No. 772,826. PATENTED OCT. 18, 1904.

J. V. W. REYNDERS & W. T. SEARS.

CONTROLLING DEVICE FOR PUNCHES.

APPLICATION FILED DEC. 22, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

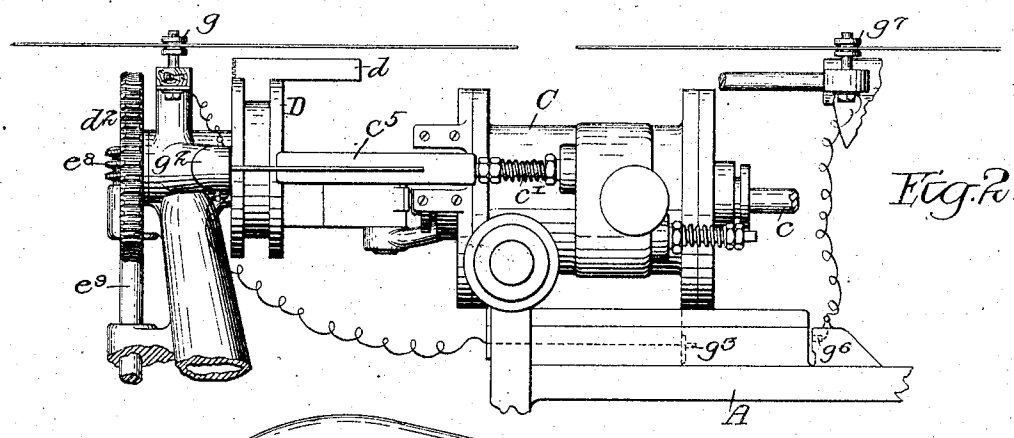


Fig. 2.

