(No Model.) 4 Sheets—Sheet 1.

J. E. MUNSON.

PERFORATING MACHINE.

No. 332,419. Patented Dec. 15, 1885.

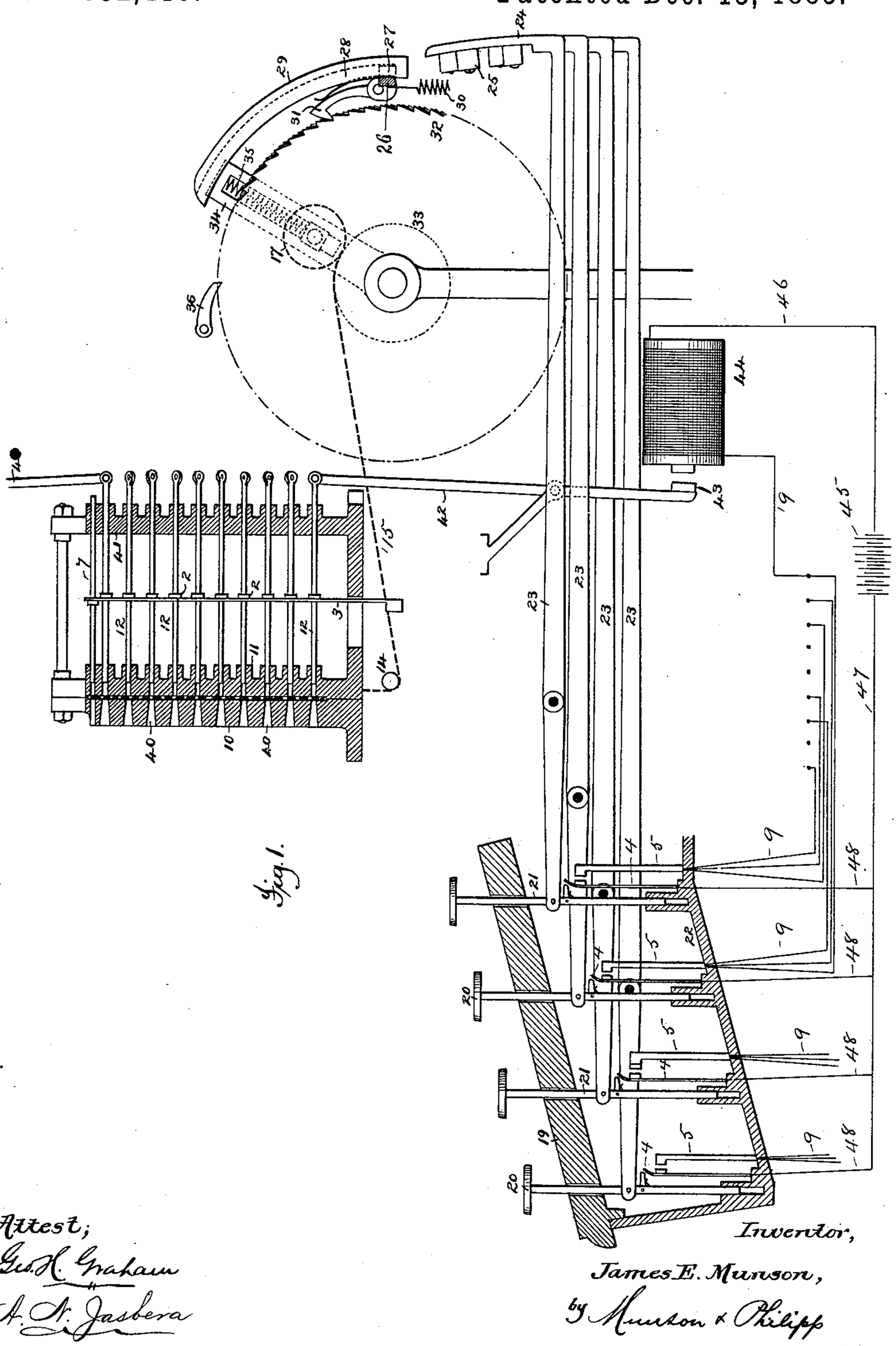

Fig. 1.

