

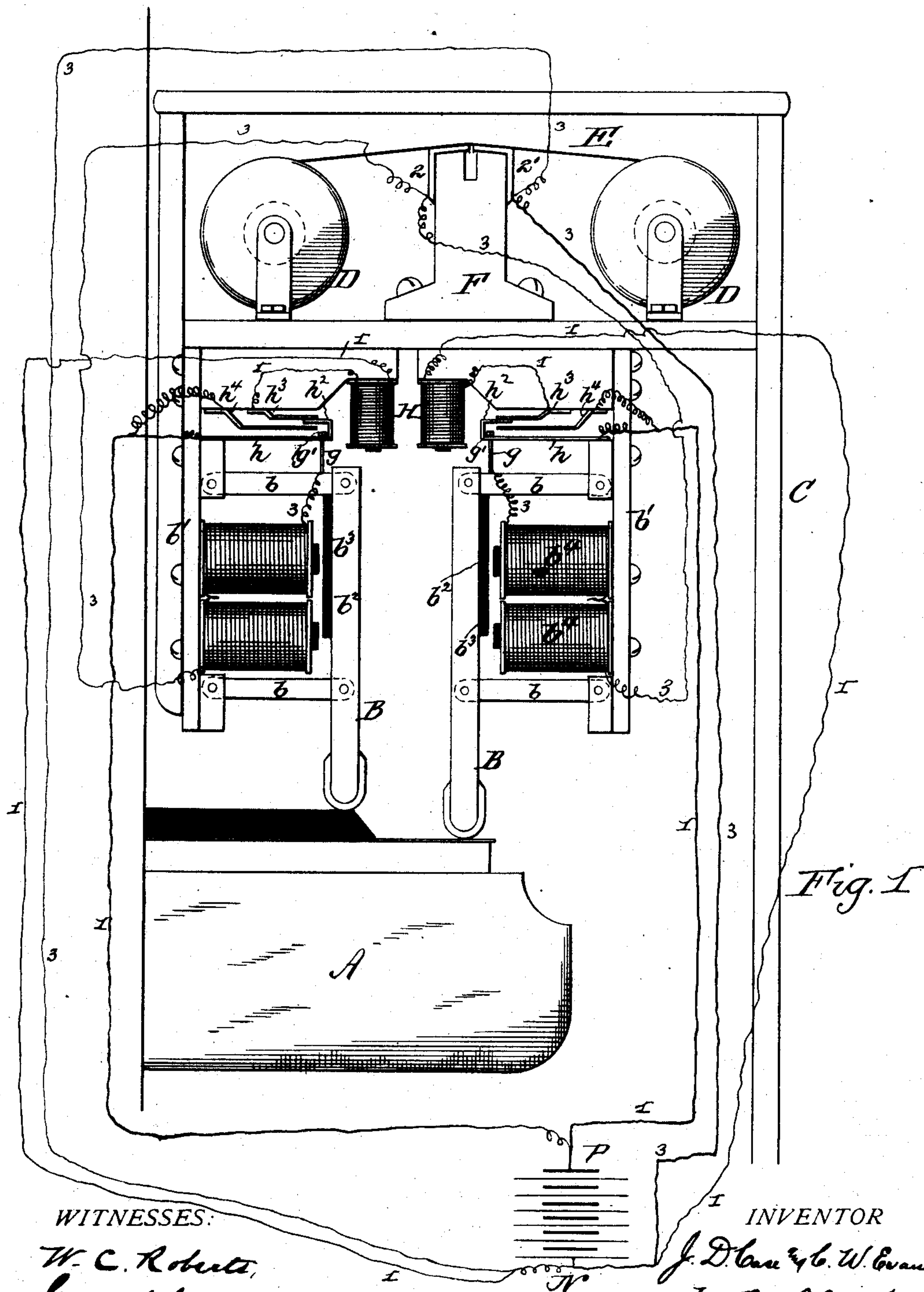
(No Model.)

2 Sheets—Sheet 1.

J. D. CASE & C. W. EVANS.
KEY BOARD SELF PLAYING ATTACHMENT.

No. 430,065.

Patented June 10, 1890.



