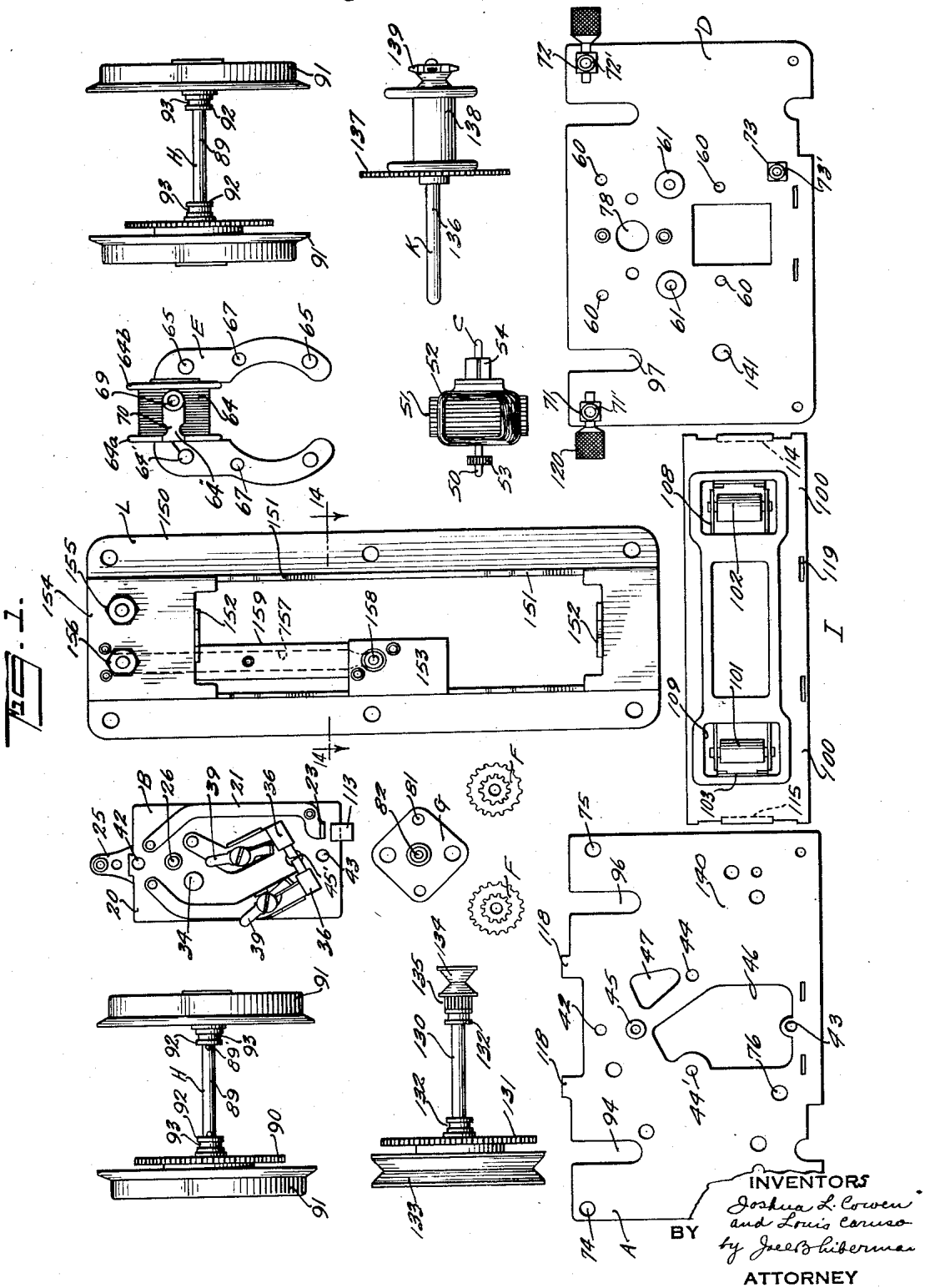
Oct. 31, 1933. J. L. COWEN ET AL 1,932,512

ELECTRICAL TOY

Original Filed April 26, 1928 4 Sheets-Sheet 1



INVENTORS
Joshua L. Cowen
and Louis Caruso
by Jacob Liberman
ATTORNEY

BY

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ELECTRICAL TOY

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FIG. 4.

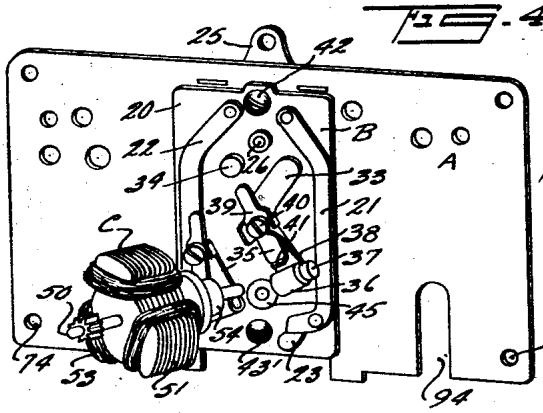


FIG. 2.

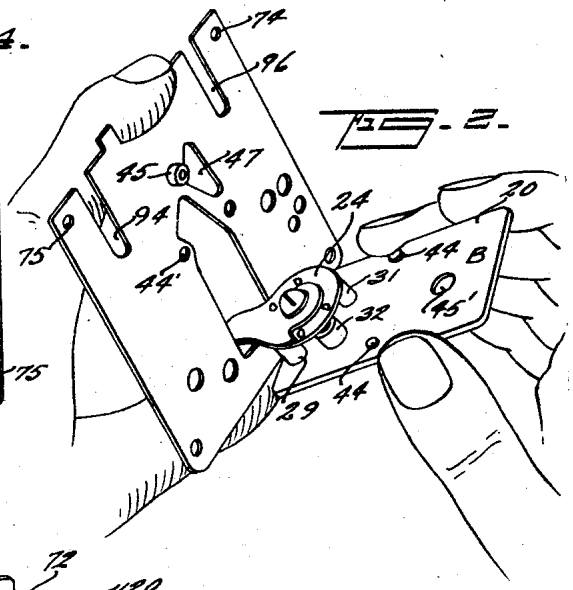


FIG. 5.

