



A.D. 1844 N° 10,041.

Concertinas and other Musical Instruments.

WHEATSTONE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CHARLES WHEATSTONE, of Conduit Street, Hanover Square, Esquire, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Eighth day of February, in the seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Charles Wheatstone, Her especial licence, full power, sole privilege and authority, that I, the said Charles Wheatstone, my exors, admors, and assigns, or such others, as I, the said Charles Wheatstone, my exors, admors, or assigns, should
10 at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, my Invention of "IMPROVEMENTS ON THE CONCERTINA AND OTHER
15 MUSICAL INSTRUMENTS, IN WHICH THE SOUNDS ARE PRODUCED BY THE ACTION OF WIND ON VIBRATING SPRINGS;" in which said Letters Patent is contained a proviso, that I, the said Charles Wheatstone, shall cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in
20 part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Charles Wheatstone, do hereby declare that the nature of my said Inven-

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tion, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, and to the figures and letters marked thereon (that is to say):—

The object of the present Patent refers solely to improvements in that class 5 of musical instruments in which the sounds are produced by the action of wind on vibrating springs or tongues placed over apertures, so that they may vibrate within or through such apertures without touching their sides. A former Patent for improvements in musical instruments of this class was granted to me on the Nineteenth day of June, One thousand eight hundred 10 and twenty-nine, and in the Drawings attached to the Specification thereof, enrolled on the Nineteenth of December, One thousand eight hundred and twenty-nine, was represented a musical instrument in which the wind was caused to act on the springs or tongues by means of a bellows moved by the two hands, and in which the notes of the instrument were commanded at the 15 pleasure of the performer by a peculiar disposition of the finger stops, which regulated the openings of the various valves covering the apertures in which the springs or tongues vibrated. This musical instrument has since been named the concertina, and is generally known by that designation; but as it has undergone many important improvements since the date at which the 20 Specification was enrolled, in order clearly to indicate the new improvements, which form the subject of the present Letters Patent, and to distinguish those improvements from those which are already before the public, I shall commence with describing the concertina in its present complete form.

Figure 1 is an external view of the right-hand side of the instrument, shew- 25 ing the bellows, the disposition of finger stops, with the notes of the musical scale which they govern, marked on them, and the thumb and finger pieces by which it is held. Figure 2 shews the disposition of the finger stops for the left-hand sides of this instrument. Figure 3 shews the internal arrangement of the valves, and the manner in which they are connected with the finger 30 stops. The Figure shews only that of the right-hand side of the instrument; the left-hand side is so similar as to render it unnecessary to be represented. Figure 4 shews the arrangement of the cavities in which the tongues or springs are placed, so that the wind may be caused to act upon them or not, according as the corresponding valve is open or shut. There are two tongues, *a* and *b*, 35 to each cavity; one, *a*, is fixed withinside the cavity, and the other, *b*, on the outside, within the bellows; the former sounds when the wind is drawn in by the bellows, and the latter sounds when the wind is pressed out from the bellows. Small leather valves *c* are attached to each aperture, so that when

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the wind is pressed out none of the air passes through the aperture, through which it passes when the wind is drawn in, and vice versa. Figure 5 is a section of the instrument; and Figure 5^a represents the parts of a key of the instrument. *d* is a lever, having a motion on the pivot *e*; to one end of the 5 lever is attached the disc or valve *f*, which covers the aperture of the cavity in which the tongue or tongues are placed. This disc is formed of leather or felt, covered on its under side with goldbeater's skin, and by its flexible attachment to the collar of hard leather *g* has a kind of universal motion, which allows it to bed itself air-tight on the surface beneath. The other extremity 10 of the lever is inserted loosely in the cylinder *h*; this cylinder, which forms the touch or finger stop, works parallel, being guided by the hole in the front board, and by its lower narrower extremity working in a hole in the board to which the keys are fixed; a grasshopper spring *i* keeps the key closed, when the touch or cylinder *h* is not pressed. The instrument is held by placing the 15 thumb in the loop *j*, and the third and fourth fingers against the finger plate *k*, leaving the first and second fingers free to act on the touches or finger stops; but occasionally, for the purpose of facilitating the fingering of particular passages, the third finger is also employed. The bellows is moved backwards and forwards by the action of the arms, whilst the fingers act on the finger 20 stops. The finger stops are arranged in four rows, the two middle rows being restricted to the notes of the diatonic scale, whilst the two external rows are appropriated to the flat and sharp notes. It will be seen that each flat or sharp note is placed by the side of its corresponding natural note, so that to substitute the former for the latter the finger has merely to move a little out- 25 wards. The notes of the scale are placed alternately on each side of the instrument; all the notes written on spaces being on the right side, Figure 1, and all those written on lines on the left-hand side, Figure 2. By this arrangement, to perform a diatonic scale in any key the first and second fingers of both hands only are needed, and no crossing of the fingers ever occurs. The 30 instrument represented in the Drawings has a compass of two octaves and a half; some, however, are made with a greater and some with a less compass, to suit the taste and abilities of the performer. The instrument above described is called the double-action concertina, because two springs or tongues are employed for each note, so that the same note is sounded, whether the 35 bellows be pressed in or drawn out, as before explained. The single-action concertina has only one spring or tongue for each note, and the sounds can be produced only when the bellows is moving one way, for instance, when it is pressed. In this case, in order that the bellows shall collapse instantaneously, it is provided with a self-acting valve, which closes itself while the bellows is

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being pressed, and opens itself to admit the external air whilst it is being expanded. This valve is represented at *l*, Figure 6; it occupies the centre of the partition in which the cavities containing the tongues are placed.

Having now described the concertina in the most improved forms in which it has been already before the public, I shall proceed to describe the new 5 improvements, which form the subject of the present Patent.

My first improvement consists in several new arrangements or dispositions of the touches or finger stops, by which certain advantages, peculiar in each instance, are obtained with regard to the execution of passages and combinations of chords. The first arrangement is shewn at Figure 7, A being the 10 right, and B the left-hand side; the upper notes are on the former and the lower notes on the latter. The stops are arranged in parallel rows of four each, which incline upwards from left to right. The notes are thus arranged, that by employing the four fingers the chromatic scale or the diatonic note in any key may be performed without any crossing of the fingers. It will be 15 observed, that three parallel rows include all the notes within the compass of one octave, and that the fingering of every octave on both sides of the instrument is exactly the same; this simplicity renders the scale of the instrument very easy to be learnt. A concertina with this arrangement of the finger 20 stops is peculiarly adapted to the performance of duets, or two-part music, the first part being played by one hand and the second part by the other. To facilitate this object, and to make the two sides more like independent instruments, some notes of the middle part of the scale may be made common 25 to both sides, so that they may be taken either by the right or the left hand, at pleasure. In the Figure one entire octave is represented as being common to both sides of the instrument. C², C³, C⁴, C⁵, indicate the octave to which the note C belongs.

The second arrangement is represented at Figure 8; it resembles the preceding, in so far that the upper notes are on one side of the instrument and the 30 lower notes on the other, and that the notes on each side follow each other in the regular sequence of the chromatic scale, the stops following each other from right to left, and the lowest row being considered the first. In this arrangement most of the major and minor common chords may be taken with a single finger, as in the ordinary fingering of the concertina. The stops are arranged in rows of four and three alternately, the stops of each alternate row 35 being intermediate to those of the rows above or below.

The third arrangement is shewn at Figure 9; in it also the upper notes are placed on one side and the lower notes on the other. It is as if the right and left-hand sets of finger stops of the ordinary concertina were brought to

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one side of the instrument and placed alongside each other, so that the alternate notes which were before on the opposite sides of the instrument are in the same horizontal line. In this arrangement, to perform a diatonic scale in any key, the four fingers are employed on the right-hand side; the first and second 5 fingers are employed for the notes written on lines, and the third and fourth fingers for those written on spaces. The arrangement of the touches or finger stops, shewn at Figures 7, 8, and 9, are all such as to suit the instrument for the performance of the two-part music, the upper notes being on one side and the lower notes on the other; they are all represented as having the same compass 10 or extent of scale, and the two sides to have one octave of notes in common.

