D. MURRAY.

PERFORATING APPARATUS.

APPLICATION FILED NOV. 24, 1915.

1,276,794.

Patented Aug. 27, 1918.

3 SHEETS—SHEET 1.

Fig 1.

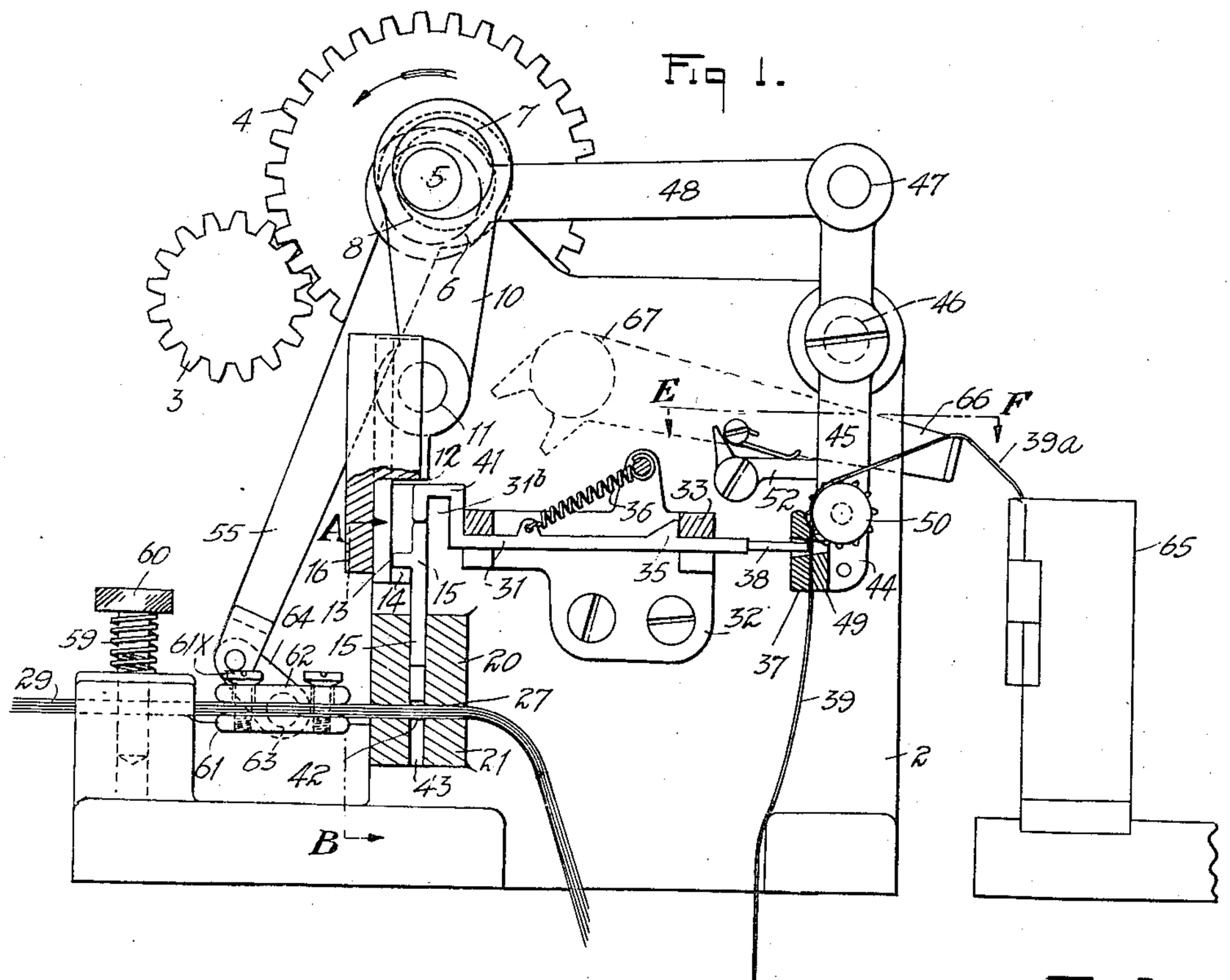


Fig 2.