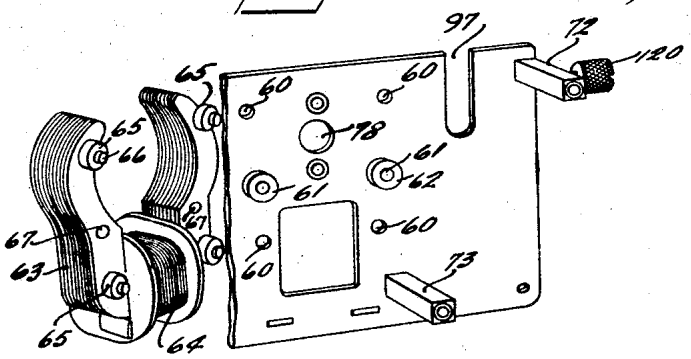


FIG. 3.

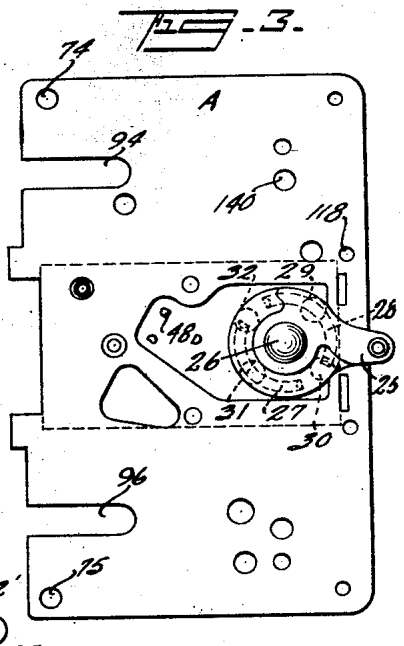


FIG. 6.

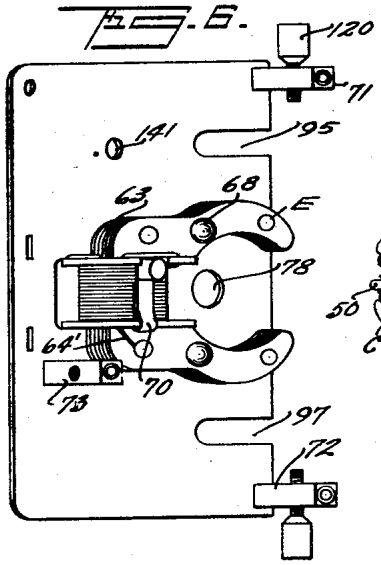
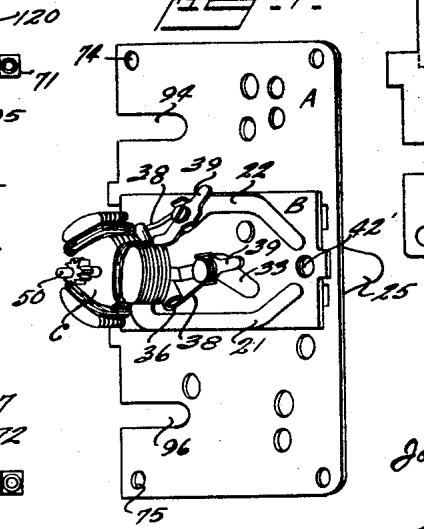


FIG. 7.



INVENTORS
Joshua L. Cowen and
BY Louis Caruso
Jacob Liberman
ATTORNEY

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ELECTRICAL TOY

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FIG. 8.

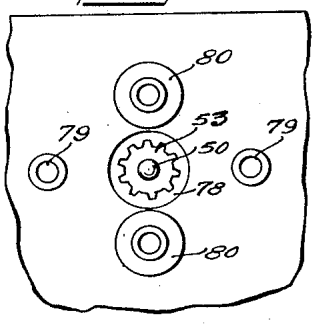


FIG. 9.

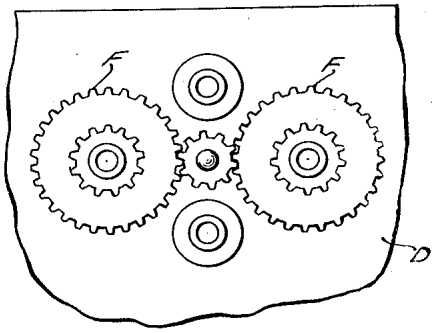
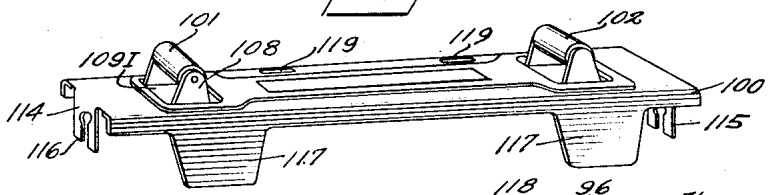


FIG. 11.