The fourth arrangement, represented at Figure 10, differs essentially from the preceding, and is not adapted, like them, for the performance of duets or music in two distinct parts. On the right-hand side all the notes of the diatonic scale of E major are arranged in four vertical rows, so that the finger 15 stops of any one row are intermediate in position between those of the adjacent rows and the stops of each alternate row are similarly placed. To perform the scale, the first, second, third, and fourth fingers are successively employed. On the left-hand side all the notes of the key of E flat major are similarly arranged. Thus, the scale of the key E with four sharps is performed on the 20 right-hand side of the instrument, and the scale of E with three flats is performed on the left-hand side, whilst to perform in any other key than these two, some notes of the scale are taken on one side of the instrument and some on the other. In this arrangement any major or minor chord whatever may be taken with a single finger. The common characteristic of all the arrange- 25 ments of touches or finger stops above described, as well as that of the ordinary concertina, is, that the diatonic scale can be performed by the progressive motion of the fingers without any crossing or abrupt transition. In the first and second methods above described the chromatic scale may also be thus performed as well as the diatonic scale.

30 And note: it will make no difference in the principle or essential peculiarity of any of the above arrangements if the touches or finger stops, described above as being on the right-hand side of the instrument, are placed on the left-hand side, and vice versa; nor if the arrangement of the stops be inverted, either in such manner that the bottom row on both sides be transferred to the 35 top, or the left-hand row on each side be transferred to the right.

My second improvement is applicable only to concertinas in which the arrangement of touches or finger stops is as represented in Figures 7, 8, and 9, that is, in which the touches corresponding to the upper notes are placed on one side, and those corresponding to the lower notes on the other

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side of the instrument. The object of this improvement is to enable the performer to give a different degree of loudness to each part, upper and lower, independently; it is effected by a partition, which divides the bellows into two parts, constituting in fact two separate bellows, each appropriated to its particular side; the position of this partition is shewn at Figure 11. When the 5 partition is prevented from moving, the performer can give different degrees of force to each side separately.

My third improvement consists in a method of constructing the concertina so that while the same mode of fingering is employed, and the portability of the instrument is preserved, bass or low notes may be substituted for high notes. 10 In order to produce low sounds, larger tongues or springs and more capacious cavities must be employed (and the size of the springs and the cavities in which they are placed must increase as their sounds are graver or lower); therefore, were the disposition of these cavities to remain the same as in the treble concertina, the dimensions of the instrument would become inconveniently large. 15 To overcome this difficulty I have recourse to the following expedient:— Instead of making the case of the instrument a circle, or a polygon with equal sides, and arranging all the cavities round a central space, I make it oblong, and place the space round which the cavities are arranged much nearer one end than the other; the cavities for the low notes may thus be made much 20 longer than they otherwise could be, and considerable space is gained by having no greater length for the higher notes than is necessary. This arrangement is represented at Figure 12. It will be observed that the depths of the cavities are also less for the higher notes than for the lower; this is effected by the board on which the tongues are fixed being inclined to the board which con- 25 tains the apertures of the valves. This is further shewn at the section, Figure 13^a.

It has been explained above, that in order to enable the same note to be sounded on the double-action concertina, whether the bellows be pressed in or drawn out, two tongues or springs turned in unison with each other are so placed that the same valve prevents the passage of the wind through both; 30 but when the valve is opened, on account of the manner in which the tongues are placed, one of them sounds when the wind passes in one direction and the other sounds when the wind passes in the opposite direction.

The object of my fourth improvement is to effect this purpose by means of a single tongue or spring, directing the wind in such manner by a particular 35 construction of the cavity in which the tongue is placed, and by the employment of self-acting valves, that a single tongue shall always sound in whichever direction the bellows is moved. Figure 13 represents this disposition for a single note, but the cavities of all the notes in the instrument are to be

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similarly constructed. A side of the cavity is supposed to be removed to allow the interior thereof to be seen. p is a partition, which divides the cavity into two compartments; in the side of this partition is an aperture, over which the tongue a is placed. There are two external apertures x to each
5 compartment, one at the top and the other at the bottom, which are provided with self-acting flap valves of thin leather; the valves of the compartment b are inside, those of the compartment c are outside; the key or valve d is placed so as to cover the upper apertures of both compartments. By this arrangement, whether the current of air be driven from or enters into the bellows, it passes
10 through the aperture in which the spring is placed always in one direction. Figure 13^a shows the direction of the wind in the two cases.

The object of my fifth improvement is to enable the notes of the concertina to be tuned at pleasure, by which its pitch may be adapted to that of any other musical instrument which it may be required to accompany, or certain notes
15 may be altered at will to render the instrument more perfectly in tune for the key in which a piece of music is to be performed. The pitch of a tongue or spring varies with its length, therefore any means by which the effective length of the tongue may be varied at pleasure will enable this object to be attained. One of the means I employ is represented by Figure 14. a is the tongue
20 fixed to the plate x ; b is a sliding block of metal, which, by means of a projection fitting the aperture, bears against the under face of the spring near its fixed end. This sliding block is connected by means of a stout pin, with another block or piece c , which bears against the upper face of the spring; a slit cut in the plate allows the pin to move backwards and forwards, but this
25 slit is kept air-tight by the close fitting of the block b , which is sufficiently large to cover the aperture. The blocks b and c are moved by means of a screw rod d , the end of which passes through an air-tight fitting to the outside of the instrument, and is squared, so as to admit of being turned like a key like that of a watch. The effective length of the spring is determined by the
30 position of the two extremities of the sliding pieces, and is lengthened or shortened, according as the screw is tuned to the right or to the left. Figure 15 represents another method of effecting the same purpose, in which the opposite edges of the spring are pressed against instead of the opposite faces. The Figure represents several views of the tongue and tuning apparatus, and also
35 the separate parts of the same. a is tongue; x is the plate to which it is fixed; b , the fixed nut, through which the screw passes to fasten the tongue to the plate; c , a screw screwed into the nut b ; the other end of the screw is squared to admit of its being tuned by a key. e is the fork or clamp, which acts upon the tongue by pressing on its edges; it is drawn backwards and

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forwards by means of a collar C on the screw *c*, and its position thus varying with respect to the nut, the effective length of the tongue *a* is necessarily changed.

Figure 16 represents my sixth improvement, being a new and different mode of constructing the key shewn at Figure 5^a. Instead of the lever *d* having a hole in A, and working on a pivot or axis, it passes through a bridge or support *b*, and is prevented from moving backwards and forwards by means of a notch cut in the upper part of the lever (but it is no manner attached to the bridge, and is also prevented from moving downwards by the upward pressure of the spring *i*. By this construction the lever can be instantly detached from its bearing to be examined, and the workmanship required is less. 10

The preceding improvements all refer exclusively to the concertina; but the following are of more general application, being suitable to a variety of musical instruments in which the sounds are produced by the action of wind on freely-vibrating tongues. 15

My seventh improvement consists of a means of setting a tongue or spring into immediate vibration by means of a mechanical impulse at the same instant the wind is admitted to act upon it. A quality of tone is thus produced which is not unlike that of the harp when the sound is of short duration. Figure 17 shows several views of the apparatus for effecting this purpose. 20
a is the tongue, fixed to the plate *b*; *c* is a lever, moving on the fixed axis *d*, and is borne upon by the spring *i*; to the lever *c* is hinged the finger or catch *e*, to which is affixed the stud *x*. This finger or catch is caused to take hold of and pull the end of the tongue *a*, and it is always borne outwards by the spring *f*. A small inclined surface *g* (which rests against the slotted guide *l*) 25
is carried by the spring *h*, the object of which is to act upon the stud *x*, as hereafter described. *k* is the communicating cord or wire, which enables the lever to be acted upon by the key. The operation of this apparatus is as follows:—The lever *c* being pulled, the stud *x* is borne against the inclined surface *g*, and causes the tooth at the end of the finger *e* to pass under the tongue *a*. The further motion of the lever *c* causes the tooth to pull the tongue 30
a, until it is released therefrom by the stud *x* coming against the side *m* of the guide *l*, and the tongue is thereby set into vibration. The spring *f* now forces the finger *e* outwards, and when the lever *c* returns, the stud *x* passes between the inclined surface *g* and the side *n* of the guide *l*, and thus avoids touching 35
the tongue *a*. The finger *e* is thus again placed in the position to be acted upon by the key when required. A stop of notes thus constructed forms a very pleasing variety in keyed instruments of that class to which the seraphine, harmonium, æolian, organ, &c. belongs.

