W. G. DOTY.

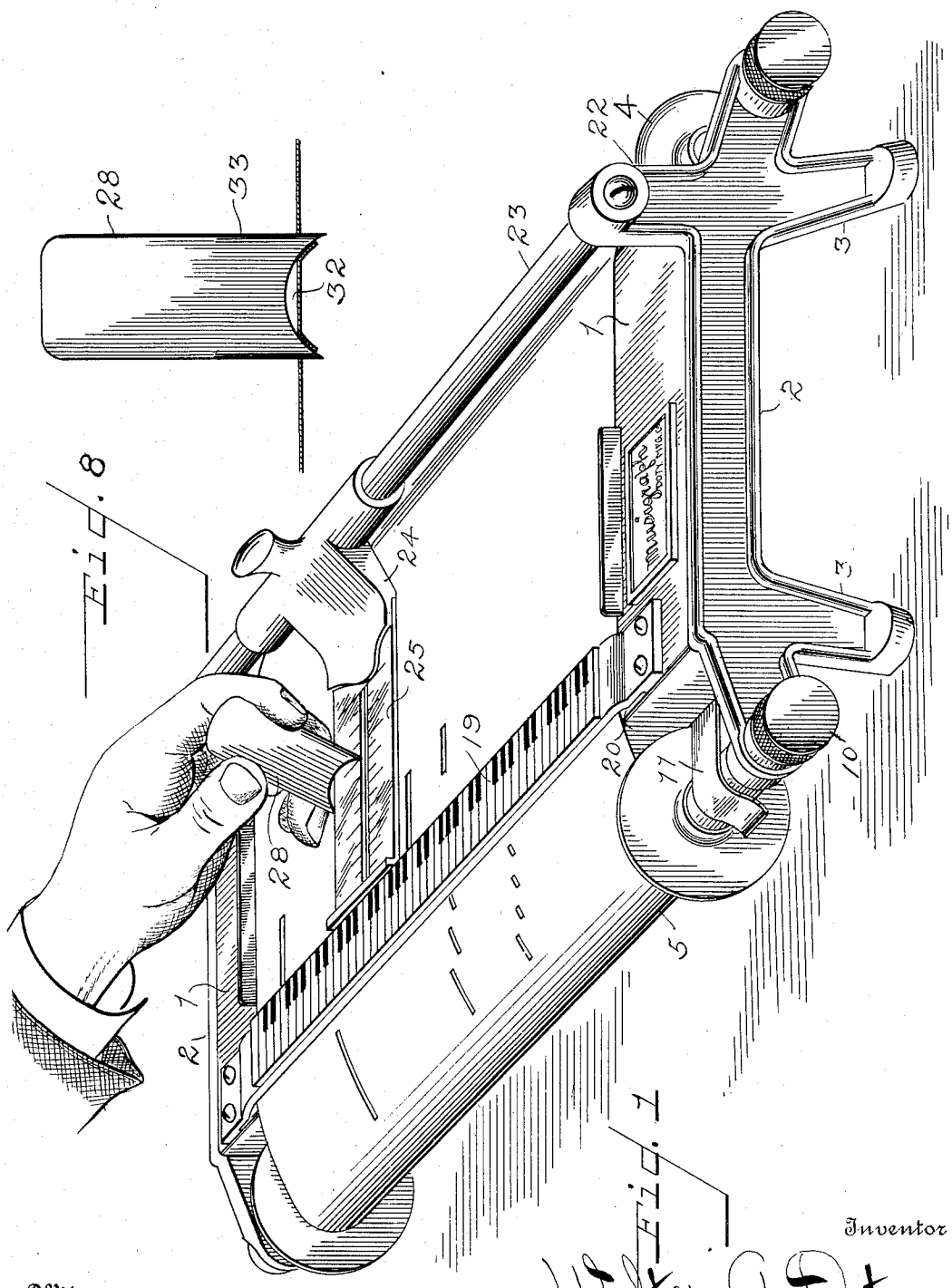
PERFORATED MUSIC SHEET CUTTER.

APPLICATION FILED MAR. 8, 1915.

1,171,932.

Patented Feb. 15, 1916.

3 SHEETS—SHEET 1.



Witnesses
Carrie M. Recker
Helen L. Williamson.

