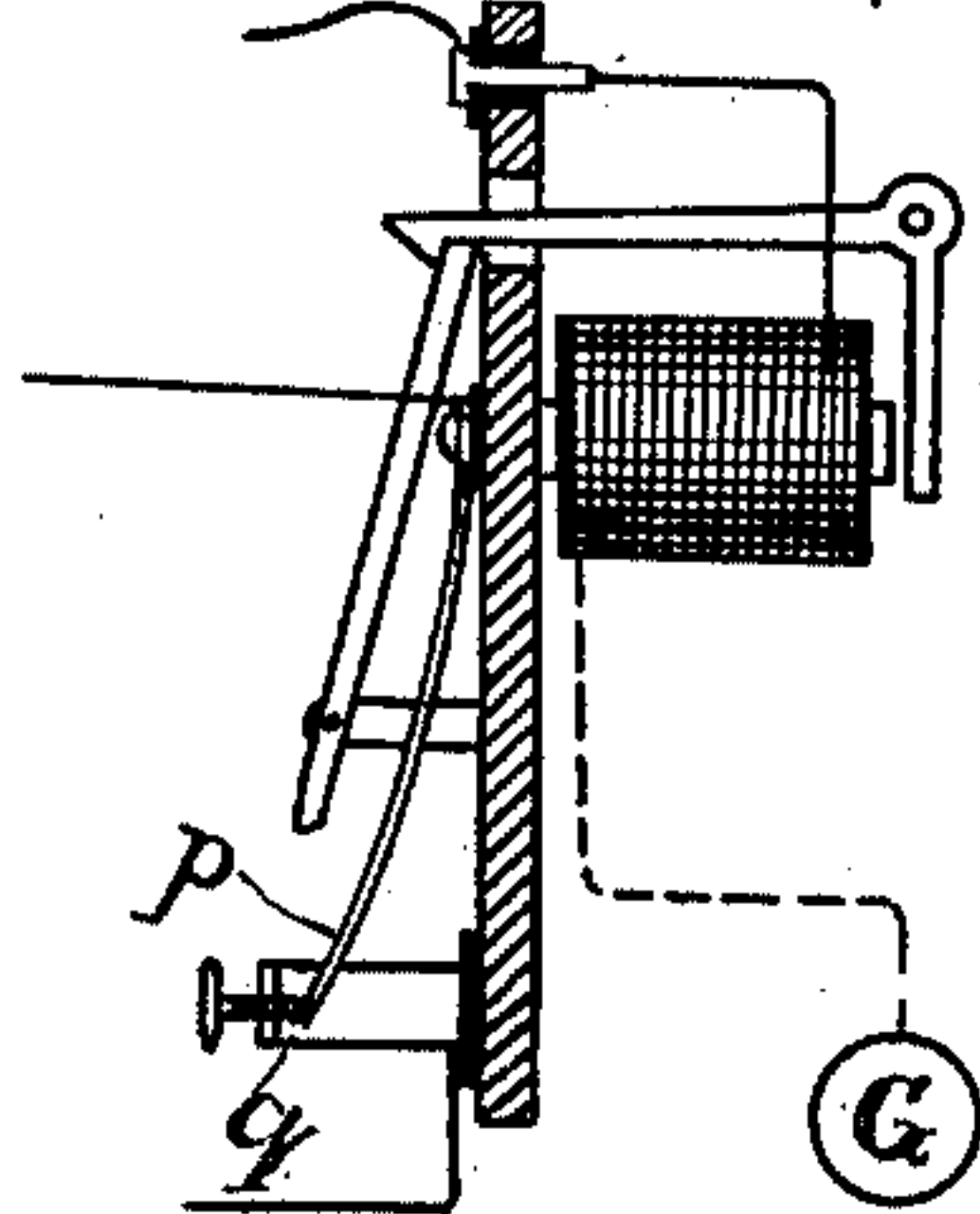
