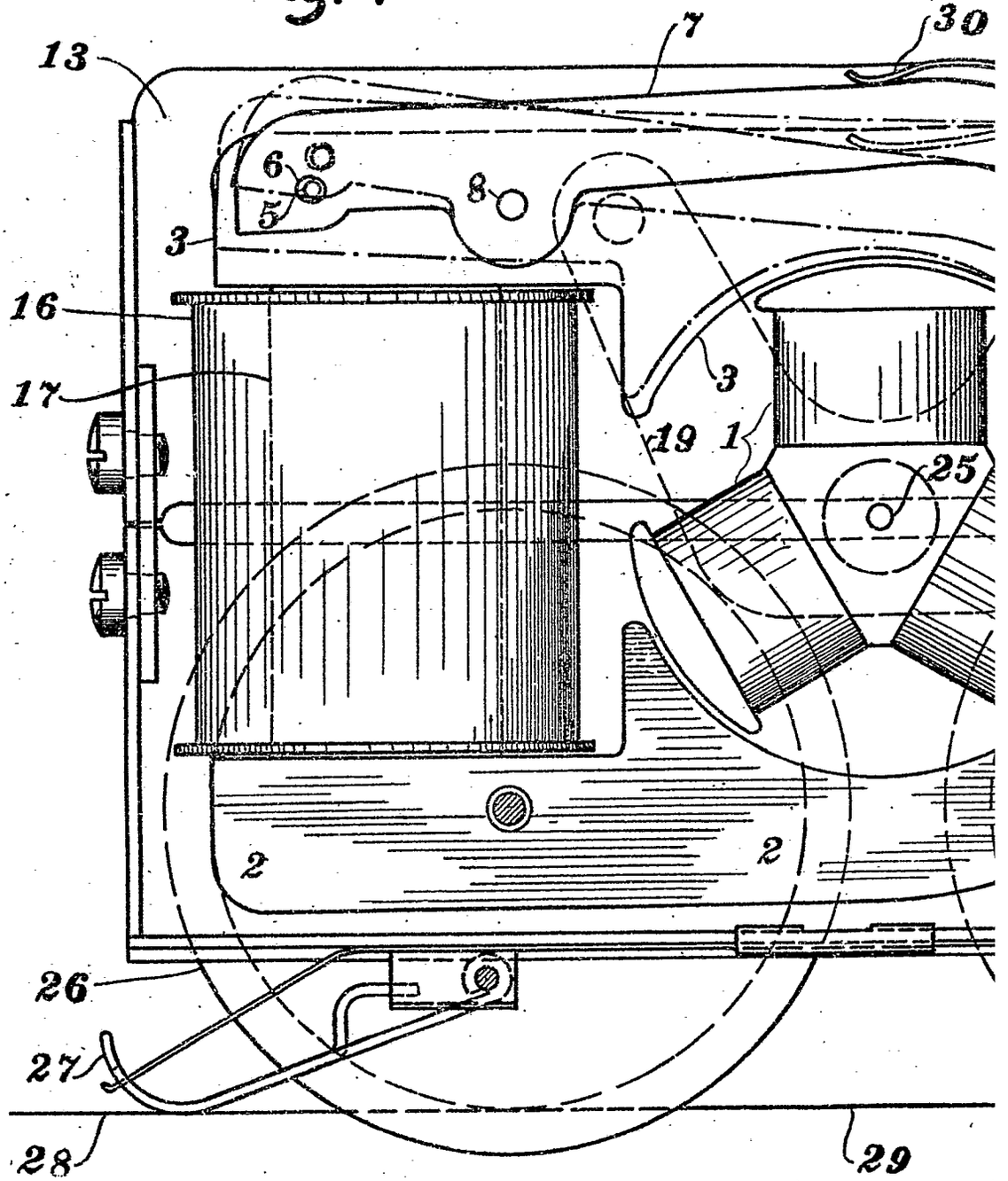
[This Drawing is a full-size reproduction of the Original.]

