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PERFORATING MACHINE.

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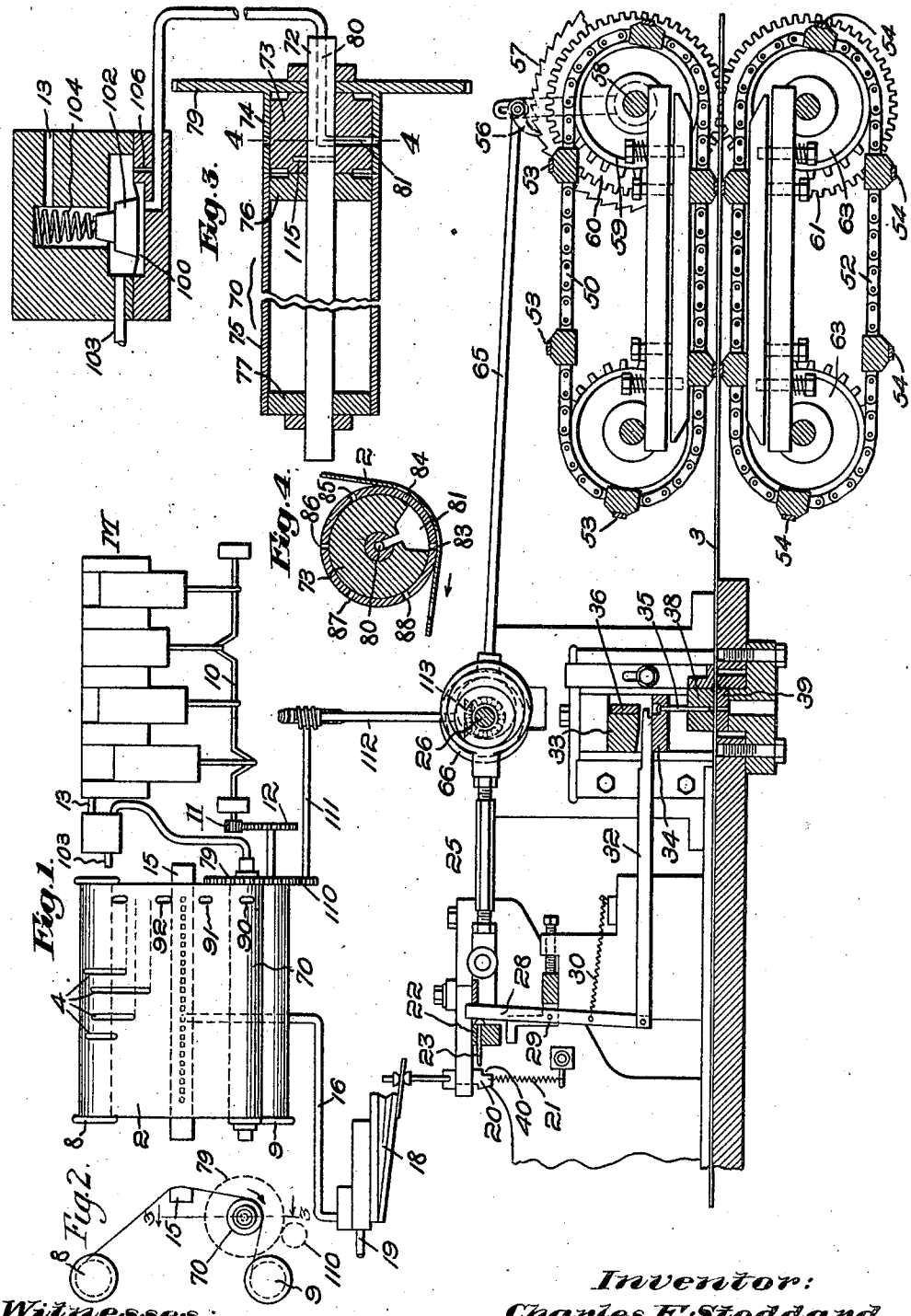


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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PERFORATING-MACHINE.

1,323,614. Specification of Letters Patent. Patented Dec. 2, 1919.

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To all whom it may concern:

Be it known that I, CHARLES F. STODDARD, a citizen of the United States, and residing in New York, N. Y., have invented an Improvement in Perforating-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to machines for making perforated note sheets for mechanical musical instruments; and pertains more particularly to mechanism for determining the proper correlation between the selective portions of a pattern and the perforating portions of a punching mechanism or the like.