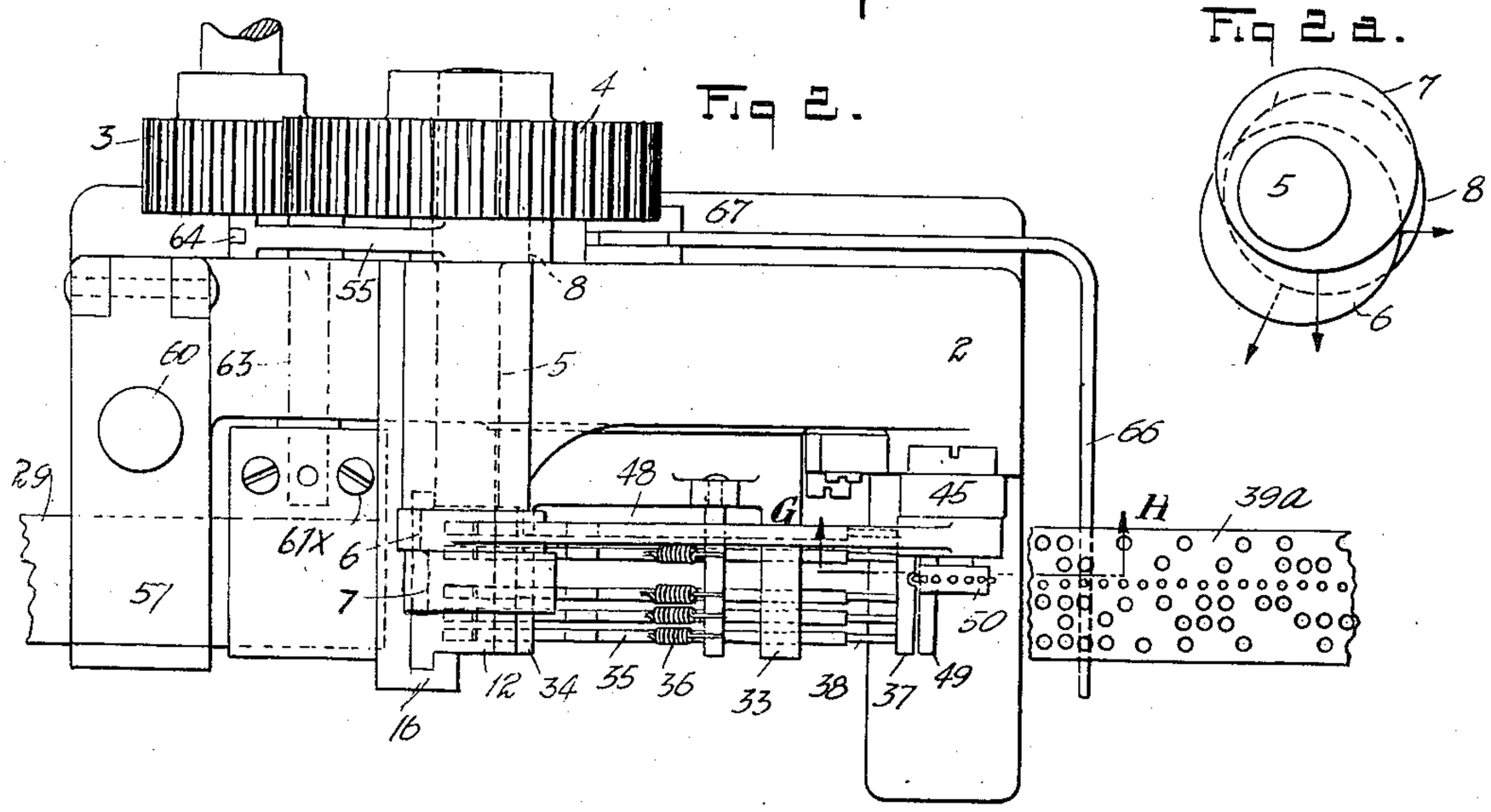


Fig 2a.




Witnesses:

J. F. Massey

Paul A. Franke

Inventor

Donald Murray

By his Attorney

H. M. Marble

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3 SHEETS—SHEET 2.

Fig 5.

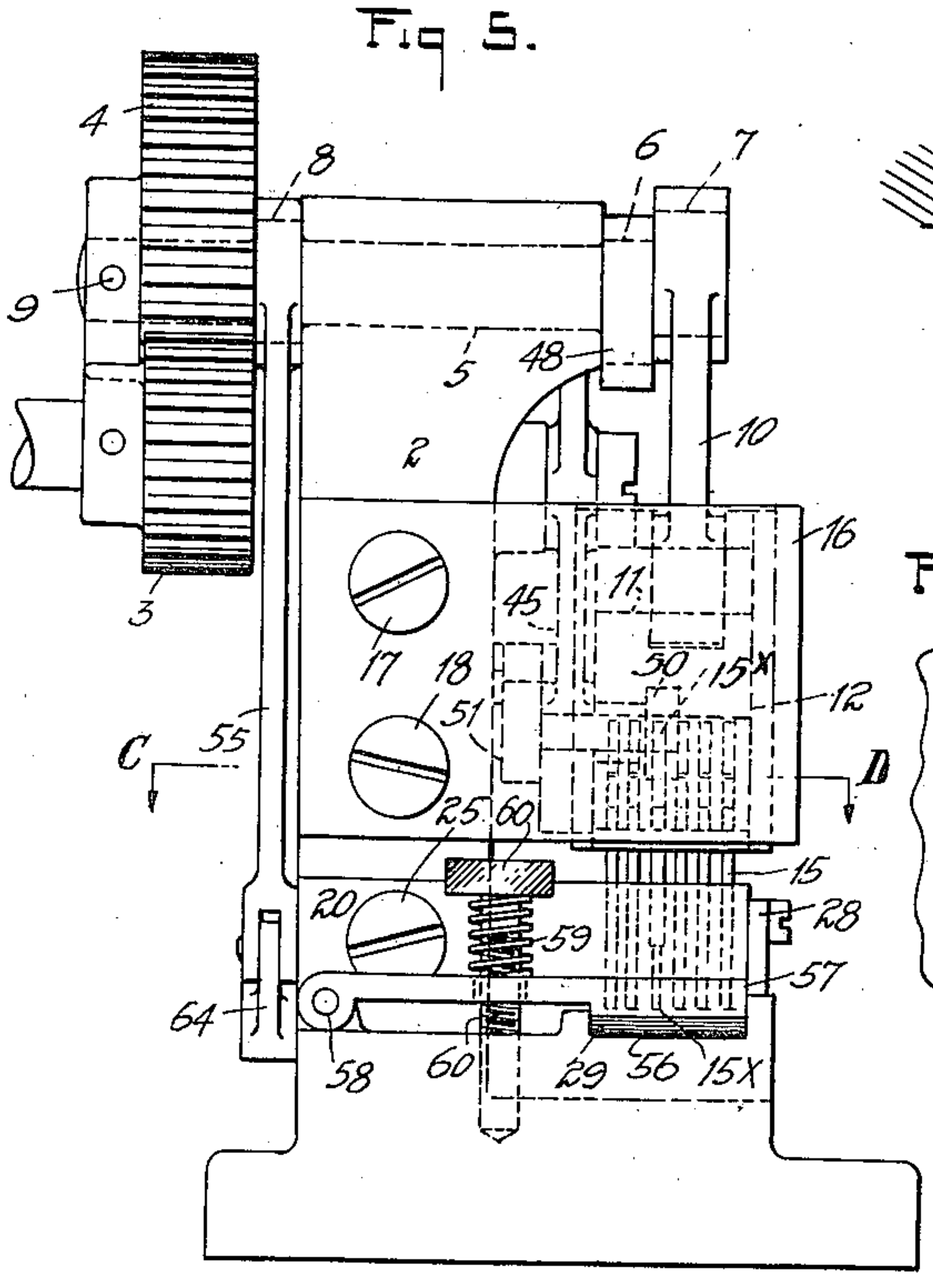



Fig 3.