Inventor
Walter G. Doty
By L. C. Walker Attorney

W. G. DOTY.

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3 SHEETS—SHEET 2.

Fig 2

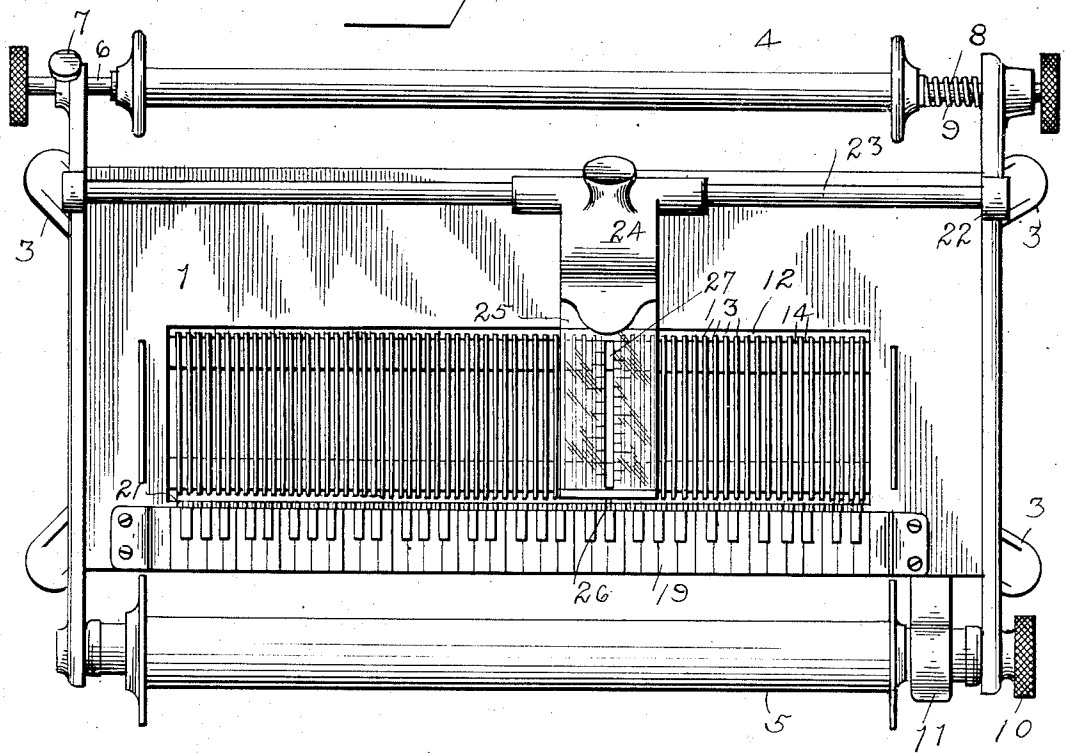


Fig 3

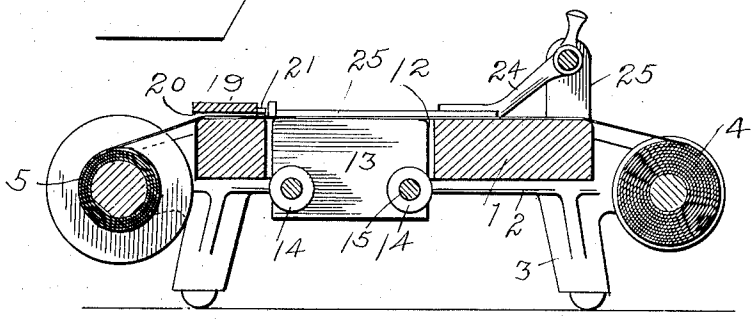


Fig. 7.

Witnesses

Carrie M. Recker

Helen L. Williamson.

Inventor

By W. G. Doty

Attorney

W. G. DOTY.

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3 SHEETS—SHEET 3.

