No. 878,525. PATENTED FEB. 11, 1908.

M. GROB.

ELECTRIC INSTALLATION WORKING WITH TURBO DYNAMOS AND ACCUMULATORS.

APPLICATION FILED AUG. 22, 1906.

2 SHEETS—SHEET 1.

FIG_1_

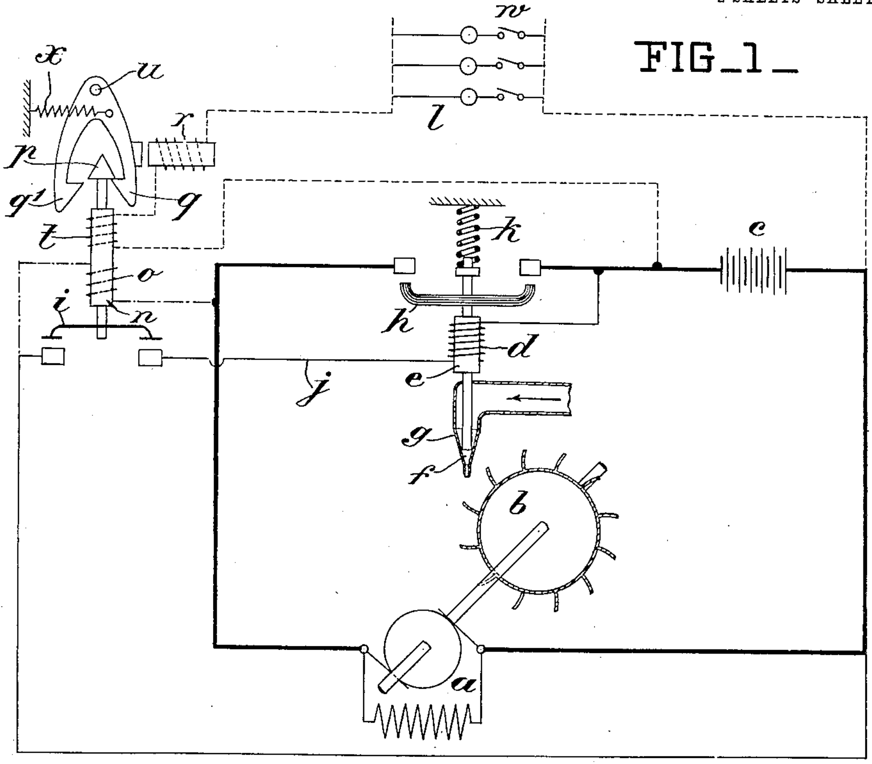
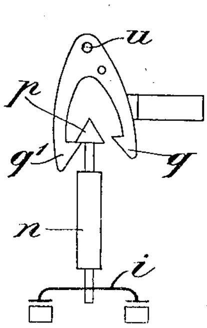


FIG_1a



WITNESSES:

Fred White

René Bruine

INVENTOR:

Max Grob,

By his Attorneys

Arthur C. Fraser Marina

No. 878,525. PATENTED FEB. 11, 1908.

M. GROB.

ELECTRIC INSTALLATION WORKING WITH TURBO DYNAMOS AND ACCUMULATORS.

APPLICATION FILED AUG. 22, 1906.

