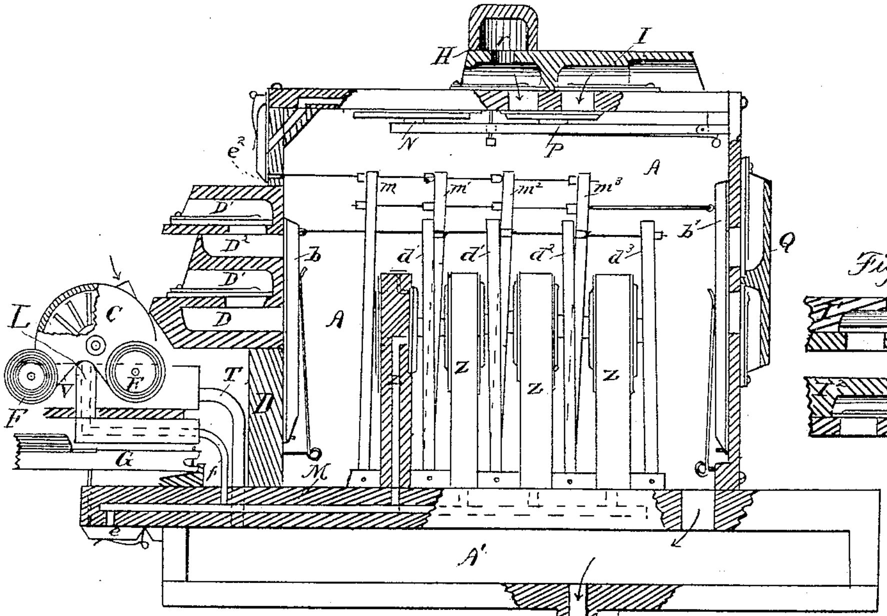
(No Model.) 2 Sheets—Sheet 1.

M. GALLY.

MECHANICAL MUSICAL INSTRUMENT.

No. 346,152. Patented July 27, 1886.

Fig. 1.



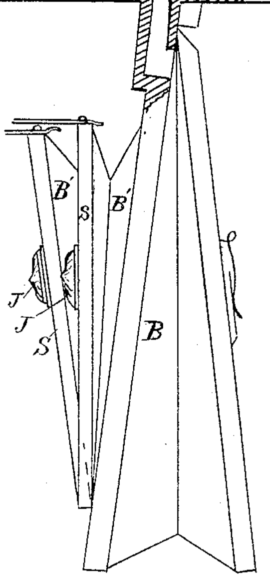


Fig. 2.

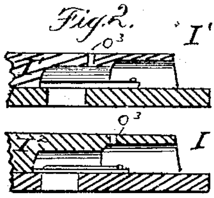


Fig. 3.

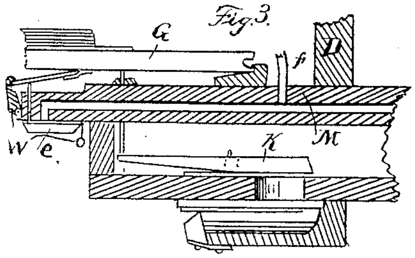


Fig. 4.

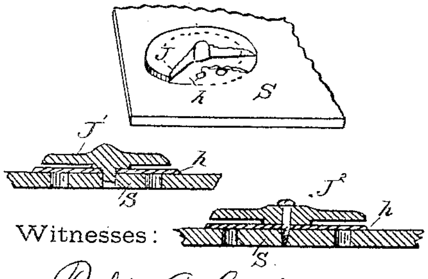
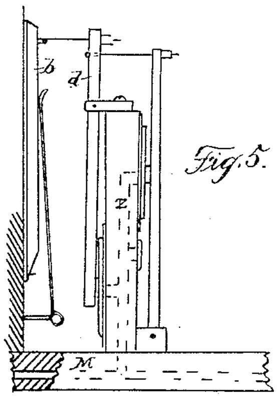


Fig. 5.



Witnesses:

Robt. A. Gally.

Wm. A. Gally.

Merritt Gally

Inventor.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

2 Sheets—Sheet 2.

M. GALLY.

MECHANICAL MUSICAL INSTRUMENT.

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Fig. 6.