Fig. 1



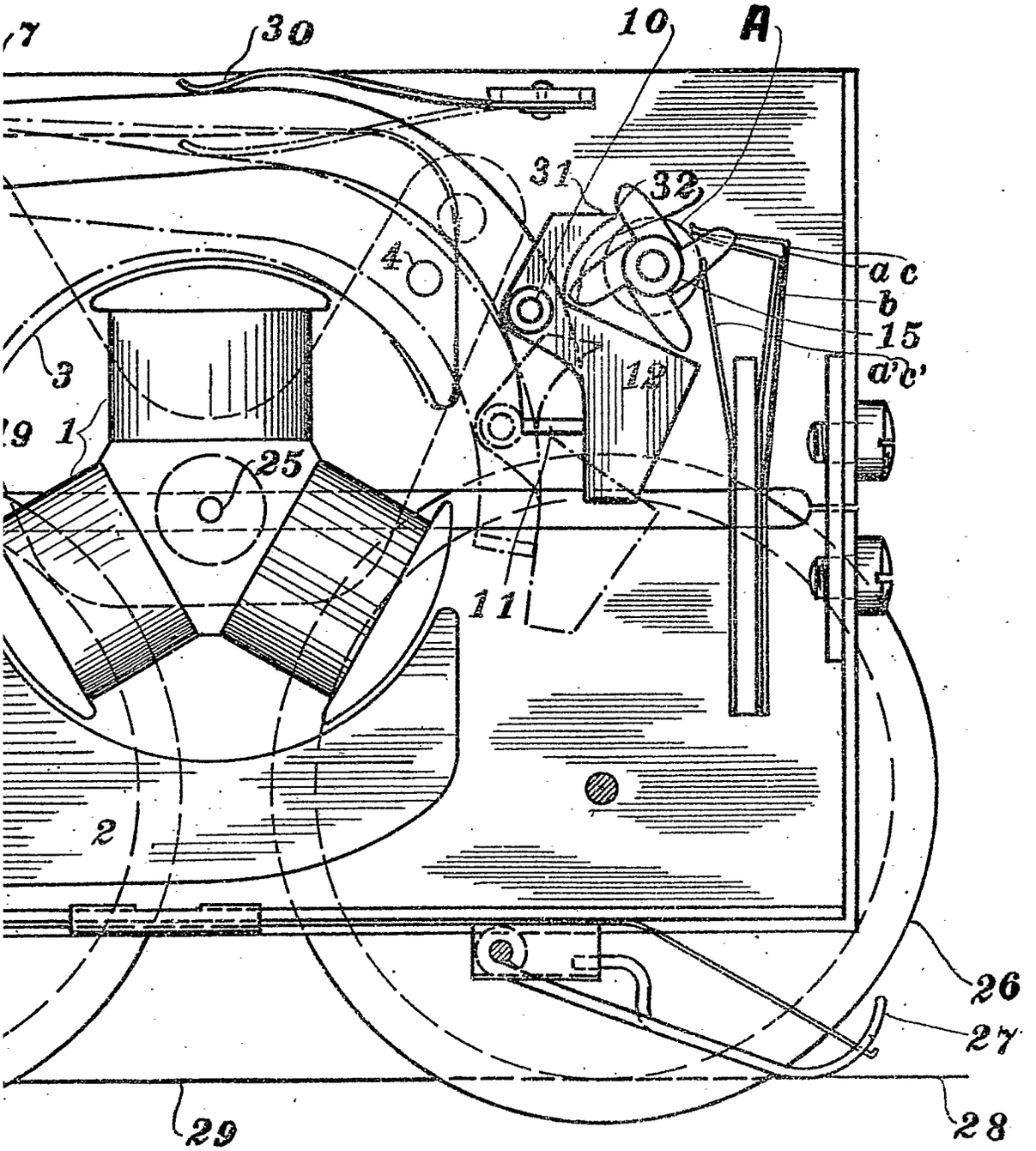


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Fig. 1