Among other objects, the invention is intended to provide in one embodiment thereof a simple feed controlling mechanism which shall operate practically infallibly to determine proper relationship between the pattern feed and the feed of the note sheet material to be perforated.

The character of the invention may be readily understood by reference to the accompanying drawing in which,

Figure 1 shows diagrammatically one practicable embodiment of the invention which has been selected for illustration;

Fig. 2 is a side elevation of the pattern sheet controlling mechanism;

Fig. 3 is a section on an enlarged scale upon a line 3—3 of Fig. 2 and including a section of a valve mechanism shown in Fig. 1 and more fully described hereinafter; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

Referring to the drawings, the pattern or stencil sheet 2 is shown at the upper left hand corner of the sheet, and the note sheet material to be punched is shown at 3 at the lower right hand corner of the sheet.

The specific apparatus is intended to cause the pattern sheet 2 and the note sheet material 3 to be fed in proper relationship. To illustrate one form of pattern sheet suitable to be used, the sheet 2 is shown as provided with perforations 4 corresponding to perforations intended to be punched in the note sheet material 3. The note sheet material 3 may consist of a stack of superposed sheets which may be punched simultaneously.

The pattern sheet 2 is mounted upon a spool 8 and is wound upon a take-up roll 9 driven by any suitable form of motor as, for instance, a pneumatic motor M shown diagrammatically. The motor M drives the crank shaft 10 having a pinion 11, which meshes with the gear 12 upon the shaft of the take-up roll 9. As illustrated, the motor M is a pneumatic supplied with suction through the duct 13, and this supply of suction is controlled as hereinafter described to regulate the operation of the motor.

The pattern sheet 2 illustrates a prime controller of a punch selecting mechanism which may be of any practicable type. For purposes of explanation, one practicable form of punch selecting mechanism is shown in the drawing as comprising a tracker bar 15 provided with vents to be opened by the perforations 4 of the pattern sheet 2. Each vent is connected by a duct 16 with the controlling valves of a power pneumatic 18. A chest for the several pneumatics 18 is connected by duct 19 with a source of exhaust. As will be understood by those skilled in the art, when a vent of the tracker 15 is opened by a perforation 4, suction from the duct 19 is admitted to a power pneumatic 18, causing the latter to collapse. When thus collapsed, the pneumatic 18 lifts a selector slide 20 in the perforating machine; and when the tracker vent is again closed permitting the power pneumatic 18 to expand again, the slide 20 is drawn downwardly to the position shown in the drawing by a spring 21.

It will be understood that there is a series of the selector slides 20 corresponding each to a punch for punching a note perforation in the note sheet material. One complete set of selecting and punching devices is shown diagrammatically in the drawing; and it will be understood that these parts are reduplicated as many times as may be necessary to provide for punching the desired number of rolls of perforations.

The selecting mechanism comprises a horizontally reciprocating cross head 22 carrying selector pins 23 which are so mounted as to slide lengthwise readily in the cross head 22. This cross head 22 is connected by a link 25 with an eccentric upon the shaft 26, which is rotated continuously during the operation of the machine, thereby moving the cross head 22 and its gang of selector pins 23 toward and from the selector slides 20. A lever 28 fulcrumed at 29 bears at its upper end against the head of the selector

pin 23 and is held in engagement with the selector pin head by a spring 30, which tends always to rock the lever 28 in a contra-clockwise direction. The lower end of the lever 28 is pivotally connected to a selector bar 32, the right hand end of which in the drawing rests in a slideway in a vertically reciprocating cross head comprising the two connected parts 33, 34. The part 34 carries the punches 35, and the part 33 includes the punch-driving bar 36.

The cross head 33, 34 is reciprocated vertically in appropriate guideways by an eccentric upon the shaft 26, which is unnecessary to be shown. This suffices to show that for each complete revolution of the shaft 26 the cross head 33, 34 is moved downwardly and then upwardly through one complete reciprocation. The punches 35 are carried sufficiently loosely in the cross head piece 34 to permit them to drop against the note sheet material 3 without punching the same except when a selector bar 32 has been moved far enough toward the right in the drawing to be interposed between the driving bar 36 and a punch head.

The punches 35 are arranged to slide vertically in a stripper bar 38, which overlies the note sheet material 3, supported at the punching point upon a die 39.