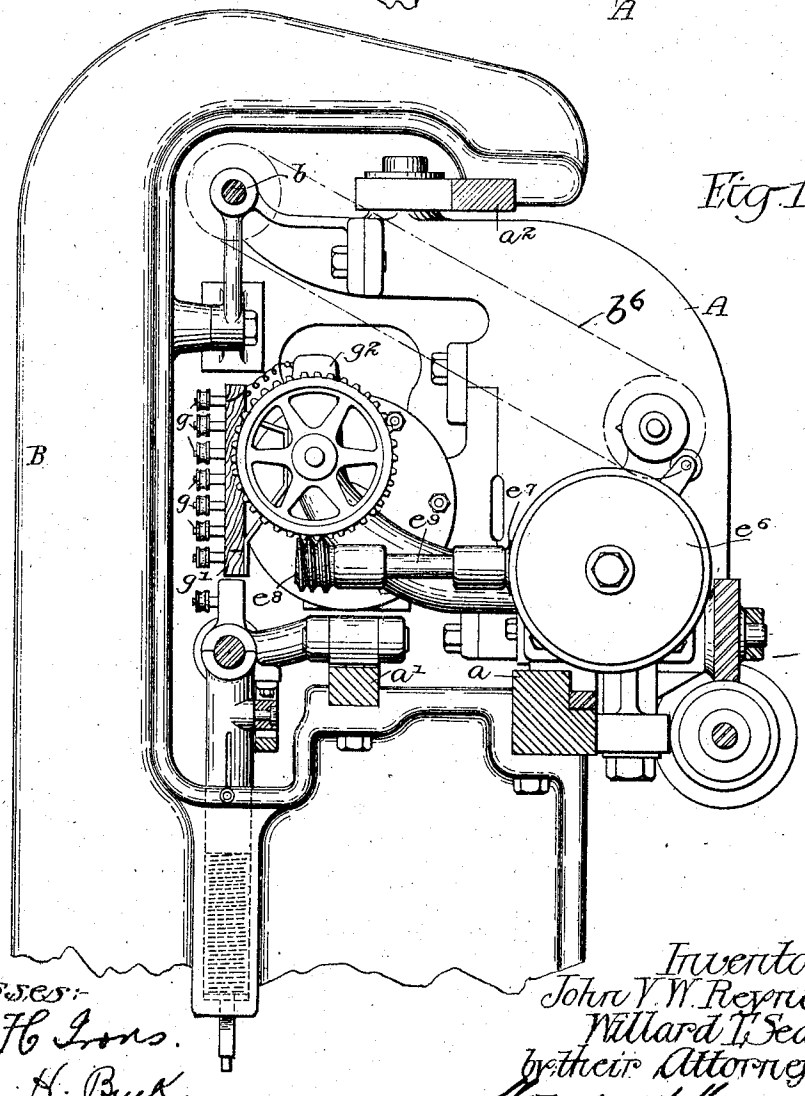


Fig. 1.

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Louis H. Buck.

Inventors:
John V. W. Reynders,
Willard T. Sears,
by their Attorneys,
Howson & Howson

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 6.

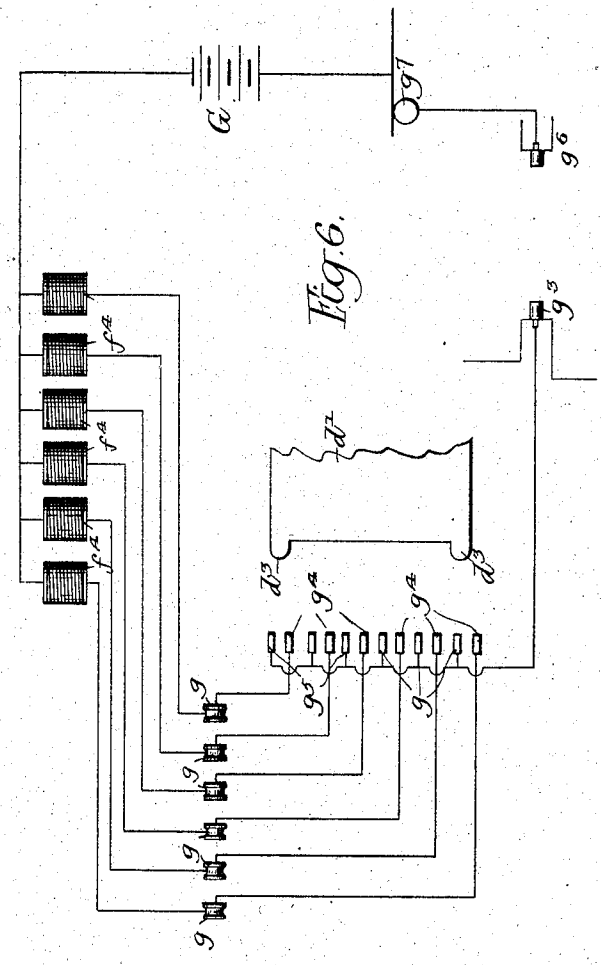


Fig. 4.

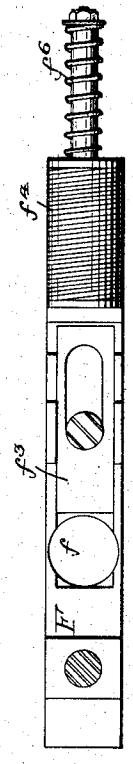


Fig. 3.

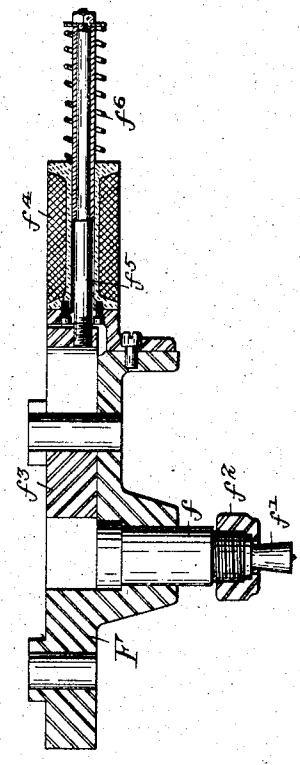
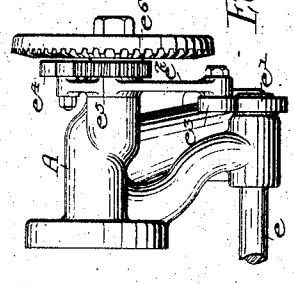


Fig. 5.



