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## THE AUTOPHONE.

The instrument illustrated by the accompanying engravings is the autophone, for which letters patent have been issued in the United States and Europe to Professor Merritt Gally, of New York city. This instrument is claimed by the inventor to be both original in its conception and fundamental in principle, and it is believed to be the first successful invasion of the domain of music by automatic mechanism.

The autophone is operated by a thin sheet of paper only three and seven eighths inches in width, punctured with small holes. The instrument is provided with any number of stops, and, if a reed or pipe instrument, with any number of sets of reeds or pipes. The invention is applicable to instruments of any quality, from the cheapest piano or cabinet organ to a grand church organ. The music sheet is prepared to represent not only the notes, but also the entire expression required to render the music in the most perfect and artistic manner.

The perforations in the sheet, which correspond with the stops, occupy such positions as to operate any stop, or number of stops for any passage, or note or part of a note, that will secure the best effect. It will readily be seen by a musician, says Professor Gally, that this is more than can be accomplished by the hands of the most expert performer. The hands being occupied in fingering the keys, prevents the possibility of manipulating the stops when it would often be desirable to do so.

The mechanism, which is operated by the music sheet for the stops, is as sensitive and rapid in its action as that for the note keys, rendering it possible to produce an unlimited variety of "expression."

Fig. 1 represents a cabinet organ to which the invention is applied. The woman represented at the organ is placing into its bearings the small spool containing the strip of perforated paper which is to produce the music. The mechanism by which this sheet operates is connected with the ordinary pedals of the instrument, and therefore requires no skill except to operate the bellows. To give the reader an accurate idea of the dimensions of this sheet, and the punc-

tures, notes, stops, and "expression," we show the spool partially unwound, full size, in Fig. 2, representing the entire range of notes, six stops, and the "expression" devices.

The size of the perforations, as will be seen, are exceedingly small, but sufficiently large for the perfect operation of the instrument. The mechanism is operated pneumatically, but these small openings in the sheet are not for the passage of air to the pipes or reeds of the instrument for producing the sound. The air passing through these small punctures simply trips sensitive devices that operate the valves which, in manual performing, are operated by the ordinary finger keys. The lines of punctures in the edges of the sheet represent the stops and "expression" devices. The air through these punctures operates the stops by means of a similar mechanism to that which opens the valves to the reeds or pipes.

Although the music with its "expression" is prepared according to the rendering of the best artists, the instrument is not limited to this or any set "expression" for the piece to be performed. For those without musical skill the "expression" prepared in the

music sheet enables them to produce perfect music without requiring instruction or practice. The instrument, however, is not limited to the "expression" prepared in the music sheet, but affords to the accomplished musician the widest scope for the exercise of his personal taste and skill, the stops being absolutely under the control of the performer, so that he may vary the "expression" at pleasure. This is done with greater facility than by any ordinary arrangement of stops, being controlled by sensitive finger keys. Four of these finger keys are represented in Figs. 1 and 3, each side of the receptacle of the punctured strip in connection with button stops. Otherwise than the fact that these button stops turn to the right and left to bring in or shut off the parts of the instrument which they represent, instead of being drawn and pushed, they operate in a manner similar to ordinary draw stops.

In Fig. 4 one of the finger keys and its corresponding button stop is represented full size. Turning the button with the lettered portion toward the operator accomplishes the same result as drawing an ordinary stop, or  
[Continued on page 354.]

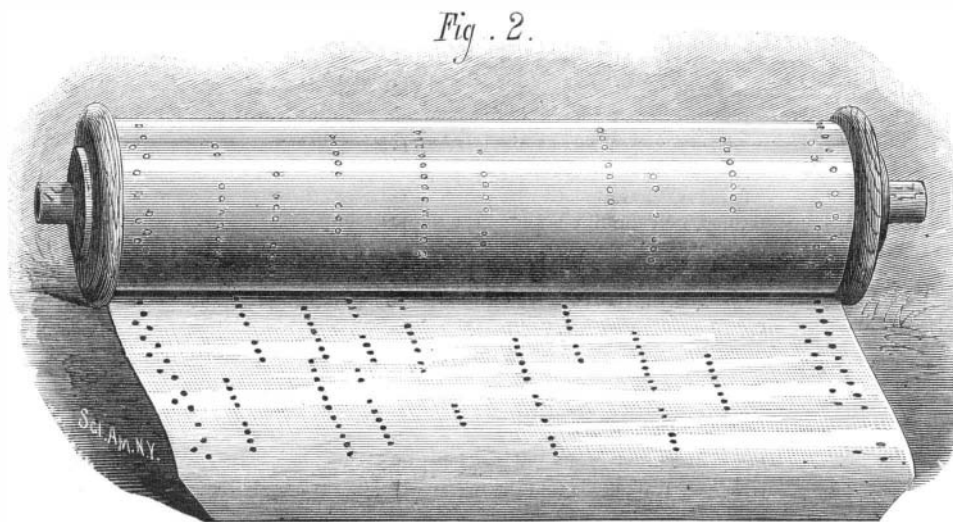


Fig. 1.—GALLY'S AUTOPHONE OR SELF-PLAYING MUSICAL INSTRUMENT.