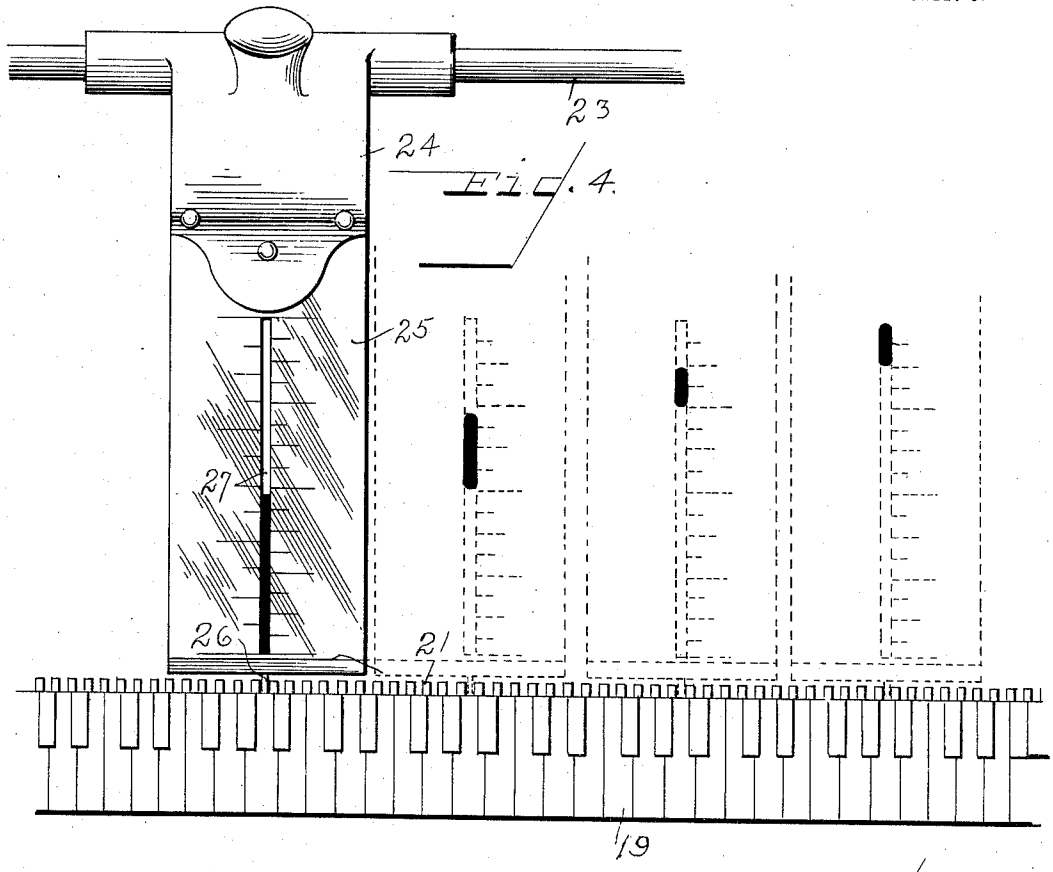


Fig. 4.

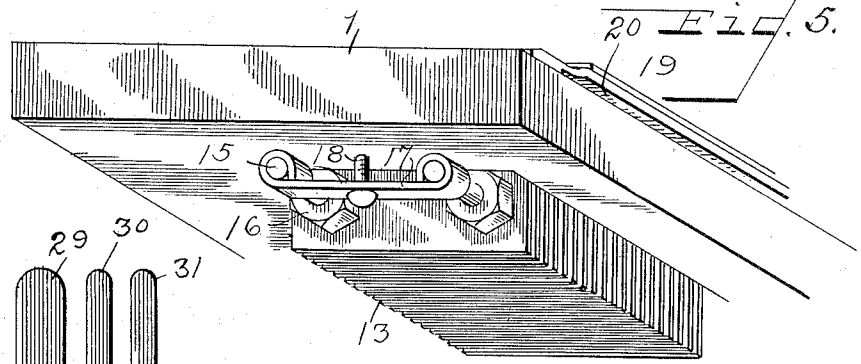


Fig. 5.

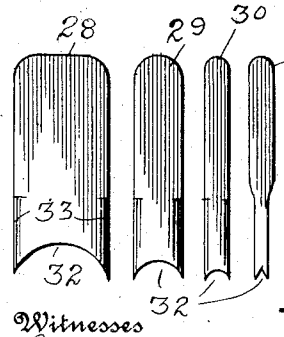


Fig. 6

Witnesses

Carrie M. Recker

Helen L. Williamson

Inventor

Walter G. Doty

By L. L. Walker

Attorney

UNITED STATES PATENT OFFICE.