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My eighth improvement consists in a means of modifying and ameliorating the tones of freely-vibrating tongues or springs by placing resonant tubes over them, which tubes are closed at the ends the most remote from the tongues, and their lengths so adjusted as to resound only to the sound of the tongues
5 over which they are placed. Figure 18: *a* is the tongue or spring, acted upon by a current of air, as in the æolian, organ, harmonium, seraphine, and other keyed instruments of a similar description; *b*, the tube, the section of which may be either circular, square, or of any other form; *c*, a plug or piston, by which the length of the column of air within the tube is accurately adjusted to
10 the tongue. The open end of the tube is perfectly free from the tongue or plate on which it is fixed. The effect of a tube thus adjusted and placed, in which the free air is between its open end and the tongue, is very different from that of a tube the end of which is furnished with a similar tongue which vibrates immediately in contact with the air within the tube without any
15 intervening free air. In the former case the tongue always maintains the same pitch, but is modified in quality according as the column of air is more closely unison with it; in the latter case the tongue and column of air become a compound system, which mutually influence each other's vibrations.

Having thus described the nature of my said Invention, and the manner in
20 which the same is to be performed, I would have it understood that what I claim is,—

First, the modes of arranging the touches or finger stops of a concertina, as described in respect to Figures 7, 8, 9, and 10.

Secondly, I claim the mode of obtaining a different degree of loudness for
25 each side of the concertina independently, by applying a partition to divide the bellows into two parts, as herein described.

Thirdly, I claim the mode of arranging and constructing the cavities in which the tongues or springs are placed, represented by Figures 12 and 12^a,
30 by which a bass concertina may be made of more portable dimensions than by the mode of arrangement usually adopted in the treble concertina.

Fourthly, I claim the mode of constructing concertinas whereby the same tongue or spring is caused to sound whether the wind be driven out from or drawn into the bellows, namely, by means of a double passage valve applied to each tongue separately.

35 Fifthly, I claim the mode of varying at pleasure the pitch of a concertina by apparatus capable of altering the effective length of its tongues or springs.

Sixthly, I claim the arrangement of the lever and support of the key or apparatus for admitting the wind to act upon a tongue of the concertina, represented by Figure 16.

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Seventhly, I claim the applying apparatus to setting a tongue or spring into vibration, in addition to the action of the wind on that tongue.

And, eighthly, I claim the modifying and ameliorating the tone of a freely-vibrating tongue or spring by means of the resonance of a column of air in a tube tuned in unison with it, which tube is so placed that the free air shall 5 intervene between its open end and the tongue or spring.

En witness whereof, I, the said Charles Wheatstone, have hereunto set my hand and seal, this seventh day of August, in the year of our Lord One thousand eight hundred and forty-four.

CHARLES (L.S.) WHEATSTONE. 10

HORNE. AND BE IT REMEMBERED, that on the Seventh day of August, in the year of our Lord 1844, the aforesaid Charles Wheatstone, Esq^r, came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according 15 to the tenor of the Statute made for that purpose.

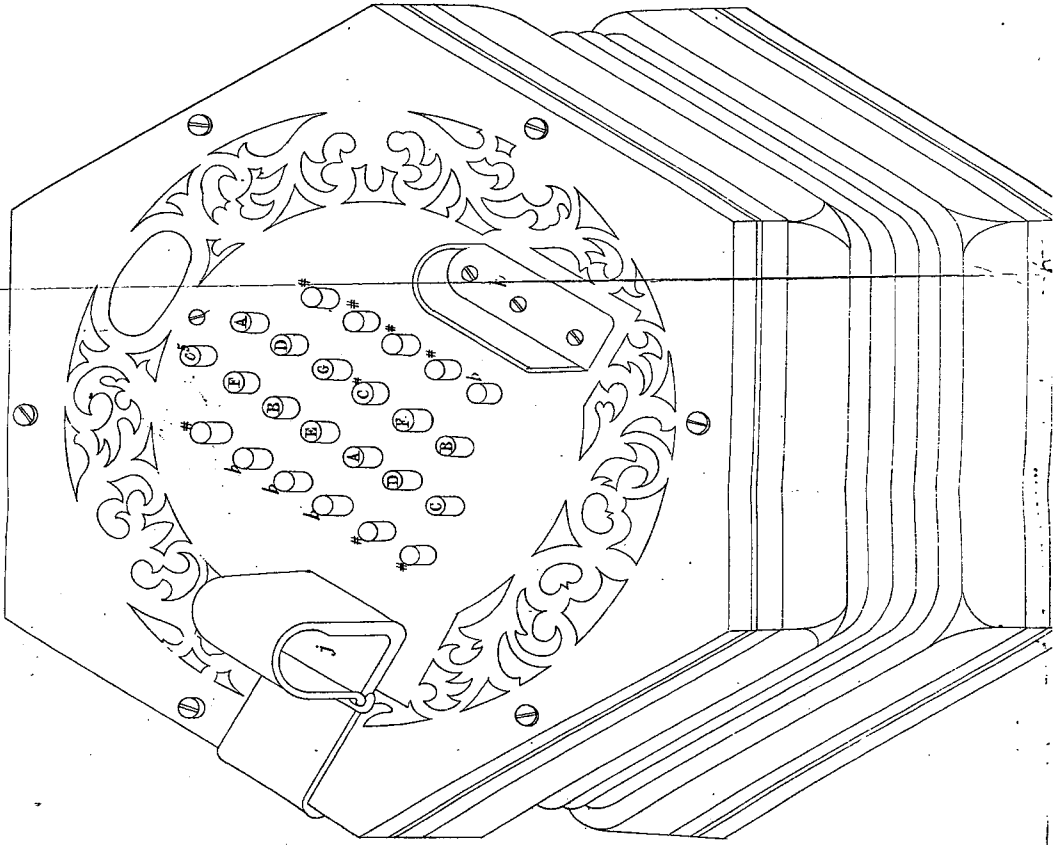
Enrolled the Eighth day of August, in the year of our Lord One thousand eight hundred and forty-four.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1856.

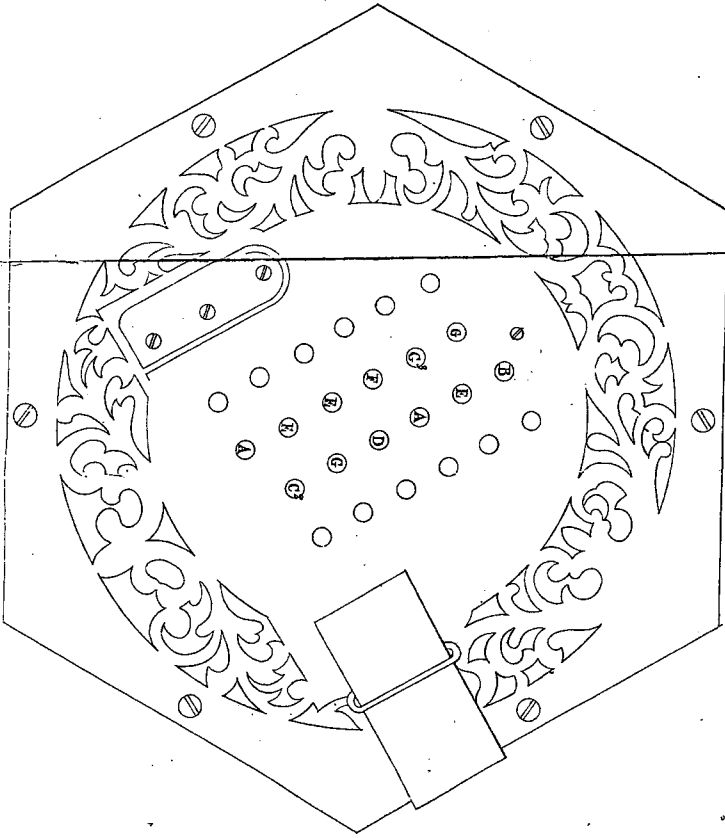
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WHEATSTONES SPECIFICATION.

FIG. 1.



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FIG. 2



The enrolled drawing is partly colored.

FIG. 3.