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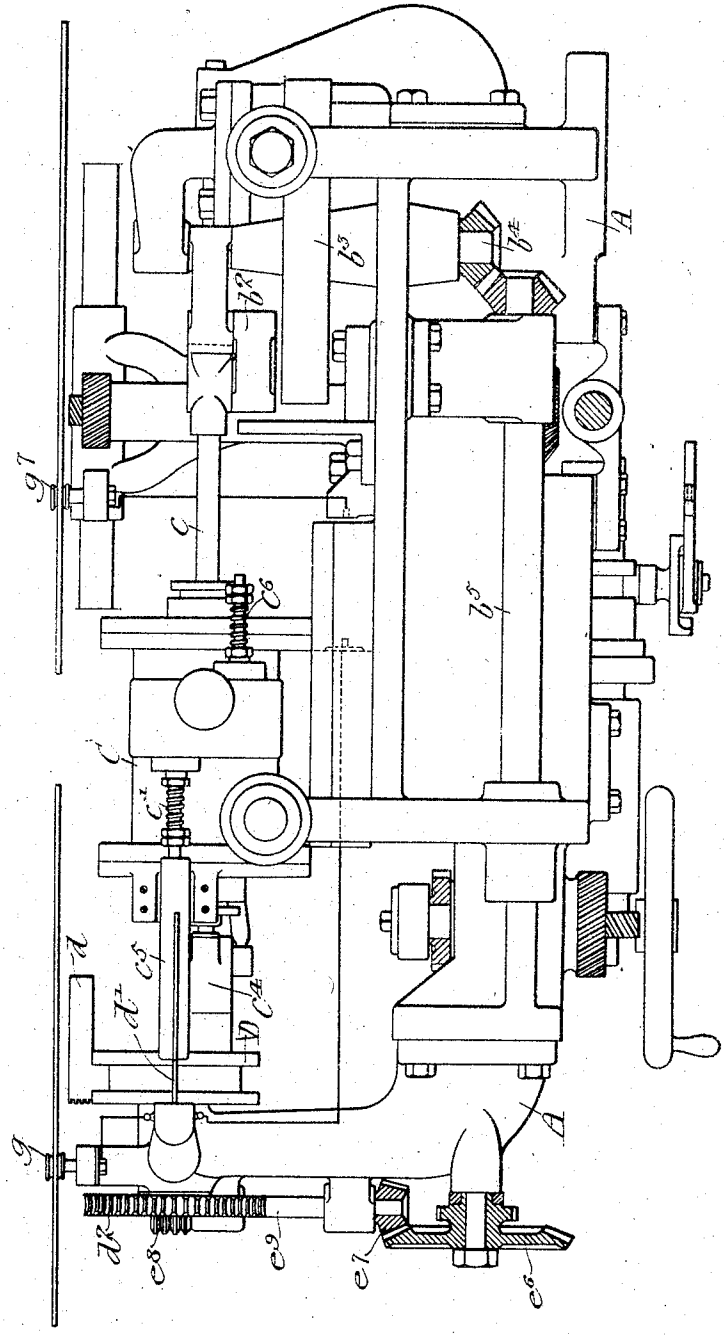
J. V. W. REYNDERS & W. T. SEARS.

CONTROLLING DEVICE FOR PUNCHES.

APPLICATION FILED DEC. 22, 1903.

NO MODEL. 4 SHEETS—SHEET 3.

Fig. 7.