With the described arrangement, when the cross head 22 is moved toward the left in the drawing, the lever 28 is permitted to rock slightly contra-clockwise, and thereby to move the selector bar 32 toward the right. If the selector slide 20 remains in the position shown, the movement of the selector pin 23 is arrested in such a position that the selector bar 32 is not permitted to move far enough to be interposed in driving position between the punch 35 and the driver bar 36; but if the selector slide 20 has been lifted (by opening of the correspondidng tracker vent)' the cut out portion 40 of the selector slide is thereby positioned opposite the selector pin 23, permitting a sufficient movement of the pin, the lever 28 and selector bar 32 to move the latter into driving position and cause its corresponding punch to be driven through the note sheet material 3. As will be understood by those skilled in the art, the horizontal reciprocation of the selector cross head 22 and the vertical reciprocation of the punch cross head 33, 34, are relatively so timed that the cross head 22 is moved toward the left to position the various selector bars 32 appropriately to the perforations to be punched, preparatory to the descent of the cross head 33, 34, to drive the selected punches through the note sheet material.

It is to be understood that the punch selecting and punching mechanism just described is merely illustrative, and any suitable equivalent or substitute may be employed.

The note sheet material 3 may be fed through the punching mechanism in any practicable manner, as, for example, by some such feeding mechanism as that described in United States patent to Davis No. 659,053, dated October 2, 1900, one form of which feeding mechanism is shown diagrammatically in the present drawings. As there shown, the note sheet feed mechanism is viewed in section on a vertical plane substantially bisecting the feed mechanism in the direction of feed, which is toward the right in the drawing. This feed mechanism comprises an upper apron 50 and a lower apron 52, each apron consisting of a pair of parallel sprocket chains (only one of which is shown) connected by slats or cross bars 53 on the upper apron and 54 on the lower apron. The cross bars 53 and 54 on the respective aprons are so disposed that a cross bar 53 registers with a cross bar 54 on opposite sides of the note sheet material 3 on the adjacent runs of the two aprons, so as to grip the note sheet material 3 between the cross bars with sufficient pressure to cause the note sheet material to accompany the aprons during their movement. As this feed mechanism is shown, the aprons are driven intermittently by a pawl 56 engaging a ratchet 57 upon a shaft 58 of one of the sprocket wheels 59 for the upper apron. Also fixed upon the shaft 58 is a gear 60 meshing with the gear 61 upon the shaft 62 for a sprocket wheel 63 of the lower apron. The pawl 56 drives this ratchet 57 in a contra-clockwise direction and thereby through the gears 60 and 61, drives the two aprons in the directions indicated by the arrows in the drawings.

The pawl 56 is reciprocated by a pitman 65 connected to an eccentric 66 upon the shaft 26. The eccentric 66 is so disposed upon the shaft 26 that the aprons 50 and 52 remain at rest during the downward movement of the cross head 33, 34 to drive the punches; and when the cross head 33, 34 is moved upwardly, the eccentric 66 causes the aprons to be driven through one feed step so as to present a new part of the note sheet material 3 in position to be punched.

The description thus far has pertained to the mechanism for selecting the punches and operating them to punch the note sheet material, and the feed mechanism for moving the note sheet material through the punching mechanism. The manner in which the prime selecting device illustrated by the pattern sheet 2 is caused to be fed in proper relationship to the feed of the note sheet material will be next described.

In the illustrative embodiment of the invention, note sheet material 3 is fed intermittently at a uniform speed, one feed step

for each complete revolution of the shaft 26. In this specific embodiment, therefore, the note sheet feed may be regarded as a constant, and the feed of the pattern sheet 2 as a variable which is regulated by the apparatus next described so as to insure the proper relative positioning of the note sheet material and pattern sheet for the succession of punching operations.

As shown in Fig. 2 the pattern sheet 2 passes over a drum 70 which drum is shown in longitudinal section in Fig. 3, and transverse section in Fig. 4. As shown in Fig. 3, the drum 70 has a stationary axle 72, to which a stationary core 73 is fastened by a pin 115. The core 73 is cylindrical and encircled by the rotating sleeve 74. The core 73 provides a snugly fitting bearing for the sleeve 74. An idle roller, comprising the sleeve 75 and ends 76, 77 is mounted to rotate freely on the stationary axle 72.

The sleeve 74 has secured to it a gear 79 which is positively driven (as presently described).