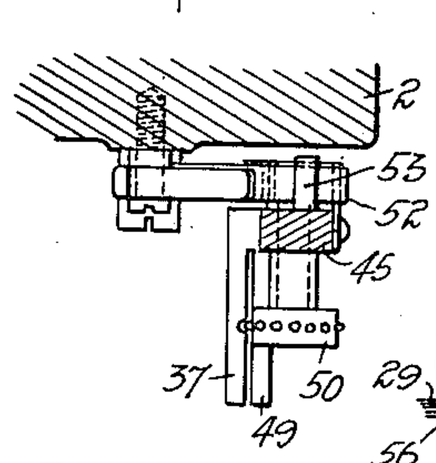



Fig 9

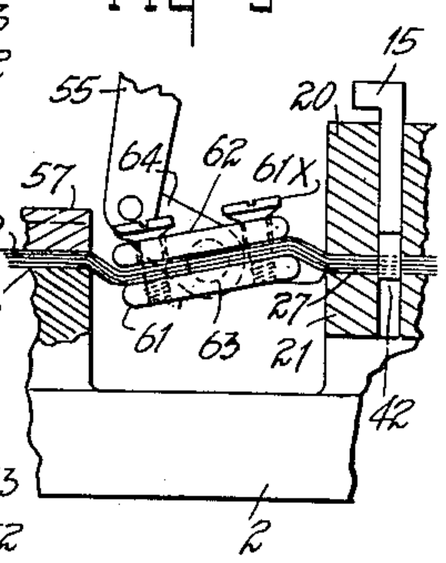



Fig 4.

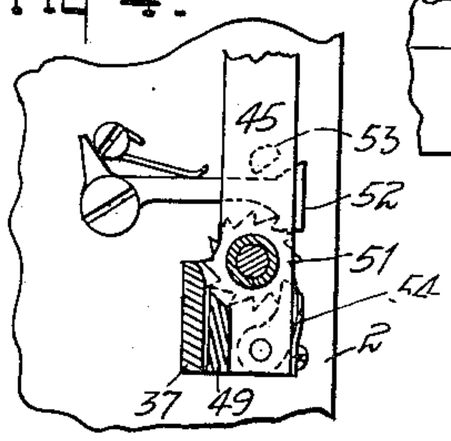



Fig 6.

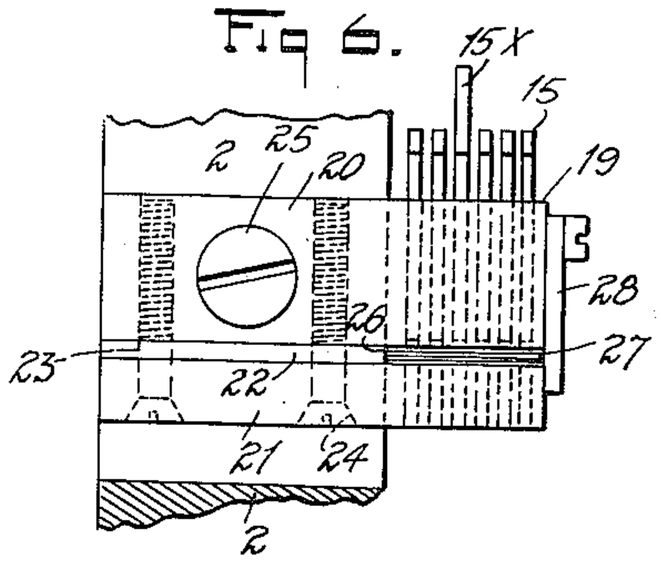



Fig 8.

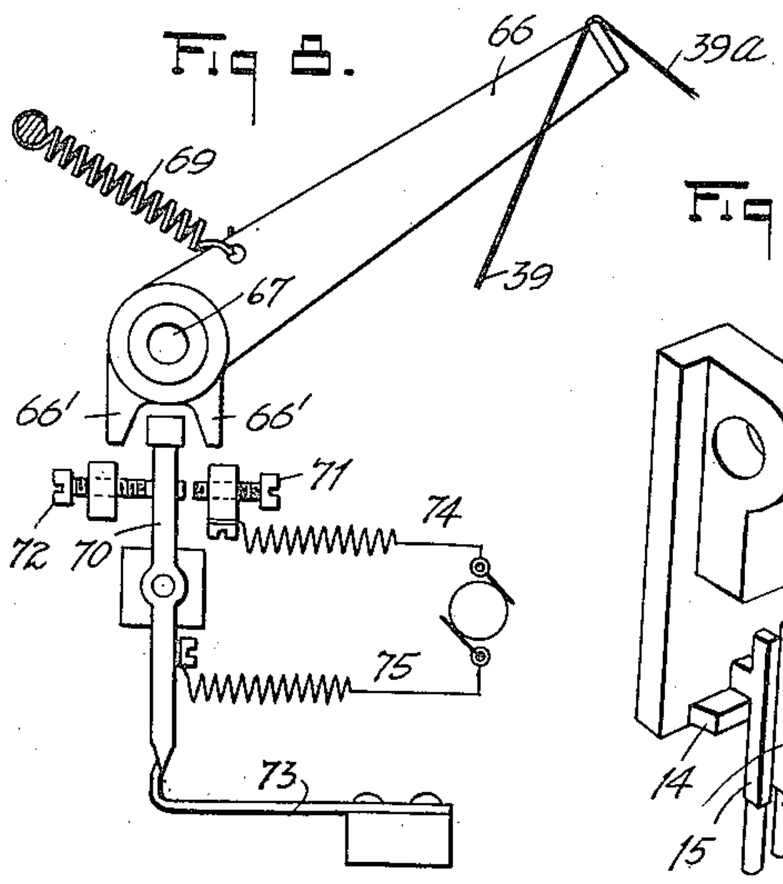



Fig 5a.