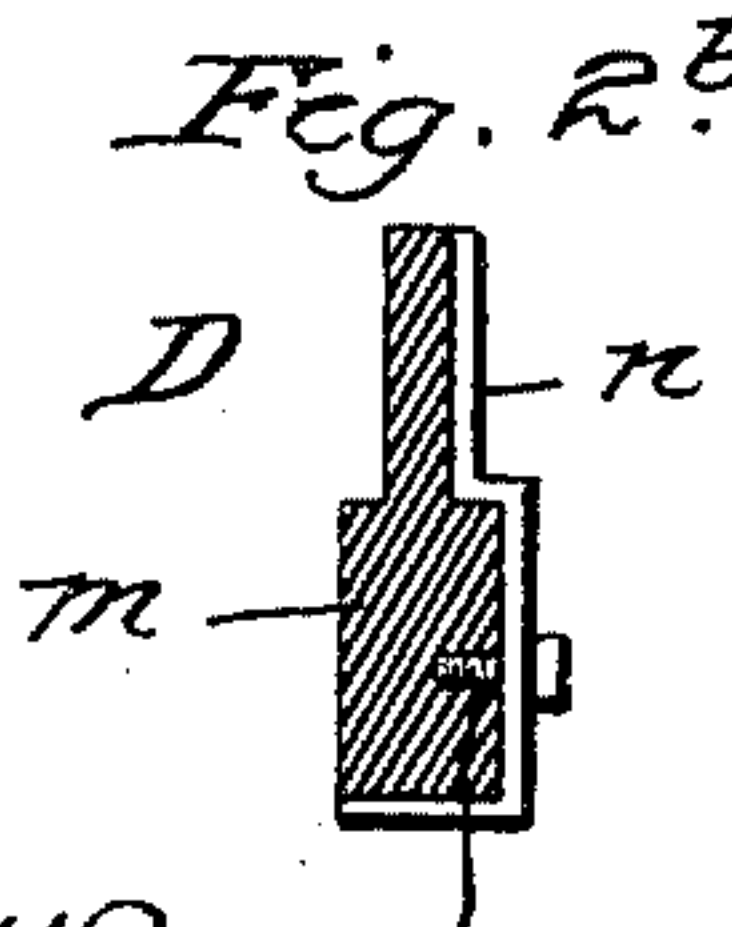
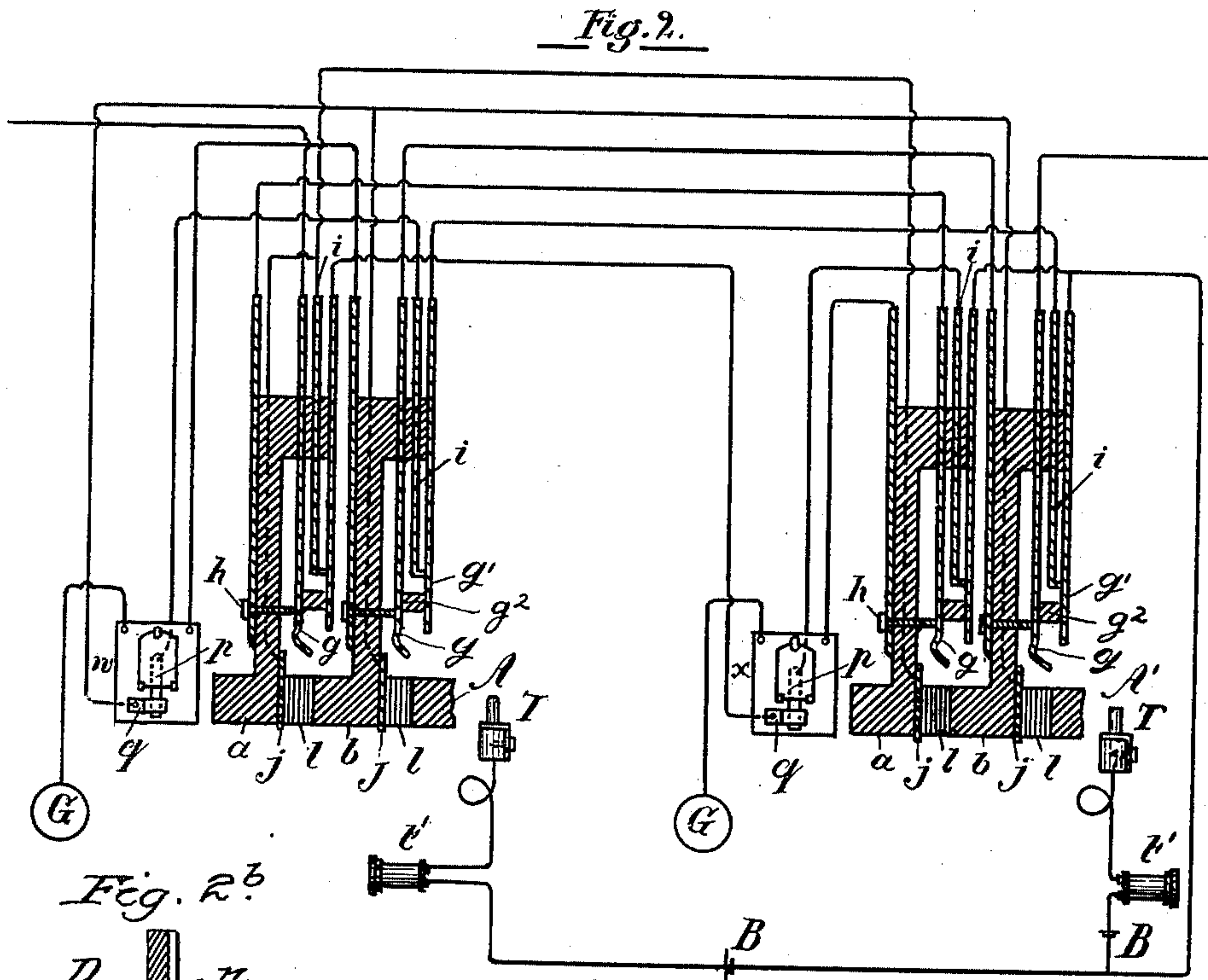