WALTER G. DOTY, OF DAYTON, OHIO.

PERFORATED-MUSIC-SHEET CUTTER.

1,171,932. Specification of Letters Patent. Patented Feb. 15, 1916.

Application filed March 8, 1915. Serial No. 13,016.

To all whom it may concern:

Be it known that I, WALTER G. DOTY, citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Perforated-Music-Sheet Cutters, of which the following is a specification.

My invention relates to improvements in apparatus for producing perforated music or master sheets for mechanical players, automatic musical instruments for electrically controlled apparatus or for other purposes to which perforated sheets of this character may be applied.

The object of the invention is to simplify the structure as well as the means and mode of operation of the sheet perforating apparatus whereby it will not only be cheapened in construction, but will be more efficient in use, accurate, easily and quickly operated, and unlikely to get out of repair.

A further object of the invention is to provide a hand operated device which may be employed by the individual, in the home or elsewhere, and who is unskilled in the ordinary method of production of such perforated sheets, to produce perforated music sheets representing original musical compositions or to produce record sheets of compositions not ordinarily obtainable from the usual manufacturers or supply houses.

A further object is to provide economical means for producing sheets for controlling electrical apparatus such as flash signs, signals, or educational apparatus.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Figure 1 is a perspective view of the assembled apparatus with a partially completed music sheet or master sheet positioned thereon. Fig. 2 is a plan view of the assembled apparatus with the music sheet removed. Fig. 3 is a transverse sectional view of the assembled device. Fig. 4 is an enlarged detail view of the gaging means by which the perforations are accurately located according to the notes or tones to be produced and their extent or time value and relative location in the measure or bar determined. Fig. 5 is a detail perspective view showing a portion of the cutting die. Fig. 6 is a detail view of a series of cutters or punches employed in conjunction with the die to produce perforations of the desired extent. Figs. 7 and 8 are detail views.

Like parts are indicated by similar characters of reference throughout the several views.

Perforated music or master sheets, such as are commonly used on mechanical players, automatic musical instruments, or for the control of electrical or other apparatus, are commonly supplied to the public by manufacturers whose factories are equipped with expensive machinery usually of the automatic type for producing such perforated sheets. It frequently occurs, however, that an individual desires for his own use a record or perforated sheet of some particular composition which may be either an original composition or some old familiar favorite air which is not ordinarily manufactured and supplied through the usual channel. Such composition may be one for which there is not popular demand. To have such a record or perforated sheet specially made involves considerable expenditure. To provide means by which such individual may conveniently and economically prepare for himself such a record or perforated sheet is one of the primary objects of the present invention. Another field of application is that of electric flash signs. The apparatus is designed to enable the operator to provide new control sheets changing the order of operation of the flash apparatus at will.

In constructing the device there is employed a bed portion 1 supported in side frames 2—2 provided with supporting feet 3—3. Journaled in the side frames at one side of the bed 1, which will be referred to as the rear side, is a supply roll 4 for the supply portion of the sheet to be perforated. Located at the opposite side of the bed, hereinafter referred to as the front of the device, and journaled in the side frames 2 is a receiving roll 5. The supply roll 4 is removable from the apparatus and is journaled upon trunnions carried by the side frames 2. The trunnion 6 at the left side of the device is preferably screw threaded and is provided with a lock or set screw 7 by which the trunnion may be secured in its adjusted position. The purpose of this adjustable

trunnion is to aline the sheets in proper relation with the cutting dies and gage. At the right hand side the supply roll 4 is provided with a spring pressed or yielding trunnion 8 such as are commonly found in mechanical players or automatic instruments employing perforated sheets of this character. The trunnion 8 is depressible against the tension of the spring 9 to permit the insertion of the roll and thereafter the spring 9 maintains the trunnion 8 in engagement with the end of the roll. The trunnions are preferably provided with knurled heads or knobs, as shown in the drawing. The receiving roll 5 is permanently located in the device and is rotated manually by means of a head or knob 10, shown in the drawings at the right hand side of the device. This roll 5 is provided with a brake arm 11 which comprises a spring blade resting upon an extension of the roll. This brake device, by frictional engagement, tends to maintain the roll in its adjusted position.