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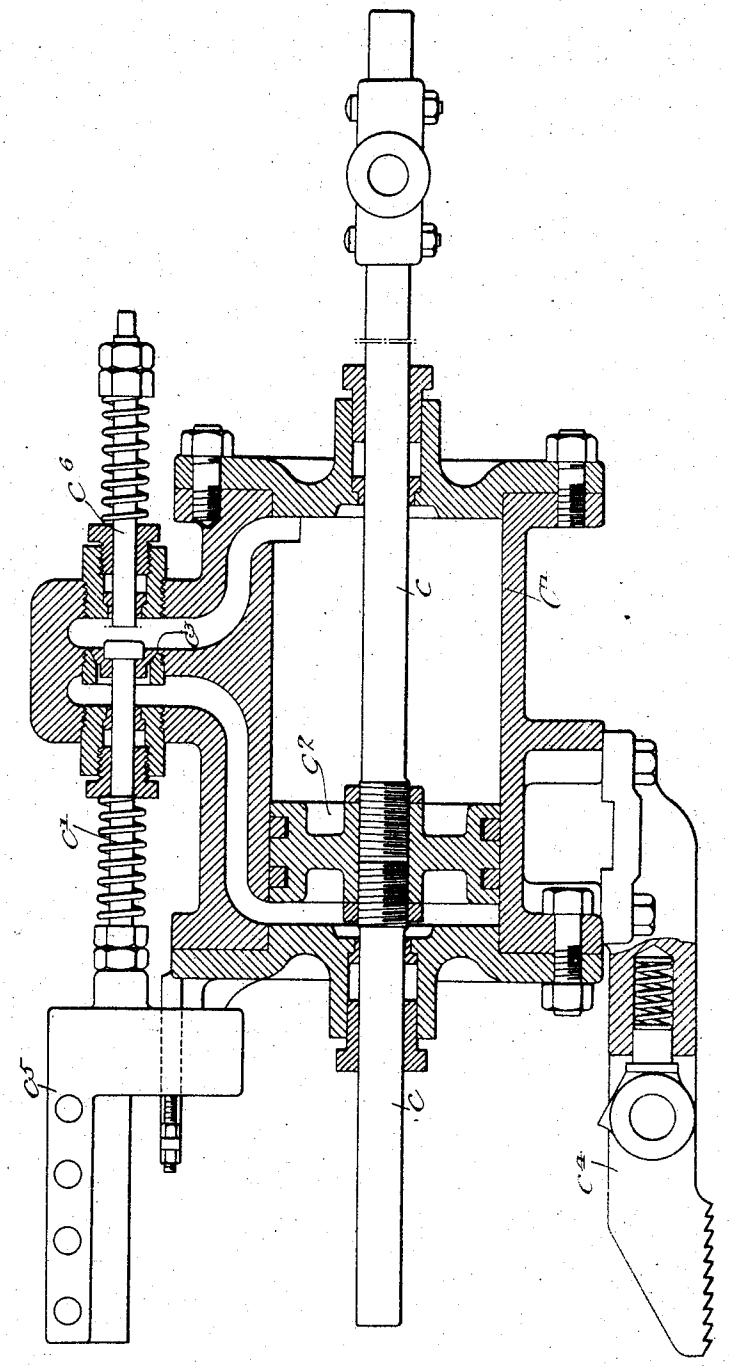
J. V. W. REYNDERS & W. T. SEARS.

CONTROLLING DEVICE FOR PUNCHES.

APPLICATION FILED DEC. 22, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 8.



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No. 772,826. Patented October 18, 1904.

UNITED STATES PATENT OFFICE.

JOHN V. W. REYNDERS AND WILLARD T. SEARS, OF HARRISBURG, PENNSYLVANIA.

CONTROLLING DEVICE FOR PUNCHES.

SPECIFICATION forming part of Letters Patent No. 772,826, dated October 18, 1904.

Application filed December 22, 1903. Serial No. 186,175. (No model.)

To all whom it may concern:

Be it known that we, JOHN V. W. REYNDERS and WILLARD T. SEARS, citizens of the United States, and residents of the city of Harrisburg, Dauphin county, Pennsylvania, have invented certain Improvements in Controlling Devices for Punches, of which the following is a specification.

This invention consists in a novel combination of apparatus for controlling the action of any desired number of punches in a punching-machine, one object of the invention being to provide mechanism which shall automatically cause the operation of a punch or punches so constructed as to be normally inactive and also to provide means whereby the operation of the punch or punches or the prevention of such operation will be made to occur at predetermined intervals.