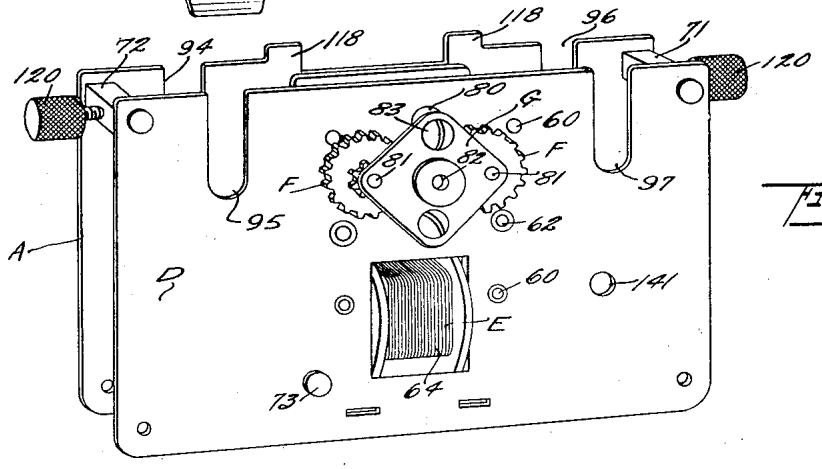


FIG. 10.

FIG. 12.

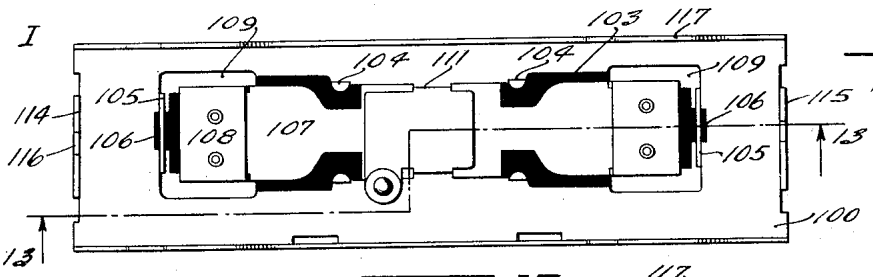
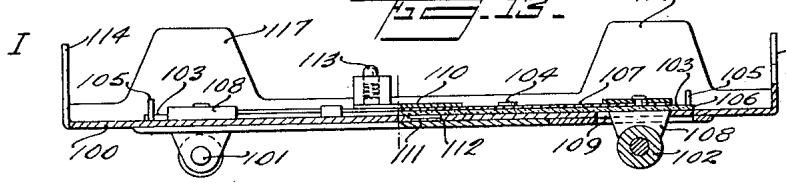


FIG. 13.



INVENTORS
Joshua L. Cowen
and Louis Corucci
by Jacob Liberman
ATTORNEY

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ELECTRICAL TOY

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FIG. 14.

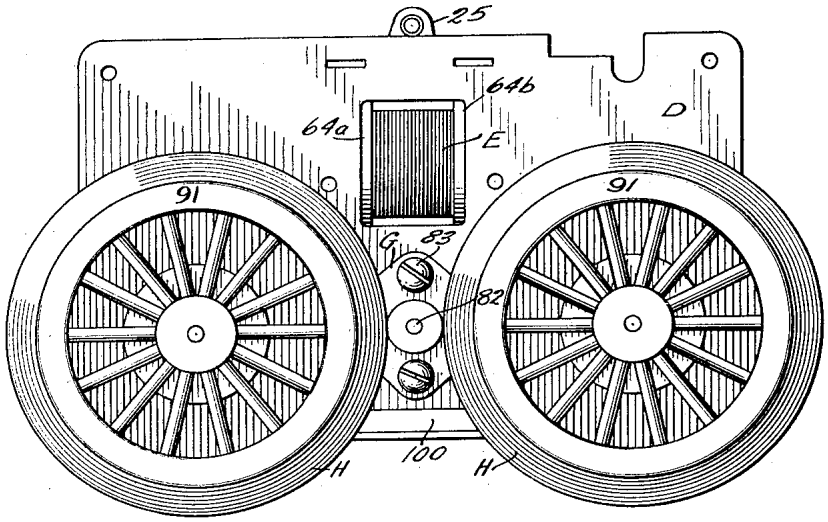
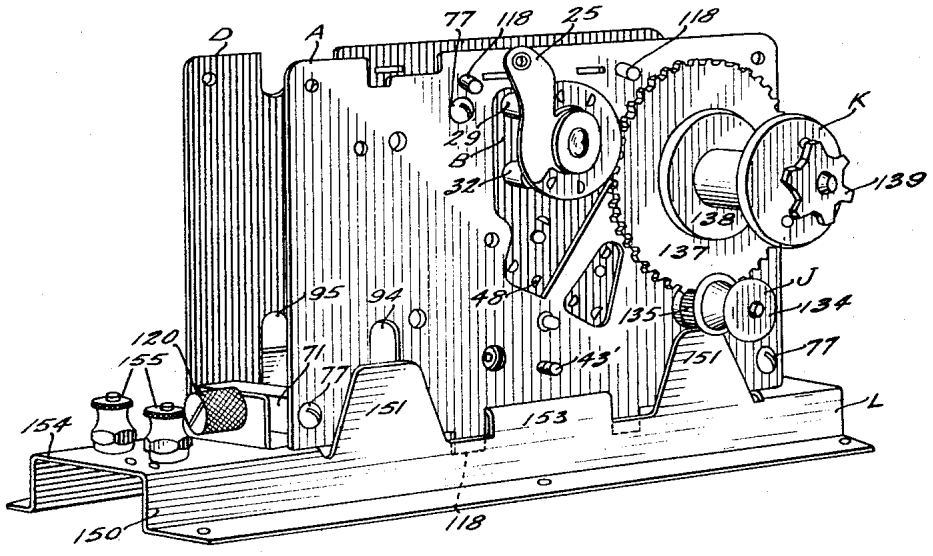


FIG. 15.