WITNESSES:

W. C. Roberts,
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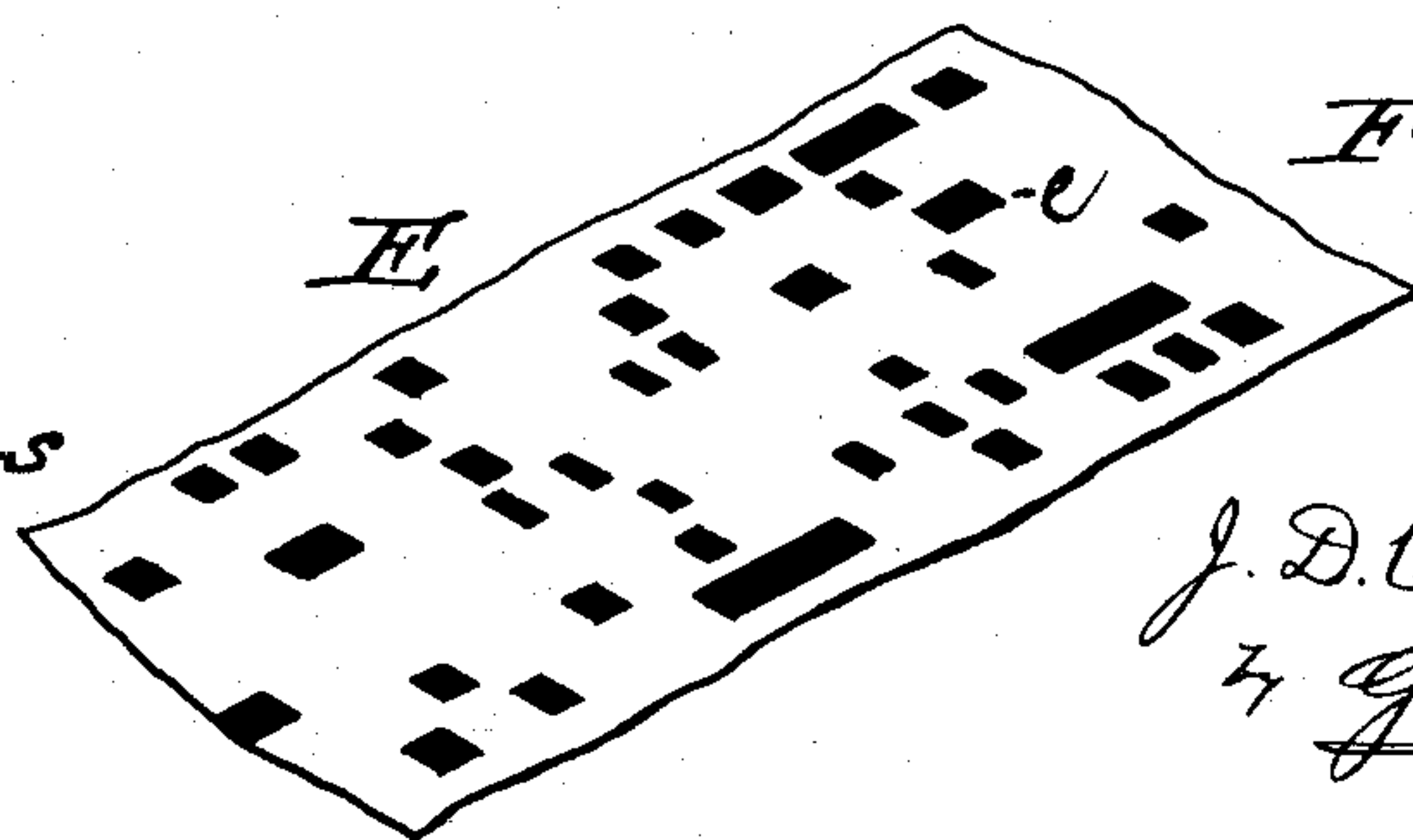