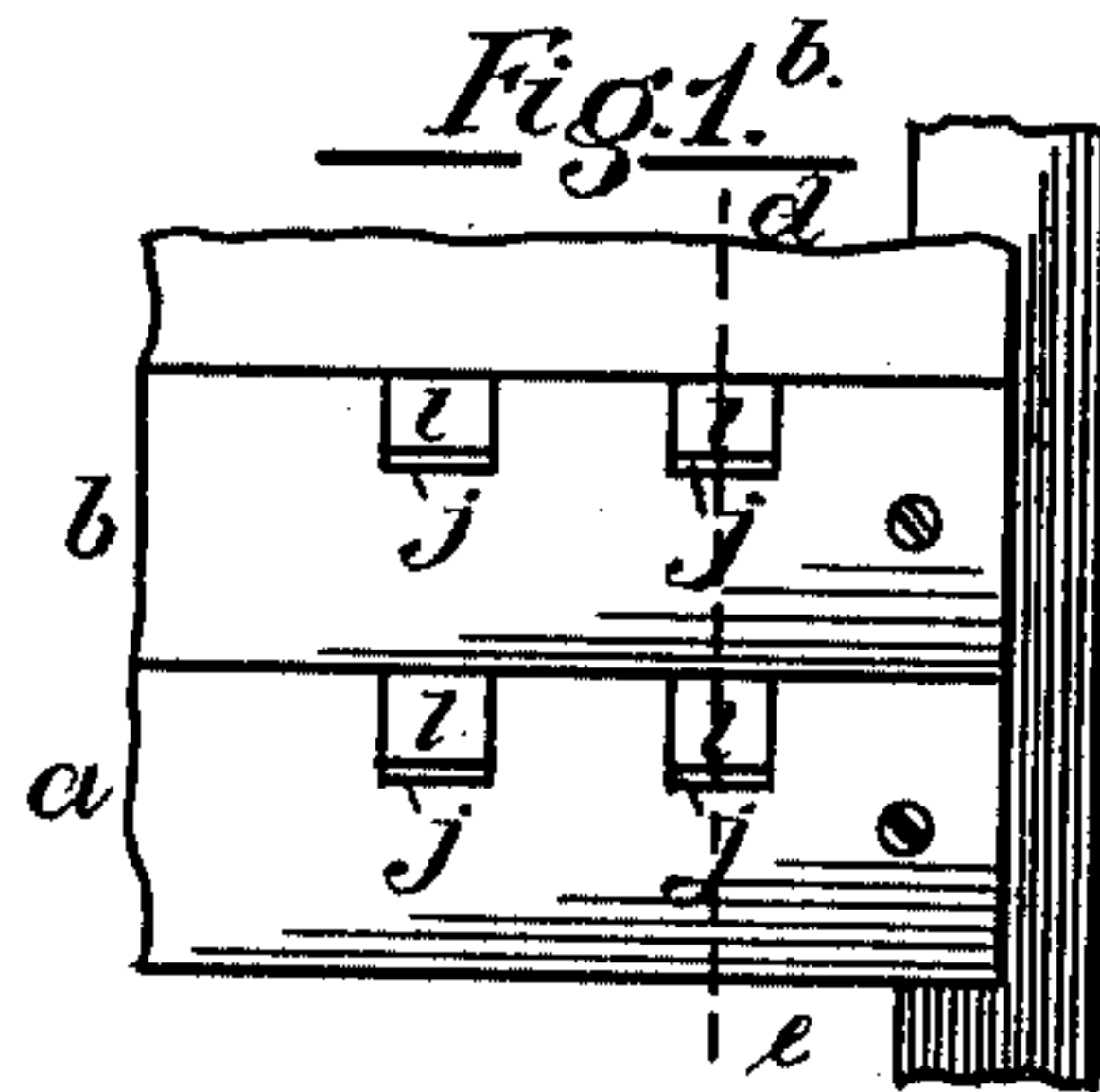
