G. A. ARNOLD.

KEYBOARD TELEGRAPHIC TAPE PERFORATOR.

APPLICATION FILED MAY 3, 1910.

1,016,313.

Patented Feb. 6, 1912.

5 SHEETS—SHEET 1.

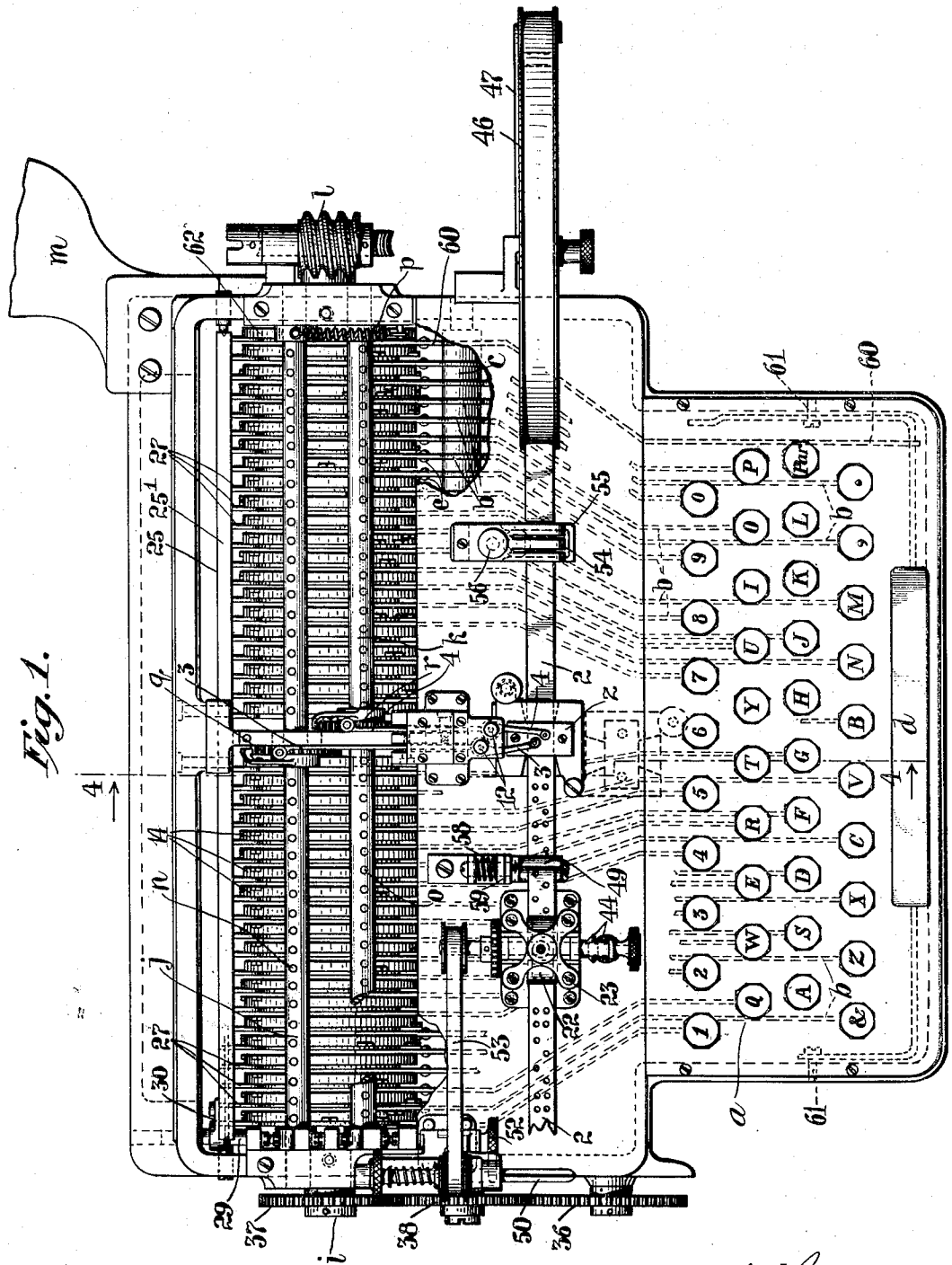

Fig. 1.