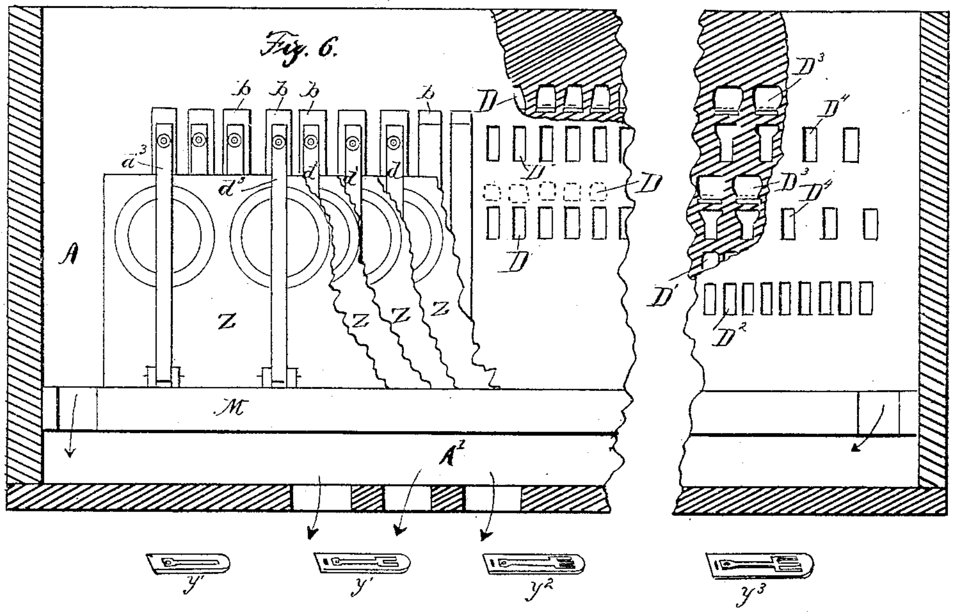


Fig. 7.

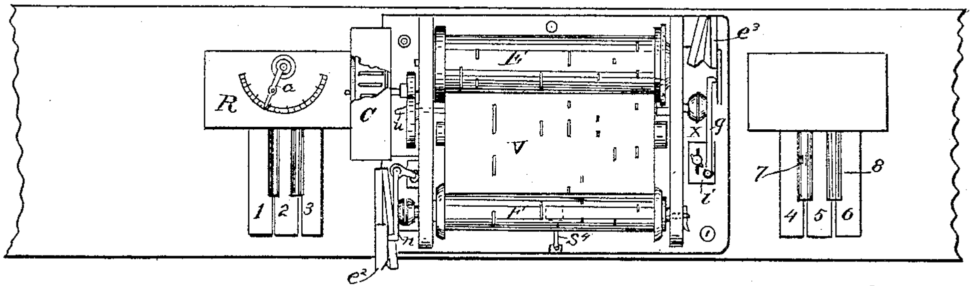


Fig. 7b

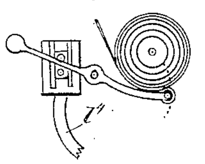


Fig. 8

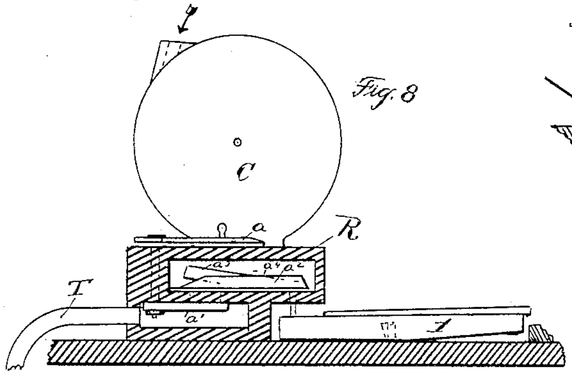
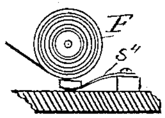


Fig. 7a



Witnesses:

Robt. A. Gally.
Wm. A. Gally.

Merritt Gally.
Inventor.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

MERRITT GALLY, OF NEW YORK, N. Y.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 346,152, dated July 27, 1886.

Application filed April 23, 1885. Serial No. 163,190. (No model.)