The bed portion 1 is provided with a centrally located opening 12 within which is located the series of cutting dies. There is one of the dies for each note within the range or compass of the device. These cutting dies are spaced in their relation one with another corresponding with the spaced relation of the orifices of the tracker bar of the mechanical player or automatic instrument with which the sheet is to be employed. At the present time these devices have, for the most part, been standardized whereby the spaced relation of the tracker bar orifices is the same in different instruments. The cutting dies may be of any desired or suitable construction. In the drawings, and particularly in Figs. 2 and 5, there has been shown a particularly efficient and economical form of cutting dies. In this particular form of dies the cutting is accomplished by means of parallel plates 13 arranged in spaced relation and separated one from the other by interposed spacing members 14. (See Fig. 3). These plates 13 are of a thickness corresponding to the distance between succeeding note perforations in the sheet. The space intermediate succeeding plates corresponds with the width of the perforations to be made in the sheet. The plates with their intermediate spacers are strung on parallel shafts or rods 15 which extend through corresponding perforations in the respective plates and spacers and are locked tightly in their assembled position by means of nuts 16 on the screw threaded extremities of the rod 15. The die body thus provided is supported within the opening 12 of the bed 1 by suspension plates 17 with which the opposite ends of the parallel rods 15 engage. These suspension plates 17 are secured to the under side of the bed 1 by screws 18. The die plates 13 are thus arranged in alinement with the path of travel of the sheet across the bed 1. The length of the plates 13 is substantially equal to or greater than the length of the sheet necessary to contain the notes of a single measure or bar.

Immediately in front of the series of die plates and adjacent to the opening 12 in the bed 1 is an elevated gage bar 19 spaced somewhat above the bed 1, as shown at 20 in Fig. 5. This gage bar 19 comprises a tonal gage and has indicated upon its upper surface a miniature representation of a piano keyboard, the keys of which may, for convenience, be lettered in proper sequence. The rear edge of the gage bar 19 is provided with a series of notches 21, there being one notch for each key represented upon the gage bar with which the corresponding notches register. Likewise there is one notch for each die.

Extending across the rear portion of the bed and supported in arms 22 projecting upward from the side frames 2 is a transverse shaft 23. Slidingly mounted on this shaft 23 is an oscillatory head 24 carrying a gage plate 25 which coöperates with the gage bar 19. The gage plate 25 may be of any suitable material such as metal or composition but is preferably a transparent plate of glass or celluloid. At its forward end the plate 25 is provided with a stud or pin or with a suitable tooth 26 adapted to engage any one of the notches 21 to position the gage plate 25 for cutting a perforation corresponding to the particular note represented by the key indicated upon the gage bar corresponding with the notch engaged. The plate 25 is provided with a longitudinal slot 27 which, when the tooth or pin is in engagement with a notch in the gage bar, registers with the space intermediate two of the die plates 13 corresponding with the particular note. The gage plate 25, as shown in the drawings, is provided with two series of time value graduations, one series upon each side of the longitudinal slot 27. The length of the slot 27 is equivalent to a full measure or bar of the music, or in other words, is equivalent to a whole note in $\frac{4}{4}$ time. Upon the right hand side of the slot 27, in the drawings, the gage plate has been graduated for $\frac{4}{4}$ or $\frac{2}{2}$ or $\frac{2}{4}$ time. The entire length of the slot has been divided into fourths representing quarter notes in $\frac{4}{4}$ time and these fourths again bisected to represent eighth notes and these note graduations again bisected to represent sixteenth notes all in $\frac{4}{4}$ time. These graduations determine the time values of

