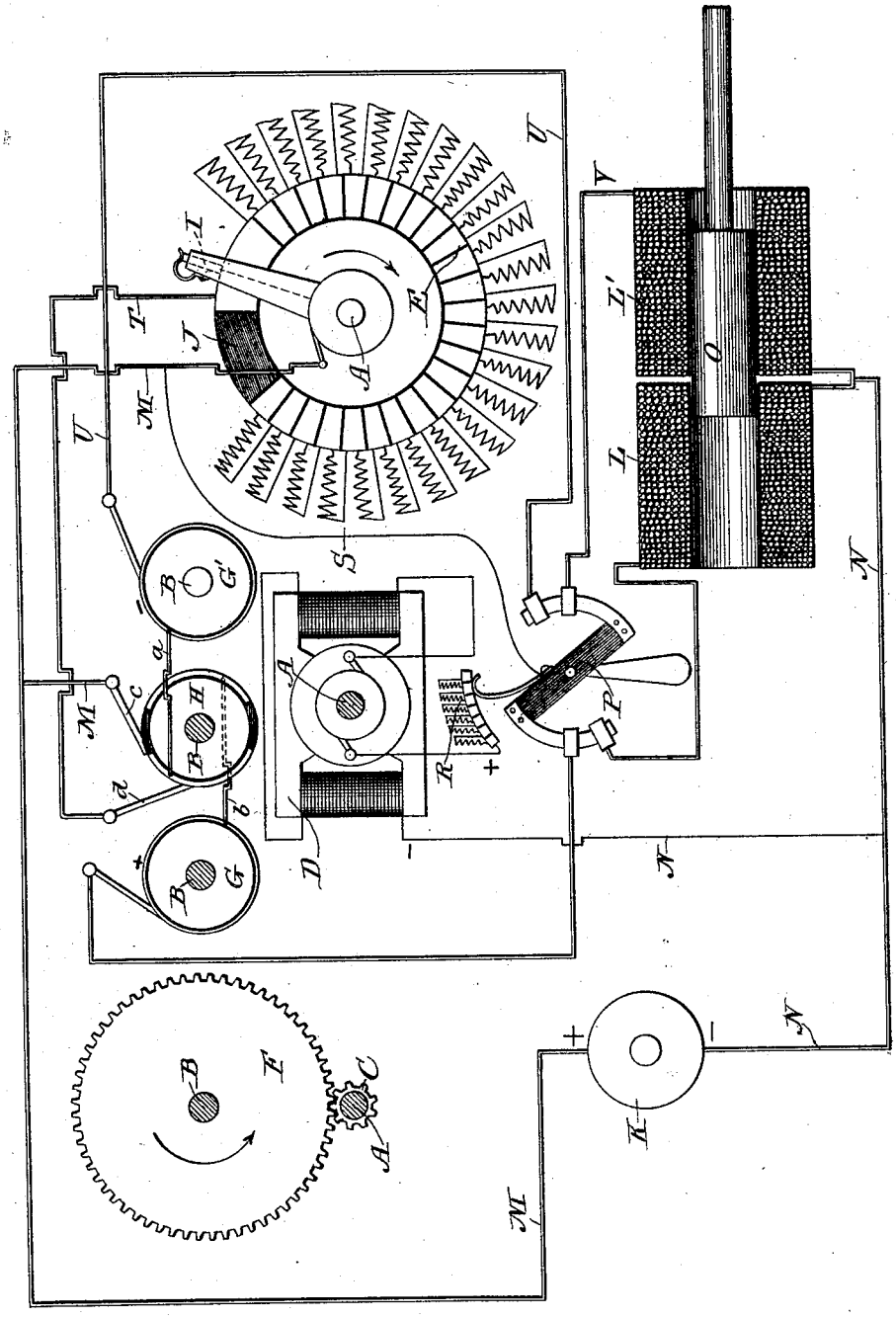
(No Model.)

# E. C. MORGAN.

## SYSTEM FOR OPERATING ELECTRIC MOTORS.

No. 507,629. Patented Oct. 31, 1893.

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# UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF CHICAGO, ILLINOIS.

## SYSTEM FOR OPERATING ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 507,629, dated October 31, 1893.

Application filed June 9, 1892. Serial No. 436,041. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Systems for Operating Electric Motors, of which the following is a specification.

This invention relates to electrical apparatus for driving machinery of different kinds, and while it is particularly designed for operating reciprocating motors, such for instance as are commonly used in rock drilling machines and coal mining machines, yet it may be employed with advantage in connection with other forms of reciprocating motors, and with various other machines.