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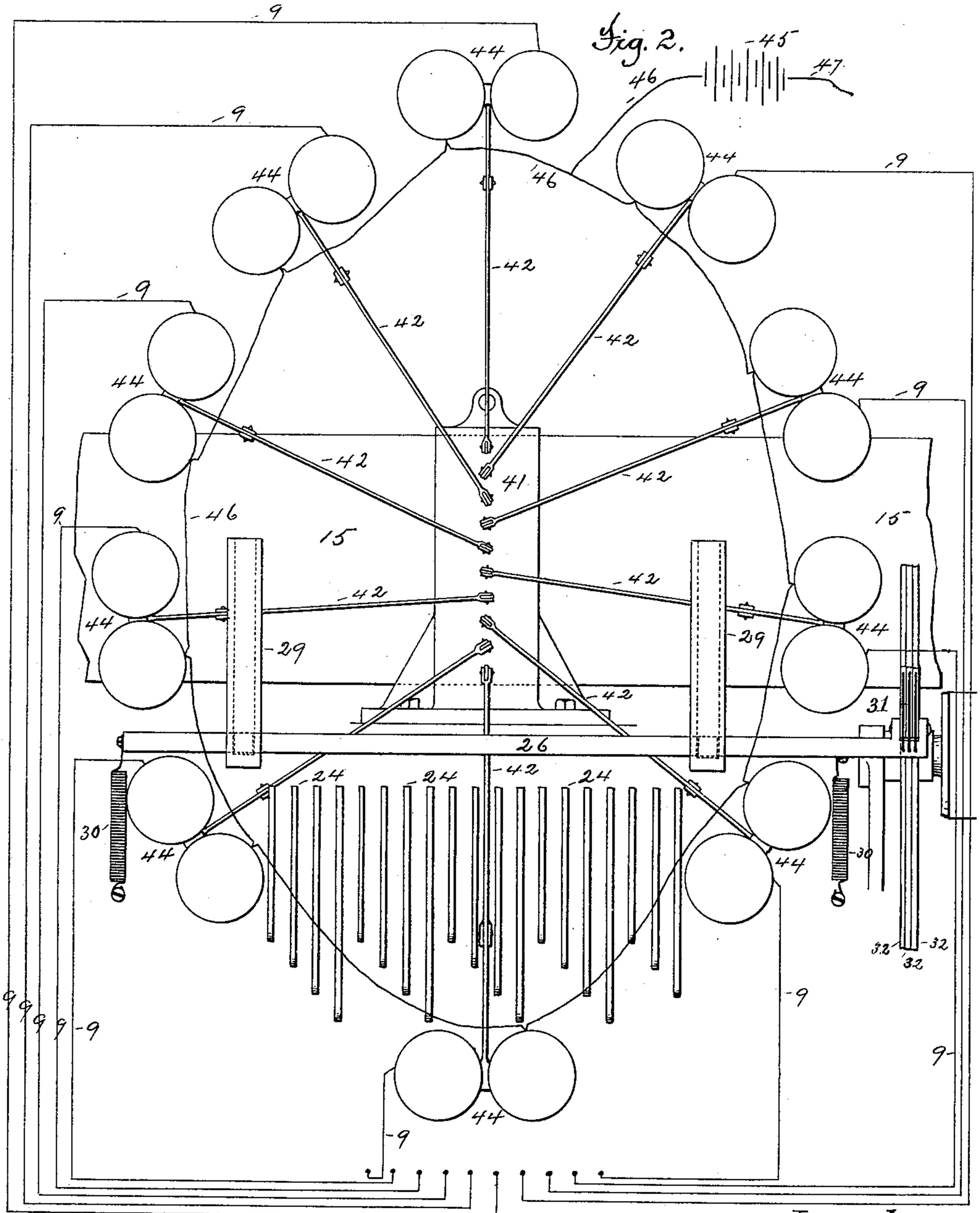
Fig. 2.