To all whom it may concern:

Be it known that I, MERRITT GALLY, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Musical Instruments, of which the following is a specification, reference being had therein to the accompanying drawings.

In the accompanying drawings, Figure 1 is a side view, partly sectional, of the interior of an organ, showing the devices of the invention in working position. Fig. 2 is a sectional view of modifications of one of the reed-tubes of Fig. 1. Fig. 3 is a sectional view of modifications of key-action. Fig. 4 shows views, in perspective and section, of the bellows-valve. Fig. 5 is a side view of modification of pneumatic lever. Fig. 6 is a rear view, partly sectional, of reed-chest, valve-board, and pneumatic action. Fig. 7 is a plan view of the music-sheet and motor. Figs. 7^a and 7^b are details, and Fig. 8 is a side view, partly sectional, of music-sheet motor and its metronome-adjuster.

The organ represented in the drawings is constructed so that it may be operated either manually or mechanically, or manually and mechanically in combination.

The grooved board M, Fig. 1, forms the base of the action, the grooves of which connect through tubes f with the tracker-range L, which operates in connection with a perforated music-sheet, V. The grooves of board M also lead to valves e, which are operated by means of finger-keys G. Passing transversely across the grooved board M are a number of narrow supplemental grooved boards, z, which taken together secure in a small space a large amount of surface for the attachment of diaphragms for pneumatic motors for operating the two lines of reed-valves b b'. Pneumatic diaphragms are attached to both sides of the supplemental grooved boards z. Each supplemental grooved board has, therefore, two lines of diaphragm pneumatics—those on one side operating one set of valve-levers and those on the opposite side operating another set of valve-levers, as shown. Four supplemental grooved boards are shown in Fig. 1, allowing the diaphragm of the pneumatics to be in diameter equal to the width of space occupied by four reed-valves, thus making the pneumatics sufficiently large to be of considerable power. A greater or less number of supplemental grooved boards may be used, making the pneumatics, larger or smaller, according to the amount of power required to operate the valves. The lines of levers d d' d^2 d^3 operate the line of valves b, and the lines of levers m m' m^2 m^3 operate the line of valves b'. Fig. 6 shows the arrangement of several lines of pneumatics, lapping each other successively the width of a valve. The levers m m' m^2 m^3 are attached by means of draw-wires to valves b', and are also provided with push-wires, which operate the external vent-valves, c^2. The line of vent-valves c^2 are employed to operate, through tubes or grooves, the line of pneumatics N, which connect with a line of reed-valves, P. The reed-cells H I Q are attached, in ordinary manner, to their valve-boards. The cells D' D' are placed at right-angles to their valve-board, and have supplemental cells D^2 D^2, through which the air passes from the reeds, and which are opened and closed by means of reed-valves b. The supplemental cells D^2 D^2 open directly into the air-chest A. The reed-cells H are of peculiar construction, and produce a tone from the reed very closely imitating that of a flute. On the outside of the wall of the cell, opposite the reed, is a supplemental chamber, an opening, r, being made through the wall of the cell into the chamber. By means of this construction the character of tone produced by the vibrating air is entirely different from that of a reed in an ordinary cell. I also produce a peculiar quality of tone by making the reed-cell somewhat longer than ordinary, and making the part near the mouth larger than the remaining portion of the cell, as I. Two modifications of this constuction are shown in Fig. 2. The cell I' has a small opening, o^3, from the smaller part of the cell to the external air. The cell I^2 has a small opening, o^3, through the wall of its larger part to the external air.

Figs. 3 shows a modification of the finger-key action, the finger-keys G operating two lines of push-pins—one operating the pneumatic valve e, and the other directly connecting with a line of reed-valves, K.

Fig. 4 shows the peculiar construction of the valves J of the exhausters of the bellows. A number of holes are made in the board S, prefrably in a circle. A piece of valve-leather, *h*, is placed over these holes. The central part of the leather is then made fast to the board of sufficient area to govern and hold in position the entire piece. A piece of wood or other suitable material, J, is placed so that the central portion holds the leather fast to the board, the outer rim being a little removed from the leather and forming a check for the movement of the margin of the leather. J′ represents the valve-check, the central portion of which forms a stud, which is driven into a central hole in the valve-board, stopped by a shoulder which forms the binding part for holding the leather in position. J^2 is a modification of the valve-check, held to the valve-board by means of a central screw. The valve thus constructed may present a very large amount of valve-surface and windway, and at the same time have very little flap, and no tendency to crumple or get out of place.