The invention consists in substantially the construction and arrangement herein described and set forth in the claims.

Like letters refer to the same parts in the drawing in which the figure represents a diagrammatic view of the arrangement of the circuits and contacts in connection with the mechanical parts.

In the drawing I have elected to show a reciprocating motor to be operated by my arrangement of electrical apparatus, which motor is illustrated as consisting of two coils L, L′, of a well known construction, and the core O whose stem projects beyond the coils and operates any suitable machinery. The coils and the core in the present instance constitute what is familiarly termed a solenoid. Any suitable source of electricity of sufficient power, which is preferably a continuously acting dynamo, is connected to the apparatus by the conductors M and N respectively issuing from its positive and negative poles. From any suitable point on the positive wire M, a shunt S leads to a hand switch P and thence through a small rheostat R with which said switch connects to the motor D. The motor D is connected to or mounted upon a shaft A upon which is also mounted a pinion C and a revolving arm I which contacts in its travel with more or less of the blocks connected to the coils of a circular rheostat E which latter has an insulating block J immediately adjacent to its last coil. It will thus be seen that the revolution of the motor will also revolve the pinion C and the arm I at the same rate of speed, or, as it is termed, synchronously.

In the drawing the view being diagrammatic the several portions of the shaft A upon which are mounted the gears, motor and revolving arm are shown displaced from their proper position in the machine, but represented as they would appear with relation to their electrical connections.

The motor imparting its motion to the pinion C will cause the latter to drive a gear F which being of a suitable circumference is revolved at one-eighth the speed of the pinion but of course these relations may be changed according to the circumstances of the case. The gear F is mounted upon the shaft B which also carries and operates two circular contacts G, G′, and a segmental contact H so that they are all driven synchronously. I prefer the arrangement shown of the segmental contact,—with two contact segments and two insulating segments, one contact and one insulated segment constituting one half of the wheel and the other the remaining half, the insulating segment being extended one quarter the distance of the contact segment, thus making each insulating segment one-eighth the circumference of the wheel, and each contact segment three eighths. As before suggested these relations may be varied according to the exigencies of the case and the judgment of the constructer. The opposite contact segments are connected to different coils of the solenoid. In the position as shown in the drawing the left contact segment is connected through the contact ring G′ to the coil L′ and the right contact segment is connected through the ring G to the coil L; short wires *a*, *b*, being used to connect the contact segments with the contact rings. The circular rheostat is made up for the most part in the customary way of a series of coils connected to blocks, over which the revolving contact arm passes and thereby places more and more resistance in the circuit as such arm continues its revolution, and finally by interposing the entire resistance of the rheostat, brings the strength of the current down to an inconsiderable amount which is insufficient to produce a spark of a detrimental character when such circuit is broken. Im-

mediately adjacent to the last coil of this rheostat is an insulating block J so that when the revolving arm passes beyond the last contact block, it is upon this insulating block and the circuit is therefore broken at a point where the current is weakest. The positive pole of the dynamo is, as before suggested, connected by the conductor M to the segmental contact H but this of course is only when the brush bears upon the contact portion of this wheel. When the brush *c* bears upon the insulated section as shown in the drawing the current passes to the revolving arm I and thence through the conducting block of the circular rheostat to the wire T, then through the wire T to the left contact segment of the segmental contact wheel and by the wire *a* to the contact wheel G′ and by the wire U through the right arm of the switch P and the wire V to the coil L′ and thence back through the wire N to the negative pole of the dynamo. The segmental contact wheel is shown as revolving to the left, and as having bearing thereon two brushes *c*, *d*, which are so arranged in relation to the revolving contact arm and circular rheostat that before the brush *c* passes from the insulating segment the brush *d* is upon the insulation, at which instant the contact arm will be upon the insulation J of the circular rheostat; or, to express it differently and perhaps more clearly, the revolving contact should be upon the insulation J before the brush *d* is upon its insulating block, that is, before the brush *d* leaves its contact. It will be manifest however that inasmuch as the revolving contact arm is upon the shaft A and the segmental contact wheel is upon the shaft B, the arm I moves eight times as rapidly as the segmental contact wheel, and that such arm breaks the circuit only once in four revolutions inasmuch as there are two insulating blocks in the segmental contact wheel and these constitute one fourth of the surface of such wheel or in other words the relative revolutions of the arm and the segmental contact wheel are as eight to one but there are two insulating blocks in the wheel so the circuit is broken once to every four revolutions of the arm. During all the other revolutions of the arm, when it is upon the insulating segment J, the brush *c* is on the contact surface and either forms the only path for the current, or when the revolving arm is on the contact, forms the shortest path for the current which is around the circular rheostat.

