No. 842,514. PATENTED JAN. 29, 1907.

G. BAEHR.

FURNACE CHARGING APPARATUS.

APPLICATION FILED SEPT. 17, 1904.

3 SHEETS—SHEET 1.

FIG. 1

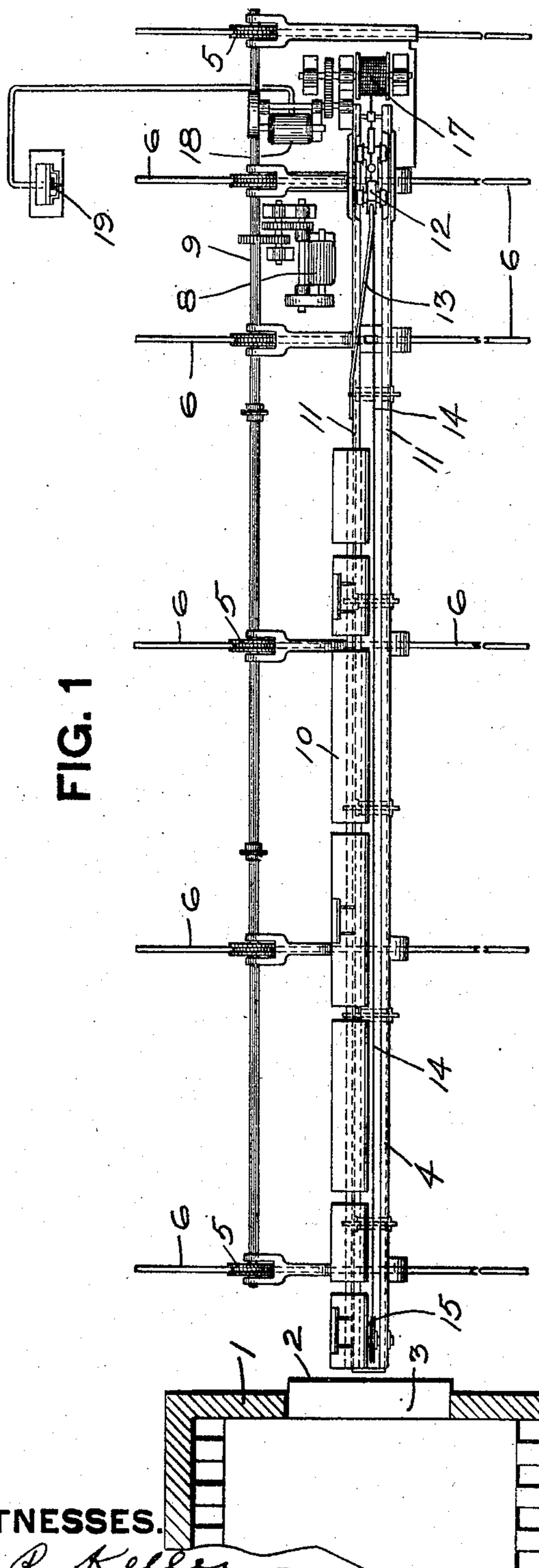
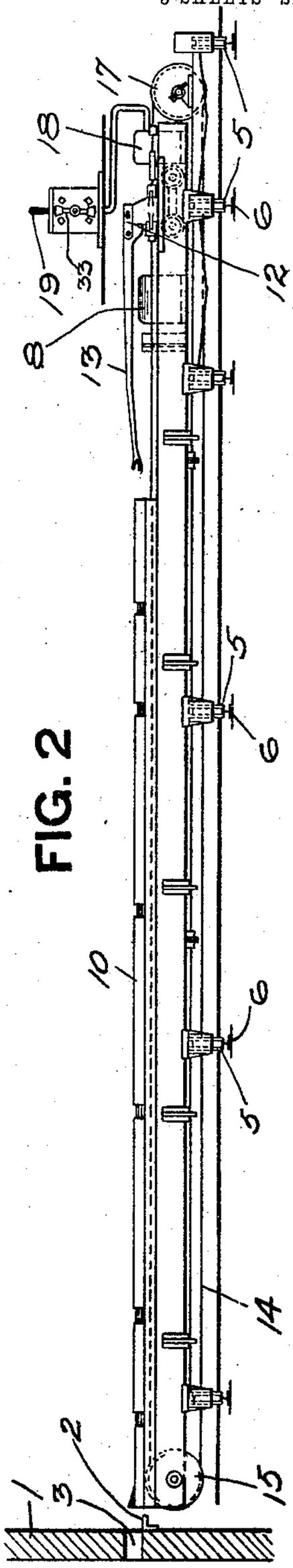