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by George A. Arnold

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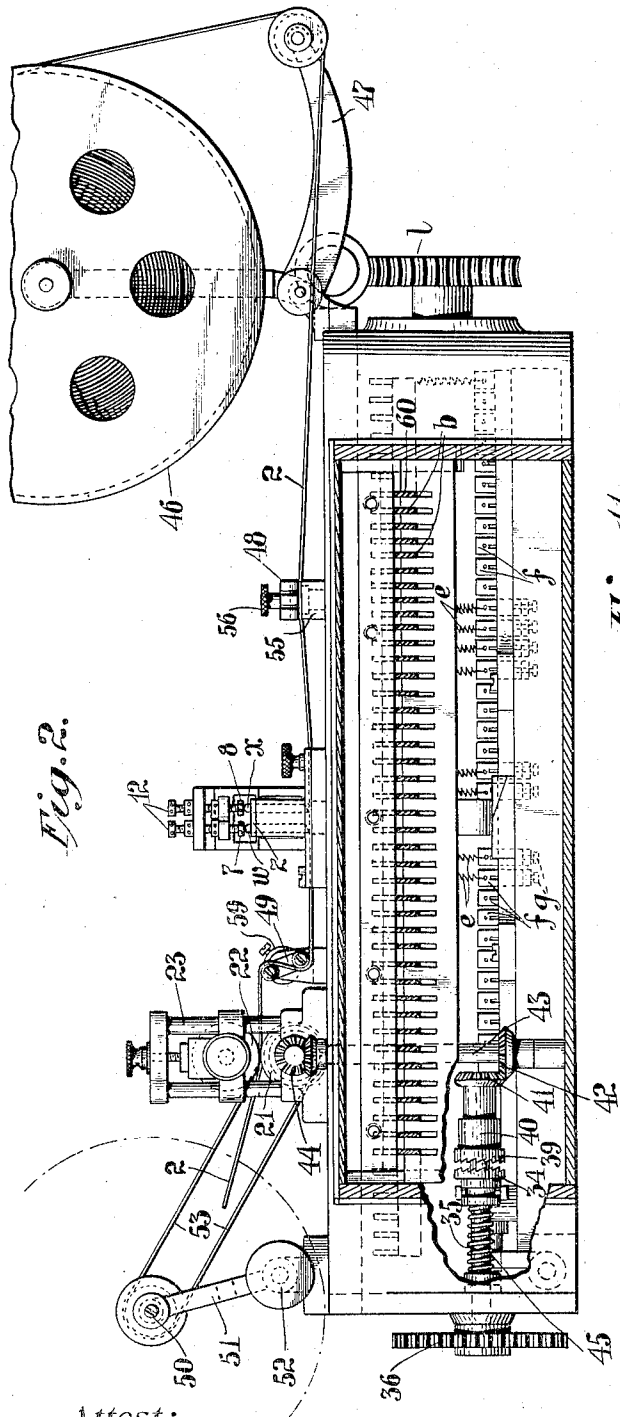

Fig. 2.

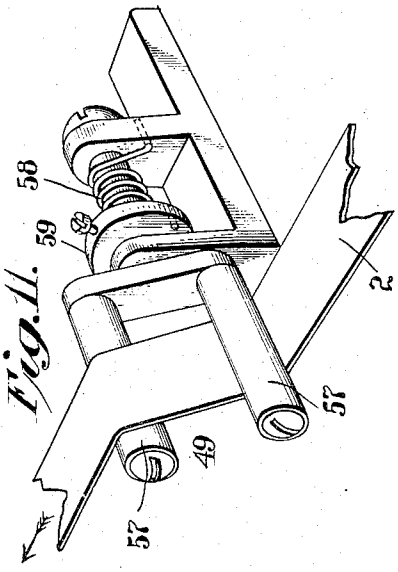

Fig. 11.

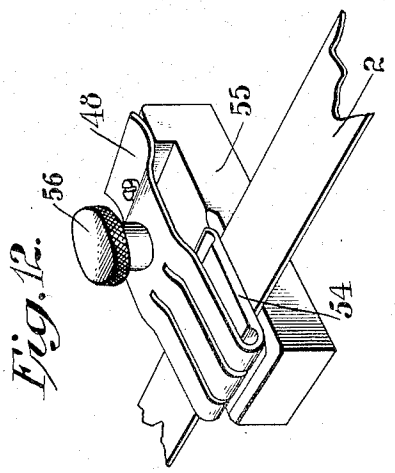

Fig. 12.

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Fig. 10.

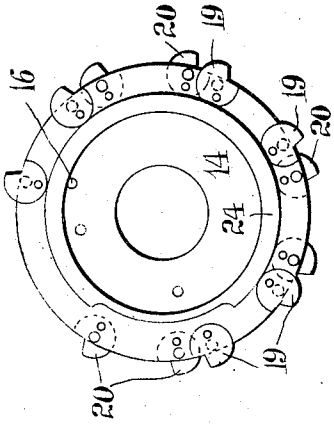


Fig. 3.