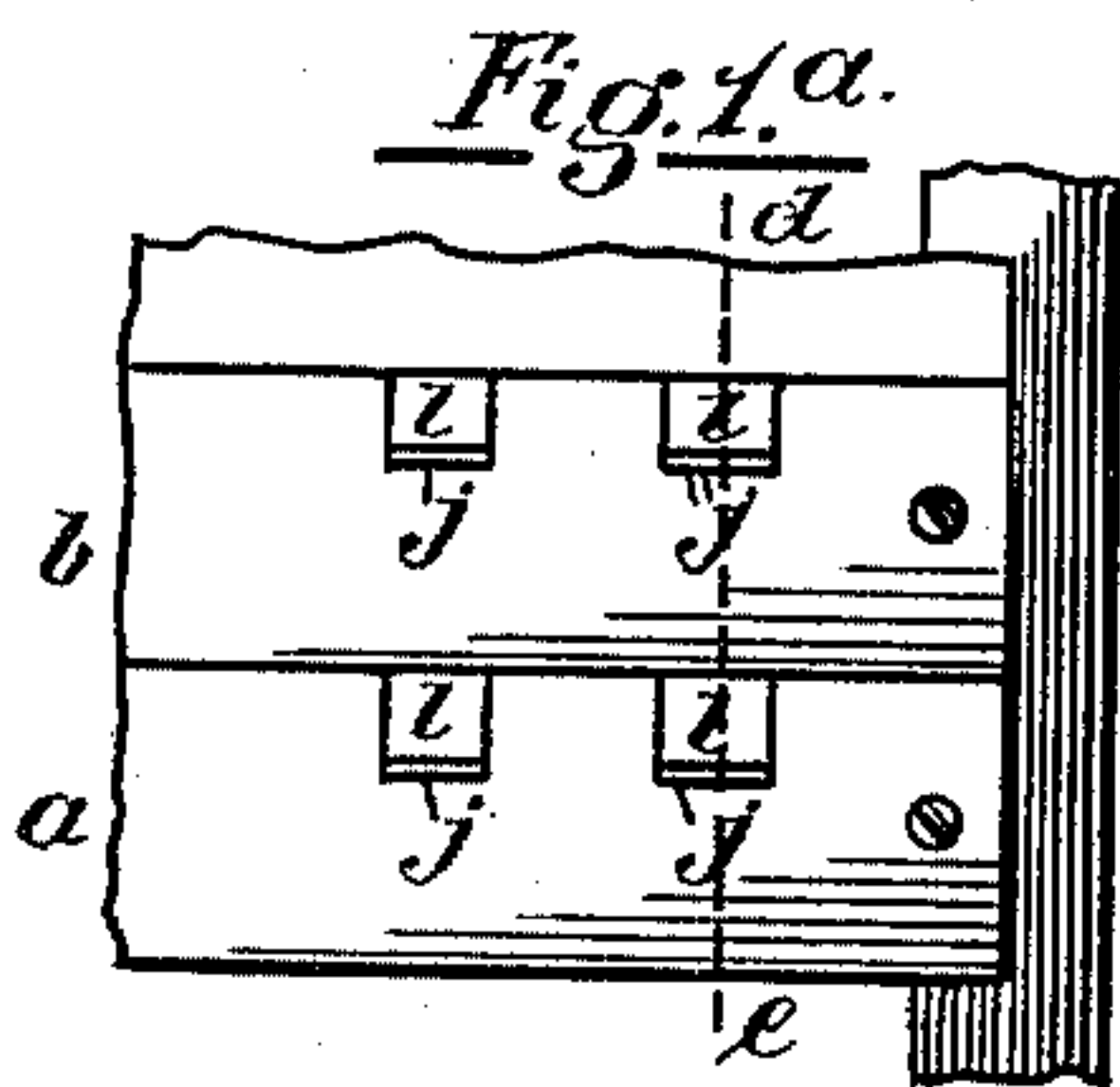