FIG. 2



WITNESSES.

J. R. Keller

Robert C. Sutton

INVENTOR.

George Baehr

By Kay Sutton & White

attorneys

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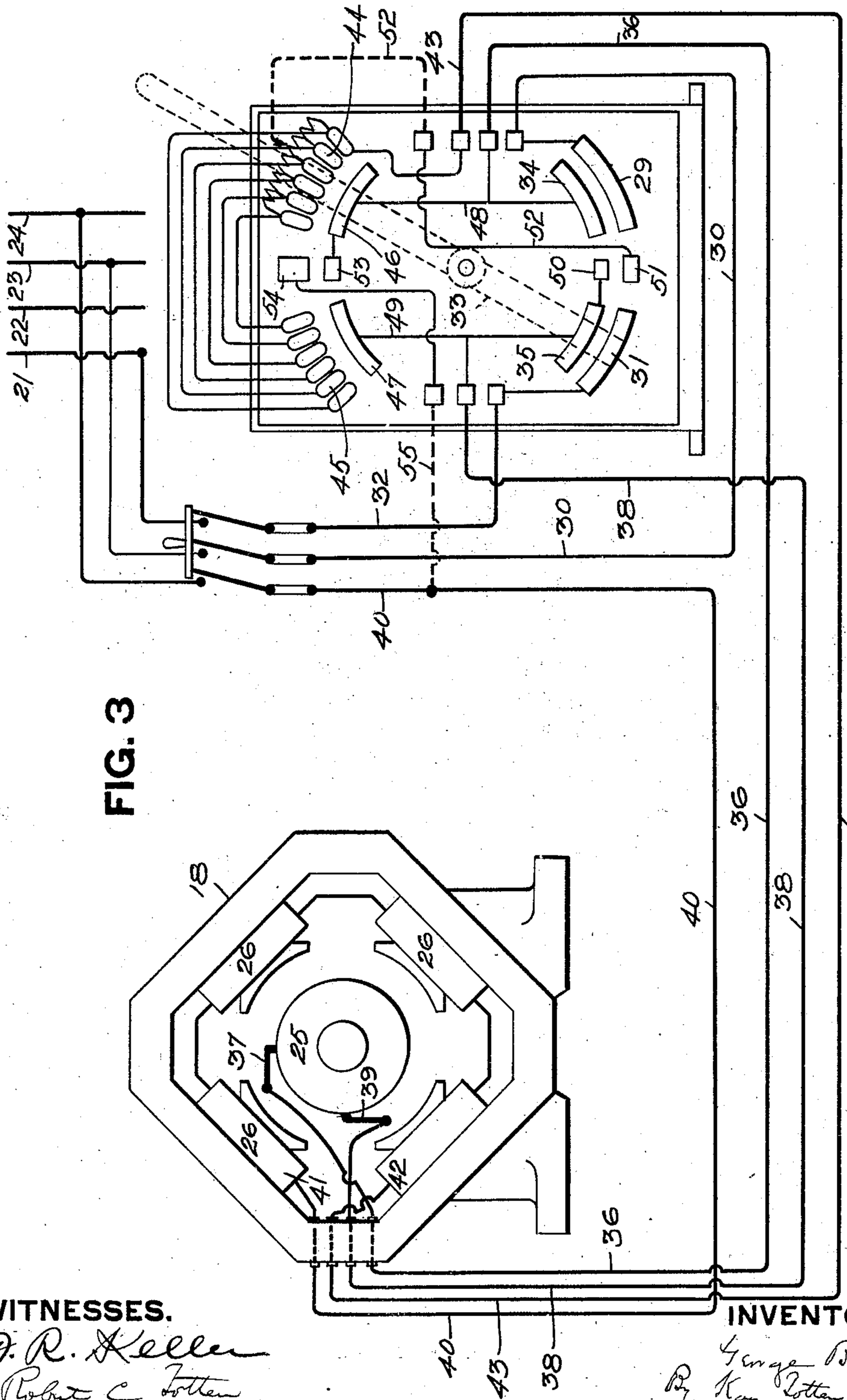
3 SHEETS—SHEET 2.