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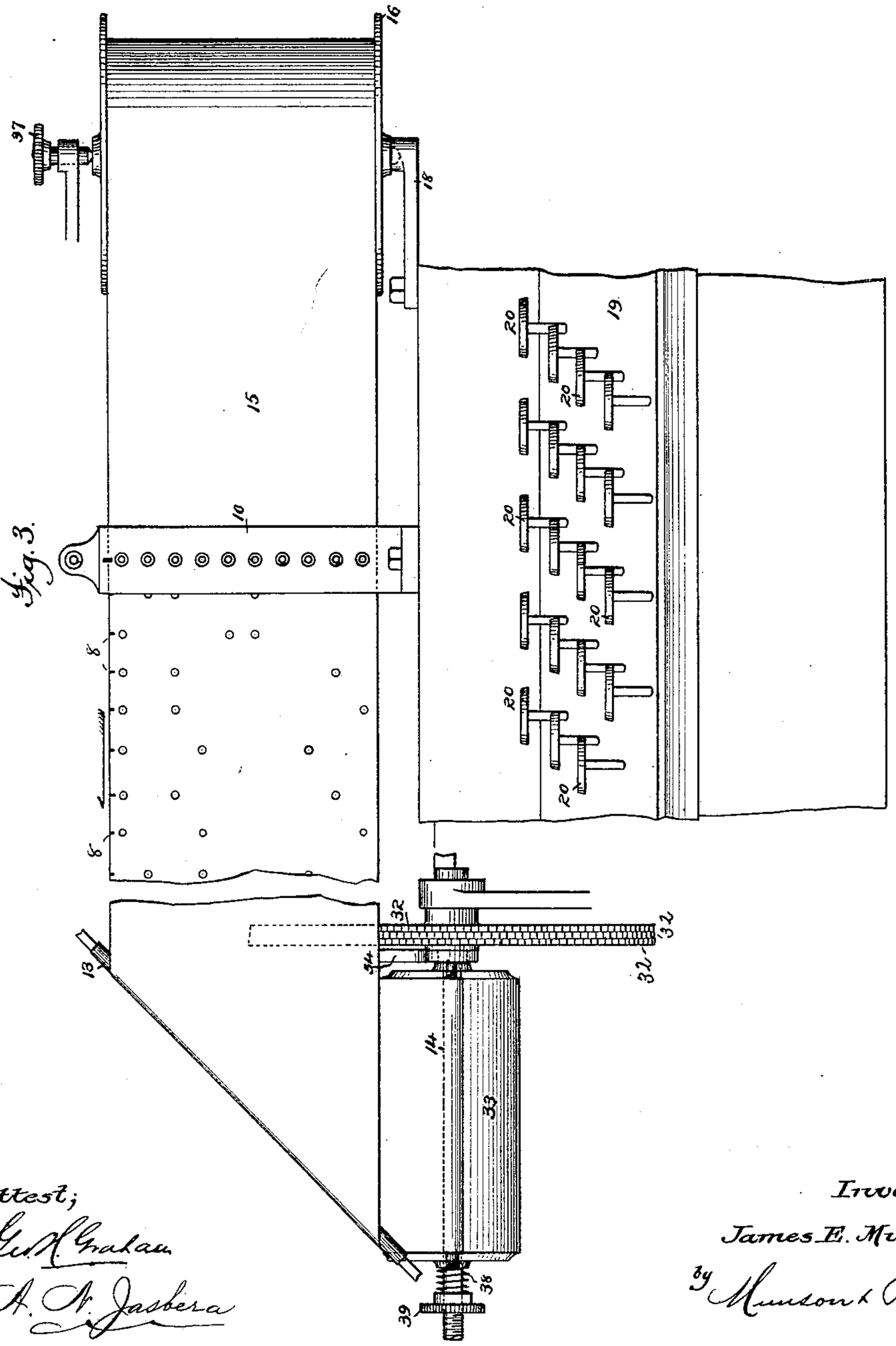

Fig. 3.