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,340.

Patented Oct. 26, 1897.



Witnesses:  
G. Chas Dietz.  
Gustav Gross.

Inventor:  
Milo G. Kellogg.



# UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

## MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,340, dated October 26, 1897.

Application filed December 21, 1889. Serial No. 334,517. (No model.)

*To all whom it may concern:*

Be it known that I, MILO G. KELLOGG, of Chicago, Illinois, temporarily residing at Stuttgart, in the Empire of Germany, have invented certain new and useful Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention is an improvement over the multiple-switchboard system described in my Patent No. 362,217, dated May 3, 1887.

It consists, first, of a compound spring-jack switch with the switch parts mounted on a rubber strip, such as I shall hereinafter describe and claim in detail, designed to be used in the switchboards of the central office of a telephone-exchange, and especially in said multiple-switchboard system.

It consists, secondly, of the multiple-switchboard system, which I shall hereinafter describe and claim in detail, said system being substantially in the arrangement of the annunciator contact-points and circuits connected with them and the switch contact-points by which the test receiving instruments sound or respond when on a test of a line being made neither the line is switched at any board nor the annunciator indicates a call and do not respond otherwise.

In the drawings illustrating my invention, Figures 1<sup>a</sup> and 1<sup>b</sup> represent sections of two multiple switchboards of the exchange to which the same lines are connected. Fig. 2 shows a complete diagram of the boards with all the central-office apparatus, circuits, and connections necessary to illustrate my invention. Fig. 2<sup>a</sup> is a detail view of one of the line-annunciators. Fig. 2<sup>b</sup> shows in sectional view a switch-plug adapted to cooperate with the telephone and test systems.