FIG. 3



WITNESSES.

J. R. Keller

Robert C. Lotten

INVENTOR.

George Baehr

By Kay Lotten & Winter

attorneys

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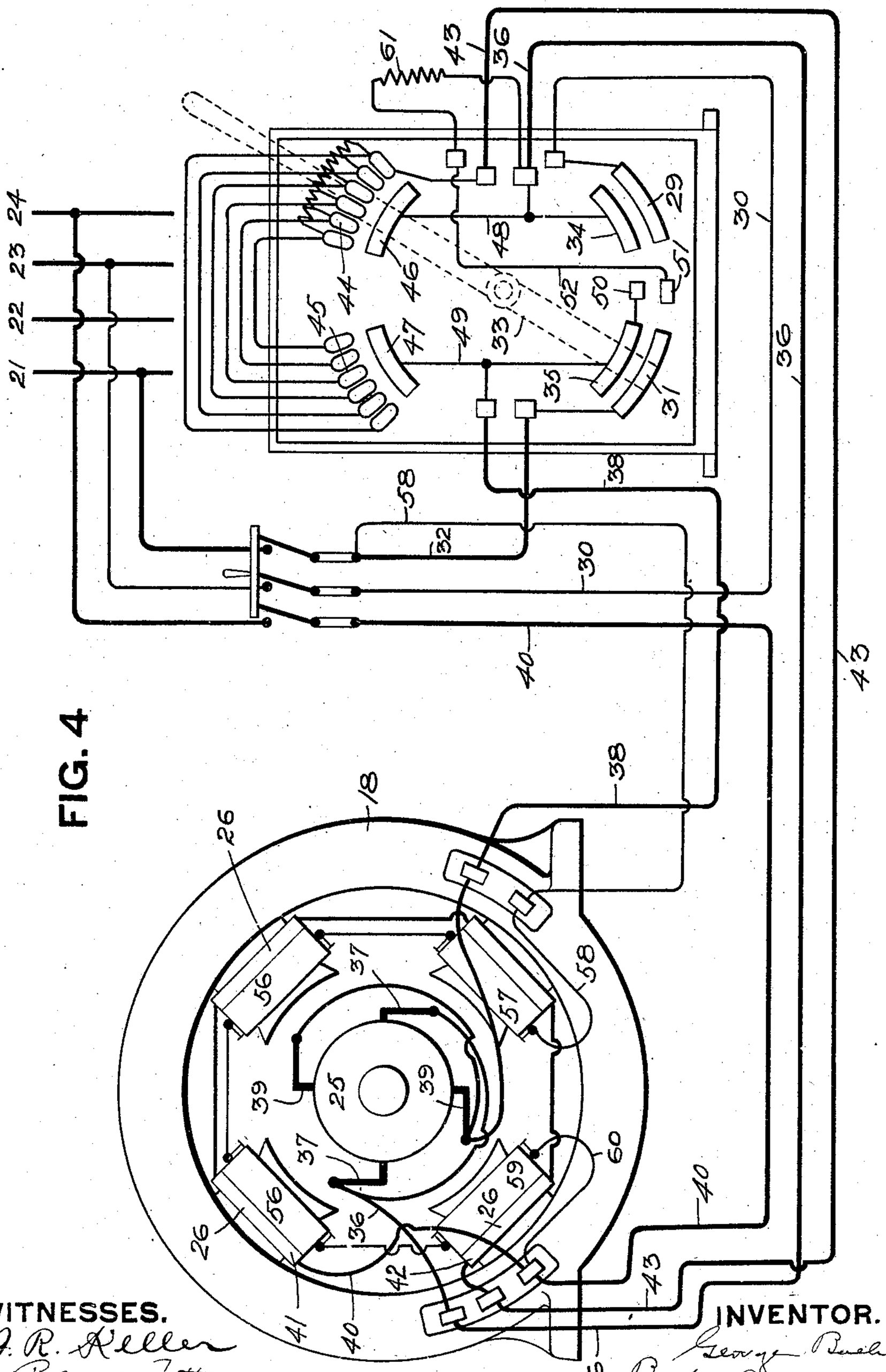
3 SHEETS—SHEET 3.