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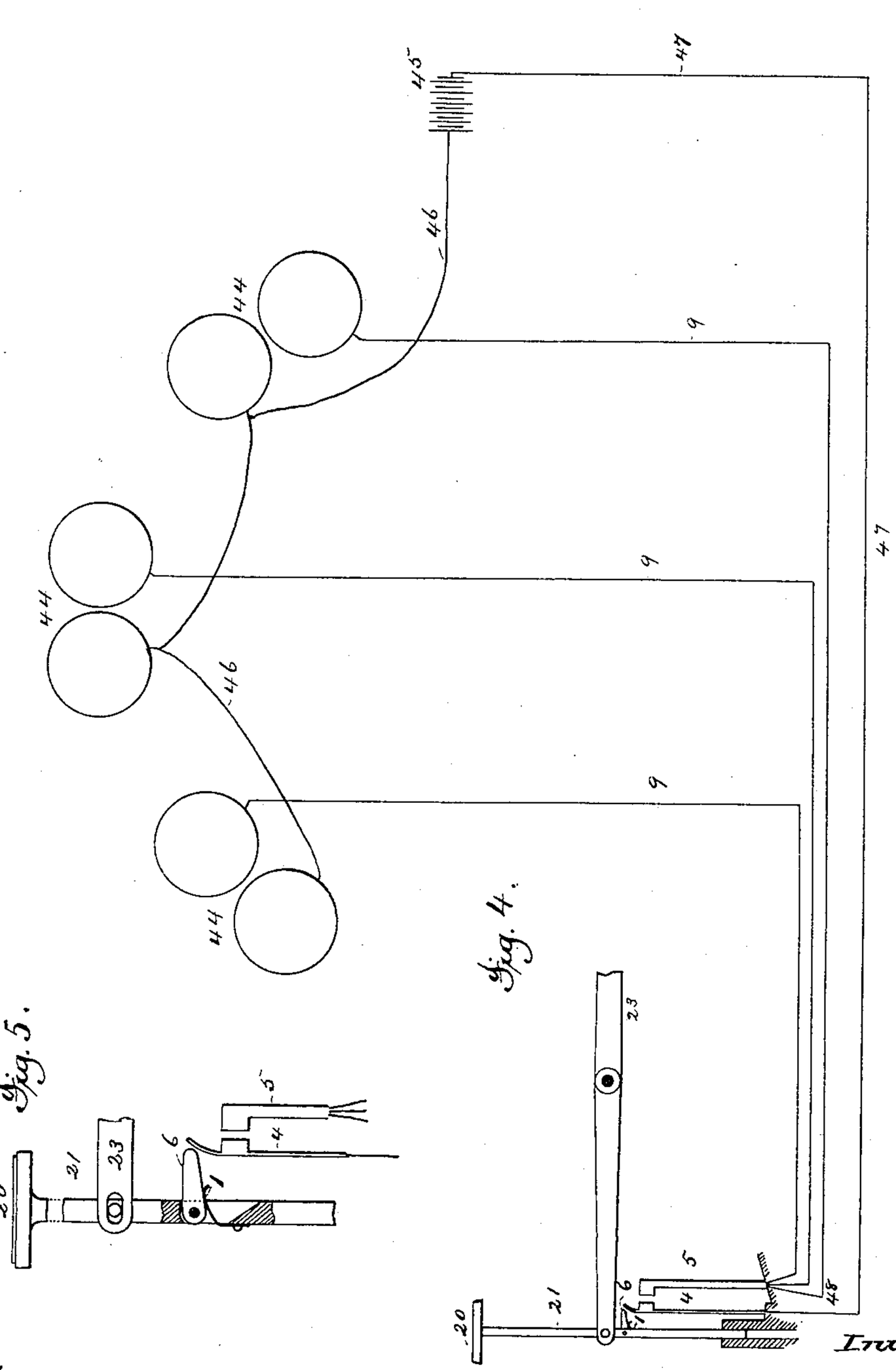

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES E. MUNSON, OF NEW YORK, N. Y.

PERFORATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,419, dated December 15, 1885.

Application filed August 5, 1882. Renewed October 9, 1885. Serial No. 179,409. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. MUNSON, a citizen of the United States, residing in the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Perforating-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In a former application for United States Letters Patent I have described and illustrated a method of automatically operating a type-setting machine by means of perforations in a strip or band of paper, said band being so moved that its perforations are brought within the range of action of the type-selecting devices, the position of said perforations upon the band and with relation to each other indicating the types to be selected, and causing the devices to make the proper selection. In said former application I have also described a method by which the composition, after being indicated upon the band or strip of paper, is corrected and justified before being put in type.