the perforations and the positions of the perforations longitudinally upon the sheet or the relation of successive notes in a single measure or bar, while the tonal gage bar 19 determines the position of the note perforations transversely upon the sheet or the position of the perforations representing different notes or producing different tones. Upon the left hand side of the slot 27 the length of the slot has been divided or graduated to represent $\frac{3}{4}$, $\frac{3}{8}$ or $\frac{6}{8}$ time. The length of the slot has been divided first into thirds, each representing a quarter note, the three quarter notes making up the entire measure or bar. Each of these quarter note graduations is divided into half to represent eighth notes and further divided into fourths to represent sixteenth notes. Thus when producing a composition in $\frac{2}{4}$, $\frac{2}{2}$ or $\frac{4}{4}$ time the graduations upon the right hand side of the slot 27 will be employed while when producing in $\frac{3}{4}$, $\frac{3}{8}$ or $\frac{6}{8}$ the graduations at the left of the slot will be employed. Assuming that a bar of music in $\frac{4}{4}$ time containing first a half note, second a quarter note, and then two eighth notes to be represented upon the sheet by means of perforations therein, starting at the forward end of the slot 27, the sheet will be perforated for a distance indicated by one half the length of the slot to represent the half note. Then the sheet will be perforated a distance corresponding with the third quarter of the slot to represent the quarter note, and will be again perforated a distance corresponding to and registering with the seventh eighth of the slot and with the last eighth of the slot to represent the two final eighth notes in the measure or bar. It will be understood that the gage plate 25 is shifted each time to a different position by sliding the head 24 transversely upon the shaft 23 to bring the gage slot 27 into registry with the die for cutting the particular note corresponding to the half note, quarter note, or eighth note to be reproduced. Thus if the first note is *c* the gage plate 25 will be adjusted with the pin or tooth 26 engaging in the notch 21 of the gage bar 19 corresponding with the particular key *c* indicated upon the bar. If the succeeding note is then *e* the gage plate 25 is shifted laterally and the tooth 26 thereof is engaged in the notch 21 corresponding with the key *e* upon the bar.

In order to cut or perforate the sheet when the gage plate 25 has been properly positioned, there are provided a plurality of punches or cutters shown in detail in Fig. 6. There is one of these cutters provided for each denomination or value of notes. That is, there is one wide cutter, as shown at 28, for half notes, a second cutter 29 of substantially half the width for quarter notes and other cutters 30 and 31 of proportionate size for eighth and sixteenth notes. It will also be understood that there are two sets of cutters; one set of cutters for $\frac{2}{4}$, $\frac{2}{2}$ or $\frac{4}{4}$ time corresponding with the graduations at the right of the slot 27 and a second set of cutters for $\frac{3}{4}$, $\frac{3}{8}$ or $\frac{6}{8}$ time corresponding with the graduations at the left of the slot. These cutters preferably comprise plates of steel having a thickness substantially equal to the space intermediate succeeding die plates 13. The lower or operating end of the punch or cutter is recessed, as shown at 32 Fig. 6, and the opposite edges of the punches adjacent to the cutting end are rounded as shown at 33. The recessed cutting end of the punches cause the paper to be perforated or cut from the opposite ends of the perforations or slots toward each other as shown in detail in Fig. 7. The intersection of the recesses in the cutter with the sides thereof forms two points which puncture the sheet in separated places, the further operation causes the intermediate shearing portions to extend these initial punctures one toward the other until they meet. Having first positioned the guide plate or time gage 25, the cutter or punch corresponding to the note value or denomination is selected and is inserted within the slot 27 in registry with the proper graduations according to the position of the note in the measure or bar. The punch or cutter is then pressed downward. The slot 27 in the guide plate, being positioned in registry with the space between succeeding die plates 13 causes the punch selected to register with the space and to coöperate with the edges of the adjacent die plates 13 to shear or cut the material forming the sheet. As the punch or cutter is pressed downward the extreme corners of the cutter or punch are thrust through the sheet making two substantially semicircular incisions which are then extended toward each other in parallel lines until they meet and the tongues of paper formed thereby are entirely removed, leaving a single slot in the sheet corresponding in length with the value or denomination of the note and in position transversely with the character or tone of the note. The punches or cutters are of slightly less width than the extent of the corresponding graduations upon the guide plate 25. By referring to Fig. 5 it will be seen that the half note, indicated within the slot 27, does not extend entirely to the medial graduation of the slot. The purpose of this is to leave a small bridge or connecting portion between slots or perforations representing succeeding notes of the

same tonal value. As each measure or bar represented by the length of the slot 27 is completed, the receiving roll 5 is rotated by means of the handle or knob 10 to advance the sheet across the bed 1, thereby rolling the finished portion of the sheet upon the roll 5 and drawing a fresh supply from the roll 4. The length of movement is determined by the gage bar 19. The sheet is advanced until the last perforation, *i. e.*, the perforation representing the final note of the preceding bar is substantially in registry with the notched edge 21 of the gage bar 19. The same process is repeated for each succeeding measure or bar of the composition.