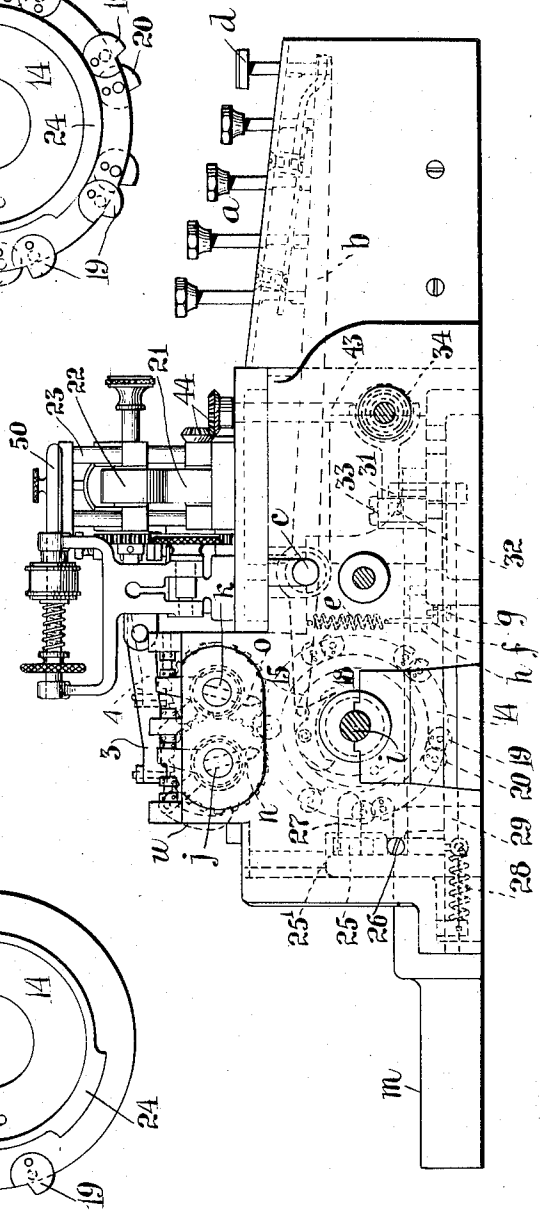
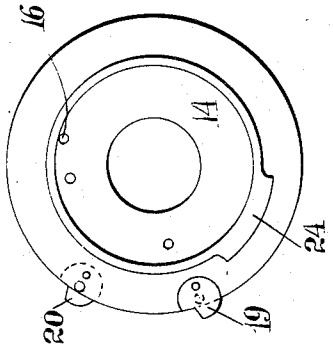


Fig. 9.



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5 SHEETS—SHEET 4.

Fig. 6.

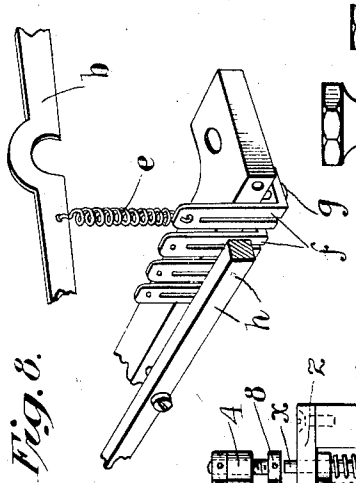

Fig. 7.

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KEYBOARD TELEGRAPHIC TAPE PERFORATOR.

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5 SHEETS—SHEET 5.

Fig. 5.

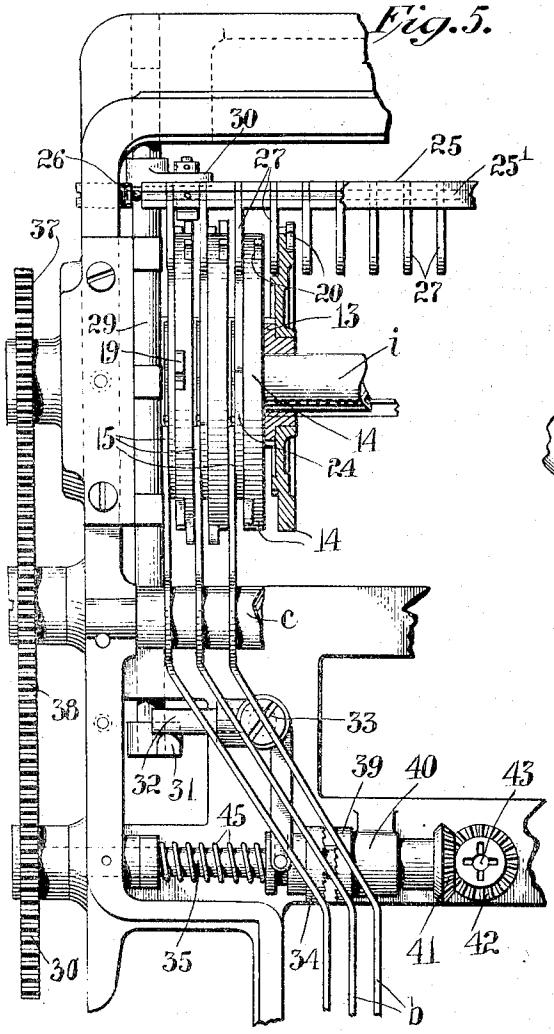


Fig. 6.