In Fig. 2, A is a sectional view of the switchboard shown in Fig. 1<sup>a</sup>, and A' is a sectional view of the switchboard shown in Fig. 1<sup>b</sup>, each as indicated by the lines *d e*. I place as many boards in the central office as are found necessary or desirable, in order to properly answer the calls and make the necessary connections. On each board is a spring-jack suitable for

each line. Each spring-jack switch has a contact-spring which normally bears on an insulated contact-point and is adapted to receive a switch-plug, and when the plug is inserted to disconnect the spring from the contact-point (on which it normally bears) and connect the contact-piece of the plug with the spring.

In the drawings, *g g* represent the springs of the different switches, and *h h* the contact-points on which the springs normally bear. *l l* are the switch-holes. *a b* are the rubber strips on which the spring-jack parts are mounted, as shown, and through the fronts of which are the switch-holes *l l*. These holes are adapted to receive the switch-plugs, and when a plug is inserted into a switch it operates the switch, as described. Said contact-points mentioned above are main-line contact-points. Each switch has also a pair of local contact-points insulated from said main-line contact-points and normally insulated from each other. One of the said local contact-points is a spring *g'*, placed above the spring *g* of the main-line points and parallel to it. It is connected with the spring *g* by an insulating-piece *g<sup>2</sup>*, and is pressed upward when the spring *g* is pressed upward by a plug on its insertion, and moves down again when the spring *g* is allowed to move down by the withdrawal of the plug. The other local contact-point *i* of the pair is mounted on the rubber strip substantially as shown, and, extending near the front of the switch, is bent or shaped so that the local contact piece or spring *g'* is in contact with it when there is no plug in the switch and is disconnected from it when the plug is in the switch.

There is a third local contact-piece *j* for each switch, which is placed in the surface of the switch-hole, and is so placed that a test-plug may be readily applied to it. This contact-piece is insulated from the rest of the pieces, except by the circuit connections, as hereinafter described. This contact-piece is used as a test-piece only and may be placed as shown or in any other position where a test-plug may readily be applied to it.

*w* and *x* are calling-annunciators, one for each of the lines shown. Each annunciator has a pair of local contact-points, which are



in contact when the annunciator does not indicate a call and which are separated by the drop on falling and indicating a call.

$p$  is one of the contact-pieces of the annunciator and is a spring which is pressed in by the drop when it falls.  $q$  is the other contact-piece and is an angle-piece, as shown, on which the spring  $p$  presses when it is not operated by the drop.

The annunciator is shown in detail in Fig. 2<sup>a</sup> and is a modification of one very generally used, the modification being in the arrangement and operation of the contact-points.

$T$  are test-plugs, and  $t'$  are test receiving instruments, one plug and one instrument at each board.

$B$  are test-batteries.

The connections of the main lines through their main contact-points on the several boards and their annunciators are as shown.

I have not represented a complete system of operator's switch plugs and apparatus, as well-known forms of apparatus may be used for switching the lines. In Fig. 2<sup>b</sup>, however, I have illustrated the kind of a switch-plug that may be used. This plug (marked  $D$ ) is composed of insulating material  $m$ , along one side of which is mounted a contact  $n$  to make connection with the spring-contact  $g$  when the plug is inserted in a switch and thereby make connection with the line-circuit.

The local or test circuits and connections are as follows: The test-circuit for a line passes successively through the pairs of contact-pieces  $g' i$  of its switches and through the pair of contact-points  $p q$  of its annunciator. One side or end of the circuit is then connected to one side of all the test receiving instruments of the boards. The other side of the circuit is connected to all the test contact-pieces  $j j$  of its switches. The other side of each test receiving instrument is connected by means of a flexible conductor with a test plug or device adapted to be brought for testing into connection with any test contact-piece  $j j$  at its board. In the test-circuit with each test receiving instrument is a test-battery.

When a line is tested at any board by the test-plug being connected to the contact-piece  $j$  of the switch of the line and neither the line is switched at any board nor the line-annunciator indicates a call, the test instrument will sound or respond, the circuit being complete through the pairs of local switch contact-points and the annunciator contact-points and the operator knows that the line is free for her to switch to it. Should, however, the line be switched at any board or should the line-annunciator indicate a call, the instrument will not sound, indicating to her that either the line is switched at some board or that the subscriber has sent in a call. In either case she should not switch the line with any other line.