The present invention relates to a mechanism adapted to perforate or prepare the automatic strip to be used in carrying into operation the method described in my said former application, it being the object of the invention to produce a mechanism for this purpose which shall be simple and compact in structure, and capable of rapid, certain, and reliable operation.

To this end the invention consists in various features of construction and combinations of parts, all of which will be hereinafter fully explained and particularly pointed out.

In the accompanying drawings, Figure 1 is a longitudinal vertical section of a mechanism embodying the invention, the frame-work and some of the other parts being omitted for the sake of clearness of illustration. Fig. 2 is a rear, and Fig. 3 a front, elevation of the same, the key-board being partly broken away in the latter figure. In these figures also the frame-work and certain of the other parts are omitted, to avoid confusion. Fig. 4 is a diagram illustrating the electric circuits by which the punches are operated; and Fig. 5 is a detail view of one of the keys and its connections.

The mechanism constituting the present invention consists, essentially, of two sets of devices—that is to say, the punches and their actuating devices constituting the perforating mechanism proper and the devices for presenting the band of paper in proper position to be acted upon by the punches. The latter of these sets of devices will be first described. The strip or band of paper 15, contained upon a spool, 16, supported upon a suitable bracket, 18, at the right of the machine, as shown in Fig. 3, has its end passed through a narrow opening between the vertical plates 10 11 in front of the punches 12, after which it is led around the angularly-arranged turning-bar 13, thence downward around the guide roll or bar 14 to the spindle 17, upon which it is wound after receiving its perforations.

In order to successfully practice my method of justification it is necessary, as has been fully explained in my former application, that the perforations representing the different types, spaces, &c., to be composed should be separated from each other in the direction of the length of the band of paper by spaces proportioned to the running width of such types—that is to say, the perforations representing a type of a given running width must be allowed twice the space which is allowed to those representing a type of one-half such width, and so on through all the variations in the running widths of the different types, spaces, &c., used. The spaces allowed to the perforations representing the several types may be exactly or substantially equal to the running widths of the types represented; or, if the types to be composed are large, the spacing, while being proportioned to the type, may be less than their actual running width. When ordinary type are to be composed, it will, however, be found best to make the spacing upon the perforated band considerably greater than the actual running width of the type, as by this means sufficient room will be afforded for making corrections, &c. To accomplish this variable spacing between the perforations it is necessary that the mechanism for presenting the band of paper to the action of the punches should be arranged so that just before or just after the perforation or perforations representing each type, space, &c., is or are made the band will be advanced a distance exactly proportioned to the

running width of such type or space. In the present case the feeding mechanism is arranged to operate upon the latter plan, and is constructed as follows: The key-board 19, which is arranged in front of the machine in the usual manner, is provided with a series of keys, 20, equal in number to the types, including spaces, &c., used in ordinary composition, said keys being mounted upon stems 21, which move up and down in bearings formed in the key-board and in an underlying piece, 22. Each of the stems 21 is pivotally attached to the forward end of one of the series of oscillating levers 23, the rear ends of said levers being provided with upwardly-extending arms 24, to each of which is adjustably secured a lug, 25.

Extending across the machine just in advance of the arms 24, and in position to be engaged by any one of the lugs 25 when it is raised by the oscillation of its lever, is a bar, 26, which is provided with dovetail projections 27, which rest in like grooves 28, of supporting-guides 29. (See Figs. 1 and 2.) This bar 26 is provided with spiral springs 30, by which it is held in its lowermost position, or returned thereto whenever it is raised by the lugs 25, as will be hereinafter explained. One end of the bar 26 is provided with a series of hooked pawls, 31, which engage with the teeth of a series of ratchet-wheels, 32, fast to the shaft of a roll, 33, (see dotted lines in Fig. 1,) upon which rests the spindle 17, which, as before stated, receives the band of paper after it has received its perforations. The spindle 17, as shown in Fig. 1, is mounted in slotted bearings 34, so as to move away from the roll 33 as the paper accumulates upon it, and is provided with springs 35, by which it is constantly pressed against said roll with a force sufficient to insure the feeding forward of the band of paper.