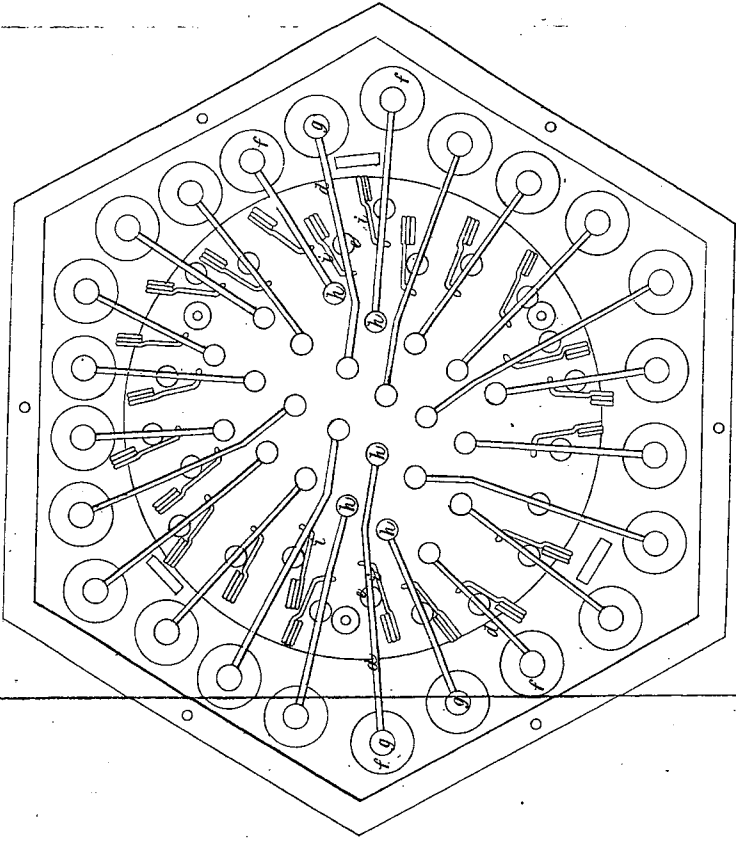
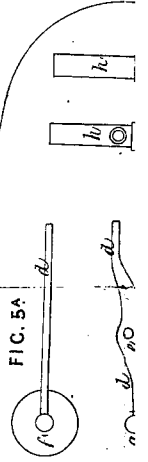


FIG. 5A



SHEET 1.
(3 SHEETS)

FIG. 4.

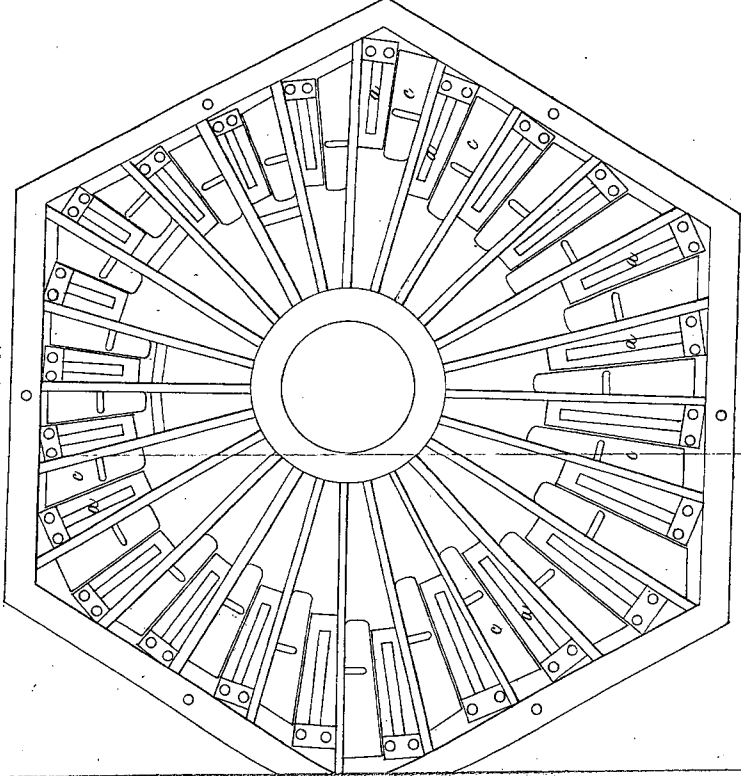


FIG. 5:

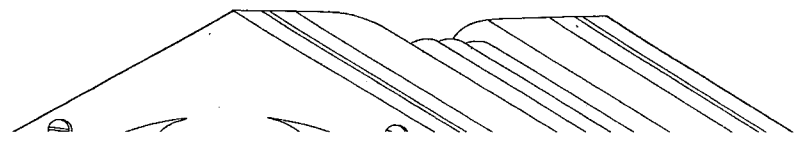
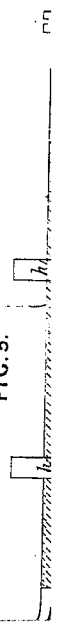


FIG. 5.

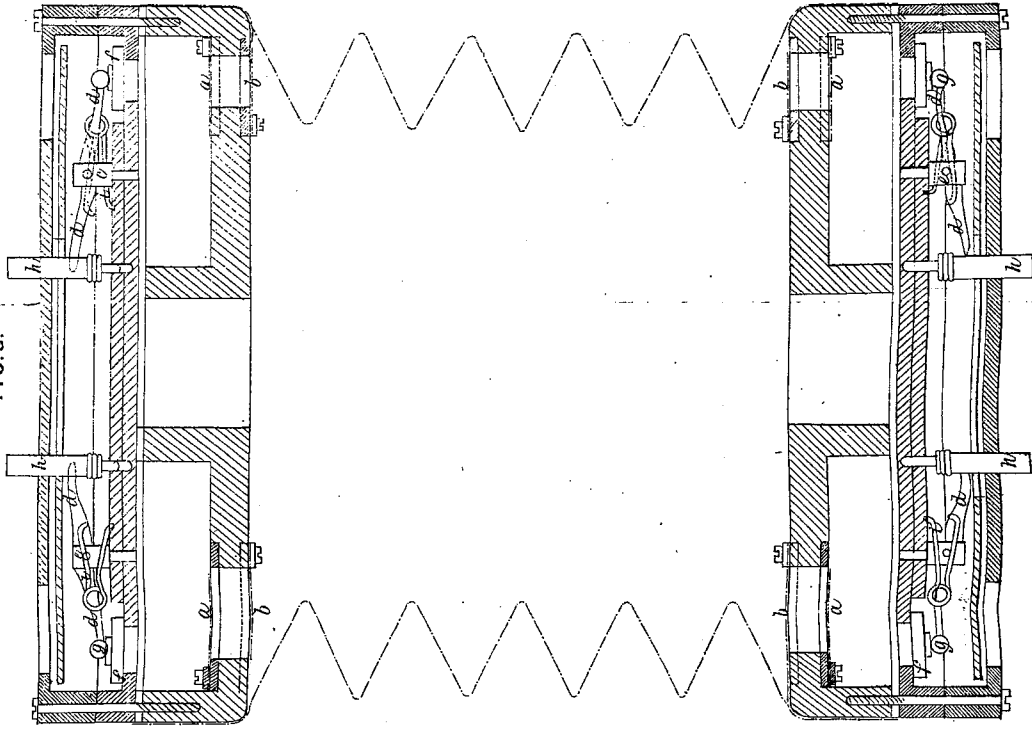
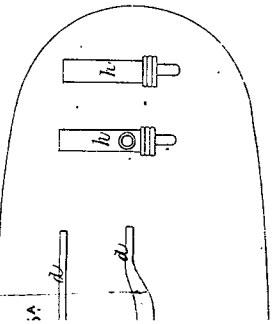
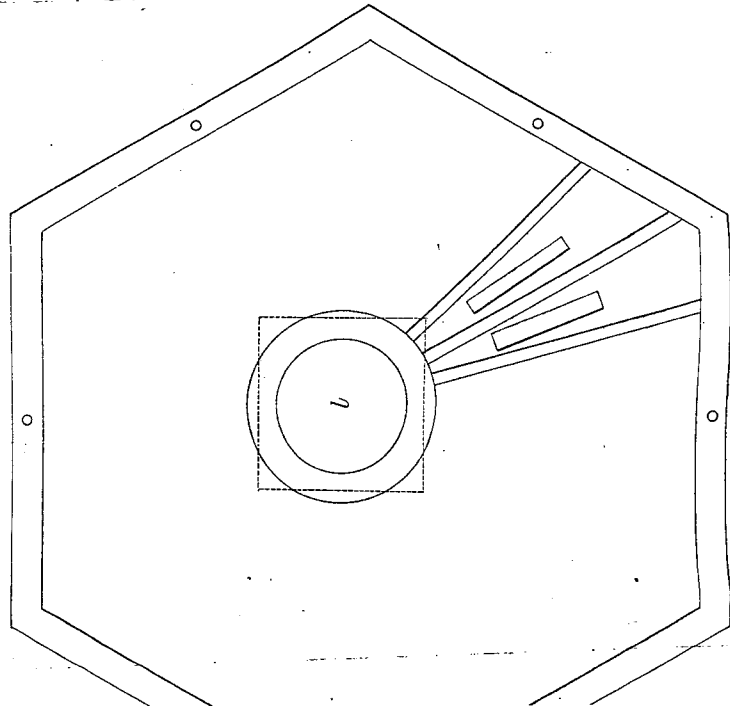