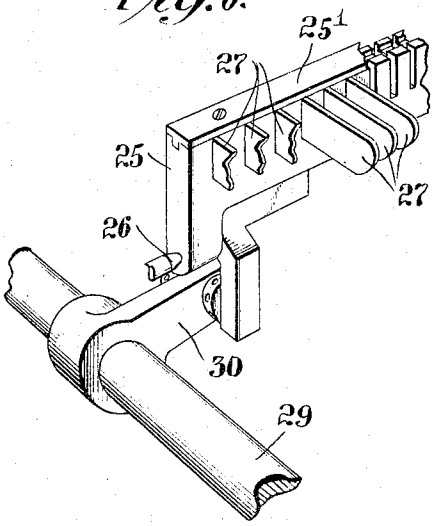
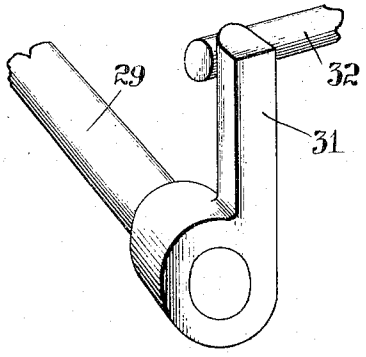


Fig. 7.



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UNITED STATES PATENT OFFICE.

GEORGE A. ARNOLD, OF NEW YORK, N. Y., ASSIGNOR TO TELEPOST COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

KEYBOARD TELEGRAPHIC-TAPE PERFORATOR.

1,016,313. Specification of Letters Patent. Patented Feb. 6, 1912.

Application filed May 3, 1910. Serial No. 559,232.

To all whom it may concern:

Be it known that I, GEORGE A. ARNOLD, a citizen of the United States of America, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Keyboard Telegraphic-Tape Perforators, of which the following is a specification.

This invention pertains to perforating machines adapted to perforate or puncture material in ribbon form, as strips of paper, with the perforations arranged in certain groups, each consisting of a selected number and arrangement of perforations.

The machine of this invention embraces positively actuated puncturing and feeding devices, a key-board of typewriter character, a continuously rotating shaft driven by a suitable motor, means including disks carrying tappets for operating the puncturing devices in order and proper sequence in accordance with telegraphic transmissions corresponding to the characters or letters on the key-levers. Each of the disks is controlled by a character lever of the key-board and connected to the shaft so as to make a full revolution each time its key lever is depressed. The strip feeding device also receives motion from the continuously rotating shaft through the medium of a set of gears and a clutch controlled by cams on the tappet disks in such manner as to cause the feed device to act during the time the puncturing devices are operated by the sets of tappets on each disk. A tension take-up is provided to relieve strain on the strip while the punches are in operation.

In the accompanying drawings: Figure 1 is a plan view of the machine with the frame partly broken away: Fig. 2, a front elevation with the key-board removed, showing some of the parts in section: Fig. 3, a left-hand side elevation, with the feed connecting gear eliminated: Fig. 4, a transverse sectional view on an enlarged scale, taken on the line 4, 4, Fig. 1: Fig. 5, an enlarged plan view of some of the tappet disks, feeding mechanism, etc., at the left hand side of the machine: Figs. 6 and 7 are detached views of parts shown in Fig. 5: Fig. 8 illustrates a part of one of the key-levers and adjustable spring connections: Figs. 9 and 10 are side elevations of two of the tappet carrying disks: Fig. 11 is a detached view of the strip tension take-up device: and Fig. 12, a detached view of a friction clamp for holding the strip before it reaches the puncturing devices.

The key board *a*, comprises key levers *b* fitted to rock on a transversely arranged shaft *c* and a spacing bar *d* similar to the corresponding parts found in ordinary typewriters. Each key lever is provided with a tension spring *e* adjustably connected to the frame of the machine through the medium of an angle plate *f*, a screw *g* and clamping bar *h*. Arranged in bearings in the frame parallel to shaft *c* are three shafts *i*, *j* and *k*. The shaft *i* is continuously rotated by a power transmission gear *l* adapted to be connected to a suitable motor which may be placed on a bracket *m* on the frame. The other shafts *j* and *k* are provided with downwardly projecting arms *n* and *o*, respectively, equal in number to the key-levers of the key-board, and normally held in the positions shown in Fig. 4 by springs. One such spring acting on shaft *j* is shown at *p*, Fig. 1, the other spring acting on the shaft *k* being beneath the spring *p* and partly hidden thereby. At or near the central parts of the shafts *j* and *k* are located notched wheels *q* and *r* fitted to rotate on the shafts, and fast on the shafts adjacent these notched wheels are levers *s* and *t* carrying pawls *u*, *v*, arranged to act on and move the notched wheels *q* and *r* one notch each time their respective shafts *j* and *k* are rocked as hereafter described.