The operation of these devices in advancing the band of paper is as follows: The key 20, representing the desired type, being depressed, the rear end of its lever 23 will be thrown upward, causing the lug 25, with which it is provided, to strike against and raise the bar 26, thus moving the pawls 31 upward over the ratchet-wheels 32. As soon as the key is released, the lever 23 will at once fall back to its normal position, and the bar 26, drawn by springs 30, will follow, but in returning one of the pawls 31 will engage with the teeth of one of the ratchet-wheels 32, and revolve said wheels and the roll 33 so as to feed the band of paper forward a short distance. The distance which the band of paper is thus advanced will, as will readily be understood, depend upon the height to which the bar 26 has been raised by the lug 25, and this will be governed by the position at which said lug is fixed upon its arm 24, the lugs being adjustable, as already explained, so that their positions can be regulated to produce feed movements proportioned to the widths of the types represented by the keys with which they are connected.

The differences in the running width of the various types used in ordinary composition are so numerous and many of them so slight that, in order to proportion the feed of the band of paper sufficiently near to the running widths of the types represented, it is required that the mechanism be capable of imparting feed-movements of numerous lengths varying only slightly from each other. From this it results that to secure the desired feed the bar 26 must be raised to many different positions, and that some of these positions must vary only slightly from each other, and also that the pawls 31 must engage with the ratchets, so as to act during the whole of the downward movement of the bar. If it were attempted to secure this movement by means of a single pawl and ratchet, it would necessitate the teeth of the ratchet being made so fine that not only would they soon wear away, but the engagement of the pawl with them would be rendered uncertain. To avoid this difficulty a series of ratchets are used each of which has comparatively coarse teeth, the ratchets, however, being secured together, so that their teeth mismatch, as shown in Figs. 1 and 3, and a corresponding series of pawls being used so that at no matter what position the bar 26 stops in its upward movement, one of its pawls will always be in position to engage with a ratchet-tooth. The retrograde movement of the roll 33 is prevented by means of a series of holding-pawls, 36, arranged in the usual manner, and the band of paper is maintained at the proper tension by means of the friction set-screw 37, arranged to act upon the spindle of the spool 16, as shown in Fig. 3. The roll 33 is mounted loosely upon its shaft, so that it can be turned by hand to advance the band of paper without operating the feeding mechanism, when desired, the roll being held in frictional contact with the ratchets 32 by means of the spring 38 and thumb-nut 39 upon its shaft. As the band of paper passes through the narrow opening between the plates 10 11, it receives the perforations which indicate the types to be composed by the type-setting machine. These perforations are made by the punches 12, of which there are ten, and which are arranged in a vertical row extending nearly the whole width of the band. The plates 10 11 are provided with openings 40, in which the forward ends of the punches reciprocate in passing through the paper, the rear ends of the punches being supported in openings in a plate, 41, which, together with the plates 10 11, forms a supporting-frame for the gang of punches. The rear ends of the punches extend through the plate 41, and are connected to one end of the pivoted levers 42, the opposite ends of said levers being attached to the armatures 43 of the series of electro-magnets 44. Between the plates 11 41 the punches pass through a slot in a thin spring-

plate, 3, and just in the rear of this plate said punches are provided with collars 2, as shown in Fig. 1. From this construction it results that as soon as the punches have been relieved from pressure after they have been pushed forward through the band of paper, they will at once be retracted and thrown back to their normal position by the spring.

It will be observed that the number of punches used in the present machine is only ten, which is of course very much less than the number of keys in the machine, and of types, including spaces, &c., which it is required shall be indicated by the perforations in the band of paper. This deficiency in the number of punches is compensated for by providing that each type, instead of being represented by a single perforation, the particular type being determined by the position of said perforation, shall be represented by a combination of three perforations made by simultaneously operating three punches, the ten punches thus affording, by proper permutation, a sufficient number of different combinations to represent all the types, &c., required.