2 SHEETS—SHEET 2.

FIG_2_

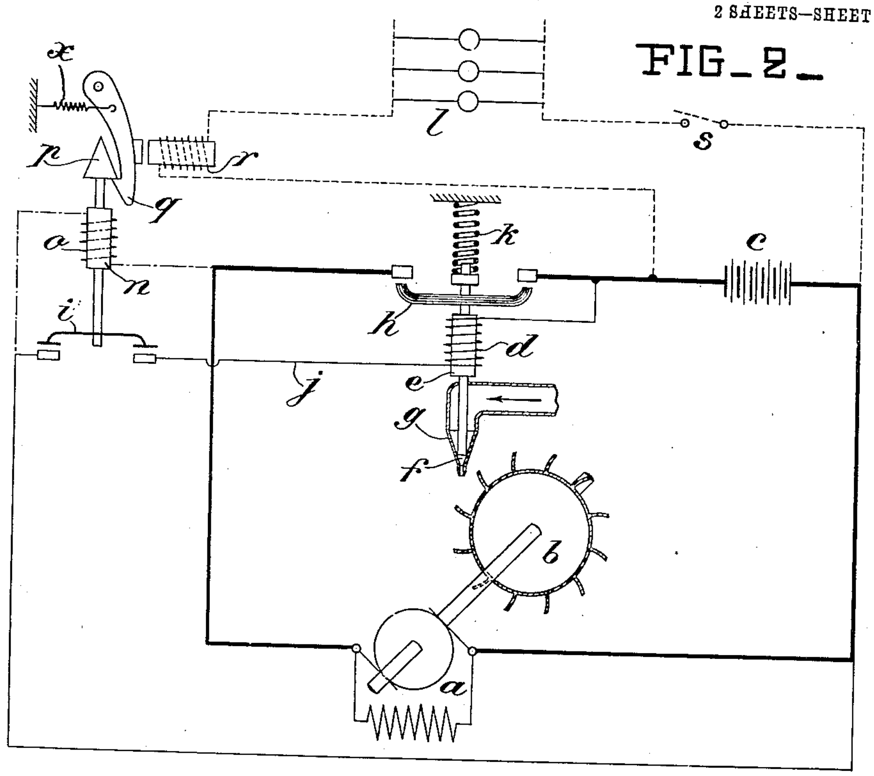
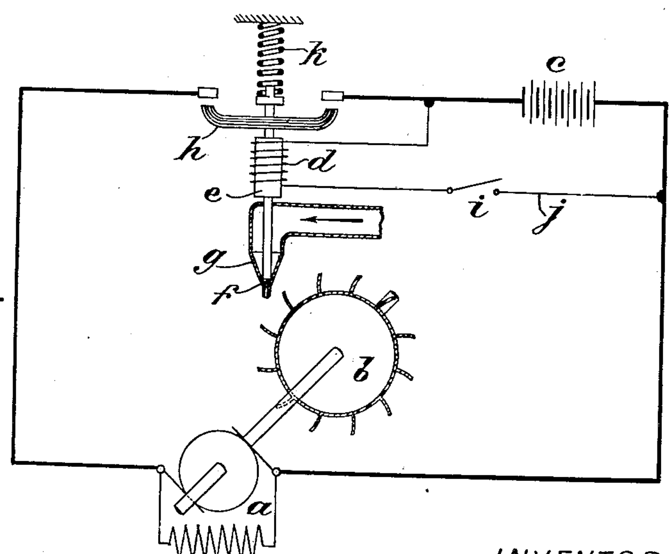


FIG_3_



WITNESSES:

Fred White

René Bruine

INVENTOR:

Max Grob,

By his Attorneys

Arthur C. Fraser & Usina

UNITED STATES PATENT OFFICE.

MAX GROB, OF WINTERTHUR, SWITZERLAND.

ELECTRIC INSTALLATION WORKING WITH TURBO-DYNAMOS AND ACCUMULATORS.

No. 878,525. Specification of Letters Patent. **Patented Feb. 11, 1908.**

Application filed August 22, 1906. Serial No. 331,622.

To all whom it may concern:

Be it known that I, MAX GROB, a citizen of the Swiss Republic, and resident of Winterthur, Switzerland, have invented new and useful Improvements Relating to Electric Installations Working with Turbo-Dynamos and Accumulators, of which the following is a full, clear, and exact specificaion.

The present invention has for its object an electric installation working with a turbo-dynamo and accumulators arranged for simultaneously controlling the supply of driving fluid to the turbine and the connection between the accumulator battery and the dynamo. By the term "turbo-dynamo" is to be understood a machine made up from a turbine and a dynamo in such a way that the turbine is in mechanical connection with the dynamo, while water, steam or gas is employed as the driving medium for the turbine.

According to this invention a movable part of an electromagnetic device, for instance of an electromagnet or solenoid arranged in an electric circuit is connected mechanically on the one hand with a throttle or cut-off device (valve or the like) for controlling the flow of the driving fluid to the turbine and on the other hand with a switch serving to make the connection between the accumulator battery and dynamo; consequently when the electromagnet is energized the controlling means for the turbine is simultaneously opened or closed while the switch for closing and breaking the connection between the dynamo and accumulator battery is operated.

The accompanying drawings illustrate diagrammatically three examples of arrangements according to this invention.

Figure 1 shows the general diagram of the preferred form of construction. Fig. 1^a is a view of a detail of this form of construction, having another position with regard to that shown in Fig. 1. Figs. 2 and 3 show the diagrams of other, more simple embodiments of the invention.

Referring first to Figs. 1 and 1^a which show the preferred form of construction, *a* indicates a dynamo mechanically coupled with a turbine *b* and arranged in circuit with an accumulator battery *c*; *d* is a solenoid or electromagnet, the movable core *e* of which is mechanically connected on the one hand with the cut-off valve *f* in the supply nozzle *g*, for the turbine *b*, and on the other hand with the bridge piece *h* of a main switch for breaking and closing the electric circuit above mentioned; the winding of the electromagnet *d* is arranged in a shunt circuit *j* across the terminals of the battery *c*, this shunt containing a cut-out or secondary switch *i*; *k* is a spring which when no current is flowing through the solenoid *d*, causes the switch *h* to be opened and at the same time closes the cut-off valve *f* of the turbine.