It is further desired to provide means whereby any number of punches may be simultaneously caused to operate, it being desired to employ our improved mechanism in connection with an automatically-operated spacing-table in such manner that as said table is intermittently moved a single punch may be made to operate so as to form holes in a plate at any desired intervals or if a number of punches be employed to operate upon the same plate to so actuate the punch-controlling mechanism that its punches will be made to act at any desired intervals and in any desired combination.

These objects we attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is an end elevation of a portion of a spacing-table for a punching-machine, showing our improved apparatus as applied thereto. Fig. 2 is a plan view of a part of the device shown in Fig. 1. Fig. 3 is a sectional elevation of a portion of a punch, showing our improved device applied thereto for controlling its action. Fig. 4 is a plan view of the mechanism shown in Fig. 3. Fig. 5 is a side elevation of the mechanism for intermittently turning the templet-carrying wheel. Fig. 6 is a diagrammatic view of the preferred arrangement of electrical connections employed in carrying out our invention. Fig. 7 is a plan view, partially in section, showing the preferred arrangement of the parts of a spacing-table with which our invention may be used; and Fig. 8 is a sectional elevation of the stroke-controlling cylinder and its attached parts.

In the above drawings the invention is illustrated as employed in connection with an improved form of automatically-operated spacing-table, which will not be described in detail or claimed in the present application, as this has been done in an application for patent filed by us under date of December 26, 1903, Serial No. 186,725. It may, however, be stated that a plate of material to be operated upon is supported so as to be connected to and movable with a carriage whose framework is shown at A, which carriage is supported on a series of tracks a and a^2, carried by suitably-placed standards, of which one is illustrated at B.

A driving-shaft b or other source of motive power is so connected to the mechanism of the punching-machine with which the whole structure is employed as to be given a certain amount of rotation or movement at each operation of said machine, and this source of power by means of suitable gearing is made to reciprocate a rod c once for each stroke of the punch. Said gearing in the present case includes a chain b^6, connecting suitable sprocket-wheels on the shaft b and on a shaft b^5, bevel gear-wheels respectively fixed to shafts b^5 and b^4, a cam b^3, fixed to the shaft b^4, and a lever b^2, pinned to the rod c and having a roller (not shown) which follows the cam-groove on said cam b^3. Said rod c has upon it a piston c^2, which operates within the cylinder C and while being supported so as to be movable relatively to the carriage is made to intermittently move the latter, and with it the work carried relatively to the punch, through the medium of a toothed arm c^4, which engages with a similarly-toothed rack a' on the frame of the machine. The amount of such motion of the carriage, or, what is the

same thing, the length of the stroke of the cylinder, is, as described in our above-mentioned application, determined by a series of stop-plates, of which two are shown at d and d', these being supported so as to be successively made to engage a valve-rod c', by which a valve c^3 is controlled so as to permit the flow of fluid in the cylinder C to take place from one side of the piston to the other. It will be understood that the stop-plates of the various lengths required are supported in a substantially rigid manner upon the carriage, so that whenever the piece c^5, carried by the valve-rod of the cylinder C, strikes one of them motion of said cylinder immediately ceases, since the piston within it is then free to force the liquid from one end of the cylinder to the other through the opened valve. On the return stroke the valve c^3, being free to move on its stem, immediately closes and the cylinder, being held from motion by the engagement of the arm c^4 with its toothed rack, causes the spacing-table with the piece operated upon to be moved bodily until a rod c^6, which has a valve similar to the valve c^3, strikes a portion of said table, and thereby opens said second valve, thus permitting liquid to again pass from one end of the cylinder to the other end, so that the device is ready to make another stroke. The stop-plates are carried in the present instance upon a templet-wheel D, which is shown as grooved for their reception, and there is fixed to the same shaft as said templet-wheel a worm-wheel d^2, which is intermittently turned to the extent of the angle between each stop-plate by means of any desired mechanism. For this purpose we have shown a driving-shaft e connected in any desired manner to the main shaft b and provided with a cam e', which oscillates a lever e^2, suitably provided with a roller in engagement therewith. This lever carries a pawl e^4 in engagement with a ratchet-wheel e^5, and this latter is keyed to the same spindle to which is fixed a bevel-gear e^6. A pinion e^7, meshing with this gear, operates a worm e^8, in engagement with the worm-wheel d^2 through the medium of a shaft e^9, and by this means it will be seen that the templet-wheel D, with its stop-plates, will be moved forward to the desired extent upon each revolution of the driving-shaft e. The templet-wheel is so supported upon its shaft that either it or said shaft is free to move longitudinally, or, if desired, the stop-plates may be so fixed to said wheel as to move to a limited extent when engaged by the valve-rod c', and it will be seen by reference to Figs. 2 and 6 that the rear edge of each of the stop-plates is provided with any desired number of projections d^3 for purposes hereinafter set forth.