INVENTORS
Joshua L. Cowen and
Louis Caruso
BY
Jules B. Lieberman
ATTORNEY

Patented Oct. 31, 1933 1,932,512

UNITED STATES PATENT OFFICE

1,932,512

ELECTRICAL TOY

Joshua L. Cowen, New York, N. Y., and Louis Caruso, Irvington, N. J., assignors to The Lionel Corporation, New York, N. Y., a corporation of New York

Original application April 26, 1928, Serial No. 273,025. Divided and this application February 3, 1931. Serial No. 513,071

26 Claims. (Cl. 172—36)

The present invention relates to electrical toys and is more particularly directed toward a toy comprising an electric motor and capable of ready assembly and disassembly into forms which it may be used either as a power plant of general utility for driving tools, hoists, accessories, and the like, or as the power plant of a toy electric locomotive.

The present invention contemplates the provision of suitable parts and subassemblies whereby one can readily assemble a toy locomotive or a toy electric power plant out of these parts.

The invention also contemplates so constructing and arranging the parts that they may be readily put together or taken apart with ease without the use of tools other than a screw driver. It has been found that an electrical toy of this nature can be constructed out of accurately made, rugged substantial parts in such a way that the locomotive power plant or the electric power drive can be very quickly assembled. Such power plant or toy locomotive becomes as substantial and strong and has an efficiency and operative characteristics which are equal to or better than similar sized motors designed for factory assembly with tools, riveting machines and the like.

A further object of the invention is to provide a toy locomotive or power plant wherein it is unnecessary for one to fasten any wires to conduct the current to the various parts of the structure. According to the invention the electrical connections are made simultaneous with the putting of the parts together. In this manner the assembly of the locomotive with the running gear and contact mechanism provides all the electrical connections necessary for the operation of the motor. Similarly the assembly with the motor and frame with the driving shaft and supporting base provides all the electrical connections necessary for a power plant. By this arrangement it will be apparent that there is no opportunity for erroneously connecting the parts as is the case when separable wires must be used. Furthermore the device presents a far more pleasing and workmanlike appearance.

According to the present invention it is possible for the manufacturer to place on the market a knocked down locomotive and power plant which the purchaser may readily assemble by following directions which accompany the parts. With the present form of construction it will also be possible for the user of the toy train or toy power plant to obtain replacement of worn, lost or damaged parts without the delay and loss of use of the toy incident to returning it to the service station for repair; for, according to the present invention, it is contemplated that the purchaser will be able to readily take apart the locomotive or power plant and insert a new part which can be obtained from the manufacturer or dealer's stock of spare parts.

According to the present invention it is possible to provide complete outfits of parts and units from which the desired toy locomotive or power plant may be assembled. These parts and units are made up in the form of subassemblies and given the desired configuration and constructional features that they are easily fitted together. The preconstructed units are so made that the component parts thereof are permanently held together, and yet the purpose and function is readily observable by the boy.

This application is a division of application Serial No. 273,025, filed April 26, 1928, on which Patent No. 1,822,015 was granted September 8, 1931.

The accompanying drawings show, for purposes of illustrating the invention, one form in which the construction may be embodied, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a composite view illustrating a typical set of parts constituting an outfit for building a wide gage toy locomotive or a power plant using the motor of the wide gage locomotive unit, the parts being arranged in this figure substantially as they might be displayed when packed by the manufacturer;

Figure 2 is a perspective view illustrating the first step of placing the controller unit on one of the side plates;

Figure 3 is an elevational view of the side plate and controller placed in position thereon;

Figure 4 is a perspective view of the plate and controller looking at the opposite or inside of the same, and showing the motor armature in position to pass the armature shaft through the bearing;

Figure 5 is a perspective view illustrating the inside of the other frame plate and the motor field and field winding unit, showing these parts in position to be brought together to mount the motor field on this frame plate;

Figure 6 is a perspective view of the second plate and field structure assembled;

Figure 7 is a perspective view of the first plate, the controller and armature assembled, these two figures, 6 and 7, being placed opposite one an-

other to indicate the manner in which the assembly of the motor unit is completed;

Figure 8 is a fragmentary outside elevational view of the second plate of the motor frame showing the driving pinions on the end of the armature shaft;

Figure 9 is a view similar to Figure 8 showing the reduction gears in place;

Figure 10 is a perspective view of the assembled motor and reduction gears;

Figure 11 is a perspective view of the contact carrying cross plate or shoe, this figure being placed above Figure 10 to illustrate the manner of assembling these two parts;

Figure 12 is a top plan view of the contact shoe carrying member;

Figure 13 is a section taken on the line 13—13 of Figure 12;

Figure 14 is a side elevational view of the completed toy locomotive; and

Figure 15 is a perspective view of a completed toy power plant utilizing the motor frame shown in Figure 10 and utilizing the supporting base and power drive parts adapted to complete a toy power plant.

In the present form of construction, as shown in detail in the drawings, the outfit from which one can assemble either a toy locomotive or a toy power plant is shown as consisting of a number of distinct parts. These parts may be generally described as including the following. A side plate A, is combined controller and brush rigging assembly B, a motor armature unit C, a second side plate D, a motor field assembly E, a pair of reduction gears F, F, a gear cover plate G, a pair of locomotive trucks H, H having driving wheels and axles, a bottom plate I, provided with contact rollers, a first speed reduction power shaft and assembly J, a second speed reduction power shaft and assembly K, a power base L, and nine screws.

In making up the toy locomotive, the parts J, K and L are not employed, while in making up the toy power plant the parts H and I are not employed.

The side plate A may be a flat smooth steel plate provided with holes, slots and projections such as indicated in the drawings. These special parts will be enumerated as the description proceeds.