The puncturing apparatus is located in front of wheels *q* and *r* and embraces two punches *w* and *x* upheld by springs acting between collars on the punches, and by a guide bar *y* that forms a guide for the lower ends of the punches, their upper ends being guided in the upper part *z* of the punch frame, the lower part of which carries die plate 1. The punches are offset transversely relatively to the strip of paper 2, which is moved between the ends of the punches and the die plate by a feeding device that uniformly moves the strip when the machine is operating. As the punches are actuated alternately, as hereafter described, some of the pairs of perforations in the groups telegraphically representing the letters or characters on the finger pieces of the key-board are arranged in transverse lines at right angles to the longitudinal line of the strip,

Fig. 1. Other arrangements of the punctures or perforations in the strip may be effected by variations in the positions and operation of the punches, but those shown and here described produce a transmitting strip suitable for use in the "Delany system" of telegraphy now used commercially by the Telepost Company.

To operate the punches *w*, *x*, there are provided levers 3 and 4 fulcrumed at 5 and 6 on a bracket frame extending upwardly from the main frame of the machine and whose forward ends act on the tops of the punches through adjustable striking plugs 7 and 8. The rear ends of these levers are provided with toe pieces or wipers 9 and 10, that are acted upon by the notched wheels *q* and *r* each time said wheels are moved a notch or tooth by the pawls *u* and *v*, thereby depressing the outer ends of the levers and actuating the punches. The levers are raised after each such action by springs 11 acting against the under side of the levers and pressing them against the adjustable stop screws 12, whereby the toes or wipers 9 and 10 are suitably set relatively to the notched wheels *q* and *r*.

Fitted to rotate freely on the hubs of ratchet wheels 13, keyed rigidly to shaft *i*, are tappet carrying disks 14, one for each of the key levers *b*. The inner end 15 of each key lever lies along one side of its disk which is held in inoperative position by a pin 16 thereon that abuts against the end of the controlling lever. This lever holds the spring acting pawl 17, pivoted on the side of the disk, out of engagement with the ratchet wheel 13, Fig. 4. Each disk 14 is provided with two sets of tappets 19 and 20 secured to its sides, extending beyond its periphery and arranged to act on the arms *n* and *o* of the shafts *q* and *r*, respectively, when the disk is caused to be rotated upon the depression of the key-board end of the lever *b*, which causes the end 15 to release the pawl 17 and disengage the pin 16, whereupon the pawl is immediately engaged by the rotating ratchet wheel and the disk is caused to rotate therewith and as the tappets strike and pass by the arms *n* and *o* the shafts *j* and *k* are rocked, their pawls *u* and *v* respectively moving the notched wheels *q* and *r* and so actuate the punches *w* and *x*, as before described. Now when the disk has been carried around by the shaft *i* one full revolution the inclined end 18 of pawl 17 and stop pin 16 come in contact with the end 15 of the controlling key-lever, it having been relieved of pressure on its key-board end, thereby moving the pawl 17 away from the ratchet wheel 13 and arresting further motion of the disk until said key-lever is again manipulated. During such revolution of the disk all of the tappets have acted on the arms of the rock shafts and caused as many punctures to be made in the strip of paper as there are tappets. The arrangement and number of tappets on the disk determine the arrangement of the punctures in the group and as the depression of the different key-levers should produce different groups of punctures, the number and positions of the tappets on the disks will correspond to the groups of punctures to be produced. Two such disks detached from the machine are shown at Figs. 9 and 10.

To operate the strip feeding device which consists of a pair of rollers 21, 22 geared together and held in a suitable frame or housing 23, each disk is provided with a cam 24 whose active surface is different on the different disks to accord with the lengths of the strip required to be fed for each group of punctures so as to avoid unnecessary waste of the strip and secure proper spacing of the groups of punctures, see Figs. 4, 9, and 10. To impart motion to the feed rollers from the cams 24, a bar 25 pivoted at 26 to the main frame is provided with projecting plates 27 acting as wipers one for each of the cams 24. This bar is under the influence of a strong spring 28 that acts to hold the wipers against the cams. These wiper plates 27 are seated in slots formed in the upper edge of the bar 25 and are held therein by a cap plate or bar 25′ secured by screws to the bar 25 and having a tongue or flange on its under side which fits into a longitudinal groove in the bar 25 and into notches formed in the upper edges of the wipers, see Fig. 6; which figure also shows how the bar 25, as it rocks on its pivot 26, acts on a sliding rod 29 through an arm 30 projecting therefrom and embraced between lugs projecting downwardly from the bar 25. The rod 29 slides in bearings on the end of the main frame and has at its forward end an upwardly extending arm 31 against which rests an arm of a bell crank lever 32 rocking on a stud bearing 33. The other arm of this bell crank is forked so as to engage a groove in a sliding part 34 of a clutch splined to a short shaft 35 extending through the end of the main frame, and there provided with a gear 36 connected through an idler gear 38 with a gear wheel 37 secured to the end of the continuously rotating shaft *i*. The co-acting part of clutch 39 rotates in a bearing 40 and is secured to a miter wheel 41 whose fellow wheel 42 is attached to the lower end of a vertical shaft 43, the upper end of which is, by a pair of miter wheels 44, placed in communication with the feed roller 21 of the feeding device. By this arrangement it is seen that the shaft 35 rotates with the main shaft *i*, normally without imparting motion to the feed rollers, and that when the sliding rod 30 is moved by the rocking bar 25, arm 31 releases bell crank lever 32 and allows the