With the parts in the position shown in Fig. 1 if the cut-out switch *i* in the shunt circuit *j* is automatically closed by means of a device hereinafter referred to, current flows from the charged accumulator battery *c* through the winding of the electromagnet *d* whereby this latter is energized and the valve *f* is opened while simultaneously the switch *h* is closed. The consequence of this is that the turbine *b* is set in action by the driving fluid allowed to pass through the open nozzle *g* and at the same time, in consequence of the closing of the switch *h*, the electric connection between the dynamo *a* and the battery *c* is closed. The dynamo is then in a position to supply current to the accumulator battery to an extent corresponding to the power of the turbine, and as long as the switch *i* is closed; when this switch is opened the spring *k* opens the switch *h* thus cutting off the battery from the dynamo and simultaneously closing the valve *f* thereby cutting off the supply of working fluid from the turbine.

The plant as represented in Fig. 1 serves for supplying an electric lighting circuit *l* and the arrangement hereby is such that, when single lamps are switched on, firstly the turbine is stopped even if the battery has not been fully charged or, secondly, that the turbine remains out of action if it was already idle owing to the battery having been completely charged before the switching on of the lamps, and that in both cases the turbine is set in action again only when all the lamps have been cut out. To this end, the automatic controlling device for the secondary switch *i* is in some respects in relation with the electric lighting circuit *l*, the lamps of which are combined with separate switches *w*. The movable contact maker of the switch *i* is mechanically connected with the movable core *n* of a solenoid *o* arranged in a shunt circuit upon the battery c and surrounded by an auxiliary solenoid t located in the lighting circuit l and which acts in the same direction as the first. This core carries also a catch-head p arranged to operate in conjunction with two opposite catch-pawls q, q^1 made in one piece after the manner of an escapement catch and arranged to turn around a pivot u, a spring x acting upon said double catch. The latter is also under the influence of a releasing electromagnet r which has its coil arranged in the lamp circuit, in series with the solenoid t. This arrangement operates in the following manner: Assuming that the cut-off valve f is opened, the switch h is closed and the lamp circuit is opened, all the switches w having been turned off, the battery will be charged preferably, as is usual, with a compensating resistance (not shown) connected in circuit therewith. By this means the controlling solenoid o is influenced in such a way that at a certain potential which corresponds to that of the full load of the battery c, the core n is drawn in and the cut-out or secondary switch i is opened. (This is the position of the parts in Fig. 1). The shunt circuit j is thus broken so that the valve f is closed under the action of the spring k and the main switch h is opened, the battery c being thus charged and the turbine b thrown out of action.

If now the separate lamps are switched on at w after the charging of the battery c and the throwing out of action of the turbine b the compensating resistance above referred to being cut off the lighting current flows through the releasing solenoid r, the consequence of which is that the pawl q is released from the catch-head p and the core n is released so that this latter can fall under its own weight until it is stopped by the pawl q^1 which is brought into position to engage its catch-head p (Fig. 1ª). When all the lamps are switched off the current ceases to flow from the solenoid r so that the pawls q, q^1 can move back under the tension of the spring x into the position shown in Fig. 1 whereby the catch-head p and the core n are completely freed allowing the cut-out switch i to close, whereupon the electromagnet d is energized, the cut-off valve f for the turbine driving fluid is opened and simultaneously the switch h is closed for connecting the battery to the dynamo. If lamps are switched in while the battery is being loaded the magnetic actions of the two solenoids o and t are added together so that the core n is drawn up, the circuit j of the electromagnet coil d is broken at the switch i and the turbine is thrown out of action. The core n is then held fast by means of the pawl q^1 engaging with the catch-head p (the solenoid r being still energized) and the parts continue in this position until all the lamps are switched off whereupon the core n is released in consequence of the deënergizing of the solenoid r, and the switch i is closed so that the cut-off valve f for the turbine driving fluid is opened and the switch h is closed to connect the battery with the dynamo. If all the separate lamp circuits are simultaneously opened and if the battery charged by the dynamo has reached its full load potential the core n may be raised again by the action of the solenoid o so that its head p may be engaged by the pawl q which is now hanging free, which is the condition of affairs illustrated in Fig 1.

Fig. 2 represents a somewhat different embodiment of the invention. Here the lamp circuit l has one single switch s common to all the lamps, and one single spring pawl q is adapted to coöperate with the headed core n of a single solenoid o connected in shunt to the main circuit. The movable core n is also rigidly connected to the contact bridge of the switch i and further the pawl q is also under the influence of a releasing electromagnet r located in the lighting circuit l. With respect to the other parts indicated by the same letters of reference, they are substantially the same as in the preferred embodiment above described.