Fig. 5 shows a modification of the pneumatic levers of Fig. 1, the fulcrum of the lever being placed between the pneumatic motor and the pull-wire. This construction is desirable when considerable power is required to operate the valves *b*.

In Fig. 6 a portion of the reed-board is shown in section, to expose the reed-cells. The figure is broken in order to show the two extremes of the reed-board. The part on the left hand shows two distinct sets of reeds of ordinary width, the two being operated by means of one line of valves. Below are shown three styles of reeds, all having ordinary width reed-blocks, any or all of which styles are applicable to the cells. The reed-board terminates at the right of the break with two lines of cells, having only one set of reeds, the cells alternating in position. This alternation is to accommodate the branching tongued reeds at the base end of the scale, where the reeds, being large, are necessarily wider than ordinary blocks. The pneumatic action, however, not necessarily corresponding in measurement with the manual, allows the regular order without alteration, if desired.

Fig. 7 is a plan view of the music-sheet motor, and Fig. 8 is a side view of same, partly sectional, showing metronome-valve and valves for finger-keys. To produce the motive power for driving the take-up roller E, I use a fan-wheel inclosed in the drum C, which wheel is revolved by means of the exhaust through tube T, which leads to the exhaust air-chest of the instrument. Such a motor has seemed heretofore impracticable, on account of the variable tension produced by the exhaust-bellows, and the consequent diffiulty of producing regular time. I overcome all such difficulties by the construction shown in Figs. 7 and 8. Under the wind-wheel C, Fig. 8, are shown two chambers, through which the exhaust-air passes from the wheel to the wind-chest of the instrument. Upon the cover of the upper chamber is a metronome-scale, arranged upon an arc, and an adjustable pointer pivoted to an upright shaft, passing downward to the lower chamber, where it is attached to a valve, *a′*, which opens and closes (more or less) a port leading from the upper to the lower chamber. The exhaust-tube T connects with the lower chamber, and the drum of the wind-wheel connects with the upper chamber. The valve between the chambers would determine accurately the amount of air which will pass from the drum C through tube T, provided the tension were invariable and with a constantly-equal power required to operate the music-winding apparatus. The valve *a′* could be easily constructed to pass the proper amount of wind to produce a speed corresponding with the position of the pointer *a* at any point of the metronome-scale. With the variable tension of the exhaust of a reed-organ, however, this would be entirely unreliable and useless without some controlling mechanism to overcome the variation. For this purpose I use a compensating friction device which is under control of the exhaust, and acts as a counterpoise between the force required and the power applied. The pinion of the wind-wheel connects with a wheel on the driving-shaft *u*. This driving-shaft gears to and drives the take-up roller E. On the end of the driving-shaft is a friction-disk, X, and pressing against this disk is a counter friction-disk, which connects the lever *g*. The lever *g* is operated by means of a pneumatic, e^3, which is connected by a tube to the exhaust-chamber of the instrument. The friction device X acts as a retard against the power of the wind-wheel, and regulates its velocity. The lever *g* is made adjustable by means of a sliding adjustable fulcrum, *i*, as shown.

To adjust the apparatus, the pointer *a* of the metronome is set for any given time, and the wheel revolved by means of the exhaust. The lever *g* is then adjusted until its leverage upon the friction device, with the power applied by pneumatic e^3, brings the speed of the wind-wheel to the proper time. Now, however variable the tension of the exhaust may be the time of the motor will not change, for if the air-tension increases and tends to increase the speed of the wind-wheel the same increase of air-tension proportionately increases the retarding friction at X, and if the air-tension is diminished, tending to diminish the speed of the wind-wheel, the friction is proportionately diminished by a proportionate decrease in power of pneumatic e^3, applied to lever *g*. It is now only necessary to so shape the port of valve *a′* that the valve shall produce the proper opening, when set by the pointer *a*, for the several degrees of the scale, and the metronome device is accurately operative under all variations in the exhaust. The bellows-pedals of the organ can now be operated rapidly or slowly, and the music rendered powerfully with high tension or softly with low tension, as desired, without disturbing the time of the music-sheet motor.