FIG. 4



WITNESSES.

J. R. Keller

Robert C Totten

INVENTOR.

George Baehr

By Kay Totten & Winter

attorneys

UNITED STATES PATENT OFFICE.

GEORGE BAEHR, OF McKEESPORT, PENNSYLVANIA, ASSIGNOR TO NATIONAL TUBE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

FURNACE-CHARGING APPARATUS.

No. 842,514. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed September 17, 1904. Serial No. 224,892.

To all whom it may concern:

Be it known that I, GEORGE BAEHR, a resident of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Furnace-Charging Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to furnace-charging apparatus, and more especially to apparatus for charging tube-blanks into welding-furnaces.

The object of my invention is to provide apparatus of this kind having two different speeds—a slow speed for charging the blank into the furnace and a quick return speed—both speeds being obtained by a simple controlling-lever having a movement in only two directions and preferably so arranged that by pushing the lever toward the furnace the pusher will be given the forward stroke and by pulling the lever away from the furnace the pusher will be given its backward or return stroke.

In the manufacture of tubing the blanks are pushed into the welding-furnace through an opening in the rear wall thereof and when raised to a suitable temperature are pushed or drawn out through an opening in the front wall of the furnace and into welding mechanism. It is the custom, especially with large and heavy tube-blanks, to charge them into the furnace by means of a reciprocating mechanical pusher mounted to travel on ways or a carriage located in the rear of the furnace and propelled toward and from the furnace by a suitable mechanism, such as an electric motor mounted on the charging-carriage. With apparatus of this kind heretofore in use the driving mechanism or motors have been designed to run at a constant speed, and as a result the return movement of the pusher is at the same speed as the forward or pushing stroke. In this way a great deal of time is lost, it being desirable that the return or idle movement of the pusher be as rapid as possible. Another objection to mechanical pushers heretofore in use, and especially those driven by electric motors, has been that the controllers for said motors have been of a rotary or other type having a movement bearing no relation whatsoever to the movement of the pusher itself. As the help employed about the mills is frequently of a low grade, it is difficult to instruct the workmen in the use of these controllers, and they frequently move the controlling-handle in the wrong direction to secure the desired movement of the pusher. Damage frequently results from this.

It is desirable that the controller for the motors be as simple as possible and that the handle thereof have a movement bearing some relation to the movement of the pusher itself, so that even an ignorant workman will not easily move the same in the wrong direction.

One object of my invention is to provide furnace-charging apparatus in which the driving mechanism or motor is arranged to have two different speeds—a slow speed for pushing the blank into the furnace and a quick return movement.

Another object of the invention is to provide controlling means or such mechanism or motor consisting of a simple lever having a movement in two directions only and serving to operate the driving mechanism or motor when in one position to propel the pusher toward the furnace at one speed and when in the other position to withdraw said pusher from said furnace, this lever preferably being arranged to have movement toward and from the furnace, so that the workman by merely pushing the lever toward the furnace will secure the forward travel of the pusher, while by drawing the lever away from the furnace the pusher will be propelled away from the furnace. By this simple arrangement the workman need only with his hands follow the desired movement of the pusher, so that there will be no danger of propelling the pusher in the wrong direction.