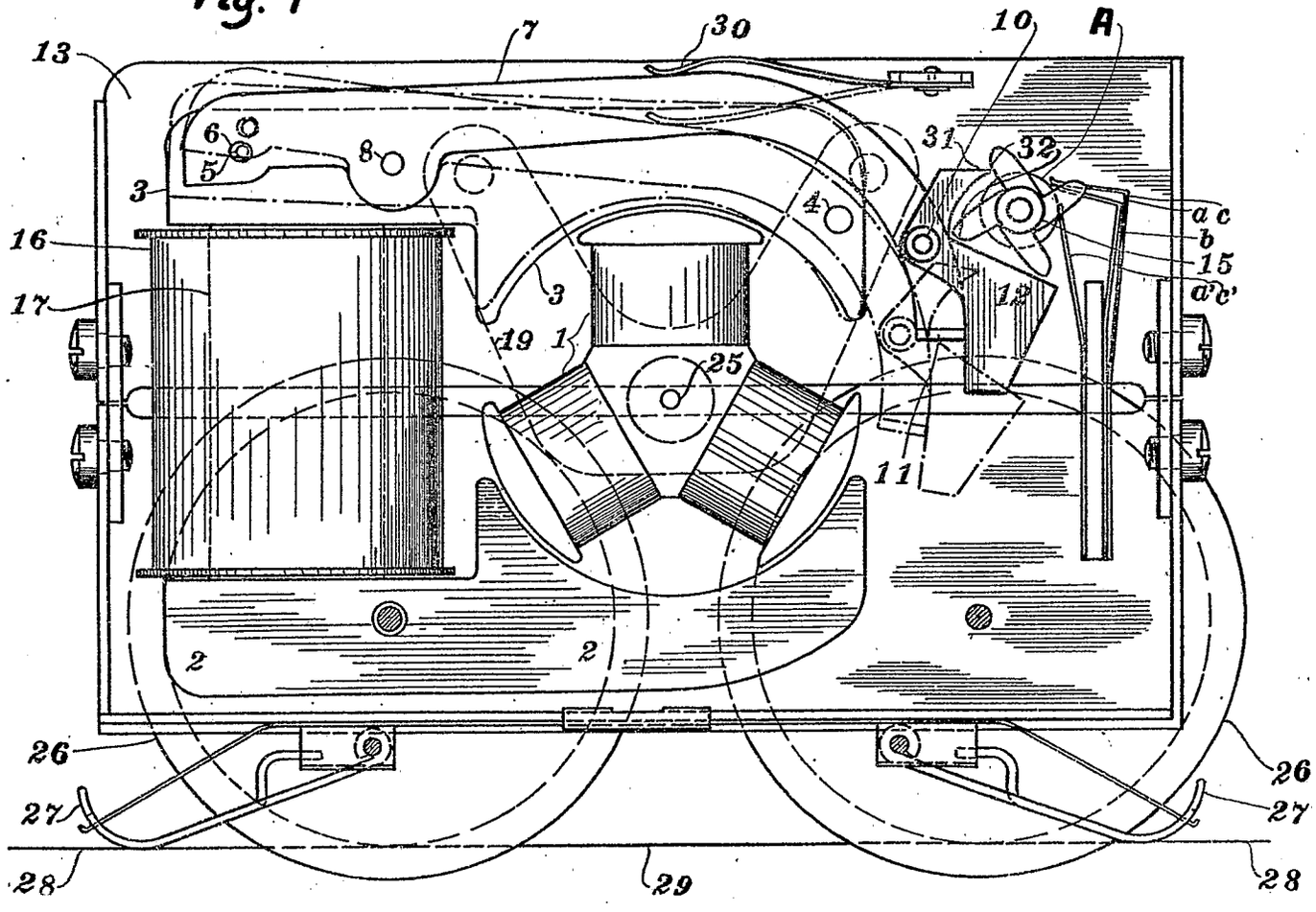

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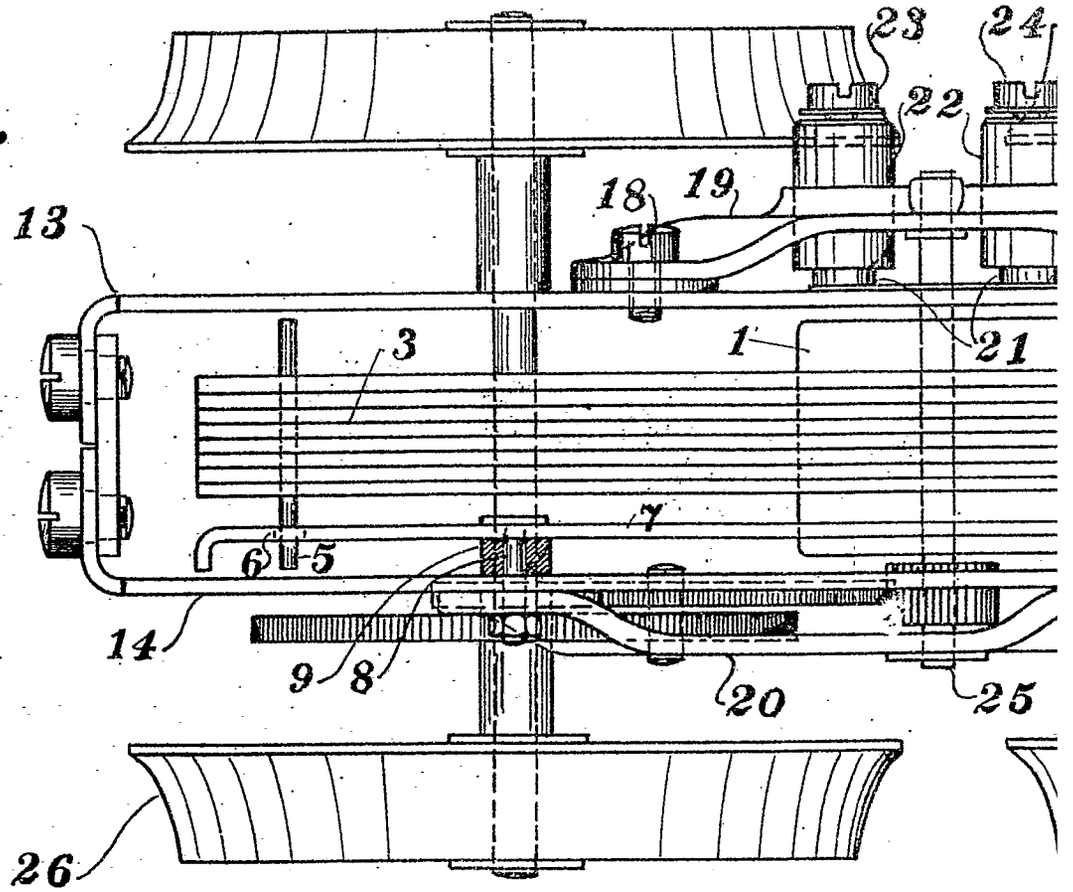
Fig. 2