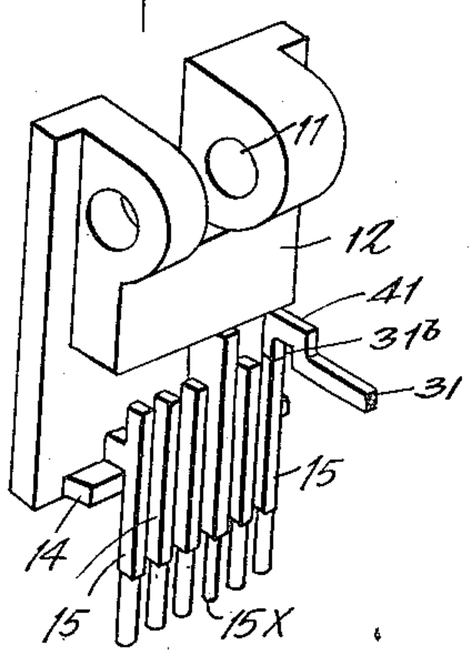
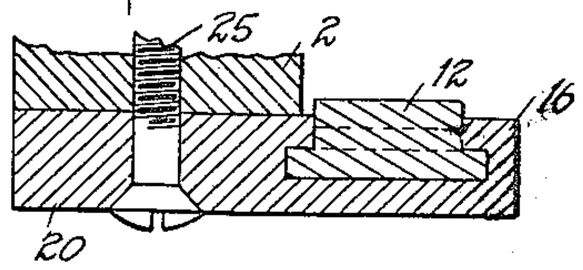



Fig 7.

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Paul L. Franke

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Donald Murray

By his Attorney

H. M. Marble

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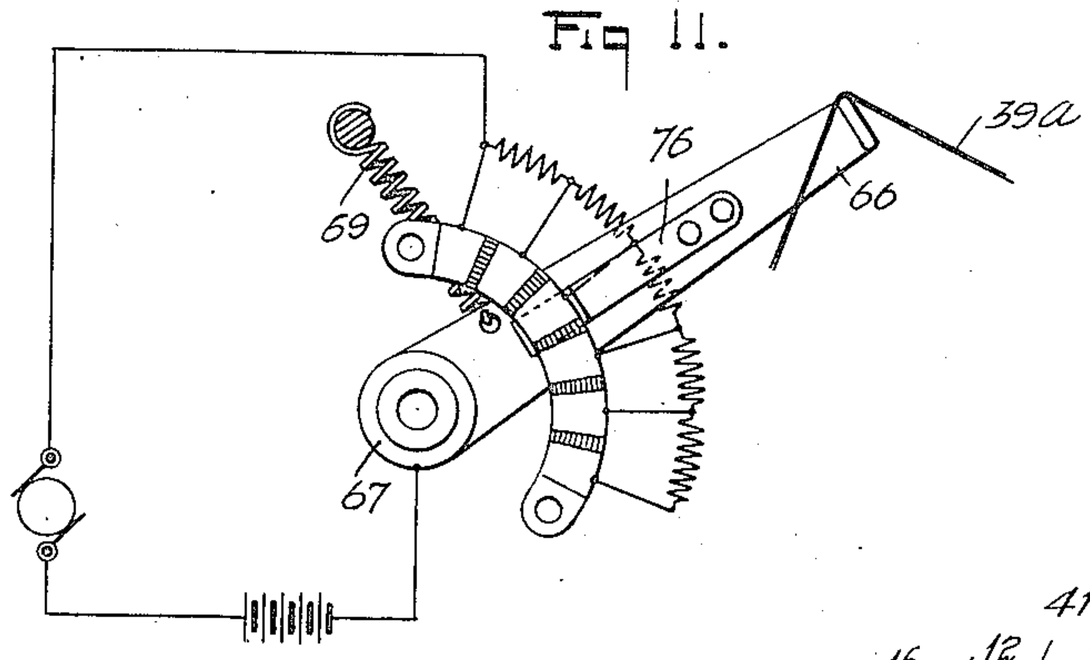
3 SHEETS—SHEET 3.

Fig 11.