Another pneumatic friction-retarding device, e^2, similar to that already described, is shown in Fig. 7, connected with the journal of the delivery-roll F. This regulates the friction which is applied to hold the music-sheet taut, so that it shall also be proportionate to the air-tension and not disturb the regularity of the time. This may be used without the device e^3, g, if desired, answering a double purpose, both as the music-sheet holdback and the retarding regulating-friction of the motor.

For playing long pieces of music, the music-sheet roll is of such size that its diameter is so much changed as the unrolling progresses that there is a perceptable change in the power required for unrolling and taking up on the take-up roller. In order that this shall not affect the regularity of the time of the motor, I apply a compensating friction to the surface of one of the rolls or to some other point of the apparatus which is affected by the change in size of the roll. In Fig. 7 a spring, s^4, having attached to it a presser, which bears against the surface of the roll of music, is shown for this purpose. A side view is shown in Fig. 7^a. As the roll diminishes in size, the pressure of the spring diminishes, which compensates for the greater power required to unwind the roll.

For the greatest accuracy, when desirable, instead of applying the spring-pressure, I produce a change in the power of the holdback device $e^2\ n$, which will correspond with the change in the diameter of the roll of music. This I do by substituting for the spring and presser s^4 a lever, which is applied either to shift the fulcrum of lever n or to operate a small vent-valve connecting with pneumatic e^2. The application of lever and vent-valve is shown in Fig. 7^b. The vent-tube l^4 leads to the pneumatic e^2.

Above the rear ends of the manual key-levers is a table extending from end to end of the manual key-board, and attached firmly to the case of the instrument. This table forms the base upon which are arranged the motor-controlling keys 1 2 3 and expression-keys 4 5 6, as shown in Fig. 7. Through an opening in this table, projecting upward, is the pneumatic "tracker-range" or tubular rest, upon which the music-sheet travels to mechanically operate the instrument. This tracker-range is attached to the instrument or to the table, and firmly fixed in position.

In order that the music-sheet may not run crookedly, and may properly pass from one roller to the other, it is necessary that the tracker-range or tubular rest, over which the music-sheet travels, and both rollers be in perfect parallelism.

It is very difficult to make the adjustment on the table of the instrument. I therefore attach the supporting-bearings for the rollers to a base only sufficiently large to receive them, and on this base carefully adjust and line the rollers away from the instrument. Through this base is an opening somewhat larger than the pneumatic tracker-range, so that the base can be placed on the table and surround the tracker-range, and be sufficiently movable to bring all the parts in line. This base is held to the table with screws, and the holes for the screws through the base are made larger in diameter than the screws and washers placed under the screw-heads, to allow for adjustment of the base. With this construction a new adjustment may be made at any time to compensate for warping, shrinkage, or swelling of any part affecting the movement of the music-sheet.

The music-sheet motor, as thus far described, is constructed to produce invariable metronome time, as indicated by the pointer a of the metronome R. It is desirable to be able to vary this time at will for accelerando, rallentando, or hold, according to the taste of the performer, which may differ from the arrangement in the music-sheet. For this purpose I use the finger-keys 1 2 3. These operate valves $a^2\ a^3\ a^4$, as shown in Fig. 8. The valve a^3 is a tip-valve, and serves to close the port of the metronome-valve a' for producing a hold, as when its key is fully depressed it cuts the exhaust instantly off from the motor-wheel. If slowly and partially depressed, a rallentando is produced. The valves $a^2\ a^4$ open ports of different sizes from the upper into the lower chamber, and produce an accelerated movement, one greater than the other when fully depressed. When depressed gradually, the movement is gradually accelerated. By different combinations of the three keys six accurate and sudden changes may be produced. By the addition of one or two more keys a much greater number of combinations may be made, if desired; but three keys are found to be practically sufficient.

The keys 4 5 6 7 8 at the right of the music-sheet, Fig. 7, connect with the expression-pneumatics of the instrument.

I do not herein claim the combination with the bellows of the pneumatic motor and the sheet-winding devices, the same being contained in my application filed October 24, 1885. Serial No. 180,845.