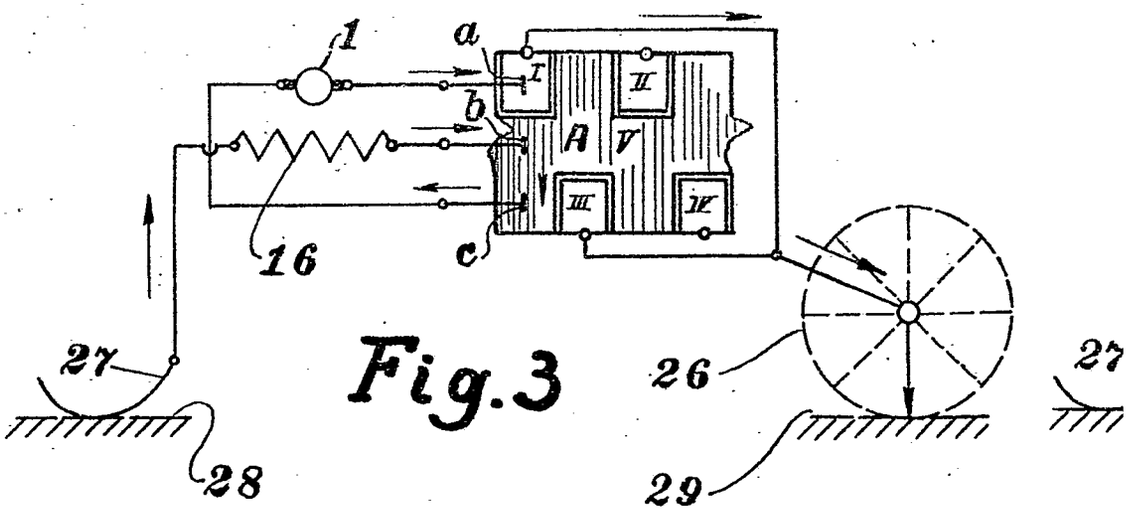
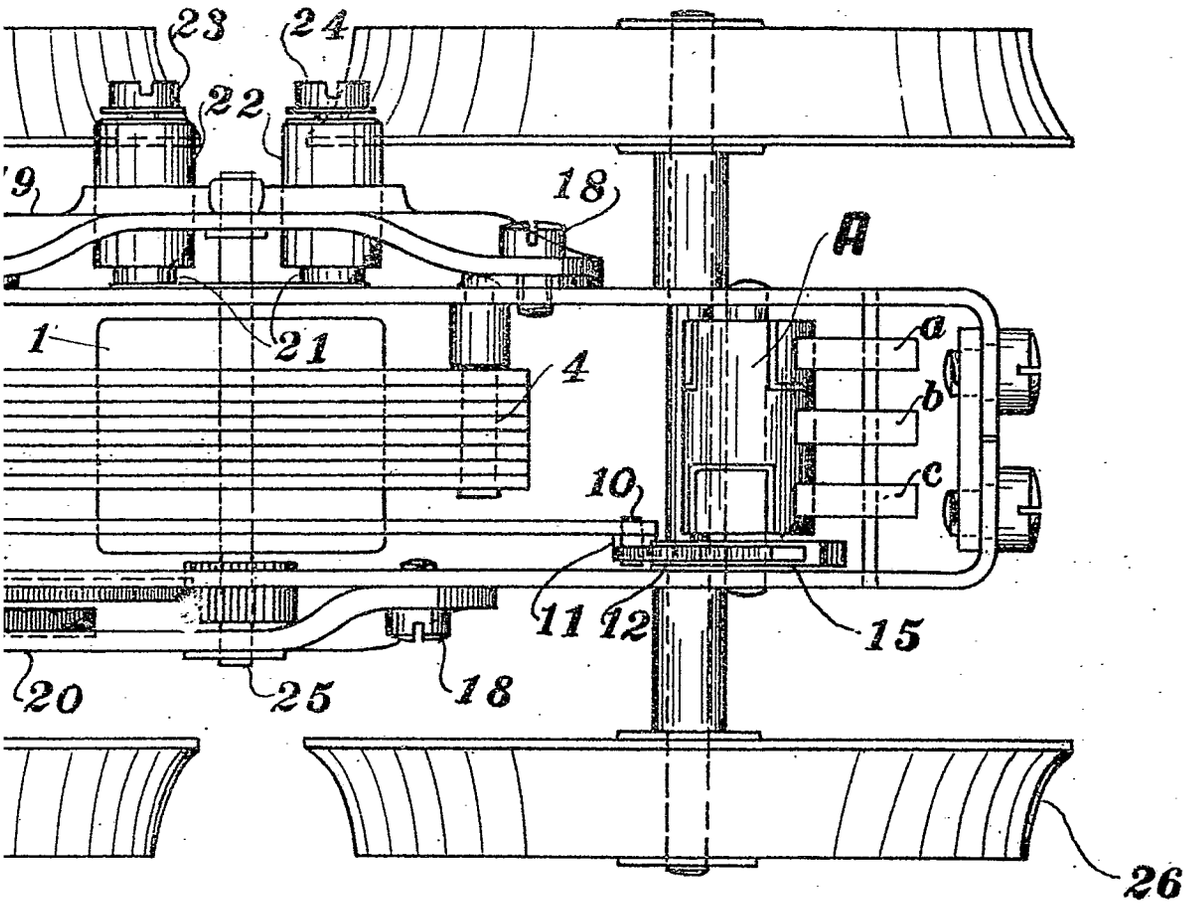