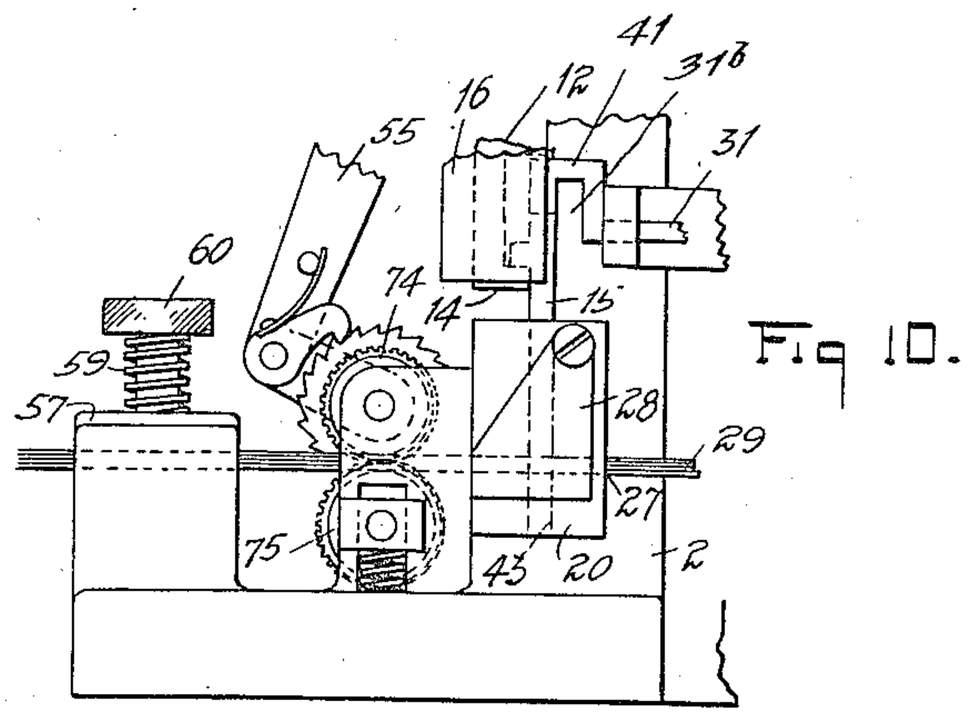




Fig 10.

Witnesses

F. J. Massey

H. M. Marble

Inventor

Donald Murray

By his Attorney

H. M. Marble

# UNITED STATES PATENT OFFICE.

DONALD MURRAY, OF LONDON, ENGLAND, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## PERFORATING APPARATUS.

1,276,794. Specification of Letters Patent. Patented Aug. 27, 1918.

Application filed November 24, 1915. Serial No. 63,149.

*To all whom it may concern:*

Be it known that I, DONALD MURRAY, a British subject, and a resident of London, in the county of London, England, have invented certain new and useful Improvements in Perforating Apparatus, of which the following is a specification.

This invention relates to perforating apparatus designed to produce rapidly and by simple mechanism a number of duplicate perforated tapes from an original or master tape.

Perforated tapes of various kinds, chiefly paper tapes, but sometimes metal tapes, are used to a considerable extent in various arts and industries, for example, in the telegraph art, in the type setting art, and in the musical instrument art; and it is often desirable to be able to produce rapidly a number of duplicate tapes from one original or master tape. For example, in telegraph service, perforated paper tapes are largely employed for the transmission of press messages, and it is often desired to produce at one time a number of duplicate message tapes in order that news items may be sent simultaneously over a number of telegraph circuits. So far as I am aware, however, no simple and rapid mechanism has been devised heretofore for producing a number of duplicate message tapes simultaneously from one master tape. The main object of the present invention is to provide a machine, particularly adapted for producing simultaneously a large number of duplicate telegraph message tapes from one original or master tape. Other objects are to make the machine simple, compact, accurate, and of such construction that but little power shall be required for its operation. My invention consists in the novel construction of the machine whereby the above objects are accomplished. In particular, it comprises punch mechanism comprising a plurality of punches, power-operated means for operating the same, and interponent members controlled by the master tape and adapted each to be interposed between a corresponding punch and corresponding power-operated means, whereby only those punches are operated at any one stroke of the power-operated means, the corresponding interponent members of which have not been operated. My invention further comprises novel paper feed mechanism particularly adapted for feeding a number of paper tapes simultaneously through the punch mechanism; also other features as hereinafter described and particularly pointed out in the appended claims.

While in the particular machine herein illustrated and described the power-operated means for operating the punches is purely mechanical in its nature, it is to be understood that electrical and pneumatic power-operated means may also be employed, and the term "power-operated means" as used herein is used inclusive of pneumatic and electric operated means, as well as mechanically operated means.

I will now proceed to describe my invention with reference to the accompanying drawings, in which one of the many possible embodiments of my invention is illustrated, and will then point out the novel features in claims.

In said drawings:

Figure 1 shows a front elevation and partial vertical section of the machine.

Fig. 2 shows a top view of the machine.

Fig. 2ª shows a detail side elevation of the three eccentrics employed in the machine.

Fig. 3 is a detail horizontal section on the line E—F of Fig. 1.

Fig. 4 is a detail vertical section along the line G—H of Fig. 2.

Fig. 5 shows a side elevation of the machine looking from the left of Fig. 1.

Fig. 5ª is a detail perspective elevation showing the punches and the reciprocating punch-operating driver.

Fig. 6 is a detail elevation, looking from the right of Fig. 1, showing the punch block and punches.

Fig. 7 is a detail horizontal section taken on the line C—D of Fig. 5 and shows in section the reciprocating driver for the punches, and the guides for this driver.

Fig. 8 is a diagrammatic elevation of means for automatically stopping and starting the duplicator in accordance with varying length of the loop of master tape intervening between the primary perforator for the master tape, and the duplicator.

Fig. 9 is a fragmentary side elevation and partial section of the machine, illustrating feed mechanism for the group of tapes to be perforated.

Fig. 10 is a fragmentary side elevation of

the machine, illustrating alternative mechanism for feeding the group of tapes to be perforated.

Fig. 11 is a diagrammatic elevation illustrating alternative means for regulating the operation of the duplicator in accordance with varying length of the loop of master tape intervening between the primary perforator, and duplicator.

Referring first to Figs. 1, 2 and 5: 2 designates the frame of the machine, 3 a power pinion, driven by any suitable means, such for example as an electric motor, and engaging the gear wheel 4, secured in any suitable manner to the main driving shaft 5 of the machine. Upon this main driving shaft are three eccentrics, 6, 7 and 8, the eccentric 8 being a collar projecting from the gear wheel 4; this construction being adopted to facilitate removing the shaft 5, which can be done by knocking out the pin 9 (Fig. 5). These three eccentrics communicate motion necessary for the various operations of the machine. Eccentric 7 operates a connecting bar 10 (Fig. 1) which bar 10 is connected by wrist pin 11 to a reciprocating plunger or driver 12 for operating the punches hereinafter mentioned. The lower end of this plunger is slotted horizontally at the point designated by numeral 13 (Figs. 1 and 5[a]) thus forming a shoulder to engage the heads of the punches; and lower down the reciprocating driver 12 is provided with a ledge 14 adapted to engage the undersides of the punches and elevate the same. 15 designates the various punches. The plunger or driver 12 is mounted to reciprocate in a guide block 16, secured to the frame of the machine by means of screws 17 and 18 (Fig. 5). The punches 15 move up and down in a punch block 19. This punch block consists of an upper punch block 20 and lower die plate 21 separated by a distance piece 22 extending from the inside face of the punch block to the point designated by numeral 26 in Fig. 6. The guide block 20 and die plate 21 are fastened together by the two screws 23, 24 (Fig. 5) and the punch block is fixed in a horizontal slot in the frame 2 of the machine by a screw 25 (Fig. 5). The group of tapes to be perforated passes through an opening 27 (Fig. 6) between blocks 20 and 21, the outside confining plate 28 keeping them in place. This plate may be swung aside to permit the insertion or removal of the tapes.