The invention also consists in specific features of the invention, such as an electric motor for operating the pusher, said motor being connected to a multiple-voltage circuit and employing a simple lever-controller in said circuit for driving the motor in opposite directions and with its backing speed higher than its forward speed; also, in the application of a brake at the end of the high-speed return movement, said brake being applied by the lever-controller when in its neutral position and preferably being a dynamic one secured by short-circuiting the motor on itself through a resistance, so that it will act as a generator.

The invention also consists in the specific arrangement of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan view of charging apparatus, showing my invention applied thereto. Fig. 2 is a side elevation of the same. Fig. 3 is a diagram of the motor and controller and circuits connecting the same, showing a series-wound motor; and Fig. 4 is a similar diagram showing a compound-wound motor.

In the drawings the welding-furnace is shown at 1. This is provided with a hearth 2 for receiving the tube-blanks and has an opening 3 in its rear wall through which said blanks are charged onto the furnace-hearth. In line with the opening 3 is the charging-bench 4, which may be of any known or desired type of charging-bench for this purpose. That shown in the drawings comprises a bench mounted on wheels 5, traveling laterally of the furnace on suitable tracks 6 on the mill-floor, so as to bring the carriage into different positions with reference to the furnace-hearth, as is now the practice. This lateral travel may be secured by any suitable mechanism, such as a motor 8, mounted on the carriage 4 and connected by suitable gearing to a shaft 9, forming the journals of the wheels 5. This charging mechanism is provided with a suitable table 10 for supporting the tube-blanks and from which they are pushed into the furnace. Said carriage is also provided with suitable tracks or ways 11, on which moves the pushing-buggy 12, the latter carrying a pushing-arm 13, arranged to engage the rear ends of the blanks as they rest on the table 10 and push the same through the opening 3 into the furnace. The buggy 12 is propelled along the track by means of an endless cable 14, secured to said buggy and passing over a guide-pulley 15 at the forward end of the carriage and having its ends connected to a drum 17, arranged to be driven alternately in opposite directions, so as to propel the pushing-buggy 12 toward the furnace to push the blank into the furnace and then propel the same to the rear end of the bench in position to engage a new blank.

The mechanism so far described is old and forms no part of my invention, and the specific form of charging-bench shown and described has been adopted for illustration merely, it being understood that my invention can be applied to furnace-charging mechanism of any type whatsoever. My invention relates to the means for driving the drum 17 and comprises an arrangement for propelling the pushing-buggy 12 toward the furnace at one speed and away from the furnace at another speed, as well as for applying a dynamic brake at the end of the return stroke of said buggy.

My invention may be carried into effect by driving mechanism for the drum 17 of various types, even mechanical, such as connecting the same to a suitable counter-shaft by proper gearing and providing a controlling-lever arranged so as to secure the desired movements. Preferably, however, the drum 17 will be driven by a motor mounted directly on the carriage itself, and this motor may be an engine of any known type, but preferably will be an electric motor 18, connected to the drum 17 by suitable intermediate speed-reducing gearing. This motor will be controlled by a simple lever controller, shown at 19, placed on the mill-floor at one side of the charging-bench. If desired, however, this controller may be placed on the bench itself or in the pulpit of a crane. This lever-controller will have a movement only in two directions in the same plane and will be mounted so as to swing toward and from the furnace, as shown in the drawings, or toward or from the bench itself. The connections will be so arranged that when said lever is pushed toward the furnace or toward the bench the motor will be driven in such a direction as to propel the pushing-buggy 12 toward the furnace, whereas by moving said lever away from the furnace or away from the bench the motor 18 will be driven in the opposite direction, thus moving the buggy 12 away from the furnace. By this simple arrangement even a very dull workman can safely be entrusted with the apparatus, only two movements of the controller being necessary, and he will merely have to follow with his hand the desired movement of the buggy and such desired movement will necessarily follow. By this arrangement practically all possibility of propelling the pushing-buggy in the wrong direction is avoided.