The combined controller and brush rigging assembly B which is shown in detail in Figures 1, 2, 4 and 7 includes a rectangular insulating plate 20 which carries all these parts. This insulating plate carries two connecting straps 21 and 22 the former being the lead-in connection for the controller as indicated more clearly in Figure 4. The lower end of this strap has an outwardly extending foot 23 for a purpose to be pointed out later. The upper end of the insulating plate 20 carries a reversing switch and controller for the motor. This reversing switch includes a pivotally mounted operating lever 25 which is mounted about a center 26. It carries contacts 27 and 28 indicated in dotted lines in Figure 3. These contacts are cooperative with four posts 29, 30, 31 and 32. The post 29 is connected at the upper end of the lead-in strap 21 while the post 30 is connected at the upper end of the brush lead strap 22 and the post 32 is connected to the other brush lead strap 33. The post 31 connects with a contact button 34 fixedly carried by the insulating plate.

The contact straps 22 and 33 each carry a brush rigging as indicated at 35. On making up this brush rigging the lower ends of the straps 22 and 33 are rolled as indicated at 36 to provide a round passageway or holder for a brush 37. Each of these brushes is carried on the end of a spring 38 which urges it inwardly toward the commutator of the motor. Each of the brush riggings is provided with a brush lifter in the form of a lever 39 pivoted about the screw 40 and having a free end 41 engageable with the spring 38 to lift the brush.

The insulating plate 20 and the metal plate A are provided with pairs of aligned holes 42 and 43 to receive screws 42′ and 43′ for fastening these two parts together. To facilitate aligning these two parts, the insulating plate 20 carries pins 44 which pass into holes 44′ in the metal plate and the metal plate carries a bushing 45 for the armature shaft, which bushing passes through a hole 45′ in the insulating plate. The plate A is also provided with cut-outs as indicated at 46 and 47 which accommodate the prongs 48 used in fastening the conducting strips on the insulating plate 20. The slot or cut out 46 also permits passing the controller handle through the slot as indicated in Figure 2.

The assembly of these two parts is accomplished as indicated in Figure 2 in a very simple manner, it being merely necessary to pass the handle of the controller through the slot, and swinging the parts into position so that the pins 44 pass through the holes 44′ and the bushing 45 passes through the hole 45′. The screws 42′ and 43′ may then be inserted in place and this part of the assembly is completed, as shown in Figures 3 and 4.

The commutator assembly C may, as here shown, include an armature shaft 50, armature field structure 51, armature windings 52, spur driving gear 53 and commutator 54. These parts are provided as an assembled unit and may be inserted into the motor assembly as indicated in Figure 4. To accompany this operation it is merely necessary to press the tips 39 of the brush lifting fingers toward one another and pass the shaft 50 through the bushing 45. This brings the parts to the assembled condition as illustrated in Figure 7.

The plate D resembled in general the plate A but it is intended for carrying the field structure E. As appears in Figures 1 and 5 the plate D is provided with four small holes 60, and with two short spacers 61 riveted to it and provided with tapped holes 62.

The motor field assembly E is made up to have the usual laminated field structure 63 and field windings 64. This field structure is held together by rivets indicated at 65 and having reduced end portions 66 cooperative with the holes 60 in the frame plate D. The field structure is also provided with screw receiving holes 67 through which screws 68 may be passed to thread them into the tapped holes 62 in the bosses 61 carried by the frame plate. In this manner the field structure and plate may be brought together to place the parts in position as shown in Figure 6.

One end of the field winding is grounded by soldering it to a rivet, as indicated at 64′. The other end 64″ is connected to a strap 70 fixedly mounted in the insulating spool ends 64*a* and 64*b*. The strap 70 carries a spring pressed plunger 69 which projects outwardly as indicated in Figure 6. It is in a position to come opposite the contact 34 carried on the controller assembly.

The plate D as here shown also carries three

spacers or posts 71, 72 and 73 preferably riveted to it and provided with reduced end portions cooperative with holes 74, 75, and 76 in the plate A. The parts shown in Figures 6 and 7 may be brought together by merely moving them toward one another in the positions there indicated so as to bring the reduced ends of these spacers through the corresponding holes after which screws 77 may be passed into the threaded holes 71', 72' and 73' in the spacers to clamp the plates and supporting parts together. When the parts have been assembled to this extent the armature shaft 50 and pinion 53 project out through a hole 78 in the frame plate D.

The outside of the frame plate D is provided with two posts 79 shown in Figure 8, adapted to receive the reducing gears F which may be assembled so that the parts will appear as shown in Figure 9. These two gears are each in mesh with the pinion 53. The plate D is also provided with two posts or lugs 80 having reduced end portions and threaded holes. The cover plate G above referred to is adapted to fit over the parts as indicated in Figure 10. This cover plate has small holes 81 to receive the studs 79, has a bearing hole 82 for the armature shaft 50 and is provided with two holes to permit passing screws 83 into the supporting studs 80. All the foregoing parts may be assembled in the manner indicated, and the device in this stage of assembly is in condition for further assembly to make it into a toy locomotive power plant or a toy unit for general purposes.

Assuming that it is to be assembled into a toy locomotive power plant, the operations will be described. During these operations one employs the two truck units H and the current collector or bottom plate I. As shown in Figure 1 these truck units each have a shaft 89 fixedly carrying a driving gear 90 and a pair of track wheels 91. The shafts 89 also loosely carry bushings 92 having undercut portions 93 as indicated. The bushings are held in place by prick marks 89'.

The frame plates A and D are provided with slots 94, 95, 96 and 97. These slots are arranged to be opposite one another in pairs when the frame plates and motor parts are assembled as shown in Figure 10. These slots provide guide ways to receive the bearing members 92, and the next step in assembling the locomotive power plant is to place these two axles and associated parts in position by merely sliding the bushings down the slots thereby bringing the gears 90 into mesh with the reducing gears F.