The arrangement of Fig. 2 operates as follows: Assuming that the cut-off valve f is opened, the switch h closed and the lamp circuit switch s opened, the battery c will be undergoing charging, preferably, as is usual, with a compensating resistance (not shown) connected in circuit therewith. By this means the controlling solenoid o is influenced in such a way that at a certain potential corresponding to that of the battery c when fully charged, the core n is drawn in and the cut-out switch i is opened. (The parts are shown in this position in the drawing). The shunt j is thus broken so that the valve f is closed under the action of the spring k and the switch h is opened. In order to prevent the solenoid core n from being released when the dynamo potential is cut off the catch-head p is arranged to fall into engagement with the pawl q. The parts remain in this position until when the lamps are switched in by the closing of the switch s the releasing magnet r is energized whereby the pawl q is released against the action of the spring x, so that the head p is left free and the cut-out switch i can be closed. The consequence of this is that the solenoid or electromagnet d is energized, the cut-off valve f is opened allowing driving fluid to pass to the turbine and the switch h is closed for connecting the battery with the dynamo.

In Fig. 3, the main parts of the installation are the same as above described, but this figure shows no outer or working circuit, while the switch i in the shunt circuit j of the electromagnet-coil d is arranged to be operated by hand or automatically at a predetermined time by a clock-work mechanism.

What I claim is:

1. In electric installations working with turbo-dynamos and electric accumulators, the combination with a cut-off device for controlling the flow of driving fluid to the turbine and a switch for controlling the connection between the accumulator battery and the dynamo, of an automatic electromagnetic device having a solenoid in a controlling circuit, and a spring-actuated movable core connected mechanically on the one hand to said turbine-controlling device and on the other hand to said connecting switch, so that when the electro-magnetic device is energized or deënergized the opening and closing of the turbine-controlling device is effected simultaneously with the operation of said switch for the closing or breaking of the connection between the dynamo and the accumulator battery, substantially as described.

2. In electric installations working with turbo-dynamos and electric accumulators the combination with a cut-off device for controlling the flow of driving fluid to the turbine, a connecting circuit between the accumulator battery and the dynamo and a main switch for controlling this circuit, of an electromagnetic device having a movable part connected mechanically on the one hand to said turbine controlling device and on the other hand to said main switch, a shunt circuit inclosing the winding of said electromagnetic device, a secondary switch located in this shunt circuit in series with said winding shunted electromagnetic means for automatically controlling this secondary switch, and an electrically controlled catch device for governing the movable part of the last named electromagnetic means substantially as described.

3. In electric installations working with turbo-dynamos and electric accumulators the combination with a cut-off device for controlling the flow of driving fluid to the turbine, a connecting circuit between the accumulator battery and the dynamo and a main switch for controlling this circuit, of an electromagnetic device having a movable part connected mechanically on the one hand to said turbine controlling device and on the other hand to said main switch, a shunt circuit inclosing the winding of said electromagnetic device, a secondary switch located in this shunt circuit in series with said winding, a shunted solenoid, a movable core therein mechanically connected to the movable part of said secondary switch, a spring acted catch pawl adapted to coöperate with this core so as to retain it temporarily in a position corresponding to the opening of the secondary switch, a working circuit with a cut-off switch, and a releasing electromagnet located in this working circuit and adapted to disengage said catch pawl from the core connected to the secondary switch, substantially as described.

4. In electric installations working with turbo-dynamos and electric accumulators the combination with a cut-off device for controlling the flow of driving fluid to the turbine, a connecting circuit between the accumulator battery and the dynamo and a main switch for controlling this circuit, of an electromagnetic device having a movable part connected mechanically on the one hand to said turbine controlling device and on the other hand to said main switch, a shunt circuit inclosing the winding of said electromagnetic device, a secondary switch located in this shunt circuit in series with said winding, a shunted solenoid, a movable core therein mechanically connected to the movable part of said secondary switch, a spring acted catch pawl adapted to coöperate with this core so as to retain it temporarily in a position corresponding to the opening of the secondary switch, another catch pawl connected bodily to the first named and adapted to catch the core connected to the secondary switch in an intermediate position when it is released from the first catch pawl, an electric lighting circuit with lamps and separate cut-off switches combined therewith, a releasing electromagnet located in the lighting circuit and adapted to act upon the first named catch pawl, and an auxiliary solenoid on the core connected to the secondary switch, placed in series with the releasing electromagnet in the lighting circuit, substantially as described.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

MAX GROB.

Witnesses:

PAUL GUTTINGER,

A. LIEBERKNECHT.