The lever-controller shown not only secures the movement of the pushing-buggy in both directions, but also at variable speeds, so that the withdrawing speed is greater than the pushing speed. It also applies a dynamic brake at the end of the return stroke. These results are accomplished by the electrical system now to be described. In Fig. 3 is shown a diagram of a motor system suitable for accomplishing these results. The motor 18 will be driven from a multiple-voltage circuit comprising mains 21, 22, 23, and 24, connected to a suitable source of electric energy and in such a manner that the difference in potential between mains 21 and 22 is forty volts, between mains 22 and 23 is one hundred and twenty volts, and between mains 23 and 24 is eighty volts. As a consequence the difference in potential between mains 21 and 24 is two hundred and forty volts. My system is so arranged that for the withdrawing speed the motor is supplied with two hundred and forty volts—that is, connected to the mains 21 and 24—whereas for the forward or pushing speed the motor is supplied from the mains 23 and 24 and as a consequence

receives only eighty volts. The motor-armature is shown at 25, and the field at 26, this motor being a series-wound motor. The controller is provided with a contact 29, which is connected to the main 23 by a conductor 30 and also with a contact 31, which is connected to the main 21 by a conductor 32. These two main contacts 29 and 31 are arranged on opposite sides of the middle of the controller-board and will be respectively engaged by the lever-switch 33 when in its opposite positions. Arranged adjacent to the main contacts 29 and 31 are the armature-contacts 34 and 35, respectively, the former being connected by a conductor 36 to the one armature-brush 37, while the latter is connected, by means of conductors 38, to the other armature-brush 39. The armature-contact 34 is so located with reference to the main contact 29 that it will be connected thereto by the lever-switch 33 in one of its working positions, while the armature-contact 35 is so located with reference to the main contact 31 that it will be connected thereto by said lever-switch when in its other working position. The main 24 is connected, by means of a conductor 40, to one terminal 41 of the motor-field. The opposite terminal 42 of the field is connected, by means of a conductor 43, with resistance-contacts 44 and 45, arranged in two groups on opposite sides of the middle of the controller-board, which contacts hereinafter will be referred to as the "field-contacts." Arranged adjacent to each group of these field-contacts are the companion contacts 46 and 47, respectively, the former of which is permanently connected, by means of a conductor 48, to the armature-contact 34, and the latter of which is permanently connected, by means of a conductor 49, to the armature-contact 35. The contacts and connections so far described are sufficient for securing the slow forward stroke of the motor and the quick return stroke. The dynamic brake is applied in the following way: On the neutral line of the controller-board and on the lower side thereof is a contact 50, permanently connected to the armature-contact 35 and which in turn is in permanent electrical connection with the armature-brush 39. Located in proximity to this, so as to be bridged by the lever-switch when in its neutral position, is a companion contact 51, which is permanently connected, by means of the conductor 52, with the field-contacts 44. On the upper side of the board is located a contact 53, which is in permanent electric connection with the contact 46, which in turn is in permanent electrical connection with the armature-brush 37. In proximity to the contact 53, so as to be connected thereto by the lever-switch when in its neutral position, is another contact 54, which is connected to the conductor 40 by means of a conductor 55.

The foregoing describes all the essential parts of the motor system for getting the variable speed and dynamic braking effect for the pusher-motor. The lever-switch 33 is pivoted centrally of the various contacts described and is arranged to be moved into two working positions as well as in a neutral position. In one working position it will connect the contacts 29 and 34 and 45 and 47. In the other working position it will bridge the contacts 31 and 35 and 44 and 46, while in its neutral position it will bridge the contacts 50 and 51 and 53 and 54. It has no other positions, and consequently the movements thereof are very simple, which will prevent confusion on the part of the operator.