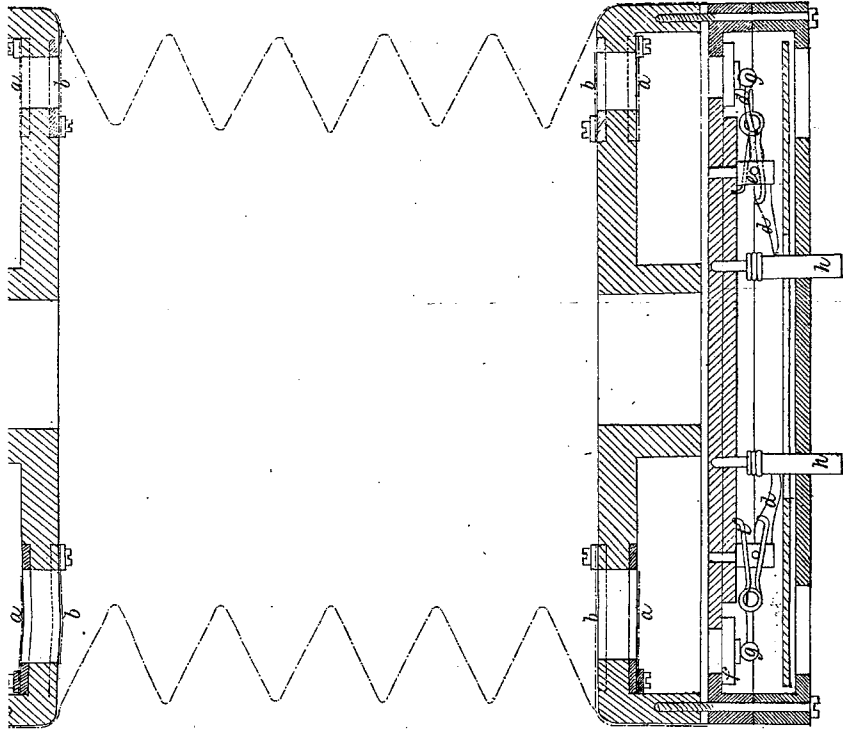
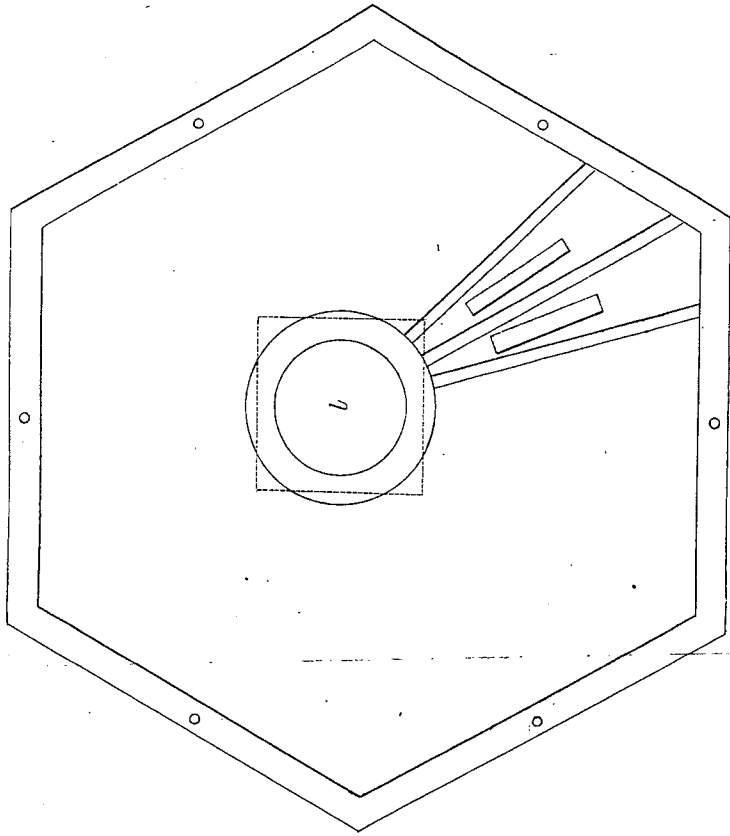
FIG. 6.



Drawn on Stone by Mally & Sons.

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FIG. 6.



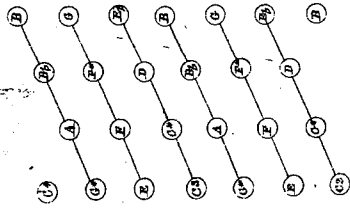
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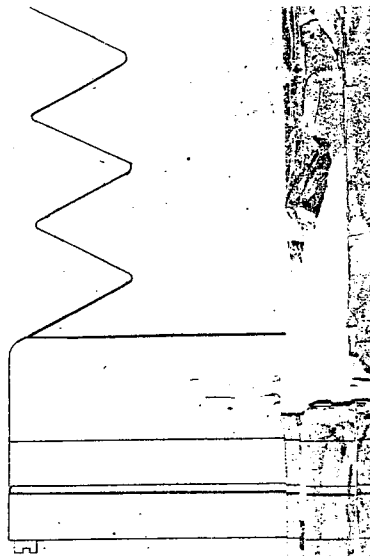
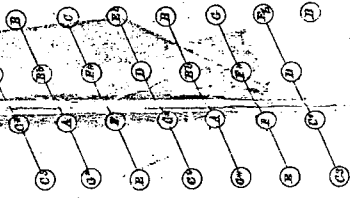
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FIG. 7