Referring now to Figs. 3 and 4, we have illustrated a punch and a portion of its adjacent parts arranged for operation according to our invention, and it will be understood that any desired number of these punches may be supported upon the plunger of a punching-machine so as to be capable of forming a plurality of holes in a suitably-placed sheet of material when said plunger is depressed. In Fig. 3, F is the punch-holding piece, which is bolted or otherwise suitably attached to the face of the plunger of the punching-machine in the well-known manner, and in this piece is a cavity into which the punch-carrying head f is free to pass. To this head is secured a punch f' by means of a nut f^2, and there is a horizontally-movable slotted block f^3 so placed as to be free to be moved over the end of said punch-head and between it and the face of the plunger. The position of the block f^3 depends upon whether or not a solenoid f^4 is energized, for this latter is carried at one side of the punch F and has an armature f^5 fixed to the said sliding block. A spring f^6 normally tends to hold the armature, and consequently the block f^3, in such position that the punch will not act to make a hole in a piece of material, but will simply move upward when the plunger carrying it is lowered. When, however, the magnet f^4 is energized, said block is made to slide into position over the upper end of the punch-head f, with the result that when the plunger of the machine makes a stroke the punch f' will be forced through any material in the proper position relatively thereto. In order that the magnets f^4 of one or more of the punches may be properly energized, so as to cause operation of said punches, when desired, we connect them, as shown in Fig. 6, one terminal of all of the magnets being in electrical connection with a terminal of the current-generator G, and the remaining terminals being connected, respectively, to trolley-wires supported in any desired manner upon the supporting-standards B for the work-holding carriage, so as to be engaged by trolley-wheels g, carried upon a piece of insulating material g'. These wheels are connected, respectively, to one terminal, g^4, of switches supported upon a standard g^2 of the carriage, and all of the terminals g^5 of said switches are connected together by a wire attached to a contact-piece g^3, carried by the cylinder C, but insulated therefrom. A fixed contact g^6 is supported in a suitable position upon the work-holding carriage so as to engage the contact g^3 under certain conditions of operation, and is in turn electrically connected to a trolley-wheel g^7, so placed as to engage a trolley-wire in connection with a second terminal of the current-generator G.

Preparatory to starting our improved machine a series of stop-plates similar to d and d' is fastened to the templet-wheel D in such positions that as said wheel is turned their rear ends, which are provided with the projections d^3, will move in a plane close to the

contacts of the switches carried by the standard g^2 on the carriage. When now the device is set in operation, each time the valve-rod c' of the cylinder C strikes a stop-plate it moves the same longitudinally to an extent sufficient to bring the projections d^3 thereon into engagement with the terminals g^4 and g^5 of some of the switches, and since said projections on the stop-plates bridge the terminals of said switches certain of the magnets f^4 will be energized as soon as the cylinder C has been moved sufficiently to cause the contact g^3 to engage the contact g^6. If the punch-plunger be now reciprocated, those punches whose magnets have been engaged will be caused to make holes in the plate operated upon, while the others will simply slide upward in said plunger without acting.