When the controller-lever is in the position to bridge terminals 29 and 34 and 45 and 47, the motor will be driven in such direction as to propel the pushing-buggy toward the furnace, the current being then supplied to the motor from the mains 23 and 24, so that the motor receives eighty volts only. In this position of the lever-switch the course of the current is as follows: from the main 24 by means of conductor 40 to the terminal 41 of the motor-field, through said field and out by terminal 42, thence by conductor 43 to the field-contacts 44 of the controller-board, from these to the contacts 45, thence through the lever-switch to the companion contact 47, thence by means of conductor 49 to conductor 38 to the armature-brush 39, through the armature-winding and out by the armature-brush 37, thence by conductor 36 to conductor 48 to the armature-contact 34, thence through the lever-switch to the main contact 29, and thence by conductor 30 to the main 23. It will be seen that in this position the lever-controller connects the field and armature of the motor in series and that the same is supplied with current from the conductors 23 and 24. As the difference in potential between these two conductors is eighty volts, the motor will be driven to propel the pushing-buggy toward the furnace at a slow speed. As soon as the pushing-carriage has reached the limit of its forward stroke the controller-lever will be quickly moved to its opposite working position, in which it bridges contacts 31 and 35 and 44 and 46. In this position the circuit will be from the main 24 by means of conductor 40 to the motor-field and through the field in the same direction as in the opposite position of the controller-lever. From the field the current passes, by means of conductor 43, to the field-contacts 44, thence through the lever-switch to the companion contact 46, thence by conductor 48 to conductor 36 to the armature-brush 37, thence through said armature and out by the brush 39, thus traversing said armature in the opposite direction from which it did when the lever-switch was in its opposite position. From brush 39 the cur-

rent passes, by means of conductors 38 and 49, to the armature-contact 35, thence through the lever-switch to the main contact 31, and through the conductor 32 to the main 21. As a result the motor field and armature will be connected in series; but the current through the armature will be reversed with reference to its direction when the switch was in the opposite position. Consequently the motor will be driven in the opposite direction. It will also receive its current from the mains 21 and 24, the difference of potential of which is two hundred and forty volts. As a consequence the reverse or backward movement of the motor will be at a materially higher speed than its forward movement, and the pushing-buggy will be very rapidly returned to the rear end of the charging-carriage.

Inasmuch as the buggy and motor are running at a very high speed on their return stroke, damage might result if the switch were moved rapidly over to the opposite working position, so as to reverse the motor. Consequently I apply a dynamic brake at this point, this brake being applied by moving the controller-lever to its neutral position, so that it will bridge contacts 50 and 51 and 53 and 54. In this position of the lever-switch the mains will be entirely cut out and the motor will be placed in closed circuit and through the field resistance 44 of the controller. In this position of the lever the circuit, beginning with the armature-brush 39, is as follows: from said brush, by means of the conductors 38 and 49, to contact 35, thence to the braking contact 50, thence through the lever-switch to contact 51, through conductor 52 to the field-contacts 44, passing through said resistance, which can be varied by connecting the end of the conductor 52 to different ones of the field-contacts 44. From the contacts 44 the circuit is by means of conductor 43 to the field-terminal 42, through said field and out at the terminal 41, thence by conductors 40 and 55 to the contact 54, thence through the lever-switch to contact 53, thence to contact 46, through conductors 48 and 36 to the opposite armature-brush 37, and through said armature to the brush 39, which is the point of beginning. In this way the motor-field and armature are in a closed circuit through the resistance 44, and as a consequence said motor will become a generator and will thus be quickly and smoothly brought to a stop.