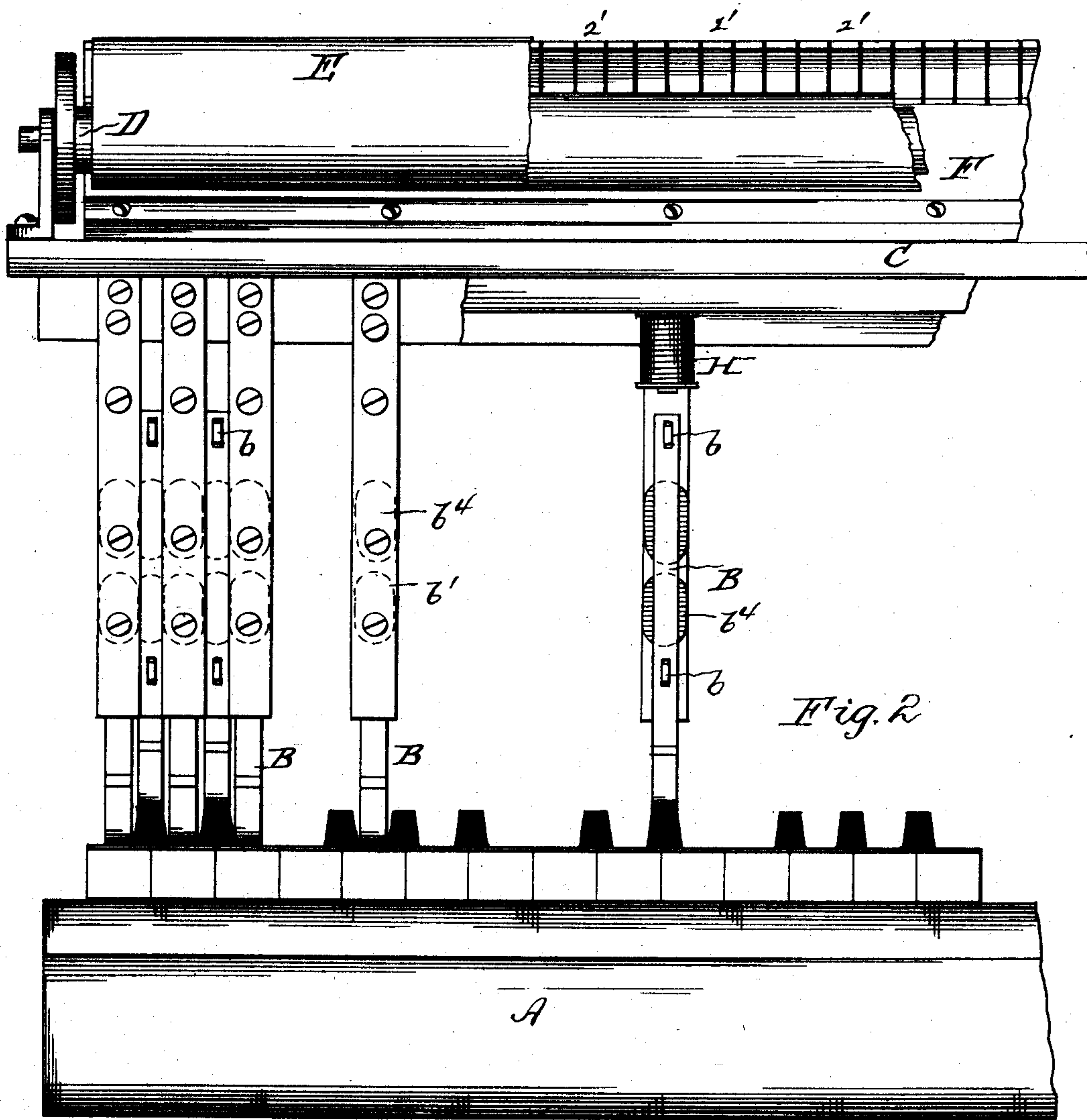
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J. D. CASE & C. W. EVANS.
KEY BOARD SELF PLAYING ATTACHMENT.