The test contact-pieces  $j j$  are placed for convenience along the surface of the switch-

holes. It is not, however, essential to the system that they be placed in that position. They may be placed at one side of their respective switch-holes, or in any other convenient position for testing.

It is obvious that various other arrangements of test systems may be combined with my test and telephone spring-jack.

Many modifications of the test system and of the jack construction may be made without departing from my invention.

I claim as my invention and desire to secure by Letters Patent—

1. In a multiple-switchboard exchange, a telephone-line, a call-circuit, and a test-circuit insulated from said telephone-line normally closed while testing but open while a call is being indicated.

2. In a multiple-switchboard exchange, a telephone-line, a test-circuit associated therewith, but insulated therefrom, normally closed contacts in said test-circuit, and a call device in a call-circuit adapted to open said contacts while a call is being indicated.

3. In a multiple-switchboard exchange, a telephone-line, a test-circuit associated therewith but insulated therefrom, normally closed contacts in said test-circuit, and a call-annunciator in said telephone-line adapted to open said contacts while indicating a call.

4. In a multiple-switchboard exchange, a telephone-line, a call-circuit associated therewith, a test-circuit associated therewith but insulated therefrom containing normally closed jack and annunciator contacts, open while the telephone-line is in use.

5. In a multiple-switchboard exchange, a telephone-line including call apparatus, and normally closed jack-contacts open while the line is switched for use, a test-circuit associated therewith but insulated therefrom, containing normally closed contacts opened by said call apparatus while a call is being indicated.

6. In a multiple-switchboard exchange, a telephone-line, including call apparatus and normally closed jack-contacts opened while the line is switched for use, a test-circuit associated therewith but insulated therefrom, containing normally closed call-contacts opened by said call apparatus while a call is being indicated, and normally closed jack-contacts opened while the telephone-line is switched for use.

7. In a multiple-switchboard exchange, telephone-lines, switching apparatus at each board adapted to switch said lines together for conversation, test-circuits for said lines, a test outfit at each board cooperating with said test-circuits, spring-jacks, one at each board for each line, a rubber strip for each jack, five contacts in each jack, supported by said strip, a test-circuit for each line, including a pair of normally closed contacts opened by the call-annunciator of the line during a call, and a pair of normally closed contacts in each



jack of the line, and terminating in multiple branches in a third contact in each jack of the line, said telephone-lines having connections with two of the contacts in the jacks of their respective lines, the jacks being so constructed that a switching device while inserted in a jack switches said telephone-line contacts in said jack for use, and at the same time opens said normally closed pair of test-circuit contacts in said jack, whereby lines switched for use test "busy."

8. In a multiple-switchboard exchange, telephone-lines, switching apparatus therefor at each board adapted to switch said lines together for conversation, a test-circuit for each of said lines, including a pair of normally closed contacts opened by a calling signal during a call, a test outfit at each board cooperating with said test system, spring-jacks, one at each board for each line, a rubber strip for each jack, five contacts in each jack supported by said strip, said test system and outfits and said telephone-lines cooperating with the contacts of said jacks, said telephone-lines having connections with two of the contacts in the jacks of their respective lines, whereby said lines may be switched for use at any board, and their "busy" condition determined at every other board.

9. In a multiple-switchboard exchange, telephone-lines, switching apparatus therefor at each board adapted to switch said lines together for conversation, a test-circuit for each of said lines, including a pair of normally closed contacts opened by a calling signal during a call, a test outfit at each board cooperating with said test-circuits, spring-jacks, one at each board for each line, a rubber strip for each jack, five contacts in each jack, supported by said strip, each of said test-circuits including in series a normally closed pair of said contacts in each jack of its line, and terminating in multiple branches in a third contact in each jack, whereby said telephone-lines may be switched together at any board, and their "busy" condition determined at every other board.