**GALLY'S AUTOPHONE.***[Continued from first page.]*

turning the lettered portion at right angles, as shown in the engraving, accomplishes the same result as pushing in an ordinary stop.

The sheet or strip of music is marked at its head with the number of button stops which should be turned on before starting the mechanism. These stops, although turned on, are operative only when perforations in the edges of the sheet occur which indicate their action. Wherever these punctures do occur, even for a note or a part of a note, or an entire passage, the effect of the stop is produced. Thus far it will be seen that the effect of the stops is limited to the set expression indicated by the punctures of the sheet. The variety which may be given in the expression to accord with the judgment or taste of the performer differing from that represented in the music strip, is produced in the following manner: By the use of the finger keys, *a*, *b*, Fig. 4, the performer renders inoperative at will any of the stops represented in the sheet, and substitutes others at pleasure. The key is double-acting, arranged to be depressed at either end. Depressed at *b* renders inoperative the stop that would otherwise come into action. Any stop that is turned off and not to come into action is thrown into action for the time desired by the pressure of the key at *a*. If the performer does not wish to use any of the stops indicated in the music strip, all the button stops are turned off before commencing the piece, and by pressing on the different keys at *a*, any variety of expression is given. These keys are very sensitive, requiring only a slight touch, but they perfectly and instantaneously control the stops of the instrument.

For example, a single note which for the best effect is to be begun softly, and would on an ordinary instrument be increased by the swell only, is in this instrument increased not only by the swell, but by an accumulation of stops commencing, if necessary, with only a single stop, and ending, if desirable, with an accumulation of ten.

Although the time in which the music is written is, by the mechanical motion, strictly adhered to, nevertheless, to avoid mechanical appearance in the rendering of the music and to divest it of every feature that might be in the least objectionable, or that in any way might fail to realize the most perfect conception of the artist, the instrument is provided with an ingenious mechanical device, by means of which the time may be instantly changed, accelerated, or retarded through any passage, note, or part of a note, or a "hold" made on a note, at the will of the performer, especially adapting the invention for rendering accompaniment for singing. The first key to the left of the receptacle for the sheet (see figure) operates a mechanism for retarding the movement of the sheet for retarding the time of a passage, producing a "hold" or a perfect rest, which is not indicated in the arrangement punctured in the strip. The degree and duration of the retard is controlled by the degree of pressure applied to the key. A positive hold on the key produces a "hold" on the tone. A positive hold between the notes produces a "rest," the length of time the key is thus held.

To repeat a passage or part of a passage not arranged in the sheet to be repeated as ordinarily performed, and to enable the operator to repeat any part at will, once or successively, without limitation, the key just described, in connection with the draw-knob at the right of the receptacle, recalls for repetition any desired part of the music-strip; the return being instantly made to prearranged limits, only so much of the strip being drawn as is desirable. The convenience of this device in singing, or in playing dance-music, will be seen at once, as comparatively short strips answer the purpose as well or even better than very long ones, besides lessening their cost.

The instrument may be arranged for any number of octaves; the music strip, however, need not necessarily be increased beyond the width already mentioned.

The autophone is not only adapted to organ music, but is equally well adapted to the piano. The "expression" produced upon the organ by the operation of the stops, in connection with the music sheet, is produced in a similar way upon the piano, the soft and loud pedals not only being acted upon on the music sheet, but the variety of touch required for the best effects is fully attained. This invention, as applied to the piano, as with the organ, is not limited to the set expression prepared in the music sheet, but allows of as great variety in the personal expression of the artist.

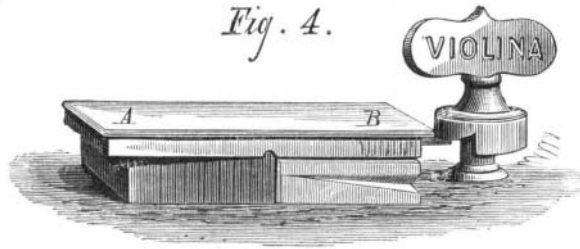
The autophone seems destined to prove invaluable in its application to orchestrons; the small, cheap music sheet accomplishing all, and even more, than the very expensive barrels of such instruments. The addition of variety in expression which this invention will impart to orchestrons, and which they have not heretofore possessed, will, it is claimed, increase their value.