spring 45 on the shaft 35 to throw the clutch member 34 into gear with the other member 39 and so cause the feed rollers 21, 22 to feed the strip 2 so long as a wiper 27 is acted upon by a cam 24 of a tappet carrying disk.

The strip 2 to be punctured is carried on a reel 46 and passes under a roller on an arm 47 to a friction clamp 48, thence to the puncturing device and feeding device after passing through a tension take-up 49, and from the feeding device to the winding up shaft 50 carried on an adjustable arm 51 having a clamp connection 52 to the main frame. The winding up shaft is driven by a belt 53 running over a slip friction pulley on the shaft 50 and a pulley on the shaft of one of the feed rollers. The spring 28 is sufficiently strong to overcome the reaction of spring 45. The function of the friction clamp 48 is that of a brake to prevent an overrun of the paper that would cause slackness at the leading side of the puncturing device. To make such a brake delicate in its adjustment and insure uniformity of pressure on the whole width of the strip the front end of the upper plate 54 is extended inwardly from a spring plate which overlies it and whose rear end rests on a projection from the under plate 55, and an adjusting screw 56 passes through the spring into the under plate, Fig. 12.

The strip feeding device is acting while the punches are acting, and although the punches act very quickly there would be a tendency to tear the strip or distort the punctures, and to obviate this is the function of the take-up device 49. This device consists of a short shaft held in a bracket bearing and carrying on one of its ends two bars or rollers 57 under one of which and over the other the strip passes, (Fig. 11) the pull on and direction of movement of the strip being indicated by an arrow. A torsional spring 58 on the shaft has one of its ends fixed to the bracket and its other end fixed to the collar 59 which can be set in any position on the shaft so that the tension of the spring may be adjusted to a strength to cause the strip to be pulled through the clamp 48 and yield to the pull of the feeding device when a punch is in the strip.

The means employed for putting the feeding rollers 21, 22 into action when the spacing bar *d* is manipulated, consists of a lever 60 fitted to rock on the bar or shaft *c* with its forward end beneath the frame of the spacing bar which is pivoted to the main frame at 61, 61. The inner end of this lever is in line with the inner ends of the finger levers *b* and is adapted to act as a stop for the stop pin on the disk 62 and to control the pawl of the ratchet connection which causes said disk to rotate with the shaft *i* when released as the spacing bar is manipulated. The operation is similar to the action of the other disks and their controlling levers. This disk 62 is provided with a cam, similar in character to the other cams 24 on the other disks 14, that acts on a wiper at the end of the rocking bar 25, and so closes communication between the feed rollers and the shaft *i* through the clutch 34, 39, as before described.

I claim:

1. A perforating machine, comprising a key-board having character bearing key-levers, a shaft continuously rotated when the machine is in use, a puncturing device common to all of the key levers, means for operating it, and separate means for and mechanically controlled by each of the key-levers for imparting motion from the continuously rotating shaft to the puncturing device operating means as each key-lever is manipulated, and adapted to complete their functions upon the key levers being released after initial depression.

2. A perforating machine, comprising a key-board having character bearing key-levers, a shaft continuously rotated when the machine is in use, a puncturing device common to all of the key levers, means for operating it, separate means for the key levers, each provided with a plurality of actuating devices selectively arranged, and means for and mechanically controlled by each of the key-levers for imparting activity to its actuating device and thereby impart motion from the continuously rotating shaft to the puncturing device operating means as each key-lever is manipulated.

3. A perforating machine, comprising a key-board having character bearing key-levers, a shaft continuously rotated when the machine is in use, a puncturing device including two punches common to all of the key levers, means for operating it, and means for and mechanically controlled by each of the key-levers to impart activity to the puncturing device operating means and thereby cause the continuously rotating shaft to fully actuate the puncturing device operating means as each key-lever is initially manipulated.

4. A perforating machine, comprising a key-board having character bearing key-levers, a shaft continuously rotated when the machine is in use, a puncturing device including two punches, means for operating it, and means provided with a set of actuating devices for each of the punches selectively arranged, for and controlled by each of the key-levers for imparting motion from the continuously rotating shaft to the puncturing device operating means as each key-lever is manipulated.