The current collector plate or bottom plate I, as shown in Figures 1, 11, 12 and 13, is adapted to be fastened in place after the running gear has been installed.

This bottom plate and contact carrier consist essentially of a sheet metal stamping 100 which fits the motor frame, and a pair of rail contacting rollers 101 and 102 insulatively supported from the stamping 100 and adapted to ride on the third rail of the toy railroad track on which the locomotive is to be used. To insulatively support the rollers a strip of insulating material 103 is secured to the stamping 100. As here shown the method of securing these parts together includes a plurality of prongs 104 bent over onto the strip of insulation and a pair of apertured prongs 105 adapted to receive the reduced end portions 106 of the insulating strip. This insulating strip carries a flexible metal strip 107 on the ends of which are mounted saddle pieces 108 which extend down through holes 109 in the stamping 100 so as to carry the rollers 101 and 102 spaced below the body of the stamping 100. The resilient roller supporting strip 107 is held in place on the insulating strip 103 by a stamping 110 and prongs 111, which are folded over the metal strip 107 and underneath the insulating strip 103, the stamping 100 being cut away as indicated at 112 in section in Figure 13 to keep the prongs 111 out of contact with the stamping. The contact carrier 107 is prevented from twisting out of place by the roller supporting saddles 108 which pass down alongside the fixedly carried insulating strip 103. The stamping 110 carries a spring pressed plunger 113 for a purpose to be described.

The stamping 100 is shaped so as to securely fit the motor parts heretofore assembled and is arranged that it cannot be improperly placed in position on the same. The stamping has upwardly bent end members 114 and 115 slotted as indicated at 116 and adapted to pass outside the posts 71 and 72. The sides of the stamping 100 are provided with four upwardly extending projections 117 adapted to fit outside the frame plates A and B and to engage with the bushings 92 on the shafts of the running gear. The plate A is provided with projections 118 adapted to pass through slots 119 in the stamping 100 thereby preventing assembling these parts improperly.

To complete the assembly of the locomotive motor the bottom plate 100 and parts carried thereby is inserted in place, which may be accomplished by merely lowering it from the position shown in Figure 11 onto the structure as indicated in Figure 10. This permits the slots 116 to pass by the shanks of thumb screws 120 carried by the spacers 71 and 72. At the same time the projections 117 are brought against the bushings on the wheel axle shafts and when the thumb screws are tightened this bottom stamping and contact carrier is secured in position.

During this operation the spring pressed plunger 113 is brought against the outstanding foot 23 on the controller brush rigging unit B. The relative position of these parts at that time are indicated in Figure 1. When the parts have been assembled as has been described, the complete power plant for the toy locomotive will have been assembled utilizing the parts designated as A, B, C, D, E, F, G, H, I and the nine screws provided in the outfit. It will be noted that it is unnecessary to connect or disconnect any wires whatever in assembling the motor. All electrical parts are securely carried by various subassemblies and when they are put together, all necessary connections are made.

The path of current through the motor may be described as follows: From the contact rollers 101 and 102 through the yielding spring supporting strap 107 to the stamping 110, thence through the spring pressed plunger 113 to the foot 23 of the strap 21, then through the reversing switch or controller and brush rigging and through the motor armature where the current is carried to the contact button 34 on the controller unit. This current will continue through the field winding to the field structure and thence to the motor frame. The extent of movement of the running switch 25 is limited by two stops 118 on the plate A.

In order to facilitate assembly of the motor, the two screws 42' and 43', used for fastening the controller brush assembly onto the plate A, the three screws 77, used for fastening the plate A onto the spacers 71, 72 and 73, and the two

screws 83, used for fastening the plate G in position, are all the same size and length. The two screws 68, used for fastening the field assembly onto the plate D, are longer but may be made to have the same thread.

When it is desired to assemble the outfit into the form of a toy electric power plant for operating various forms of toys, the parts are as above described assembled to bring them to the state or condition shown in Figure 10. Instead of using the units H and I to make up a toy locomotive one uses the units J, K and L to make up a toy power plant.

The unit J has a shaft 130 similar to the shaft 89, and is provided with a gear 131 like the gear 90 and with bushings 132 like the bushings 92. The shaft J also carries at one end a comparatively large pulley 133 and at the other end a small pulley 134 and a pinion 135.

The unit K has a shaft 136 which carries a large gear 137, a drum 138 and a sprocket wheel 139. In assembling these parts the unit K is first inserted in place by passing the shaft portion 136 through the holes 140 and 141 in the plates A and D. To make improper assembly impossible, these holes are larger than other holes in the side plates, and may be the only holes opposite one another. The unit J is lowered along the slots in the same manner that the units H were inserted bringing the gear 131 in mesh with the reduction gear unit F and bring the pinion 135 into mesh with the gear 137 on the unit K. As this gear 137 comes in behind the pulley 134 the unit K is securely held in position so that it cannot slide out of its bearings.

The base plate unit L is then inserted in place. This unit as shown in Figures 1 and 15 is in the form of an inverted channel shaped stamping 150 adapted to support the power plant on a flat surface. This stamping 150 has upwardly bent side lugs 151 corresponding with the lugs 117 carried by the unit I and adapted to pass outside the frame plates A and D as indicated in Figure 15. One pair of these lugs will secure the unit K in position, the other pair merely passing up outside the motor frame to facilitate aligning the motor parts. The stamping 150 is also provided with two lugs 152 similar to the upwardly bent ends 114 and 115 so that the unit L may be fastened onto the spacers 71 and 72 by the thumb screws 120 as indicated in Figure 15. The stamping 150 also carries an upwardly and inwardly extending shelf 153 adapted to pass inwardly between the lugs 118 on the plate A. The end 154 of the stamping carries a pair of binding posts 155 and 156 one of which is insulatively supported from the face plate. This insulated binding post 156 is connected by means of a conducting strip 157 with a plunger member 158 similar to the plunger member 113. The plunger member 158 is carried by the shelf 153 and the contact strip 157 is covered over and supported by an insulating strip 159.