The particular punch block illustrated is provided with punches of such number and arrangement as adapts the machine for use for perforating tapes for automatic printing telegraph systems employing a code wherein each character comprises five current impulses (but obviously the number of punches and the code with which the machine is to be used are immaterial). In other words, the machine comprises six punches, 15, of which five are employed for punching message holes in the tape, and the sixth punch (15[×], Fig. 6) is designed to form feed holes in the tape, the lower cutting end of this punch 15[×] being smaller than the cutting ends of the other punches. As the feed holes have to be punched for every character, this punch 15[×] is made longer than the other punches so that it will always be operated by the driver 12. The other five punches are shorter than the punch 15[×] so that the driver cannot force them through the group of tapes unless the heads 41 of the corresponding interponent members 31 are interposed in the space over the heads of the corresponding punches; that is to say, if the notches 31[b] of those interponent members are over the heads of the corresponding punches, such punches will not be actuated upon descent of the driver. These interponent members 31 are of such thickness that, when the interponent head 41 of any one such interponent member is interposed between the head of its corresponding punch and the shoulder of the descending driver 12, that punch (normally held with its lower cutting end just clear of the tapes) is forced through such tapes by the descent of the plunger 12.

The five interponent members 31 are carried by a guide block 32 (Fig. 1) having two horizontal bars 33 and 34 which are slotted to serve as guideways for the interponent members 31, and also to permit depression of the outer or left hand ends of such interponent members 31, diagonally arranged springs 36 tending normally both to hold such interponent members 31 elevated, and to hold them as far to the right of Fig. 1 as they will go; a stop 35 on each such interponent member normally engaging the bar 33 and so determining the position of the corresponding interponent member. Beyond such bar 33 the several interponent members have the form of round pins 38, adapted to play through corresponding orifices in a guide plate 37 and thence to engage and enter message perforations formed in the master tape 39, which master tape passes through a space between the plate 37 and another plate 49. The perforations in guide plate 37 are somewhat larger than the feeler portions 38 of the interponents 31, in order to allow for the tilting motion of these interponents, including their feeler portions.

The construction is such, it will be seen, that the left hand or interponent ends 41 of the interponent members 31, may be depressed a considerable distance, say one-eighth of an inch or more, by the driver 12, depressing their corresponding punches 15 correspondingly, and nevertheless upon the rise of the driver 12 these interponent members 31 will rise, returning to the hori-

zontal position shown in Fig. 1. The ends 41 of these interponent members are usually hardened, and are of such a length that in their position of rest they just clear the heads of the punches 15 and the shoulder of the plunger 12. If any of the interponent members 31 are pushed to the left of Fig. 1, the ends 41 of such interponent members will enter the recess 13 back of heads of the corresponding punches, the notches 31[b] of such interponent members 31 will be over the heads of the corresponding punches, and as the plunger descends the so-projecting interponent members will be forced down, but because of their notches 31[b] will not actuate the corresponding punches; but such interponent members 31 as have not been forced to the left will be forced down, in turn forcing the corresponding punches 15 through the bunch of tapes in the punch block at the point 42; the punchings so forced out of the paper tapes dropping out through the holes 43.

The selection of the particular interponent members 31 required for the punching of any particular code character in the bunch of tapes is performed by means of the master tape 39, in the manner described presently. For the feeding of this master tape, a small feed block 44 is provided, attached to the lower end of a vertical lever 45 pivoted at 46, the upper end of this lever 45 being connected, at 47, to an eccentric rod 48 operated by the eccentric 6; hence as the power shaft 5 rotates, the tape feed block 44 will oscillate horizontally to the extent of said two-tenths of an inch. This lever 45 carries a star wheel 50 (Fig. 4), to which star wheel is connected a ratchet wheel 51. A feed pawl 52 attached to the frame of the machine causes feeding of the ratchet wheel 51, tooth by tooth, as the lever 45 oscillates; overfeeding being prevented by the usual locking pin 53, a retaining pawl 54 being also provided. The star wheel engages feed perforations, provided, as usual, in the master tape, and as said star wheel is rotated, step by step, during the oscillation of the lever 45, the master tape is fed downward. The eccentrics 6 and 7, operating respectively the feed mechanism and the plunger or driver 12, are so positioned relatively to each other that the plunger descends immediately after the ends 41 of the selected interponent members 31 have been thrust into the recess 13. It will be understood that each time the lever 45 is moved to the left, a particular portion of the master tape 39 is pressed against the feeler ends 38 of the interponent members 31, and that such feelers 38 as are then opposite, and are caused to enter, perforations of the master tape, are not pushed to the left, while such of the feelers 38 as are then opposite blank portions of the master tape are pressed to the left, the corresponding interponent ends 41 being thereby forced into the recess 13 back of the heads of their corresponding punches, so that those interponent members 31 which have not been pushed to the left actuate their corresponding punches.

In rear of the master tape I provide a die plate 49 with holes corresponding to those holes in the guide plate 37 through which the feelers 38 extend.