Left hand side



Right side



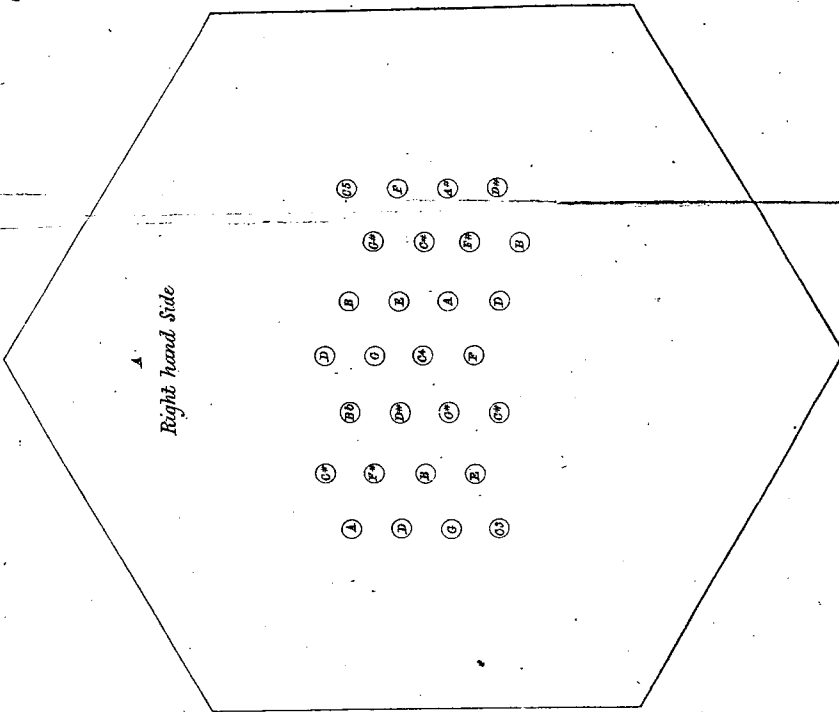


FIG. 8

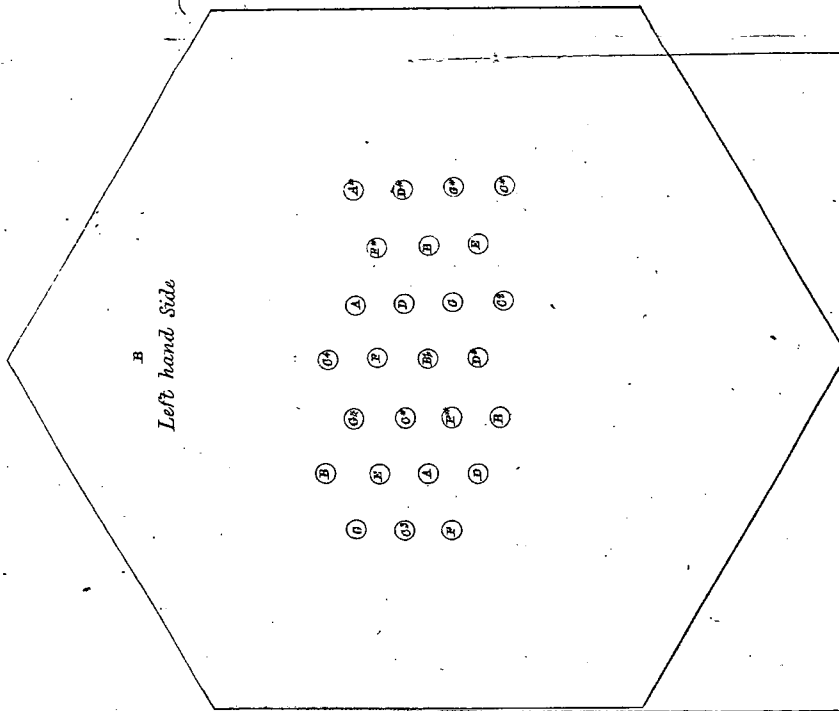
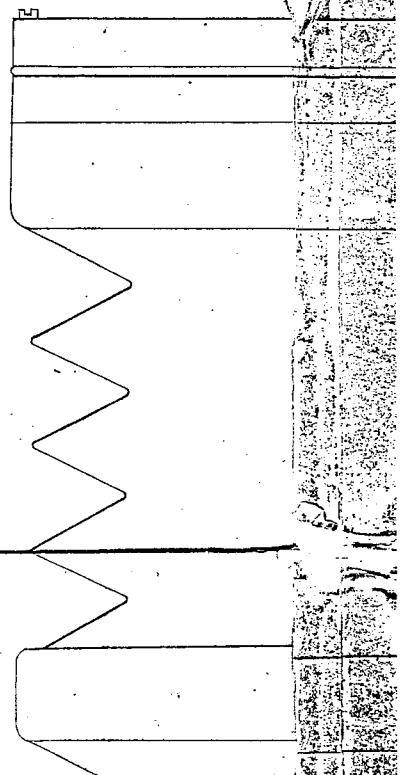


FIG. 11.



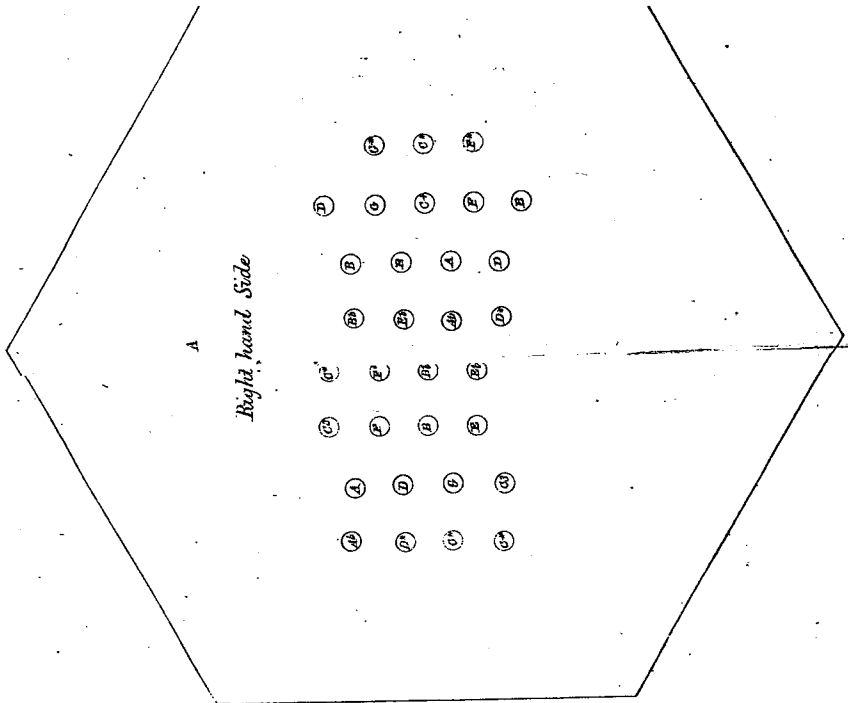
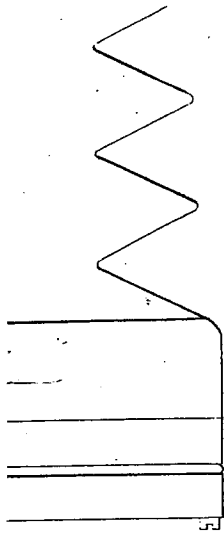
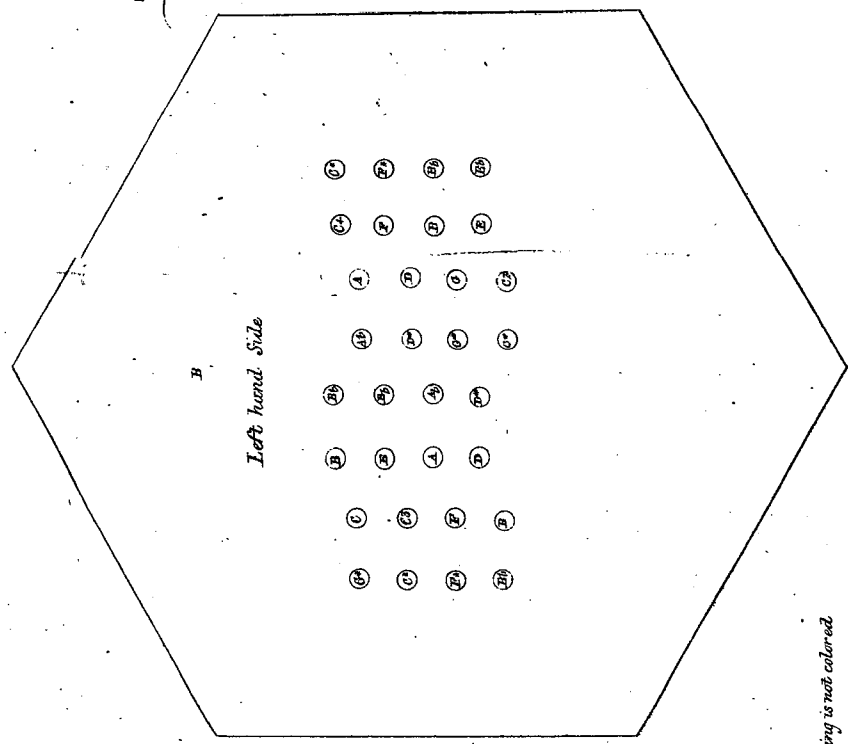