In Fig. 4 is shown a compound-wound motor for securing the same result. This motor is provided not only with the series field 26, but also with the shunt-field 56, which shunt-field has its one terminal 57 connected, by means of a conductor 58, to the conductor 32, leading to the main 21, and its opposite terminal 59 connected by a conductor 60 to the conductor 40, connected to the main 24. The contacts on the controller-board are in general arranged the same as in Fig. 3, the differences being that contacts 53 and 54 and conductor 55 are omitted; also, conductor 52, leading from contact 51, instead of being connected to the field-resistance contacts 44, as in Fig. 3, is connected to the conductor 36 and is provided with an external variable-resistance device 61. With this arrangement current is always flowing through the shunt-field 56, because said field is permanently connected, by means of the conductors 58 and 60, to the mains 21 and 24. When the lever-controller is moved to the position to bridge contacts 29 and 34 and contacts 47 and 45, the course of the current is exactly the same as with the arrangement shown in Fig. 3, the motor-armature and series-field magnets being in series and being supplied from the mains 23 and 24 with a current of eighty volts, while the shunt-magnets of the motor are supplied directly from the mains 21 and 24 with a current of two hundred and forty volts. The motor in this position of the switch will, however, be driven at its slow speed and will propel the pushing-buggy toward the furnace. When the lever-switch is moved to its opposite working position—that is, bridging the contacts 31 and 35 and 44 and 46—the current also will follow the same course as with the modification shown in Fig. 3. In this position of the switch the shunt-field will be supplied directly from the mains 21 and 24 at two hundred and forty volts, and the series field and armature will also be supplied from the same mains, and as a consequence the motor will be driven in the reverse direction and at a high speed. When the lever is moved to its neutral position, as it will be when the pushing-buggy approaches the limit of its rearward stroke, said lever will bridge the contacts 50 and 51. In this position the current coming from the armature-brush 39 passes, by means of conductors 38 and 49, to contact 35, thence to contact 50, thence through the lever-switch to contact 51, thence by means of conductor 52 through the resistance device 61 to the conductor 36, and by means of the same to the opposite armature-brush 37. The field 26 in this modification is not placed in series with the armature, as is the case in the arrangement shown in Fig. 3, but the armature itself is placed in closed circuit through the resistance 61. The shunt-magnets being permanently connected to the mains will give a sufficient field to produce the generating effect. The resistance 61 in this case takes the place of the field resistance 44 of the other modification.

It will thus be seen that either a series-wound or a compound-wound motor can be employed, and that by means of the contact arrangement shown a simple lever-switch can be employed for connecting said motor

to mains of different voltage, so as to drive the motor in one direction at a slow speed and in the opposite direction at a higher speed, and also to place the motor, or at least the motor-armature, in a closed circuit, so that the motor will act as a generator, and thus produce a braking effect.

The lever-controller has only three positions, two working positions and a neutral or braking position. It can be so located with reference to the pushing-buggy that even a dull workman can safely manipulate the same so as to produce the desired movements of the pusher and at the desired speeds and without danger of injuring any part of the apparatus or of propelling the pushing buggy in the wrong direction.

The lever of the controller is shown so mounted as to move toward or from the furnace. As the operator in some cases will face the charging-bench, the same effect can be secured by so mounting the lever that it will swing toward and from the bench, so that the operator will move the lever forward to secure the forward travel of the pusher and move the lever backward to secure the rearward travel of the pusher. Such a modification I intend to include in the claims as worded.

What I claim is—

1. The combination with a furnace, of reciprocating mechanism in front of the same and mounted to move toward and from the furnace, a reversible electric motor mounted thereon, a multiple-voltage circuit connected thereto, and means for changing the motor connections from a circuit of high voltage to a circuit of low voltage, and vice versa, whenever the direction of rotation of the motor is changed.

2. The combination with a furnace, of reciprocating mechanism in front of the same and mounted to move toward and from the furnace, an electric motor mounted thereon, a multiple-voltage circuit, and a lever-controller having two active positions and movable in a single plane, said lever being arranged in its forward position to connect the motor to a low-voltage circuit, and in its rearward position to connect said motor to a high-voltage circuit and with the direction of the current through the motor field and armature reversed.

3. The combination with a furnace, of reciprocating mechanism in front of the same and mounted to move toward and from the furnace, an electric motor mounted thereon, a multiple-voltage circuit, a lever-controller having a neutral and two active positions and movable in a singe plane, said lever being arranged in its forward position to connect the motor to a low-voltage circuit, and in its rearward position to connect the motor to a high-voltage circuit, with the direction of the current through the field and armature reversed, and a brake applied by said lever in its neutral position.

In testimony whereof I, the said GEORGE BAEHR, have hereunto set my hand.

GEORGE BAEHR.

Witnesses:
ROBERT C. TOTTEN,
G. KREMER.