Heretofore, in the feeding of tape through perforating machines, it has been common to effect such feeding by means of a star wheel engaging feed perforations of the tape. This means is not particularly convenient for the feeding together of a bunch of tapes comprising a considerable number of tapes lying one above the other. Therefore, for the feeding of the tapes to be perforated, I have devised a new feed mechanism comprising an oscillating clamp composed of two plates 61 and 62 mounted on a spindle 63 connected by a crank arm 64 and eccentric rod 55 to the eccentric 8. A guide channel 56, Figs. 1, 2 and 5, is provided for the bunch of tapes 29, and above these tapes is a friction plate 57 (Fig. 5) pivoted at 58 and pressed down against the tapes by means of the spring 59 adjustable by means of the thumb screw 60. After passing through this friction guide 56 the tapes pass between the two plates 61 and 62 above mentioned. One extreme position of the oscillation of the two plates 61 and 62 is shown in Fig. 1, and the other extreme position is shown in the detail view, Fig. 9. The position of the eccentric 8 is such, relative to the other two eccentrics 6 and 7, that when the punches have entered the tapes 29, the two plates 61 and 62 begin to move from the position shown in Fig. 1 to the position shown in Fig. 9. The tapes being held against backward motion by the punches, fresh tape is drawn through the friction guide 56 to an extent determined by the oscillation of the two plates 61 and 62. Just before the two plates 61—62 reach the position shown in Fig. 9, the punches are withdrawn from the tapes; consequently, as the two plates return to the position shown in Fig. 9, the tapes straighten out, and, as the friction block 57 prevents backward motion of these tapes, and as these tapes are now free for forward motion through the punch blocks, the tapes advance the amount required in order that the next holes punched in them may be properly spaced from the holes just previously punched.

It is of course desirable that the two plates 61 and 62 between which the bunch of tapes is gripped, shall be adjustable to different thicknesses of bunches of tape, and for that purpose I have indicated screws

61ª whereby the two plates may be adjusted different distances as required.

In order to produce a number of duplicate tapes rapidly, and without delay, from a pattern tape while the pattern tape is being produced by a suitable perforator, it is convenient to arrange the duplicator close to the perforator for producing the perforated master tape, and to provide mechanism for controlling the speed of the duplicator so that it does not exceed the average speed of production of the pattern tape. In Fig. 1 I have indicated, at the right of the duplicator, a portion of the perforator for producing the master tape, such perforator being indicated by numeral 65. Such perforator may be of any suitable type; for example, may be the perforator of my application Serial No. 874,609, filed November 30, 1914, now Patent No. 1,170,556 dated February 8, 1916. The master tape, as prepared by the perforator 65, passes out of the punch block of that perforator over the star wheel 50 of the duplicator and thence downward. There may be, therefore, a loop of master tape 39ª between the two instruments, and I provide a duplicator-control device comprising a lever 66 bearing against the portion of the tape 39ª, and tending, as hereinafter described, to preserve a loop of tape between the perforator 65 and the duplicator.

As the duplicator is designed to run at a high speed, say one hundred and twenty or more words a minute if necessary, and as the perforator 65 will rarely be run in practice at an average speed of more than forty five words per minute, the duplicator will soon overtake the perforator and break the pattern tape if a duplicator control device, or safety device, were not provided.

The lever 66 is pivoted at 67 on the back of the frame of the machine. A spring 69 (Fig. 8) tends to pull the lever up, while the loop of the master tape, as it shortens, tends to pull this lever down to the position shown in Fig. 1, against the pull of such spring. This lever 66 may control the duplicator in various ways. In the particular arrangement shown in Fig. 8, the lever 66 is provided with lugs 66′ on opposite sides of one end of a contact lever 70 adapted to play between stop screws 71 and 72, of which 71 is also a contact screw. It will be seen that when lever 66 is well up, it will force lever 70 in contact with contact stop 71, and so will close a circuit 74—75 which circuit may be understood to be the controlling circuit of a motor driving the duplicator. Correspondingly, when the lever 66 falls nearly to the horizontal position, it moves the lever 70 away from contact stop 71, so breaking the motor circuit and stopping the motor.

If the lever 66 opened and closed the circuit of the motor directly, any slight motion upward of such lever would break the motor circuit and any slight motion downward of the lever 66 would close the motor circuit. The consequence would be continual starting and stopping of the motor, with continual sparking at the contacts and consequent early destruction of the contacts. The arrangement shown, involving considerable lost motion between lever 66 and contact lever 70, avoids this; the motor not being started until the lever 66 has risen a considerable distance, the motor then continuing to run until the lever 66 has descended nearly to horizontal position. The distance between the highest and lowest position of the levers 66, may be, in practice, as much as four or five inches; which represents a length of tape equivalent to eighty to one hundred letters perforated between each start and stop. Once the duplicator is started, therefore, it may run a considerable time before it stops, even though the perforator 65 be idle, or be running at low speed.

Conveniently, a jockey spring 73 is provided which tends to hold the contact lever 70 against either the stop 71 or the stop 72; nevertheless this jockey will yield to permit the lever to pass from the one position to the other, under the influence of the lever 66.

The perforator or duplicator herein described, is of course susceptible of many modifications, too numerous to be illustrated and described herein. For example, and as illustrated in Fig. 10, instead of employing the particular feed device for the bunch of tapes illustrated in Figs. 1 and 7, a ratchet feed mechanism comprising two feed rollers 74 and 75, one above the other, and pressed together by springs, may be employed, these rollers 74 and 75 being geared together, and one of them being operated by a ratchet mechanism operated by lever 55 and eccentric 8.

The duplicator control lever 66, instead of actually stopping and starting the motor, may vary the speed of the motor, as illustrated in Fig. 11, by varying the position of a rheostat arm 76, the rheostat being in the circuit of the driving motor.