10. In a multiple-switchboard exchange, telephone-lines, switching apparatus therefor at each board adapted to switch said lines together for conversation, a test-circuit for said lines, including a pair of normally closed contacts opened by a calling-signal during a call, a test outfit at each board cooperating with said test-circuit, spring-jacks, one at each board for each line, a rubber strip for each jack, five contacts in each jack supported by said strip, said test system and said line cooperating with said jack-contacts and so organized that when said telephone-lines are switched together at any board their "busy" condition may be determined at every other board.

11. In a multiple-switchboard exchange, telephone-lines, switching apparatus at each

board adapted to switch said lines together for conversation, test-circuits for said lines, a test outfit at each board cooperating with said test-circuits, spring-jacks, one at each board for each line, a rubber strip for each jack, five contacts in each jack supported by said strip, a test-circuit for each line including annunciator-contacts and a set of contacts in each jack of the line, and terminating in multiple branches in a third contact in each jack of the line, said telephone-lines being connected with two of the contacts of the jacks of their respective lines, the jacks being so constructed that a switching device, while inserted in a jack, switches the contacts in said jack for use, and cooperates with said test circuits and outfits to give a silent indication when said lines are thus switched for use and tested.

12. In a multiple-switchboard exchange, telephone lines, switching apparatus therefor at each board, adapted to switch said lines together for conversation, a test system for said lines, a test outfit at each board cooperating with said test system, spring-jacks, one at each board for each line, a rubber strip for each jack, local and main line contacts in each jack supported by said strip, said test-circuits including a pair of normally closed annunciator-contacts and being connected with the local contacts in said jacks, said telephone-lines being connected with the main-line contacts in the jacks of their respective lines, said jacks being so constructed that a switching device while inserted in a jack switches said main line and local contacts for use, and cooperates with said test-circuits to give a silent test when said lines are tested and thus switched for use.

13. A test-circuit for a telephone-line normally open at one point and normally closed at two points, a pair of contacts closed by the operator on testing to close the circuit at said normally open point, a pair of switch contact-points which are opened when the line is switched by the switch which controls them to open the circuit at one of said normally closed points, a pair of annunciator contact-points which are opened when the line-annunciator indicates a call to open the circuit at the other of said normally closed points and a test receiving instrument and battery in the circuit, substantially as set forth.

14. A test-circuit for a telephone-line, normally open at one point and normally closed at a series of points, a pair of contacts closed by the operator on testing to close the circuit at said normally open point, a pair of annunciator contact-points which are opened when the line-annunciator indicates a call to open the circuit at one of said normally closed points, pairs of switch contact-points, one pair on each of several boards, each pair opened when the line is switched at their board by a switch which controls them to open the



circuit at one of said normally closed points and a test receiving instrument and battery in the circuit, substantially as set forth.

15. The combination of two or more switch-  
5 boards with a series of switches, for a tele-  
phone-line, one switch on each board, pairs  
of local contact-points, one pair for each  
switch, each normally closed but opened au-  
tomatically by a switch-plug when inserted  
10 into its switch, for switching, an annunciator  
normally in the circuit of the line, a pair of  
contact-points normally closed but opened by  
the annunciator while it indicates a call, test  
receiving instruments, one at each board,  
15 battery, test devices, and local circuits, sub-  
stantially as set forth.

16. The combination of two or more switch-  
boards with series of switches, one series for

each telephone-line, and one switch of each  
series on each board, pairs of local contact- 20  
points, one pair for each switch, each nor-  
mally closed but opened automatically by a  
switch-plug when inserted into its switch, an-  
nunciators, one for each line and normally in  
its circuit, pairs of contact-points, one for 25  
each annunciator normally closed but opened  
by its annunciator while it indicates a call,  
test receiving instruments, one at each board,  
battery, test devices, and circuits, substan-  
tially as set forth. 30

In witness whereof I hereunto subscribe my  
name this 29th day of November, 1889.

MILO G. KELLOGG.

Witnesses:

EMIL ABENHEIM,  
MARGARETHA RIEHL.