What I claim as my invention, is—

1. The combination, with the operating-keys or tracker-range, of a grooved board forming the base of the action and two or more supplemental grooved boards attached thereto, contained within the valve-chamber of the organ, the several supplemental grooved boards provided with pneumatic motors connected with and for operating the valves of the sounding devices.

2. The combination, with the operating-keys or music-sheet tracker-range and a main grooved board, of two or more supplemental grooved boards attached to the main board contained within the air-chamber of the organ, pneumatic diaphragms in connection with the grooves, and levers operated thereby, connected with and working the valves of the sounding devices.

3. Pneumatic motors connected with and to operate valves of sounding devices, and also constructed and arranged to operate pneumatic valves for controlling supplemental pneumatic motors for working the valves of additional sounding devices.

4. The pneumatic action consisting of an air-chest with a grooved board or grooved boards contained therein, the grooved board or boards having pneumatic motors attached to both sides thereof.

5. The pneumatic action consisting of an air-chest with a grooved board or grooved boards contained therein, the grooved board or boards having pneumatic motors connected to both sides thereof, and connecting in alternate order with valves of sounding devices.

6. The main grooved board having the music-sheet tracker-range and finger-key valves, both connecting with the grooves thereof, in combination with a supplemental grooved board or grooved boards contained within the wind-chest, and having pneumatic motors attached thereto for operating the valves of the sounding devices.

7. The combination, with an organ-reed, of a reed-cell for a single reed, the cavity having two parts, the outer part larger in diameter than the other, substantially as and for the purpose specified.

8. The reed-cell for a single reed formed of two parts, one of greater diameter than the other, one of the parts having an orifice at a distance from the mouth of the cell opening through its wall to the external air.

9. The combination, with the take-up roller for the music-sheet, of a wind-wheel inclosed in a drum or chest and operated by means of the exhaust of the organ.

10. The combination, with the take-up roller for the music-sheet, of a wind-motor having valves for controlling its motion and finger-keys for operating the valves.

11. The combination, with the take-up roller for the music-sheet and a wind-motor therefor, of an adjustable valve for the movement of the motor and an additional valve for closing the port to produce a temporary "hold" in the music.

12. The combination, with the take-up roller for the music-sheet and a wind-motor therefor, of a group of finger-keys for varying the movement of the motor, substantially as specified.

13. The combination, with the take-up roller for the music-sheet and a wind-motor therefor operated by means of a bellows, of a compensating pneumatic governing device operated by means of the air of the same bellows, and constructed to regulate the movement of the motor under variable air-tension by producing a compensation between the applied force and the required power.

14. The combination, with the take-up roller for the music-sheet, of the governing pneumatic and a friction device for applying a retarding friction to the take-up roller proportionate to the variable tension of the air of the bellows with which the pneumatic is connected.

15. The combination, with the take-up roller for the music-sheet and a retarding friction device, of a pneumatic and an adjustable lever for adjusting the power of the pneumatic under any given air-tension to the desired amount of retarding friction.

16. The combination, with the delivery-roller for the music-sheet or music-sheet spool, of a pneumatic and a retarding or holding-back friction device.

17. The combination, with the delivery-roller for the music-sheet or music-sheet roll, of a holdback device constructed to change its holding-back tension in proportion to the change of the size of the roll to compensate for the changes in the amount of power required to unwind the roll.

18. The combination, with the music-sheet and delivery roller or spool therefor, of the self-adjusting spring-friction device, constructed and arranged to change the tension according to the change in size of the roll of music.

19. The combination, with the music-sheet and delivery roller or spool therefor, of a pneumatic holdback device and a valve for the pneumatic, which valve is operated by means of a device having surface-contact with the roll of music for changing the tension of the pneumatic in proportion to the decrease in the size of the unwinding-roll.

20. The combination, with the pneumatic holdback device and regulating-valve therefor, of operating mechanism having surface-contact with the roll of music, and having proportionate movement to the decrease in diameter of the unwinding roll of music.

21. The combination, with the music-sheet rollers and their supporting-bearings, of a base, the whole forming a rolling apparatus removable from the instrument, and adjustable on the instrument relatively to the seat on which the music-sheet rests, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

MERRITT GALLY.

Witnesses:
ROBT. A. GALLY,
A. HEWITT.