While it may be true in a strict physical sense that in the construction shown in Figs. 1 and 5ª all of the interponents 31 are at all times between the driver 12 and the punches 15, yet this is only true in a strict physical sense, and not in a functional sense; for owing to the recesses 31ᵇ with which the interponents are provided, those interponents, the recesses 31ᵇ of which are over the heads of the corresponding punches, are not functionally interposed between the driver 12 and their corresponding punches.

What I claim is:

1. A perforated tape duplicating machine comprising master-tape feed mechanism, punch mechanism through which the tape

to be perforated may be fed, said punch mechanism comprising a plurality of punches and a driver therefor, a plurality of interponent members adapted to engage said master tape and also to be moved into and out of interposition between said driver and punches selectively, said master-tape feed mechanism adapted to move said master tape opposite the ends of said interponent members and comprising means for moving the portion of the tape so opposite the ends of the interponent members bodily toward and from said interponent members, whereby interponent members opposite blank portions of such master-tape are moved under selective control of such master tape, and means for returning interponent members so moved upon retreat of the master-tape.

2. A perforated tape duplicating machine comprising punch mechanism through which the tape to be perforated may be fed, said punch mechanism comprising a plurality of punches and a driver therefor, a plurality of interponent members adapted to be moved into and out of interposition between said driver and punches, master-tape feed mechanism comprising means for moving a perforated master-tape past feeler portions of said interponent members, said master-tape feed mechanism comprising means for moving said feed mechanism and the portion of the master tape in proximity to said interponent members bodily toward and from said interponent members, whereby interponent members opposite blank portions of such master-tape are moved under selective control of said master-tape.

3. A perforated tape duplicating machine comprising punch mechanism through which the tape to be perforated may be fed, said punch mechanism comprising a plurality of punches and a reciprocating driver therefor, a plurality of interponent members adapted to be moved into and out of interposition between said driver and punches, said interponent members comprising feeler portions, a pivoted master-tape carrier, a driving shaft and means operated thereby adapted to operate said driver and also to oscillate said master-tape carrier, and thereby to move the master-tape periodically toward and from the feeler portions of the interponent members, and feed mechanism for the master tape.

4. A perforated tape duplicating machine comprising punch mechanism through which the tape to be perforated may be fed, said punch mechanism comprising a plurality of punches and a reciprocating driver therefor, a plurality of interponent members adapted to be moved into and out of position between said driver and punches, said interponent members comprising feeler portions, a pivoted master-tape carrier, a driving shaft, eccentrics on said driving shaft and means operated thereby adapted to operate said driver and also to oscillate said master tape carrier, and thereby to move the master tape periodically toward and from the feeler portions of the interponent members, and feed mechanism for the master tape.

5. A perforated tape duplicating machine comprising punch mechanism through which the tape to be perforated may be fed, said punch mechanism comprising a plurality of punches and a reciprocating driver therefor, a plurality of interponent members adapted to be moved into and out of position between said driver and punches, said interponent members comprising feeler portions a pivoted master-tape carrier, a driving shaft, eccentrics on said driving shaft and means operated thereby adapted to operate said driver and also to oscillate said master tape carrier, and thereby to move the master tape periodically toward and from the feeler portions of the interponent members, and feed mechanism for the master tape operated by the oscillation of said master-tape carrier.

6. A perforated tape duplicating machine comprising feed mechanism for tape to be perforated, a master tape feed mechanism, punch mechanism through which the tape to be perforated is fed, and means controlled by the master-tape controlling the punch mechanism and arranged to cause said punch mechanism to punch in the tape to be perforated, perforations corresponding to perforations of the master-tape, the feed mechanism for the tape to be perforated comprising clamping plates adapted to grip such tape and mounted for oscillation, means for oscillating such plates arranged to oscillate the same at a time when the tape to be perforated is held by the punch mechanism, and means for retarding the passage of tape in rear of such clamping plates, whereby tape drawn forward by oscillation of such clamping plates is prevented from moving backward during return oscillation of such clamping plates.

7. A master tape perforator, in combination with a tape duplicating machine located adjacent such master tape perforator, and adapted to receive master tape direct from such master tape perforator, such duplicator comprising controlling means itself comprising an operating member normally engaging the portion of the master tape intermediate the master tape perforator and said duplicator, and tending to preserve a loop of master tape of considerable length between said perforator and duplicator but arranged, when such loop shortens to a predetermined extent, to affect the rate of operation of the duplicator.

8. A perforated tape duplicating machine comprising power operated means for perforating tape, such perforating means com-

prising punches and interponent members adapted for selective control and adapted to determine particular punches of such punch mechanism to be operated, and means for pressing perforated master tape against said interponent members and thereby operating such interponent members.

9. A perforated tape duplicating machine comprising power operated means for perforating tape, such perforating means comprising punches and direct acting interponent members adapted for selective control and adapted to determine particular punches of such punch mechanism to be operated, and a movable master tape carrier arranged to press perforated master tape periodically against said interponent members and thereby to cause selective operation of such interponent members and consequent selective determination of particular punches to be operated.

10. A perforated tape duplicating machine comprising power operated means for perforating tape, such perforating means comprising punches and direct acting interponent members adapted for selective control and adapted to determine particular punches of such punch mechanism to be operated, and a movable master tape carrier arranged to press perforated master tape periodically against said interponent members and thereby to cause selective operation of such interponent members and consequent selective determination of particular punches to be operated, and feeding means for such master tape carried by said master tape carrier.

11. A perforated tape duplicating machine comprising perforating means itself comprising a power operated driver, a plurality of punches, and interponent members adapted to be interposed functionally between such driver and punches or to be withdrawn from such interposing position, such interponent members adapted for selective control and means for pressing perforated master tape against said interponent members and thereby moving such interponent members as are opposite blank portions of the master tape, and leaving stationary such interponent members as are opposite perforations of the master tape.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DONALD MURRAY.

Witnesses:
A. CARISH,
SEVERIN GREPNEBERG.