When the units J, K and L are assembled as have been described, the electrical connections for the motor have been simultaneously completed. The current can pass from the binding post 156 through the strap 157 and plunger 158 to the foot 23 carried by the controller unit B and thence through the motor which has been described.

When the unit has been assembled for power plant purposes it will be apparent that one has available a high speed pulley 132, a low speed pulley 134, and a still lower speed winding drum 138 and sprocket wheel 139.

It is obvious that the invention may be embodied in many forms and constructions, and we wish it to be understood that the particular form shown is but one of the many forms. Various modifications and changes being possible, we do not limit ourselves in any way with respect thereto.

We claim:

1. In a toy motor, a normally vertical flat sheet metal side plate having two vertical slots extending upwardly from the lower edge, and shafts rotatably carried in bushings slidably received within the slots.

2. In a toy motor, a normally vertical flat sheet metal side plate having two vertical slots extending upwardly from the lower edge, and shafts rotatably carried in bushings slidably received within the slots, said plate also having a hole adjacent the upper end of one of the slots and adapted to receive another shaft.

3. In a toy motor, a pair of normally vertical sheet metal side plates detachably fastened together, each of the plates having two vertical slots extending upwardly from the lower edge thereof and opposite the corresponding slot in the other plate, and shafts rotatably carried in bushings slidably received within the slots.

4. In a toy motor, a pair of normally vertical sheet metal side plates detachably fastened together, each of the plates having two vertical slots extending upwardly from the lower edge thereof and opposite the corresponding slot in the other plate, shafts rotatably carried in bushings slidably received within the slots, and an armature and field mounted in the plates, the plates having aligned holes midway between the slots to receive the armature shaft.

5. In a toy motor, a pair of normally vertical sheet metal side plates detachably fastened together, each of the plates having two vertical slots extending upwardly from the lower edge thereof and opposite the corresponding slot in the other plate, the slots being adapted to slidably receive shaft bushings, an armature and field unit mounted in the plates, one of the side plates carrying a small plate on the outer side thereof, and reduction gears supported on studs on said side plate and held in place by the small plate, the reduction gears being in mesh with a gear on the armature shaft.

6. In a toy motor, a pair of normally vertical sheet metal side plates detachably fastened together, each of the plates having two vertical slots extending upwardly from the lower edge thereof and opposite the corresponding slot in the other plate, the slots being adapted to slidably receive shaft bushings, a motor field unit including field windings and laminations, and means to removably fasten the field unit to one of the side plates.

7. In a toy motor, a pair of parallel sheet metal side plates detachably fastened together, a field unit including windings and field structure detachably fastened to one of the plates and disposed between the plates, a combined terminal plate and brush rigging unit carried by the other plate, and a rotatably mounted armature unit having a commutator cooperative with said brush rigging.

8. In a toy motor, a pair of parallel sheet metal side plates detachably fastened together, a field unit including windings and field structure detachably fastened to one of the plates and disposed between the plates, a combined reversing

switch and brush rigging unit carried by the other plate, a rotatably mounted armature unit having a commutator cooperative with said brush rigging, the armature having a pinion carried outside the first plate, and reducing gears detachably carried by said first plate and cooperative with the pinions.

9. In a toy motor, a pair of parallel sheet metal side plates detachably fastened together, a field unit including windings and field structure detachably fastened to one of the plates and disposed between the plates, a combined reversing switch and brush rigging unit carried by the other plate, and a rotatably mounted armature unit having a commutator cooperative with said brush rigging, said two units having cooperative contacts for completing the circuits of the armature and field.

10. In a motor, a pair of metal side plates detachably fastened together, a motor armature unit having an armature shaft and driving pinion, means to rotatably mount the armature unit in place between the plates, a motor field unit detachably mounted between the plates in cooperative relation to the armature, the plates having aligned shaft receiving slots, reduction gearing detachably mounted on one of the side plates and in mesh with the pinion, and a shaft slidable into the aligned slots and provided with a gear adapted to mesh with the reduction gearing.

11. In a motor, a pair of metal side plates detachably fastened together, a motor armature unit having an armature shaft, a driving pinion and a commutator, means to rotatably mount the armature unit in place between the plates, a motor field unit detachably mounted between the plates in cooperative relation to the armature, the plates having aligned shaft receiving slots, reduction gearing detachably mounted on one of the side plates and in mesh with the pinion, and a brush rigging and reversing switch unit detachably fastened to the other plate, the brush rigging being cooperative with the commutator.

12. In a motor, a pair of metal side plates detachably fastened together, a motor armature unit having an armature shaft, a driving pinion and a commutator, means to rotatably mount the armature unit in place between the plates, a motor field unit detachably mounted between the plates in cooperative relation to the armature, the plates having aligned shaft receiving slots, reduction gearing detachably mounted on one of the side plates and in mesh with the pinion, a brush rigging and reversing switch unit detachably fastened to the other plate, the brush rigging being cooperative with the commutator, said units carrying contacts interconnected together when the parts are assembled whereby the circuits for the motor are completed by the mere assembly of the parts.