No. 430,065.

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Witnesses
W. C. Roberts.
George Ledger.

INVENTOR.
J. D. Case & C. W. Evans
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UNITED STATES PATENT OFFICE.

JOSEPH D. CASE AND CLARK W. EVANS, OF PLAINFIELD, NEW JERSEY.

KEY-BOARD SELF-PLAYING ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 430,065, dated June 10, 1890.

Application filed September 10, 1886. Serial No. 213,244. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH D. CASE and CLARK W. EVANS, citizens of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Electro-Magnetic Actions for Musical Instruments; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has relation to automatic piano-players operated by electricity and electro-magnetic instrumentalities. In this class of players as heretofore arranged for operation the electro-magnets have been made to operate an armature on the strings direct in a vibratory manner, or upon the action of the instrument, the same being attached thereto by means of wires.

The objects of our invention are to so arrange the strikers or levers in connection with an armature and electro-magnets that the strikers or levers will operate directly upon the key-board to give the strikers a downward and an outward or drawing motion, as is done by the fingers of a person playing the piano, and to keep the electrical resistance through the machine or action always constant or unchanging.

Our invention accordingly consists of the combination of and arrangement of parts, as hereinafter described and claimed, having reference particularly to playing hammers or strikers actuated by electro-magnets in a battery or other electric circuit and operating directly upon the key-board of the piano or other keyed instrument, the electro-magnets for operating said strikers or hammers being energized by closing and opening of the electric circuit by means of electric terminals corresponding to the key-board facing each other, the circuit being closed by a sheet of paper or other material having metallic surfaces printed or affixed thereto, passing across said electric terminals to hammers or strikers having a downward and outward or drawing motion, and to resistance-coils placed in parallel circuits or otherwise arranged for maintaining a constant resistance for the electrical circuits of the action or machine.

Referring to the accompanying drawings, Figure 1 is a side elevation of a piano-forte key-board, showing two playing hammers, electro-magnets, circuit-connections, music-sheet, circuit-terminals, switch appliances, resistance-coils, and circuit-connections embodying our invention and indicating the hammers or strikers in their normal position. For the sake of clearness, circuit-connections for only one of the hammer electric appliances are shown. Fig. 2 is a front view of Fig. 1, and Fig. 3 is a perspective view of the music-sheet.

A represents the piano or other key-board, and B the playing hammers or strikers, mounted upon a suitable frame C, to which is suitably secured the rollers D for the sheet of music E, and for the frame F of the terminals 2 2' of a battery or other electric circuit 1 1. The playing hammers or strikers B, as shown, are vertically arranged and pivoted, jointed, or loosely connected near their upper and lower ends to links or bars *b*, which in turn are correspondingly attached to a bar *b'*, suitably secured to frame C, to permit said hammers or strikers to have a free up and down and outward movement to effect a drawing action on the keys. Upon the side *b*² of each hammer or striker B is secured an armature *b*³, acted upon by an electro-magnet *b*⁴, suitably affixed to bar *b'*, which is preferably made of metal to connect the poles of the electro-magnets *b*⁴.

The hammers B and their link-connections *b b*, with the fixed sides *b'*, constitute the hammer-frames within which the electro-magnets *b*⁴ are located, being attached to the fixed part of the frames, while the armatures therefor are secured to the movable part of the frames. This construction is therefore a compact one, and brings the armatures as close to the electro-magnets as possible for imparting to the hammers a quick and powerful action.

To the upper link *b* for each hammer B is attached a metal or other conductor, rod, or pin *g*, having a T or other head *g'*, which engages with a flat metal spring bar or rod *h*, fixed at one end *h'*, and has an opposite free or bent end *h*². The end *h*² normally contacts with another metal spring-finger *h*³. Suitably fixed to frame C, and below the bent

end h^2 of spring h , but normally out of contact therewith, as shown in Fig. 1, is another metal spring-finger h^1 . The spring-fingers h^2 and h^3 are terminals of the battery or electric circuit 1 1 and of a parallel or other circuit 3 3 for cutting out or shunting one from another.

Circuits 1 1 each include a resistance-coil H, of wire or other suitable material, corresponding in resistance to that of the electro-magnets b^1 in each circuit 3 3. The circuit 1 1 is normally closed through the resistance-coils H, the current passing through the resistance-coils H and corresponding spring-fingers of each series.

The current does not pass through the electro-magnets b^1 , except when contact is made at circuit-terminals 2 2' on frame F, corresponding to said electro-magnets, by metallic or other suitable notes e on music-sheet E, bridging the space between said terminals 2 2' as it is fed across the same.

The circuit 3 3 for each striker or hammer energizing the magnets b^1 is arranged as follows: From one of the terminals 2 on frame F connection is made with magnets b^1 , thence by way of pin g , spring-arm h , and wire of circuit 1 to one side or pole of the battery, and thence from the other side or pole to the other terminal 2'. Each pair of electro-magnets has its individual circuit-terminal on frame F.