Fig. 3



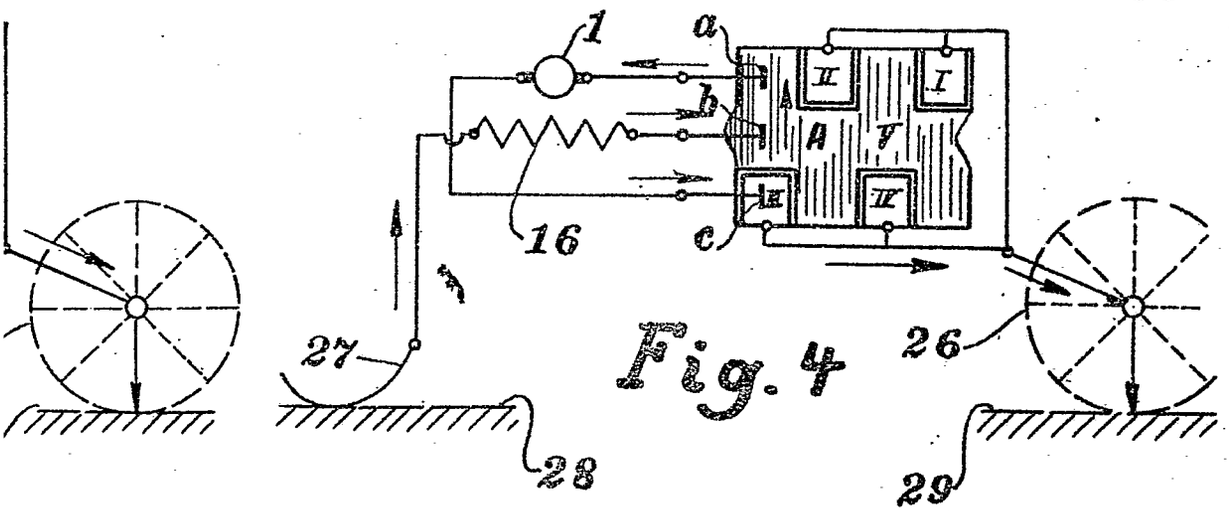


Fig. 4

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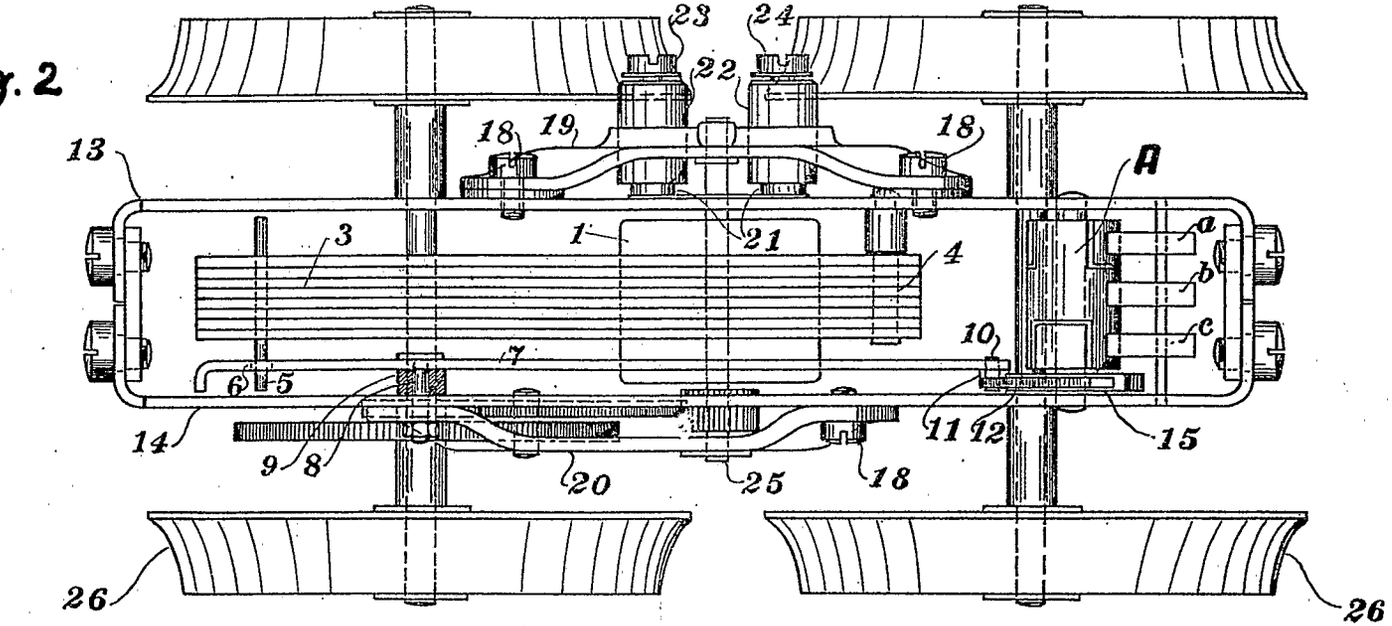
Fig. 2