The narrowness of the sheet, and the fact that it is not necessarily thick and cumbersome, but is light and cheap, are important qualifications. This music, we are informed, will be sold as cheaply as ordinary sheet music. It is made by machinery specially adapted to the purpose, and the perforations being so small, leaves it very strong and durable.

The autophone is adapted to instruments having a key board that may at pleasure be used for manual performing, as shown in Fig. 1; or it may form a part of an instrument not having finger keys, for use by those who are not musicians, and who do not desire the addition of the ordinary key board to the instrument. It is also made as an at-

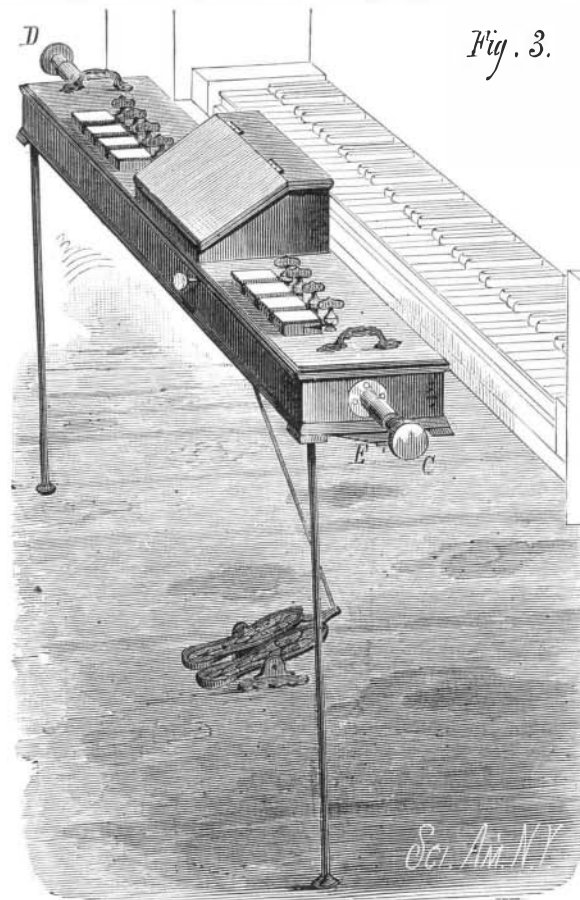
tachment to perform upon organs or pianos already in use, and may be readily placed upon or removed from the instrument.

The invention is represented in this form in Fig. 3, in which the ordinary key board of an instrument is shown, the attachment being moved toward it to be placed over the keys. If the instrument be a wind instrument, as an organ, the connecting rod, shown as attached to the foot pedals, is connected to the ordinary pedals of the organ, the pedals shown being used when the attachment is employed to perform upon a piano.



*CD* represent padded binding screws, which take hold of the uprights of the instrument at each end of the key board, to hold the attachment firmly in position. A line of strikers, corresponding with and striking upon the keys, are operated by mechanism similar to that already mentioned. Connections are also made from the attachments with the ordinary stops and "expression" devices of the instrument, and are operated by the punctures of the sheet or other finger stop keys, as heretofore explained. One of the strikers is shown at *E* projecting under the attachment. The rod supports shown are movable. In the form shown the attachment is light and portable, and may be easily carried by hand. When not desirable to have this portable a case is provided supported by casters.

Using the language of the inventor, the autophone is constructed on purely scientific principles, is as simple as it is wonderful, requires no adjustment, and is always ready for action. Its mechanism is so perfect and its operation so free, that it is not liable to get out of order, and, with ordinary care, will last for an indefinite period. It is, in all es-



sentia respects, unlike anything heretofore invented, either in structure, action, or musical results.

Professor Gally is better known to the public as the inventor and manufacturer of the Universal printing press. Further information regarding the autophone may be obtained by application to the inventor at his office, No. 9 Spruce Street, New York City.

**The Electric Light in a Fish Market.**

In the celebrated Billingsgate Fish Market in London, the electric light proved a complete failure, for the unexpected reason that it was too good. Business at Billingsgate begins at 3 o'clock in the morning, most of the bargains being struck by gaslight. When the searching electric candle was turned on, its brilliant whiteness literally showed the fish in such a new light that the trade was demoralized outright. Soles that would have fetched a shilling a pair by gaslight looked dear at sixpence, while turbot fresh from the sea looked a week old. The result was a general outcry. The copious and ornate dialect of the locality was enriched by a number of notable additions during the few days of the new light; and for fear of a revolt among the "bummarees," as the fish salesmen are called, the corporation was obliged to restore the familiar yellow gas lights.