The particular form of die embodying the separate plates 13 and interposed space members 14 has been found particularly efficient for the present purpose. The plates, being compartively thin, possess a slight degree of resiliency or tendency to yield to prevent the punch or cutter being wedged therein. It is obvious that for convenience all of the punches relating to one set, *i. e.*, all for $\frac{2}{4}$ time or those for $\frac{3}{4}$ time may be formed on a single unit, the punch bars being arranged radially about a common center. Such construction is obvious and will require no illustration.

While the apparatus has been described and shown as especially adapted for cutting music sheets, it is to be understood that it is not limited to such use but as before stated it may be used for producing perforated sheets for a variety of purposes.

From the above description it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable but which obviously is susceptible of modification in its form, proportion, detail construction, or arrangement of parts, without departing from the principle involved or sacrificing any of its advantages.

The means and construction herein described comprise but one mode of putting the invention into effect, and the invention is therefore claimed broadly in any of its possible forms or modifications within the scope of the appended claims.

Having thus described my invention, I claim:

1. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies in said bed, a gage member movable to different positions in relation with said bed, and means for insuring the registration of the gage member in each position of adjustment with one of said dies, and a cutter adapted to coöperate with the dies.

2. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a movable perforated gage member overlying the material operated upon the perforation of which is adapted to be registered with different dies of said series, and a cutter to be introduced through the perforation of the gage member and coöperating with the die.

3. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a gage for said cutter movable to different positions to cause the cutter to register with dies corresponding with different notes, said gage having indicating means thereon for determining the position of the note represented by the perforation in the measure or bar.

4. In a sheet perforating apparatus, a supporting bed for the material operated upon, and a series of dies located in said bed, a cutter coöperating with the dies, a gage movable into registry with different dies of the series for determining the position of the perforations transversely in the sheet, and means upon the gage for determining the relative position of the perforation longitudinally in the sheet.

5. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a gage member for determining the point of operation of the cutter in longitudinal relation with the sheet, said gage member being transversely adjustable into registry with different dies of the series to determine the point of operation of the cutter in transverse relation with the sheet.

6. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a tonal gage, and a time gage, one of said gages being adjustable in relation with the other.

7. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a tonal gage, and a time gage adjustable in relation with the tonal gage.

8. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, and a cutter coöperating with the dies, a tonal gage, a movable time gage, and means for interengaging the time value gage with the tonal gage in predetermined positions in which the time value gage will register with particular dies of the series.

9. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a

cutter coöperating with the dies, a movable slotted plate, and means for engaging the plate in different predetermined positions with its slot in registry with one of the series of dies.

10. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a movable slotted plate having time value graduations therein, said plate being adjustable to various positions in which its slot will register with different dies of the series.

11. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a shaft extending transversely in relation with said bed, a gage member pivoted on said shaft and slidable thereon into registry with different dies of the series.

12. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, a shaft extending transversely in relation with said bed, a gage member slidable upon the shaft into registry with different dies of the series, said gage member being capable of oscillatory movement about the shaft by which it is locked in and unlocked from its adjusted position.

13. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies, and a time value gage registerable with any one of the dies of the series.

14. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located in said bed, a cutter coöperating with the dies having graduations thereon corresponding with the keys of a piano, said key indications registering with the corresponding dies of the series.

15. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a movable gage for the cutter, and a gage with which the cutter gage coöperates to position the latter in predetermined relation with the dies.

16. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a movable gage for the cutter, and a gage bar with which the cutter gage is interengaged in different positions of adjustment to locate the cutter gage in predetermined relation with the dies.

17. In a sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a movable gage for the cutter, and a gage bar having therein a series of recesses, and a projection on the cutter gage to engage in any one of the recesses to position the cutter gage in predetermined relation with the dies.

18. In a music sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a tonal gage, and a movable time gage, and means for engaging the time gage with the tonal gage in different positions of adjustment.