5. A perforating machine, comprising a key-board having character bearing key-

levers, a shaft continuously rotated when the machine is in use, a puncturing device, means for operating it, disks concentrically arranged on the shaft, one for each key-lever and each provided with a selected number and arrangement of punch actuating devices and means for individually connecting the disk to the shaft, each of said disks and its shaft connecting means being controlled by and normally held inactive by its key-lever and made active when its key-lever is manipulated.

6. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a puncturing device, a feeding device adapted to feed a strip of paper through the puncturing device, means adapted to be connected to and receive motion from the shaft and provided with a plurality of actuating devices, as tappets, for operating the puncturing device successively during a complete single movement of said means, and means for controlling the tappet carrying means and the paper feeding device.

7. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a puncturing device including two punches, a feeding device adapted to feed a strip of paper through the puncturing device, means adapted to be connected to and receive motion from the shaft and provided with a plurality of actuating devices, as tappets, arranged in two sets thereon for operating the two punches of the puncturing device successively during a complete single movement of said means, thereby producing two rows of punctures through the strip of paper, and means for controlling the tappet carrying means and the paper feeding device.

8. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a puncturing device including two punches, a feeding device adapted to feed a strip of paper through the puncturing device, the two punches of which are diagonally arranged athwart the strip of paper, means adapted to be connected to and receive motion from the shaft and provided with a plurality of actuating devices, as tappets, arranged in two sets thereon for operating the two punches of the puncturing device successively and alternately during a complete single movement of said means, thereby producing two rows of punctures through the strip of paper, and means for controlling the tappet carrying means and the paper feeding device.

9. A perforating machine, comprising a puncturing device, a feeding device adapted to feed material in ribbon form, as a strip of paper, through the puncturing device, means for operating the feeding device during the operation of the puncturing device, a tension take-up adapted to give under the action of the feeding device when the puncturing device is actuating on the strip and so hold it, and to feed the retarded portion of the strip as soon as the puncturing device releases it, and means for actuating the puncturing device and the feeding device.

10. A perforating machine, comprising a puncturing device, a feeding device adapted to feed material in ribbon form, as a strip of paper, through the puncturing device, means for operating the feeding device during the operation of the puncturing device, a strip holding reel, a friction brake acting on the strip between the puncturing device and the reel, a tension take-up adapted to give under the action of the feeding device when the puncturing device is acting on the strip and so hold it, and to feed the retarded portion of the strip as soon as the puncturing device releases it and means for actuating the puncturing device and the feeding device.

11. A perforating machine, comprising a puncturing device, a feeding device adapted to feed material in ribbon form, as a strip of paper, through the puncturing device, a strip holding reel, a friction brake acting on the strip between the puncturing device and the reel and consisting of a pressure plate provided with a flat spring extending over it and an adjusting screw for the spring, and means for actuating the puncturing device and the feeding device.

12. A perforating machine, comprising a key-board having character bearing key-levers and a spacing bar, a shaft continuously rotated when the machine is in use, a puncturing device, means for operating it, a feeding device adapted to feed material in ribbon form, as a strip of paper, and means for and controlled by each of the key-levers for imparting motion from the continuously rotating shaft to the puncturing device operating means and the feeding device as each key-lever is manipulated, and means controlled by the spacing bar for imparting motion from the continuously rotating shaft to the feeding device.

13. A perforating machine, comprising a puncturing device, a lever for operating it, a notched wheel acting on one end of the lever, a rock-shaft on which the notched wheel is fitted to rotate, a pawl carried by the rock-shaft adapted to move the wheel one notch each time the shaft is rocked, a series of arms extending from the rock-shaft, a continuously rotating shaft, disks concentrically arranged in relation to this shaft and having tappets secured thereto adapted to act on the arms of the rock-shaft, means for connecting the disks to the continuously rotating shaft, and individual means for holding each of the disks stationary, releasing it for connection with the continuously

rotating shaft, and arresting it after it has made a revolution.

14. A perforating machine, comprising a puncturing device, a shaft continuously rotated when the machine is in use, a feeding device adapted to feed a strip of paper through the puncturing device, a series of disks adapted to be connected to the shaft and provided with means for actuating the puncturing device, gear connections between the shaft and the feeding device, a cam on each of the disks, a rocking bar provided with wipers acting on the cams and provided with means for setting the feeding device in action, and a controlling means for each disk which when manipulated permit the disks to be connected to the shaft and stop them after they have made a revolution.

15. A perforating machine, comprising a puncturing device, a feeding device adapted to feed material in ribbon form, as a strip of paper, through the puncturing device, a tension take-up located between the puncturing device and the feeding device and consisting of a horizontal shaft provided with a torsion spring and having two arms extending from one of its ends and around which the strip of paper passes, and means for actuating the punching device and the feeding device.

16. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a puncturing device, a feeding device adapted to feed a strip of paper through the puncturing device, a tension take-up located between the puncturing device and the feeding device adapted to give under the action of the feeding device and draw the strip from under the puncturing device after it has been acted upon thereby, means adapted to be connected to and receive motion from the shaft and provided with a plurality of actuating devices as tappets, for operating the puncturing device successively during a complete single movement of said means, and means for controlling the tappet carrying means and the paper feeding device.

17. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a feeding device adapted to feed a strip of paper through the puncturing device, a puncturing device, including two punches, the two punches of which are diagonally arranged athwart the strip of paper, a strip holding reel, a friction brake acting on the strip between the reel and the puncturing device, a tension take-up through which the strip passes located between the feeding device and the puncturing device, means adapted to be connected to and receive motion from the shaft and provided with a plurality of actuating devices, as tappets, arranged in two sets thereon for operating the two punches of the puncturing device successively and alternately during a complete single movement of said means, thereby producing two rows of punctures through the strip of paper, and means for controlling the tappet carrying means and the paper feeding device.

18. A perforating machine, comprising a key-board including a spacing bar, a feeding device, a puncturing device, a lever for operating it, a notched wheel acting on one end of the lever, a rock-shaft on which the notched wheel is fitted to rotate, a pawl carried by the rock-shaft adapted to move the wheel one notch each time the shaft is rocked, a series of arms extending from the rock-shaft, a continuously rotating shaft, disks concentrically arranged in relation to this shaft and having tappets secured thereto adapted to act on the arms of the rock-shaft, means for connecting the disks to the continuously rotating shaft, and individual means for holding each of the disks stationary, releasing it for connection to the continuously rotating shaft, and arresting it after it has made a revolution, said individual means including a lever connection from the spacing bar to ne of the disks which controls means for operating the feeding device.

19. A perforating machine, comprising a puncturing device including two punches, a lever for operating each punch, a notched wheel acting on each punch lever, two rock shafts on which the notched wheels are fitted to rotate, a pawl carried by each rock-shaft adapted to move the notched wheel thereon each time the said shafts are rocked, a series of arms extending from each rock-shaft, a continuously rotating shaft, disks concentrically arranged in relation to this shaft and having tappets secured thereto adapted to act on the arms of the rock-shaft, means for connecting the disks to the continuously rotating shaft, and individual means for holding each of the disks stationary, releasing it for connection to the continuously rotating shaft and arresting it after it has made a revolution.

20. A perforating machine, comprising a puncturing device, including two punches, a lever for operating each punch, a notched wheel acting on each punch lever, two rock-shafts on which the notched wheels are fitted to rotate, a pawl carried by each rock-shaft, a series of arms extending from each rock shaft, a shaft continuously rotated when the machine is in use, a feeding device adapted to feed a strip of paper through the puncturing device, a series of disks adapted to be connected to the shaft and provided with means for acting on the arms of the rock-shafts and thereby actuating the puncturing device, gear connections between the shaft and the feeding device, a cam on each of the disks, a rocking bar provided with wipers

acting on the cams and provided with means for setting the feeding device in action, and a controlling means for each disk which when manipulated permit the disks to be connected to the shaft and stop them after they have made a revolution.

21. A perforating machine, comprising a key-board having character bearing key-levers, a shaft continuously rotated when the machine is in use, a puncturing device including two punches, means for operating it, ratchet wheels secured to the shaft, a disk for each ratchet normally free of the shaft and provided with a pawl and a stop pin which contacts with and is controlled by a key-lever, means for actuating the puncturing device and means carried by the disks for operating the puncturing device actuating means.

22. A perforating machine, comprising a shaft continuously rotated when the machine is in use, a puncturing device, a feeding device adapted to feed a strip of paper through the puncturing device, ratchet wheels secured to the shaft, a disk for each ratchet normally free of the shaft and provided with a pawl and a stop pin which contacts with and is controlled by a key-lever, means for actuating the puncturing device and means carried by the disks for operating the puncturing device actuating means, gear connection between the shaft and the feeding device, means for making said gear operative, and a cam on each of the disks for actuating said means.

23. A perforating machine, comprising a puncturing device, a shaft continuously rotated when the machine is in use, a feeding device adapted to feed a strip of paper through the puncturing device, a series of disks adapted to be connected to the shaft and provided with means for actuating the puncturing device, gear connection between the shaft and the feeding device, a cam on each of the disks, a rocking bar provided with wipers acting on the cams, a clutch in the feed gear connection, a sliding rod connection between the rocking bar and clutch, a controlling means for each disk which, when manipulated, permit the disks to be connected to the shaft and stop them after they have made a revolution.

In testimony whereof, I have hereunto subscribed my name.

GEORGE A. ARNOLD.

Witnesses:

MARY DUTTON,

L. F. BROWNING.