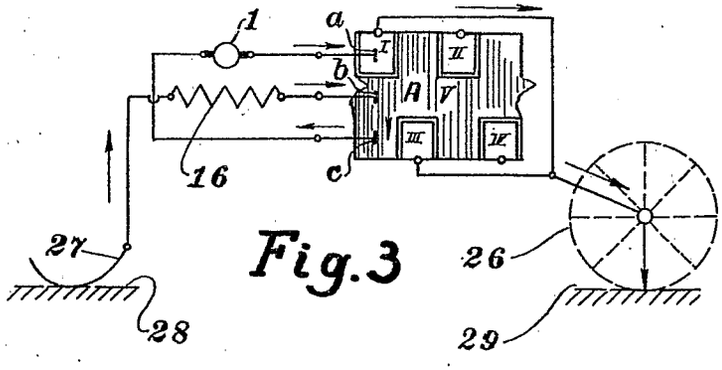


Fig. 3

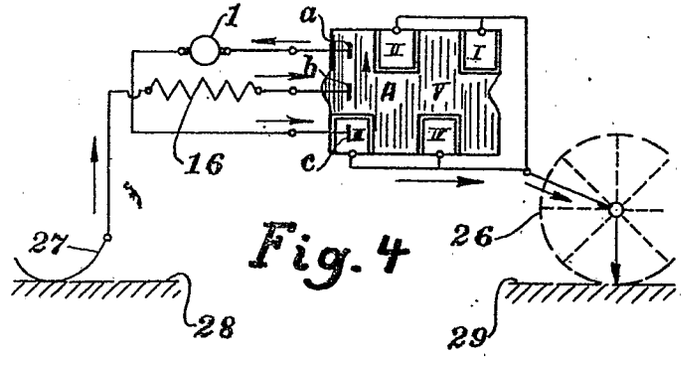


Fig. 4

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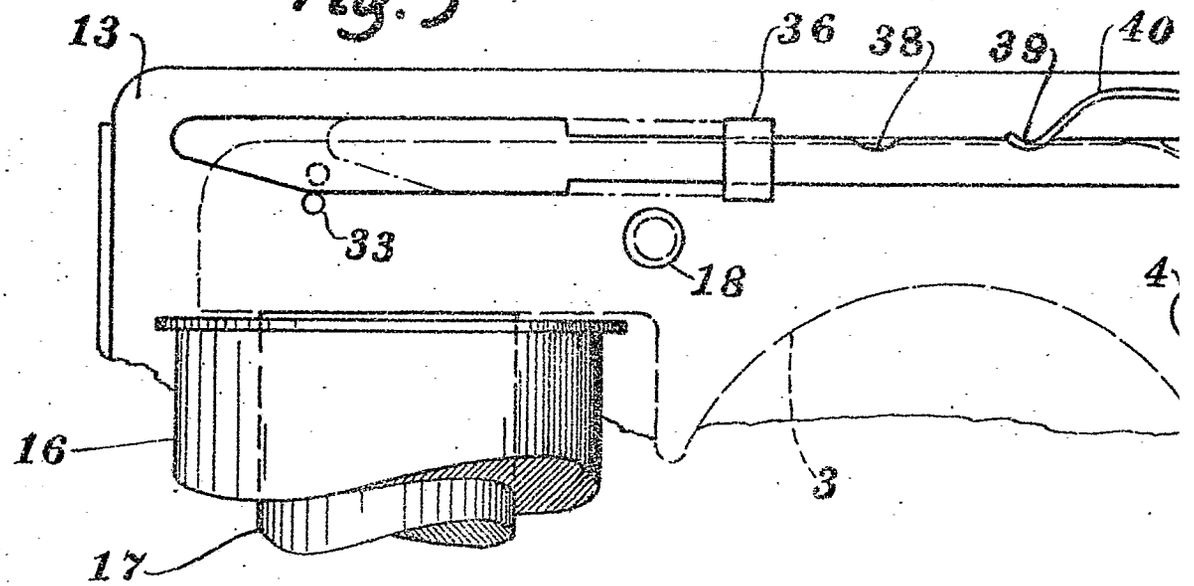
Fig. 5