From the foregoing it will be readily understood that whenever an electric current is caused to pass through any one of the electro-magnets 44 its armature will be attracted so as to operate one of the punches, and that to simultaneously operate any particular combination of three punches it is only necessary to simultaneously complete electric circuits through their respective magnets. To accomplish this result one pole of a battery, 45, is connected by a wire, 46, with one pole of each of the magnets 44, the opposite pole of the battery being connected by a wire, 47, and branch wires 48 with the spring 4 of each of a series of circuit-closers, corresponding in number and position with the keys 20 of the machine. The rigid number 5 of each of these circuit-closers is connected by three wires, 9, with the opposite poles of the magnets of the three punches which are required to punch the combination representing the particular type corresponding to the key with which they are connected. The stem of each key is provided with a pivoted dog, 6, (see Figs. 4 and 5,) held in a horizontal position by a light spring, 1, and so located that as the key is depressed it comes into contact with the spring number 4 of the circuit-closer, so as to close the circuit and allow the electric current to pass through the three magnets connected to its wires 9, thereby operating the three punches required to make the combination of perforations representing the type corresponding to the key depressed. As soon as pressure is removed from the key, it will commence to rise, and the dog 6 will at once be turned downward against the tension of the spring 1, thereby allowing the spring number of the circuit-closer to recede from its rigid number and break the circuit, upon which the punches will at once be withdrawn from the paper, after which the paper will be advanced by the feeding mechanism in the manner already described.

It is of course apparent that it is not absolutely necessary that the types, &c., should be represented by combinations of their perforations. By providing a sufficient number of punches, each type, &c., may be represented by a single perforation. This, however, would make the number of punches so great as to make the machine unduly expensive, compli, cated, and cumbersome. Combinations of two perforations might also be used; but even this would increase the number of punches beyond what is desirable. It is also apparent that even when only ten punches are used, as in the present case, some of the types, &c., might be represented by single perforations, others by combinations of two perforations, and the remainder by combinations of three perforations. This, however, would be undesirable, because it would make the action of the battery irregular. I have found it best, therefore, to have all of the types, &c., represented by combinations of three perforations, as by using this number in combination a sufficient number of combinations can be formed to represent all of the different types, &c., required by the use of as few as ten punches, while by having the same number of perforations in all of the combinations uniformity in the action of the battery is secured.

By using combinations of four perforations to represent the different types, &c., the number of punches might be still further reduced; but this would increase the necessary number of electrical connections both in the perforating and the type-setting machines to such an extent as to make such an arrangement undesirable.

In addition to the devices for making the perforations representing the types, &c., to be composed by the type-setting machine, the machine is provided with an extra punch or marker, 7, situated just above and in line with the punches 12, and arranged, as shown, to be operated by the spring 3, so as to make a row of marks or indentations, 8, along the margin of the band of paper. The purpose of these marks or indentations is, as explained in my former application, to aid in the proper justification of the matter composed upon the band of paper.

The perforating apparatus herein described is what I have termed in my former application a "compositor's machine;" but it may by slight modifications, as therein set forth, be readily adapted for use by the justifier.

What I claim is—

1. The combination, with a gang of punches, as 12, and a corresponding series of magnets, as 44, for operating the same, of a series of keys, as 20, and electrical connections whereby the movement of a single key operates a plurality of punches, a series of levers, as 23,

corresponding in number with said keys and connected thereto, and provided with adjustable lugs, as 25, whereby like movements of the several keys produces variable feed movements, all substantially as described.

2. The combination, with the magnets 44, of the keys 20, having the pivoted spring-dogs 6, the circuit-closers 4 5, operated by said dogs, and electrical connections, substantially as described.

3. The combination, with the punches 12, magnets 44, circuit-closers 4 5, and connections, substantially as described, of the keys 20, connected to the levers 23, for operating the feeding mechanism, and being provided with the pivoted spring-dogs 6, for operating said circuit-closers, whereby the magnets 44 are kept energized a sufficient length of time to allow the punches to act, but are de-energized in time to allow the feeding mechanism to act, all substantially as described.

4. The combination, with the gang of punches 12 and the auxiliary punch or marker 7, of means for supporting a band of paper within the range of action of said punches and for advancing said band of paper with a variable step-by-step movement, means for operating said punches at each step of said band, and means whereby the operation of any one or more of said punches operates said auxiliary, all substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES E. MUNSON.

Witnesses:
T. H. PALMER,
JAS. A. HOVEY.