FIG. 9



The enrolled drawing is not colored

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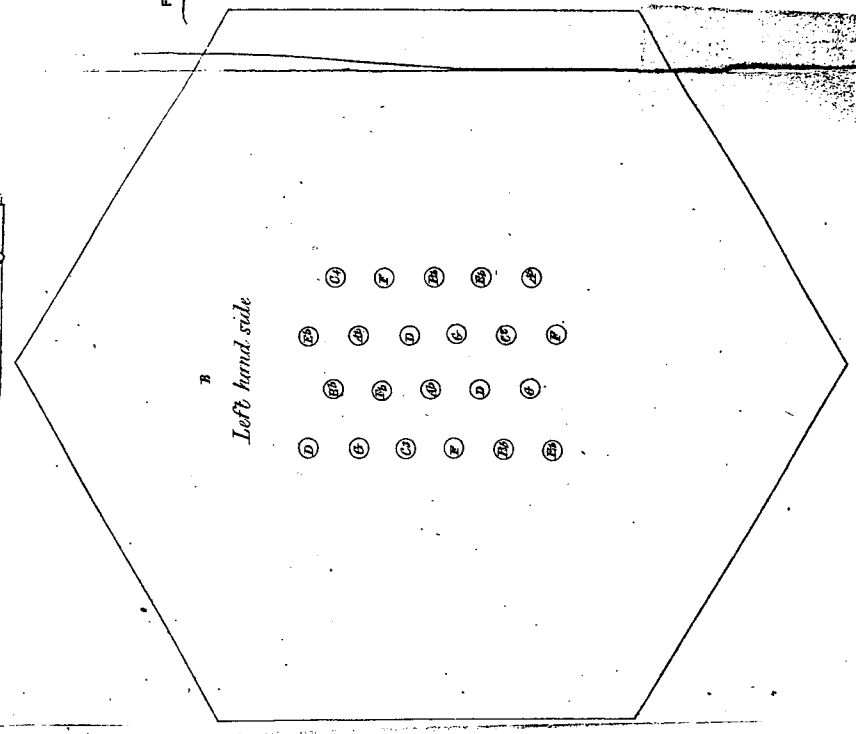
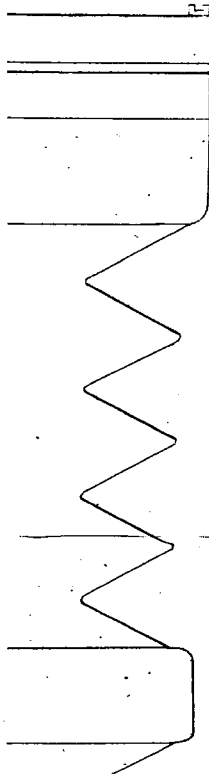
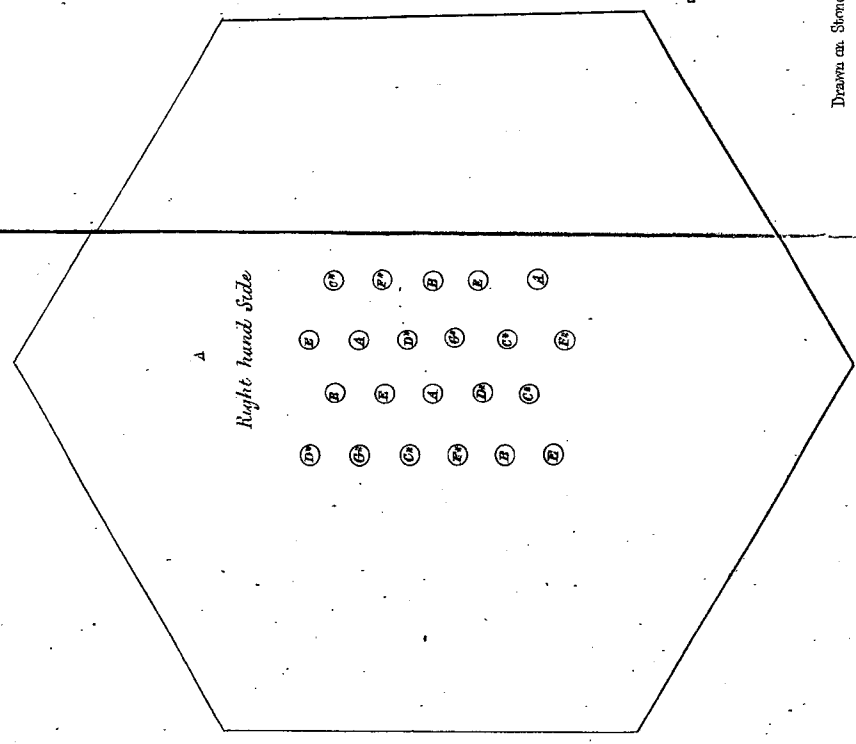
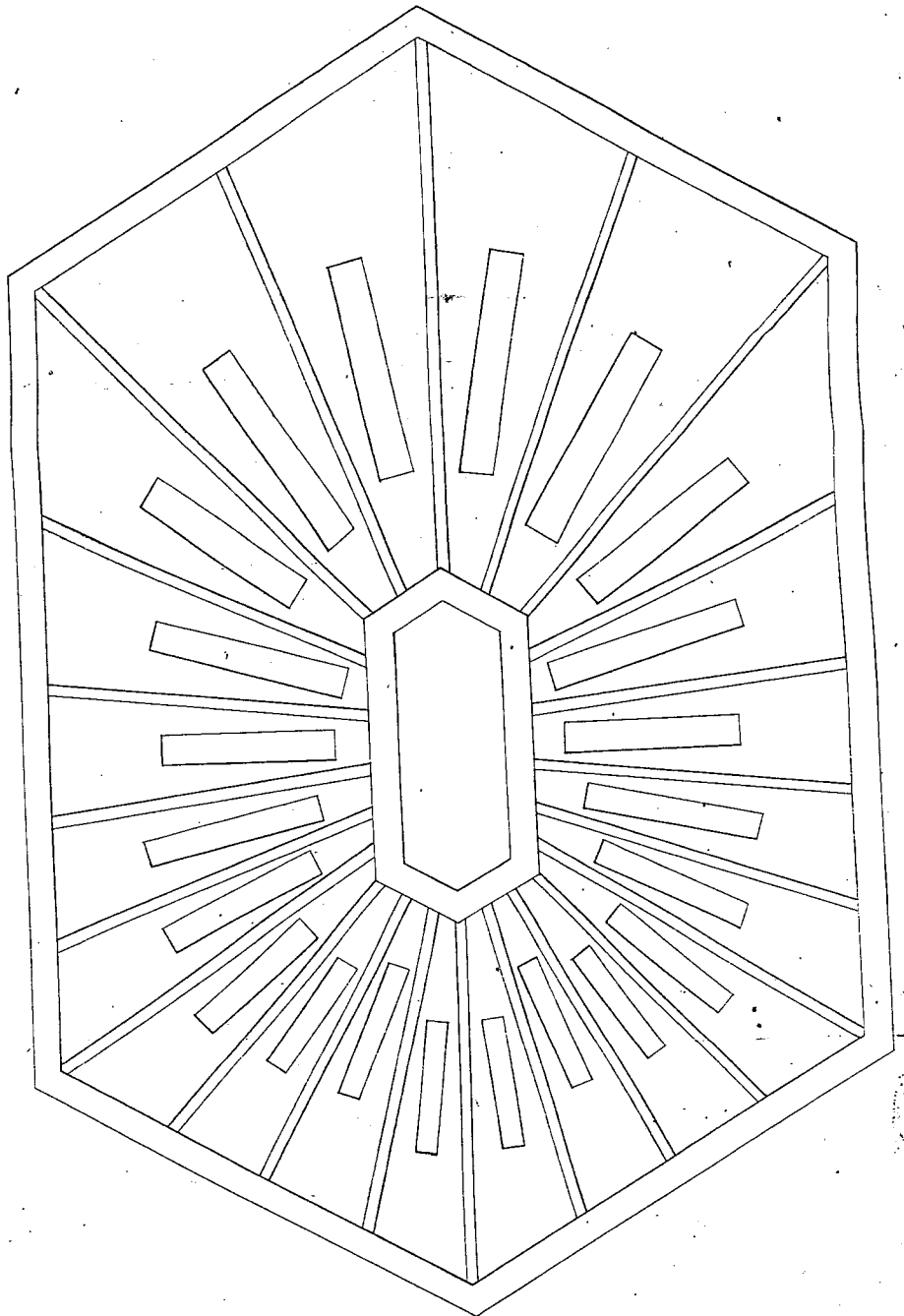


FIG. 10.



Drawn on Stone

FIG. 12.