13. In a motor, a pair of metal side plates detachably fastened together, a motor armature unit having an armature shaft and driving pinion, means to rotatably mount the armature unit in place between the plates, a motor field unit detachably mounted between the plates in cooperative relation to the armature, the plates having aligned shaft receiving slots, reduction gearing detachably mounted on one of the side plates and in mesh with the pinion, a shaft slidable into the aligned slots and provided with a gear adapted to mesh with the reduction gearing, and a detachably supported plate having members disposed alongside the slots for securing the shaft therein.

14. In a motor, a pair of metal side plates detachably fastened together, a motor armature unit having an armature shaft, a driving pinion and a commutator, means to rotatably mount the armature unit in place between the plates, a motor field unit detachably mounted between the plates in cooperative relation to the armature, the plates having aligned shaft receiving slots, reduction gearing detachably mounted on one of the side plates and in mesh with the pinion, a brush rigging and reversing switch unit detachably fastened to the other plate, the brush rigging being cooperative with the commutator, said units carrying contacts interconnected together when the parts are assembled whereby the circuits for the motor are completed by the mere assembly of the parts, and a detachably supported plate having members disposed alongside the slots for securing the shaft therein, said last mentioned plate carrying an insulated current supply contact engageable with a current receiving contact carried by one of said units to provide a power supply connection.

15. In a toy motor a pair of sheet metal side plates detachably fastened together in fixed spaced relation, the plates having aligned slots extending inwardly from an edge thereof, a shaft bodily movable into the slot, a detachably fastened transverse plate having members overlying the slots and preventing the removal of the shaft, a motor field element mounted between the side plates, and a motor armature unit rotatably supported from the side plates and in driving relation with the shaft.

16. In a toy motor, a pair of sheet metal side plates, detachably fastened together in fixed spaced relation, the plates having aligned slots extending inwardly from an edge thereof, a shaft having bushings slidable lengthwise of the slots whereby the shaft may be rotatably carried therein, a transverse plate detachably fastened in place and having members overlying the slots to engage the bushings and secure the shaft in place, a motor field unit, a motor armature unit and brush rigging unit detachably fastened to the side plates and assembled in operative relation for motor operation, the armature unit being drivingly connected with the shaft, the transverse plate and the units carrying all electrical connections for supplying current to the motor, said connections being completed by the assembly of the parts.

17. In a toy motor, a pair of sheet metal side plates, detachably fastened together in fixed spaced relation, the plates having aligned slots extending inwardly from an edge thereof, a shaft having bushings slidable lengthwise of the slots whereby the shaft may be rotatably carried therein, a transverse plate detachably fastened in place and having members overlying the slots to engage the bushings and secure the shaft in place, a motor field unit, a motor armature unit and brush rigging unit detachably fastened to the side plates and assembled in operative relation for motor operation, the armature unit being drivingly connected with the shaft, the transverse plate and the units carrying all electrical connections for supplying current to the motor, said connections being completed by the assembly of the parts, the interengaging elements of each of the aforesaid units and plates being such that their assembly in improper relation is impossible.

18. A toy motor frame comprising two sheet metal side plates, spacers for detachably fastening them together in fixed relation, the plates having aligned shaft-receiving slots extending inwardly from an edge thereof, and a transverse plate detachably fastened to the spacers and having extensions overlying the slots to prevent removal of the shaft.

19. In a toy motor, an assembled motor field unit comprising a plurality of laminations fastened together by rivets, a field coil wound about the laminations, an insulatively supported terminal, a supporting plate having apertures to receive the heads of the rivets and thereby align the field unit, and screws passing through holes in the laminations and threaded into the plate, the terminal being exposed for association with a terminal on another motor part.

20. In a reversing switch, a combined reversing switch and brush rigging unit, comprising an insulating plate, carrying a pair of commutator brush riggings thereon, a reversing switch having fixed and movable contacts, connectors between two of the fixed contacts of the reversing switch and the brush riggings, and a current supply terminal connected to another fixed contact.

21. A toy motor comprising a pair of metal plates; an armature unit including a shaft carrying a commutator, armature structure, armature windings, a field unit including a field structure, a field winding carried by the field structure, and at least one permanently attached terminal, a controller and brush rigging unit including a permanently attached terminal, a reversing switch and a pair of brushes interconnected with the switch and terminal, a base plate having a current supply terminal, and quick detachable means for fastening the parts together to dispose them in position to complete the motor circuit and rotatably support the armature in operative relation to the field.

22. In a toy power plant, an axle shaft, a gear fixed to the shaft near one end, other power driving devices carried by the shaft, and a pair of bushings rotatably carried by the shaft.

23. In a toy power plant, an axle shaft, a gear fixed to the shaft near one end, other power driving devices carried by the shaft, and a pair of bushings rotatably carried by the shaft, the bushings having external annular grooves.

24. A toy motor comprising frame plates, a motor field unit, a motor armature unit, and a reversing switch and brush rigging unit, said units being mounted on the plates in cooperative relation for motor operation, the latter two units each carrying connections for completing the field and armature circuits which connections are established by the assembly of the parts.

25. A toy motor comprising frame plates, a motor field unit, a motor armature unit, and a reversing switch and brush rigging unit, said units being mounted on the plates in cooperative relation for motor operation, the latter two units each carrying connections for completing the field and armature circuits which connections are established by the assembly of the parts, a power driving shaft in driving relation with the armature shaft, and a bottom plate detachably fastened to the side plates and securing the shaft in place.

26. A toy motor comprising frame plates, a motor field unit, a motor armature unit, and a reversing switch and brush rigging unit, said units being mounted on the plates in cooperative relation for motor operation, the latter two units each carrying connections for completing the field and armature circuits which connections are established by the assembly of the parts, the bottom plate being provided with a current carrying connector brought into contact with one of the aforesaid connections for supplying current to motor circuits.

JOSHUA L. COWEN.
LOUIS CARUSO.