When the brush *c* is upon one of the contact segments, the current is connected to one coil of the solenoid, and when it is upon the other contact segment the opposite coil of the solenoid is connected, so that the two coils are caused to give a reverse movement to the core and properly operate the mechanism.

The speed of the motor may be regulated by manipulating the switch P and shifting it a greater or less distance upon the rheostat R which of course correspondingly affects the action of the solenoid.

It is obvious that many variations may be made in the details of the parts and the arrangements herein described, and shown in the accompanying drawing without departing from the principle of my invention, and therefore I do not wish to limit myself to the exact construction and arrangement shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a system for operating electric motors, the combination of a continuously acting dynamo, a motor actuated thereby to operate any suitable tool, devices for shifting the direction of the current supplied to such motor, a rheostat, and synchronous mechanism connecting the rheostat and the devices for shifting the current so that the current will be reduced before it is shifted; substantially as shown and described.

2. In a system for operating electric motors, the combination of a dynamo, a motor for actuating the tool, devices for shifting the current supplied to such motor, and mechanism for reducing the strength of the current synchronously connected to the shifting devices substantially as and for the purpose set forth.

3. In a system for operating electric motors, the combination of a dynamo, a main motor for actuating a tool, devices for shifting the current, appliances for reducing the strength of the current, and mechanism for connecting such shifting devices and reducing appliances arranged to give determinate but different rates of movement to such devices and appliances; substantially as and for the purpose set forth.

4. In a system for operating electric motors, the combination of a continuously acting dynamo, a main actuating motor consisting of two coils and an armature, devices for shifting the current to one or other of these coils; appliances for reducing the strength of the current just before it is shifted, and gearing connecting the shifting devices with the reducing appliances such gearing being of a relative size to give a determinate but different rate of movement to the shifting devices and reducing appliances.

5. In a system for operating electric motors, the combination of a dynamo, a solenoid comprising two coils and a core, devices for shifting the current, appliances for reducing the strength of the current before it is shifted, a supplementary motor operating the last mentioned appliances, and reducing gearing connecting the appliances and shifting devices.

6. In a system for operating electric motors the combination of a dynamo a main actuating motor for the tool, appliances for shifting the current, devices for reducing the strength of the current consisting of a rheostat and

a movable contact, gearing connecting such movable contact with the shifting appliances, whereby they may be synchronously and automatically operated; substantially as and for the purpose set forth.

7. In a system for operating electric motors the combination of a dynamo a main actuating motor, comprising two coils, and an armature, devices for shifting the current, mounted upon one shaft, and appliances for reducing the current mounted upon another shaft, and intermediate reducing gearing; substantially as and for the purpose set forth.

8. In a system for operating electric motors, the combination of a dynamo, an electric motor for actuating the tool, devices for shifting the current, appliances for reducing the strength of the current, consisting of a circular rheostat provided with a series of coils and an insulating segment adjacent to the last coil, and a revolving contact arm carried by a suitably actuated shaft, and reducing gearing connecting this shaft with the shaft of the shifting devices, substantially as and for the purpose set forth.

9. In a system for operating electric motors, the combination of a dynamo, and a solenoid, comprising two coils and a core, devices for shifting the current alternately to the different coils of the solenoid, comprising a contact wheel carrying insulated and contact segments, and a pair of contact arms electrically connected with the contact segments, and appliances for reducing the strength of the current, and cutting it off, comprising a circular rheostat, a number of coils and an insulating segment adjacent to the last coil, and a revolving contact arm mounted upon a shaft; a supplemental motor mounted upon the same shaft; and driving such shaft, a pinion, and a larger gear carried upon the shaft of the shifting devices, and meshing with such pinion; substantially as and for the purpose set forth.

10. In a system for operating electric motors, the combination of a dynamo, a solenoid comprising two coils and a core, for operating the tool, devices for shifting the current, alternately to the different coils of the solenoid, appliances for reducing the strength of the current, a supplemental motor for driving the reducing appliances, proportional gearing connecting the shifting devices and reducing appliances, whereby their relative speeds are proportional, and a switch, a small rheostat acting in conjunction therewith for regulating the speed of the supplemental motor, and consequent speed of the actuating motor or solenoid; substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

EDMUND C. MORGAN.

Witnesses:

FRANK T. BROWN,

J. LAWRENCE GERRY.