When a pair of terminals 2 2' are bridged or connected by a metallic strip on music-sheet E, the magnets b^1 in the circuit of said terminals are energized and draw the armature b^3 down and toward the poles of magnets b^1 , which action depresses spring h to break contact with finger h^3 and make contact with finger h^1 , to switch the electric current from spring h^3 to spring h^1 and cutting out or shunting the resistance-coil H from the battery-circuit. Spring h^3 follows spring h to preserve contact at h^2 until it contacts with h^1 , thus insuring continuity of the current as the resistance-coil is shunted or cut out of the battery-circuit for connecting with combination for the next key of the piano or other keyed instrument. When the circuit at terminals 2 2', connecting with the energized magnets b^1 , is broken, the magnets b^1 are demagnetized and the reaction of spring h breaks contact of h^2 with h^1 , and contact is again made at point of h^3 with h^2 , throwing into circuit again the resistance-coil H, thereby equalizing the force of the electric current throughout the instrument, as it is obvious that the resistance in the circuit would be otherwise constantly changing as the magnets b^1 , operating the striking-hammers on the key-board, were thrown into and out of circuit, in which case no control of the expression would be practical. The circuit through the instrument is as follows: P represents the positive pole of a battery or other electric generator, from which connection is made to each spring h and spring h^1 , as the latter is normally open or out of con-

tact with the end h^2 of spring h , which is normally in contact with spring h^3 , the circuit is normally, by way of spring-fingers h^2 and h^3 , to resistance-coil H, and from the latter to the other side or pole N of the battery or generator. Each terminal 2 is in circuit with pole N of the battery or generator, and each terminal 2' is in circuit with the magnets b^1 , and thence, by way of pin g and spring h , which when in contact with spring h^1 completes the circuit for the magnets b^1 through part of circuit 1 to the other end or pole P of the battery or generator. Each striker or hammer has its separate operating electro-magnets b^1 , resistance-coil H, and terminals 2 2' and circuit-connections with the battery or generator, so that no matter which hammer or striker is operated, or whether one or more are operated at once, the resistance-coil included in the circuit of each or all of the hammers operated is cut out of the circuit-connections to always maintain the same resistance of the battery or generator circuit for admitting of obtaining the expression in playing, as above set forth. These circuit-connections are plainly shown in Fig. 1.

The arrangement of the strikers or playing-hammers B, operated by the electro-magnets b^1 , give them a downward and at the same time slightly sliding or drawing movement upon the keys of the piano or other instrument corresponding to that of the fingers of a performer.

It is obvious that the pedals can be operated in the same manner as the keys without departing from our invention.

Having fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. An automatic piano player or striker acting directly upon the keys, composed of a jointed frame and a fixed frame, an armature secured to the jointed frame, an electro-magnet attached to the fixed frame, and a reacting spring for said jointed frame, substantially as set forth.

2. The combination of a fixed frame b' , having an attached electro-magnet b^1 , a striker or hammer B, acting directly upon the keys and having a jointed or link connection with frame b' , an armature b^3 on hammer B, and reaction-spring h , and circuit-connections, substantially as shown and described.

3. A player or striker B, having an actuating electro-magnet and circuit-connections 3 3, in combination with a shunt or separate circuit 1 1, including a resistance H, as and for the purpose set forth.

4. The combination of striker B, having electro magnet b^1 , having open terminals 2 2', reacting-spring h , normally-open terminals h^2 h^3 , and circuit-connections 1 1 3 3, substantially as set forth.

5. An automatic piano-player having an electric circuit for operating the players or hammers, a parallel or shunt circuit includ-

ing suitable resistances, and switch mechanism for said circuits, substantially as set forth.

6. In combination with a piano-player B,
5 electro-magnets *b*, and circuit-connections including a battery or generator, a shunt-circuit, switch mechanism, and resistance in said shunt-circuit corresponding to the resistance in the battery-circuit, substantially as
10 and for the purpose set forth.

7. In an electrically-operated piano-player, the combination of battery or generator cir-

cuits, shunt or parallel circuits including resistances corresponding to the resistances in the battery-circuit, and switch mechanism 15 for said circuits, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

JOSEPH D. CASE.

CLARK W. EVANS.

Witnesses:

C. N. CASE,

A. W. SCHENCK.