The construction of the ratchet mechanism is shown in Fig. 5, and after each operation of the punch it will move forward the templet-wheel, so as to bring another stop-plate in line with the switches on the standards g^2 and with the valve-rod c' on the cylinder.

From the above it will be understood that by our improved device any desired series or arrangement of holes may be punched in a sheet operated upon and that without requiring the presence of an attendant. After the stop-plates have once been fixed to the templet-wheel and the plate to be operated upon has been properly fixed relatively to the carriage it is only necessary to start the machine, which will operate automatically until the work is finished.

While we have described and shown the punch as controlled by a solenoid, it will be understood that there are many other ways by which its operation may be caused at the desired time or times.

While it would be advisable in all cases to employ some form of electrical device as a connection between the carriage and the punch, the actual power for moving the gag could be obtained from any fluid under pressure, the flow of such fluid being controlled by magnets. If desired, the movement of the punch-head itself could be utilized to move the gags, the means by which this was accomplished being rendered operative through the agency of electrical apparatus.

We claim—

1. The combination of a punch, a device for controlling the action thereof, a carriage for work to be operated upon by said punch and mechanism upon the carriage electrically connected to said controlling device for causing operation of the punch at predetermined intervals, substantially as described.

2. The combination of a punch, a device for controlling the action thereof, a carriage for work to be operated upon by said punch and electrical means upon said carriage including a templet and a switch operated thereby for causing the action of said controlling means at predetermined times, substantially as described.

3. The combination of a punch, a device for controlling the action thereof, a carriage for work to be operated on by said punch, means connected to said controlling device for causing operation of the punch at predetermined times, said means including a templet and a device coacting therewith and supported upon the carriage, substantially as described.

4. The combination of a series of punches, a series of devices for controlling the operations thereof, a carriage for work to be operated upon by said punches and mechanism supported by said carriage and inoperative connection with said controlling means for causing the action of any predetermined ones of said punches, substantially as described.

5. The combination of a punch, controlling means for the same, a carriage for moving the work operated on by said punch, means for intermittently actuating said carriage and an electrical device upon said carriage including means for actuating the controlling means at predetermined times, substantially as described.

6. The combination of a series of punches, a controlling device for each of the same, a carriage for work to be operated upon by the punches, a series of electric switches in circuit with said controlling devices and automatically-operated mechanism for positively closing any desired ones of said switches at a predetermined time, said switches and mechanism being on said carriage, substantially as described.

7. The combination of a punch, means for reciprocating the same, means for causing said punch to become operative to form a hole in a piece of material, a carriage for moving said material, means for operating the carriage and a device supported on the carriage and electrically connected to the controlling device of the punch for actuating the same at predetermined times, substantially as described.

8. The combination of a punch, a gag therefor having a magnet whereby it is controlled, a carriage for moving work operated on by the punch, a switch on the carriage and means for causing the same to be closed at predetermined times, with connections between said switch and the gag-controlling magnet, substantially as described.

9. The combination of a punch and means for controlling the action of the same, a wheel carrying a series of stop-plates, means for turning said wheel and means operated on by said stop-plates for actuating the controlling means for the punch, substantially as described.

10. The combination of a punch, a device having a controlling-magnet for governing the action of said punch, a wheel having means whereby it is turned through a definite dis-

tance for each operation of the punch, a series of stop-plates carried by said wheel and a switch electrically connected to the controlling-magnet and placed to be operated by the stop-plates, substantially as described.

11. The combination with a punch of electrically-actuated controlling means, a carriage for work to be operated on by the punch and means for intermittently moving the carriage, a stop-plate actuated from said means, a switch placed to be controlled by the stop-plate and electrical connections between said switch and the punch-controlling means, substantially as described.

12. The combination of a punch, a device for controlling the action thereof, a carriage for moving material operated on, said carriage having a portion movable relatively to the remainder, an electric circuit operatively connected to the controlling means and two switches in said circuit, one of said switches having one terminal on the carriage and the other on the movable member thereof, substantially as described.