2

3

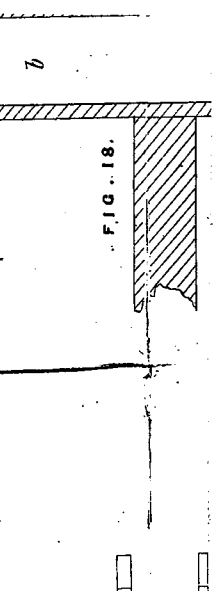
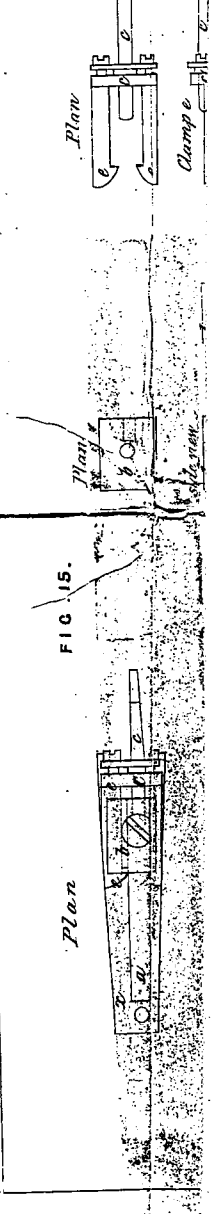
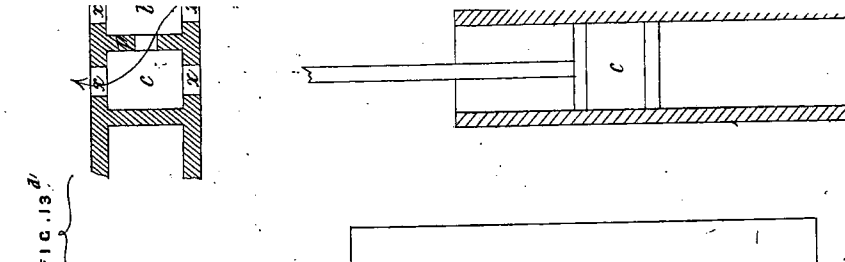
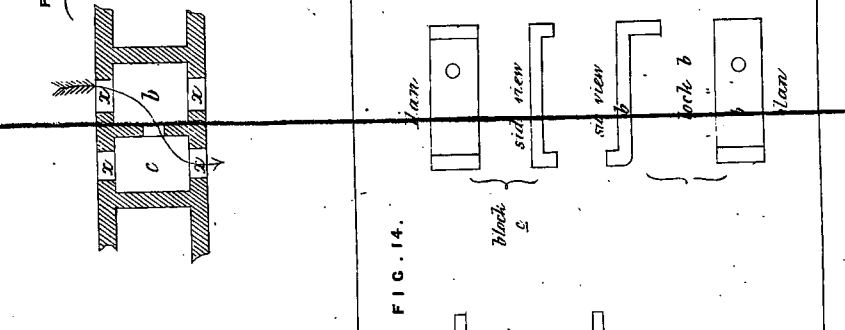
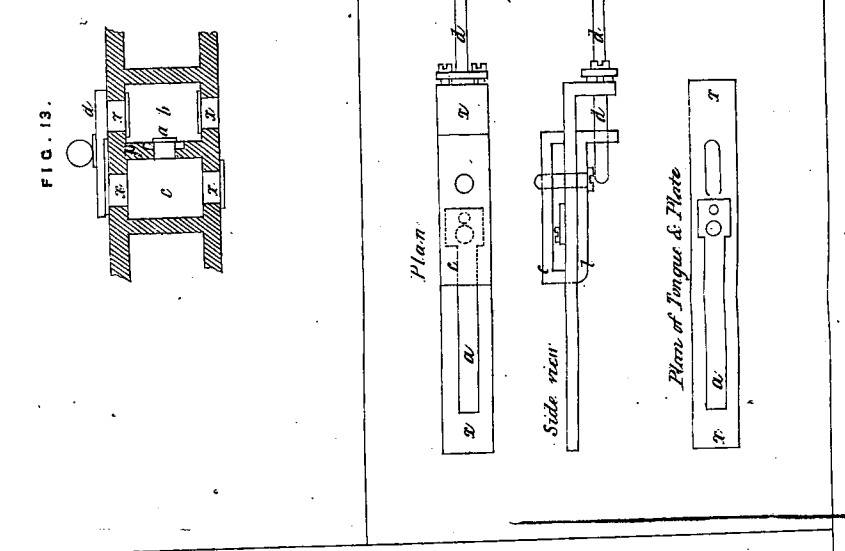
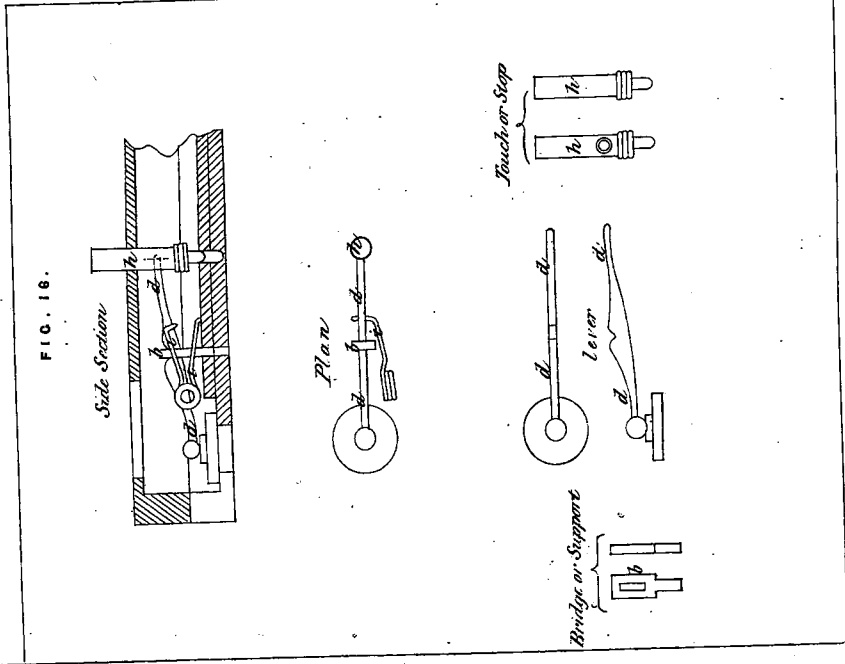


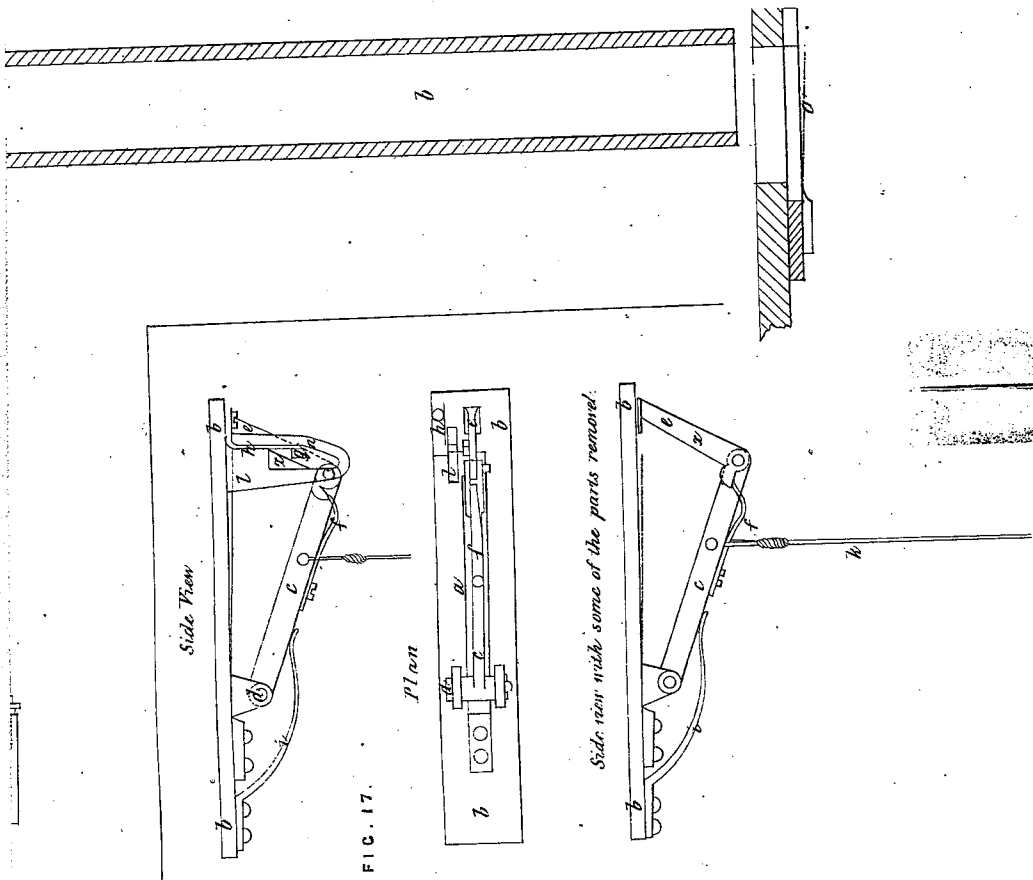
FIG. 12.



Drawn and Stamped by Malloy & Sons.

A. D. 1844. FEBY 8. N^o 10. 041.
 WHEATSTONE'S SPECIFICATION.





The engraved drawing is colored.

LONDON: Printed by GEORGE EDWARDS, FINE and WILLIAM SUTTONS, STURTISWOODS, 1856.