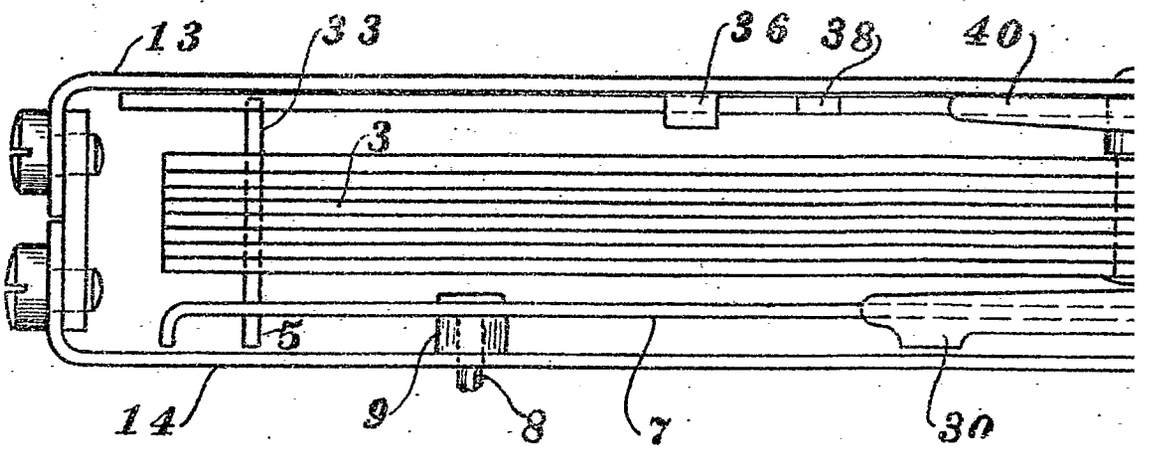
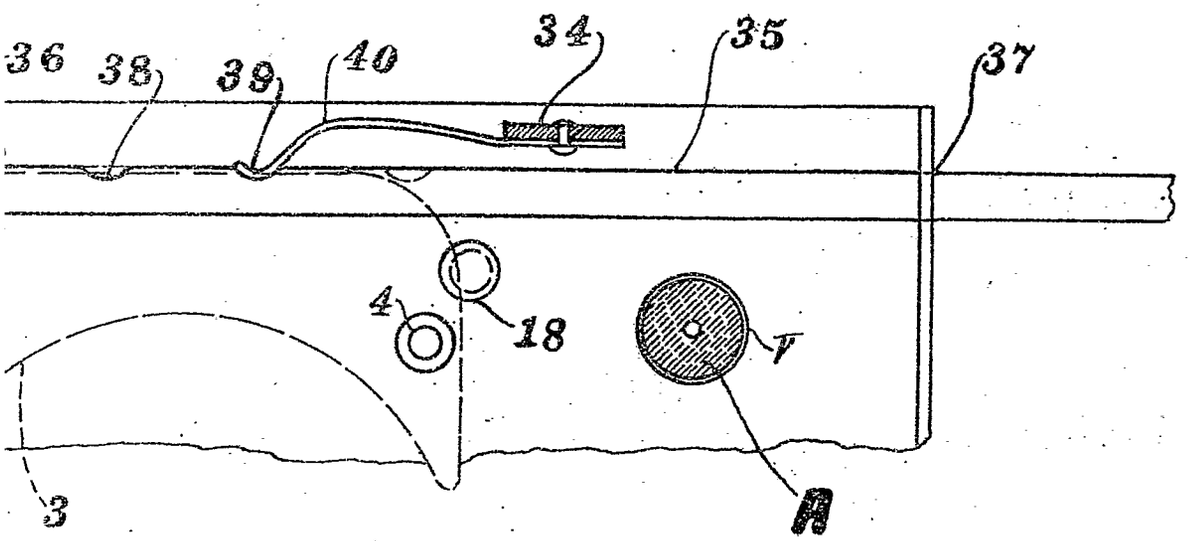