The stationary axle 72 has an axial duct 80 which communicates with a radially extending chamber 81 (see also Fig. 4) which chamber presents at the periphery of the core 73 a mouth extending through substantially 60° of the circumference of the core 73. The sleeve 74 is provided with a series of ports 83, 84, 85, 86, 87, and 88, which are arranged to communicate in succession with the chamber 81 as the sleeve 74 is rotated.

In the margin of the pattern sheet 2 is provided a row of perforations 90, 91, and 92 spaced uniformly, and so located upon the note sheet as to register with the ports 83, 84, 85, etc., in the driven sleeve 74 as illustrated in Fig. 4.

With the described arrangement, the mouth of the chamber 81 remains closed at all times except when a marginal perforation in the pattern sheet 2 coincides more or less with one of the ports 83, 84, etc., of the sleeve 74. For example, the space between the port 83 and the next port 84 is such that the mouth of the chamber 81 will never be opened to an extent greater than the cross section of one of the ports 83 or 84. And if the ports 83 and 84 be both closed by unperforated parts of the pattern sheet then the mouth of the chamber 81 is effectually sealed.

When, however, the perforation in the pattern sheet coincides more or less with a port 83 or 84, then atmosphere is admitted in greater or less degree to the chamber 81 and thence through the duct 80 in the axle 72 and to a diaphragm chamber 100, the diaphragm of which carries a throttle valve 102 interposed between a duct 103 leading to a source of exhaust, and the duct 13 through which the motor M is exhausted for operating. The spring 104 may be provided to oppose the action of the diaphragm over the chamber 100, and to assist in the operation of the valve 102.

As will appear to those skilled in the art, when a marginal perforation of the pattern sheet coincides more or less with one of the ports 83, 84, etc., of the sleeve 74, atmosphere admitted thereby to the chamber 81 and duct 80, serves to lift the valve 102 more or less according as the admission of atmosphere is more or less compensated by the exhaust through a bleed 106. The lifting of the valve 102 tends to restrict communication between the exhaust duct 103 and the motor duct 13 so as to diminish the speed of exhaust from the motor and thereby reduce the speed of the motor. Thus the speed of the motor which drives the pattern sheet is regulated by the coöperation between the marginal perforations 90, 91 and 92 in the pattern sheet with the rotating sleeve 74.

The gear 79 which is fixed upon the sleeve 74 meshes with the gear 110 upon a shaft 111 connected in any suitable manner to be driven by a shaft 112 which, in turn, is driven through the beveled gear 113 from the main shaft 26 of the perforating mechanism.

For the purpose of the specific apparatus, the train of gearing between the shaft 26 and the gear 79 is such that one revolution of the gear 79 and sleeve 74 is accompanied by thirty revolutions of the shaft 26. As already explained, each revolution of the shaft 26 causes one reciprocation of the punches 35; therefore, there are thirty punching operation during one complete revolution of the sleeve 74. There are six of the ports 83, 84, etc., in the sleeve 74 spaced 60° apart; therefore, during the revolution of the sleeve 74 through the distance between one port 83 and the next, five punching operations occur. In other words, during the revolution of sleeve 74 through such distance between one port and the next, the pattern sheet 2 should move through a distance corresponding to five punching operations. It is to be understood that the particular gear ratio between the shaft 26 and the gear 79 and the particular division of the sleeve 74 into sextants by the ports 83, etc., constitute merely one practicable arrangement described for illustration.

The perforations 90, 91, 92, etc., in the pattern sheet 2 are preferably so spaced that the advance end of one perforation is at a distance from the advance end of the next following perforation equal to the distance from the advance edge of one of the ports 83 (as the sleeve 74 rotates) from the advance edge of the next following port 84, so that the perforations 90, 91, etc., in succession will coincide more or less with the respective ports 83, 84, etc.

The operation of the illustrative ap-

paratus hereinbefore described is as follows:

The pattern sheet 2 is inserted in the machine and passed over the drums and secured to the take-up roll 9 as shown in Figs. 1 and 2; and then the perforating mechanism is started and the shaft 26 begins to rotate. The operation will be more readily understood if it is borne in mind that the sleeve 74 is constantly rotated at slow speed through the train of mechanism connecting with the shaft 26; whereas the feeding movement of the pattern sheet 2 is dependent upon the opening of the valve 102 which is controlled by the coöperation of the ports 83, 83, etc., in the sleeve 74 with the pattern sheet perforations 90, 91, etc. For the purposes of the specific apparatus—when the valve 102 is wide open, the pattern motor M operates at comparatively high speed so as to feed the pattern sheet at a greater linear speed than the peripheral speed of the sleeve 74. Thus if, when the machine is started, the pattern sheet has no perforation in position to coincide more or less with one of the ports 83, 84, etc., then atmosphere will be shut off from the chamber 81, and the exhaust through the bleed 106 will hold the valve 102 open in the position shown in Fig. 3. Therefore, there will be free communication between the exhaust supply duct 103 and the motor duct 13, and the motor will be driven at high speed. Some one or other of the ports 83, 84, etc., is always in communication with the chamber 81; and therefore, during the initial rapid feed of the pattern sheet a port then communicating with the chamber 81 will be overtaken by one of the perforations 90, 91, etc., so that atmosphere will be admitted through the perforation and the port which it has overtaken, into the chamber 81, and thence to the diaphragm chamber 100. This will lift the valve 102, restrict the exhaust from the motor chest and reduce the speed of the pattern feed. If the speed of the pattern sheet has caused a perforation therein to open a port in the sleeve 74 to a considerable extent, the speed of the pattern feed may be reduced to less than the peripheral speed of the sleeve 74, in which case the then more rapidly moving sleeve will advance its acting port enough to diminish the opening between that port and the acting perforation of the paper thereby reducing the flow of atmosphere into the diaphragm chamber 100 and tending to balance that flow of atmosphere with the exhaust through the bleed 106. That will permit the valve 102 to open slightly and increase the speed of feed of the pattern sheet. This, in turn, tends to advance the pattern sheet relatively to the sleeve 74 so as to enlarge the opening through the acting perforation and the acting port of the sleeve, thereby increasing the flow of atmosphere to the diaphragm chamber 100, and tending to over-balance the bleed through the duct 106, thereby again closing the valve 102 to decrease the feed speed of the pattern. The result of these various tendencies is that at all times the acting perforation of the pattern sheet will overlap the acting port in the sleeve 74 to an extent sufficient to admit the atmosphere through the chamber 81 into the diaphragm chamber 100 in sufficient volume to substantially balance the exhaust through the bleed 106. Thus the valve 102 is held in a floating condition, so to speak, to maintain a substantial constant speed of the motor M, and the pattern sheet 2. This speed, so maintained, renders the speed of the pattern feed equal to the peripheral speed of the sleeve 74, which is a constant. If the speed of the pattern sheet increases, the atmosphere bleed past the acting perforation and the acting port increases sufficiently to close the valve 102 somewhat, and reduce the feed of the pattern sheet. In fact, the described apparatus maintains a uniform speed of the pattern sheet equal to the peripheral speed of the sleeve 74; and therefore in the specific arrangement described, the pattern sheet is caused to move continuously through successive increments of distance, each increment corresponding to a punching operation. In the specific apparatus, the note sheet material 3 is driven uniformly with the rotation of the shaft 26, and therefore the feed of the note sheet material is effectually correlated in desired manner with the feed of the pattern.

It is to be understood that the invention is not limited to the particular construction, organization and mode of operation hereinbefore described for illustration. On the contrary, the invention may be variously embodied and the particular apparatus may be variously modified within the scope of the sub-joining claims.

Claims:

1. A note sheet perforating machine comprising, in combination, perforating mechanism; selecting mechanism including a pattern; independently driven means including a motor for feeding the pattern; and speed controlling means for said motor having operative connection with the perforating mechanism.

2. A note sheet perforating machine comprising, in combination, perforating mechanism; selecting mechanism including a pattern; independently driven means including a motor for feeding the pattern and speed controlling means for said motor having operative connection with and controlled jointly by the selecting and perforating mechanisms.

3. A note sheet perforating machine com-

prising, in combination, perforating mechanism; selecting mechanism including a pattern; separate driving means for the perforating mechanism and pattern respectively; and means for maintaining the perforating and selecting mechanisms in desired correlation, including means operatively connected to and controlled by the drive of the perforating mechanism for governing the speed of the pattern.

4. A note sheet perforating machine comprising, in combination, perforating mechanism, selecting mechanism including a pattern; means for feeding the pattern; means driven by the perforating mechanism and coöperating with the pattern; and speed governing means for the pattern controlled by coöperation of said pattern with said means driven by the perforating mechanism.

5. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising sheet moving means; a moving drum over which the sheet passes; and pneumatic means for maintaining the sheet in desired relation with said drum.

6. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising sheet moving means; a moving drum over which the sheet moves; coöperating openings in the sheet and said drum; and pneumatic means for maintaining said openings in desired correlation.

7. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising sheet moving means; a moving drum over which the sheet passes; coöperating openings in the sheet and said drum; and speed governing means for the sheet moving means controlled by coöperation between said openings.

8. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising variable-speed sheet moving means; a device driven at a uniform speed, and coöperating means on the sheet and said device for governing the speed of movement of the sheet.

9. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising variable speed sheet moving means; a device driven at uniform speed, a part thereof moving at the speed desired for the sheet; and speed controlling means for the sheet governed by said device.

10. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising variable-speed sheet moving means; a device moving at uniform speed, a part thereof moving at the speed desired for the sheet; and means for causing the sheet to move at a substantially uniform speed predetermined by the speed of said device.

11. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising variable-speed sheet moving means; a device moving at uniform speed; means controlled conjointly by the sheet and said device for maintaining a substantially constant pneumatic bleed; and means governed by said bleed for regulating the speed of the sheet.

12. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising sheet moving means; valve means controlled by the sheet; and speed governing means for the sheet controlled by said valve means.

13. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising a variable speed motor for moving the sheet; means for governing the speed of said motor; and valve means governed by the sheet for operating said speed governing means.

14. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising a pneumatic motor for moving the sheet; a drum over which the sheet is moved; coöperating openings in the sheet and drum; and a throttle valve for said motor controlled by said coöperating openings.

15. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising a motor for moving the sheet; a moving drum over which the sheet moves; and coöperating means on said sheet and drum for controlling the speed of said motor.

16. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising a motor for moving the sheet; means governed by the sheet for producing a variable atmospheric bleed; means for produc-

ing a suction bleed opposed to said atmospheric bleed; and governing means for said motor controlled by coöperation of said bleeds.

17. In a perforating machine the combination with perforating mechanism of speed governing means for a moving sheet adapted to control said perforating mechanism comprising means for moving the sheet; a moving drum over which the sheet passes, and having ports therein to coöperate with perforations in the sheet; and means to govern the movement of the sheet controlled by coöperation between said ports and perforations.

18. A note sheet perforating machine comprising, in combination, a movable selecting means for performing a succession of selecting offices; means for moving the selecting means; perforating mechanism; a member having connection with and moving synchronously with the perforating mechanism and governing means for the means for moving the selecting means, having operative connection with the selecting means and governed thereby, to maintain the selecting means in desired correlation with the said member.

19. A note sheet perforating machine comprising, in combination, a movable selector; selector feeding means; perforating mechanism, comprising a member moving at the speed desired for the selector; and governing means for the selector feeding means having operative connection with the selector and governed thereby for feeding the selector at substantially the same speed as that of said member.

20. A note sheet perforating machine comprising, in combination, a selector, selector feeding means; perforating mechanism comprising a member proximate the selector and moving at a speed substantially equal to the average speed desired for the selector; and governing means for the selector feeding means; having operative connection with the selector and governed thereby to synchronize the movement of the selector and said member.

21. A note sheet perforating machine comprising, in combination, a selector; selector feeding means; perforating mechanism; a member arranged to move synchronously with the perforating mechanism, said member being located proximate the selector and having successively acting points thereon corresponding with successively acting points on the selector; and governing means for the selector feeding means for maintaining corresponding points on the selector and said member in desired correlation.

22. In a perforating machine, the combination with perforating mechanism of controlling means for a moving sheet adapted to govern the operation of said perforating mechanism comprising sheet moving means; a moving member over which the sheet moves, coöperating openings in the sheet and said member; and means for maintaining said openings in desired correlation.

23. In a perforating machine the combination with perforating mechanism of controlling means for a moving sheet adapted to govern the operation of said perforating mechanism comprising sheet moving means; a moving member over which the sheet moves; coöperating openings in the sheet and said member; and means for maintaining said openings in the sheet in partially overlapping relation to the openings in said member.

24. In a perforating machine the combination with perforating mechanism of controlling means for a moving sheet adapted to govern the operation of said perforating mechanism comprising sheet moving means; a member having a movement like the movement intended for the sheet; and governing means for the sheet moving means for causing the sheet to move at substantially the speed of said member.

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

CHARLES F. STODDARD.

Witnesses:
ROBERT H. KAMMLER,
LAURENCE A. JANNEY.