19. In a music sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a tonal gage having a series of recesses therein, a projection on the time gage adapted to engage in any one of the recesses in the tonal gage.

20. In a music sheet perforating apparatus, a supporting bed for the material operated upon, a series of dies located therein, a cutter coöperating with the dies, a tonal gage having thereon a series of indications corresponding with the keys of a piano, and a movable gage for the cutter adapted to be differently positioned in accordance with said indications to guide the cutter in locating the perforations in accordance with the corresponding keys of a piano.

21. In a sheet perforating apparatus, a series of elongated dies, and a cutter of less extent than the die capable of coöperation therewith at any point throughout the extent of the die.

22. In a sheet perforating apparatus, a die and a punch of less extent than the die capable of coöperation therewith at any point within the limit of the die.

23. In a sheet perforating apparatus, a supporting bed for the material operated upon, and an elongated slot therein equal to or greater than the longest perforation to be formed, and a cutter of less extent than the slot coöperating therewith at any point throughout its length.

24. In a sheet perforating apparatus, a supporting bed for the material operated upon, and an elongated slot therein equal to or greater than the longest perforation to be formed, and a plurality of cutters of different sizes adapted to interchangeably coöperate with said slot.

25. In a sheet perforating apparatus, a supporting bed for the material operated upon, and a series of dies of substantially equal extent located therein, and a series of cutters of different extent coöperating with the substantially equal dies.

26. In a sheet perforating apparatus, a supporting bed for the material operated upon having a series of parallel slots of sub-

stantially equal extent therein, and a cutter of less extent than that of the slots capable of coöperation therewith at any point throughout the length of any slot.

27. In a sheet perforating apparatus, a die comprising a slotted body, the slots being of substantially equal length and equal to or longer than the longest perforation to be formed, and a cutter of less extent than the slots capable of coöperation with any slot at any point within the limits of the latter.

28. In a sheet perforating apparatus, a die comprising a series of plates arranged side by side in parallel planes and in spaced relation one with another, and a cutter common to all the plates.

29. In a sheet perforating apparatus, a series of spaced plates arranged in parallel planes, means for holding said plates in adjusted positions, and a cutter adapted to enter between any two adjacent plates of the series.

30. In a sheet perforating apparatus, a series of separate plates arranged in parallel spaced relation, a series of spacer members interposed between the plates, means for holding the plates and interposed spacers in assembled positions, and a cutter coöperating with any of the plates of the series.

31. In a sheet perforating apparatus, a series of separate plates arranged in parallel spaced relation, a series of spacer members interposed between the plates, the said plates and spacers having registering perforations therein, and a connecting rod passing through the registered openings of the plates and spacers, and a cutter common to all the plates.

32. In a sheet perforating apparatus, a series of dies, and a cutter common to all the dies, having a recessed cutting edge whereby said cutter will initially puncture the sheet independent of the die at separated points and by subsequent coöperation with the die extend the initial perforations until they meet.

33. In a sheet perforating apparatus, a series of dies, and a cutter common to all the dies, two terminal extensions on the cutter adapted to initially puncture the sheet independent of the die at separated points, and an intermediate shear edge coacting with the die to connect the initial punctures.

34. In a sheet perforating apparatus, a series of dies, a shearing cutter, two separated puncture points carried thereby operating independent of the die, and an intermediate shearing portion coacting with the die to extend the punctures in parallel lines one toward the other.

35. In a sheet perforating apparatus, a series of dies, and a shearing cutter having a recessed operating portion adapted to initially puncture the sheet at separated points intermediate the ends of the die and thereafter coacting with the die to connect the punctures one with the other.

36. In a sheet perforating apparatus, a cutter having a recessed operating edge, the said recess intersecting the side lines of the cutter at acute angles and a die comprising parallel shearing edges of greater extent than the cutter.

37. In a sheet perforating apparatus, a cutter having two puncture points connected by intermediate shear edges, and a die with which the cutter coöperates comprising two parallel shearing edges of greater extent than said cutter.

In testimony whereof, I have hereunto set my hand this 24th day of February, A. D. 1915.

WALTER G. DOTY.

Witnesses:
HARRY F. NOLAN,
CARRIE M. RECKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."