Fig. 6



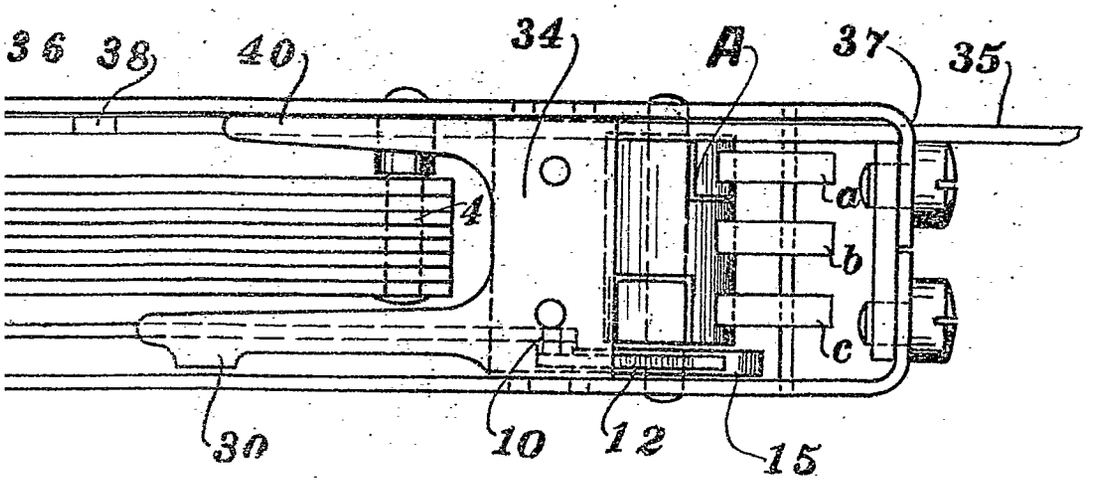


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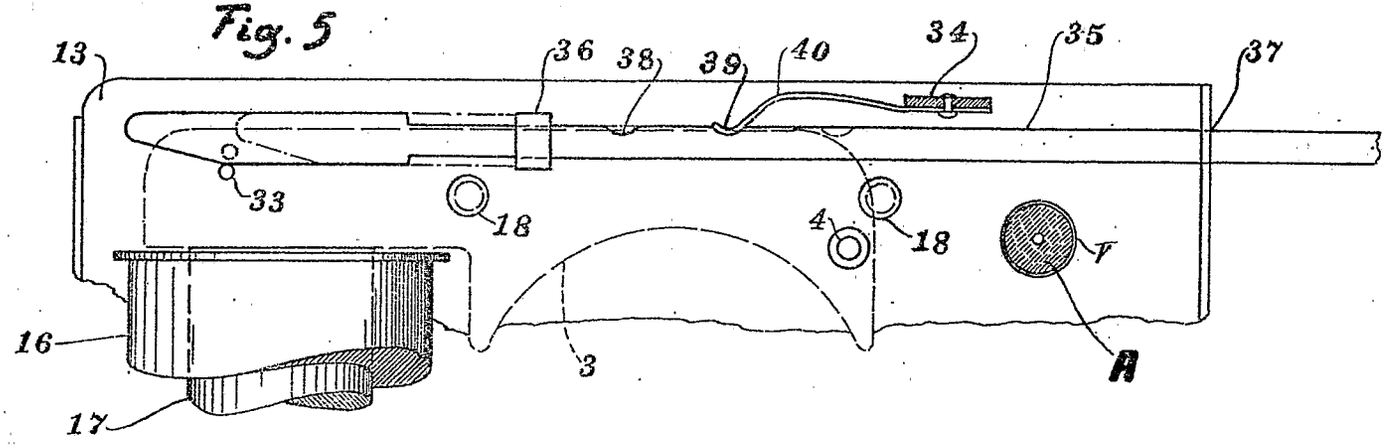
Fig. 5



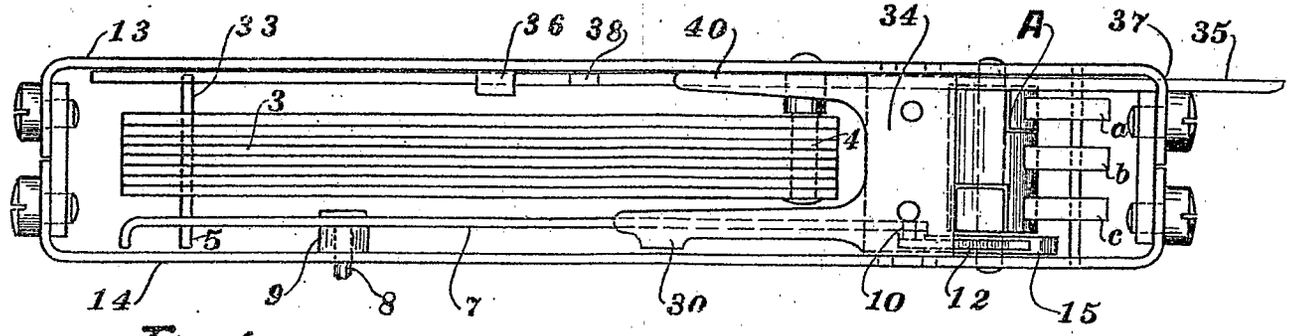


Fig. 6

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