**Captain W. H. Swift.**

By the death of Captain W. H. Swift, America has lost one of the pioneers of American engineering. While still a cadet of the United States Military Academy his service began with Major Long's expedition to the Rocky Mountains, 1818-21. During the next ten years he was employed on the early surveys for the Chesapeake and Ohio and (proposed) Florida canal, the Ithaca and Oswego and Catskill and Oswego railroads; and in 1831 in surveys for the Boston and Providence, Providence, Norwich and Worcester, and Providence and Stonington railroads. Appointed 1832 brevet captain and "assistant topographical engineer" (as the captains were then officially styled), he was among the pioneers in our coast survey work; being employed for the next ten years on the geodetic survey of the Atlantic coast. From 1836 to 1849 he was the resident and constructing engineer of the Massachusetts Western Railroad (now incorporated in the Boston and Albany). As an officer of topographical engineers, he, with ex-Governor John Davis of Massachusetts, was employed in making an examination of the Illinois and Michigan Canal, the completion of which had in 1841 been suspended for want of funds, resulting in his becoming one of three trustees into whose hands the work was committed and remained until its completion in 1848.

The work with which Captain Swift's name has been most intimately associated is the first Minot's Ledge Lighthouse, off the town of Cohasset, Mass. The erection of this iron skeleton tower—the first of its kind—was a work of great originality as well as difficulty. Resigning from the army in 1849, Captain Swift was president (1849-51) of the Philadelphia, Wilmington and Baltimore Railroad; of the Massachusetts Western Railroad (1851-4); continuing president of the board of trustees of the canal named till 1871; president of the Hannibal and St. Joseph Railroad since 1856. For the last fifteen years of his life he made his home in this city.

**The Gold Medals Won at Paris.**

The gold medals awarded to the United States exhibitors at the Paris Exhibition have been received and distributed by Commissioner-General McCormick. The medals weigh three ounces each. Each medal bears the name of the exhibitor to whom it was awarded, and is accompanied by a diploma with the signatures of the Ministers of Agriculture and Commerce and the French Commissioner-General, designating the group and class in which the award was made. The medals are one hundred and six in number. There are twenty-three "diplomas of honor," which are considered equal to gold medals, and were chiefly given for exhibits made by the government or by public institutions. The Commissioner-General has not yet been advised when the silver and bronze medals will reach this country.

**American Made Telescopes.**

The perfection of workmanship attained by American opticians in making telescopes and microscopes has often won high praise from scientific men both at home and abroad. In 1861 European astronomers maybe said to have had their eyes opened by Clark's discovery of a minute companion to the brilliant Sirius, with the eighteen inch object glass made for the Chicago Observatory. The monster telescopes of Herschel and Lord Rosse, and the great achromatics in the chief European observatories, had given no hint of this star's existence, although there were mathematical reasons for believing that Sirius had a companion. Since its discovery this delicate star has been seen with comparatively small telescopes, and now Mr. Jay Harcourt, of Wappinger's Falls, announces to Admiral Rogers that one fine night in April he saw the companion of Sirius with a Byrne telescope of only four and a half inches aperture. Several other persons saw the star, and they certify to the correctness of the observation. The maker here alluded to is John Byrne, of New York city.

**The London International Agricultural Show.**

The International Agricultural Show, to open June 1, promises to be very successful. Six hundred and fifty-one exhibitors of implements and machinery have applied for space, some two hundred and fifty more than at Bristol last year. The sheds for these exhibits would form a line three miles long, if all the space asked for were conceded. An additional mile of sheds will be required for machinery in motion. A correspondent writes that American manufacturers are among the foremost applicants outside of England, and adds:

"There is some uncomfortable foreboding here as to the issue of certain firms with whom your makers of mowers and reapers especially come into competition; nevertheless a vigorous effort is being made in the hope that the English firms will be able to show a better front in London than in Paris."

The report of the National Cotton Exchange shows that the cotton movement by rail routes this season is the largest ever known. There has been an increase of 186,651 bales in the direct shipments by rail from producers to Northern mills. The receipts of cotton at all United States ports for the year ending April 30, were 4,283,641, against 4,183,552 last year. These figures give gratifying evidence that the importance of this great staple to the industries of the country is to be still further increased.

PROF. RILEY, Entomologist of the Department of Agriculture, has resigned.