13. The combination of a punch, means whereby the action of said punch is controlled, a carriage for work operated on by the punch, a switch on the carriage electrically connected to the punch-controlling means, a series of pieces also on the carriage having means for causing operation of said switch, means for successively presenting said pieces to the switch and means for causing the pieces to close the switch, substantially as described.

14. The combination of a series of punches, means for controlling the action of the same, a carriage for work to be operated on having upon it a series of switches for said punch-controlling means, a series of pieces also on the carriage coacting with the switches, means for presenting different ones of said pieces to the switch and means for successively moving the pieces to operate the switches, substantially as described.

15. The combination in a punching-machine, of a plurality of punches having means whereby their action is controlled, a carriage having means for moving a piece of material relatively to the punch, a series of electric switches for the punch-controlling mechanism, a movable structure having a series of pieces with portions arranged to coact with the switches, means for presenting said pieces to the switch and means for actuating said pieces after they have been presented to the switches to operate the same, substantially as described.

16. The combination in a machine having a series of punches, of means for controlling the action of each of said punches, a carriage for moving the work to be operated on, a series of electric switches connected to the punch-controlling means, a series of pieces placed to successively act on said switches and means coacting with the pieces for governing the amount of movement of the carriage, substantially as described.

17. The combination of a punch having controlling means, a carriage having means whereby it is intermittently moved, an electric switch for governing the action of the punch-controlling means and a series of pieces placed to perform the double function of switch-actuating means and means for governing the amount of movement of the carriage, substantially as described.

18. The combination with a punch having means whereby its action is controlled, of a carriage having on it a relatively movable cylinder, a piston therefor, means whereby said parts are caused to impart motion to the carriage, an electric switch connected to the punch-controlling means, a series of pieces for governing the length of stroke of the carriage, said pieces having parts coöperating with the switches, with means for presenting said pieces to the switches, substantially as described.

19. The combination of a punch having controlling means, a work-carriage having a cylinder, a piston therefor and a controlling-valve, with a wheel having on it a series of removable pieces, a switch in circuit with the punch-controlling means and means for acting on said wheel to bring said pieces into position to simultaneously actuate the valve and operate the switch, substantially as described.

20. The combination with a punch of a gag, a magnet for moving said gag and automatically-operated means for causing said magnet to be energized at predetermined times, with a carriage for work operated on by said punch, said means being supported by said carriage, substantially as described.

21. The combination of a series of punches, a gag having an operating-magnet, for each punch, a carriage, means for intermittently moving said carriage, means for varying the amount of the carriage movement, a series of switches connected to the gag-operating magnets, a revoluble wheel and pieces on the wheel having portions coöperating both with the said switches and with the means for varying the carriage movement, substantially as described.

22. The combination of a punch having electrical means for controlling its action, a carriage for work to be operated on, an automatically-operating device on said carriage for actuating the punch-controlling means at predetermined times and means for connecting said device with said controlling means, the same including a contact on the carriage and a conductor for the same extending in the line of motion of the carriage, substantially as described.

23. The combination with a punch of a gag, means for actuating the same, a carriage for

work to be operated on, means for intermittently moving said carriage, and electrical mechanism on the carriage for causing operation of the gag-actuating means, substantially as described.

24. The combination with a punch of a gag, means for actuating the same, a carriage for work to be operated on, means for intermittently moving said carriage, an electric switch and means for closing the same at predetermined times, all supported on the carriage, and apparatus in circuit with said switch for causing operation of the gag-actuating means, substantially as described.

25. The combination with a punch of a gag including a block slidable at right angles to said punch, means for automatically moving the same, and automatically-operated means for causing the gag-moving means to be actuated at predetermined times, said means also including a device for varying the amount of movement of the carriage, substantially as described.

26. The combination with a punch of a gag bodily movable in a line at right angles to the line of action of the punch, a magnet for moving said gag and means for actuating the magnet, said means including pieces of different lengths, contacts on said pieces, a series of fixed contacts, with means for bringing the contacts on the pieces into engagement with said fixed series of contacts, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN V. W. REYNDERS.
WILLARD T. SEARS.

Witnesses:
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MARY E. HAUER.