

mouth, with sliders or perforated slips of wood arranged under the inlets to the pipes in such a way as to shut off the air as desired by drawing the sliders or sliders in and out from the front, as here delineated in Fig. 2. This contrivance furnished really the origin of the modern valve, and was unquestionably a great step toward the perfecting of the instrument. The Hebrew "Magrephah," also shown by Kircher, had two bellows attached at the rear of the wind box and worked from behind (the antitype of our modern harmonium), by which means a fairly uniform current of air was obtained. The magrephah had ten notes, with ten pipes to each note, and it is spoken of as having stood in the Temple of Jerusalem.

In the Talmud the hydraulic organ is mentioned under the name of "hidraulic" or "ardablis," and several references could be added did space allow to show that windmill organs and hydraulic organs were well known as early as the 3d century. A 4th century organ is thus described by a Greek epigram, attributed to the Emperor Julian the Apostate, who died A.D. 363, in the following literal translation:

"I see a strange sort of reeds—they must, methinks, have sprung from no earthly but a brazen soil. Wild are they, nor does the breath of man stir them, but a blast leaping forth from a cavern of ox hide, passes within beneath the roots of the polished reeds; while a lordly man, the fingers of whose hands are nimble, stands and touches here and there the concordant stops of the pipes; and the stops, as they lightly rise and fall, force out the melody."

Theodosius, who died A.D. 395, erected an obelisk at Constantinople which has a sculptured representation upon it of an organ of great interest, and which we have here redrawn, because it illustrates a singular mode of giving weight to the bellows by men standing upon them, a method which was not unfrequently followed more than a thousand years later, as, for instance, at the old church of St. Ægidien, in Brunswick, which Prætorius illustrated in 1620, showing 20 bellows worked by ten men, each bellows having a wooden shoe upon it, the blowers holding a transverse bar and treading with their feet after the style of a treadmill. Julianus, a bishop of Spain in A.D. 450, says that organs were in common use in the churches of that country during his time, and in A.D. 666 Pope Vitalian introduced the organ into the services of the congregations, appointing also canonical singers. The Anglo-Saxons were acquainted, too, with its use, and as far back as the commencement of the 8th century the instrument was made and thoroughly appreciated in England.

Aldhelm, who died A.D. 709, tells us that organs at that time were ornamented with gilding. In the 9th century they became common in England, and English makers constructed their instruments with pipes of copper fitted in gilt frames. At Malmesbury Abbey, between the years 925-988, St. Dunstan erected an organ with pipes of brass, and gave another similar one to Abingdon Abbey, besides those provided by him in several other English churches.

Elwin gave an organ to Ramsey with copper pipes "and a far-resounding peal." The MS. Psalter of Edwin at Trinity College, Cambridge, furnishes an early instance of the instrument as it was then known. In the British Museum, in a Saxon MS. of the 11th century is a drawing of the "Bumbulum eum fistula aerea," with brass pipes, but having no keyboard. The "Bumbulum" in this respect is like that described by Monk Theophilus in his "Divers Arts," which was written in the early part of the same century. We here draw from "Thesaurus Diptychorum," by Gori, dated 1759, a copy which is there preserved of a MS. drawing of an old organ, said to be contemporary with Charlemagne. It shows a pneumatic organ, blown by two bellows, and, like the Theophilus one, played by sliders from the front. King David, in the original MS., is playing the harp or lyre, and singing psalms, while beside the organ he is accompanied by a trumpet, a sort of violin, and a set of bells. Wulstan, the monk of Winchester, describes the great organ set up in that cathedral by order of Bishop Elphege, who died in 951, and Wackerbarth, in his "Music of the Anglo-Saxons," gives a full translation of the monk's poem descriptive of it.\*

The first keyboard was employed at Madgeburg, at the close of the eleventh century. This organ had 16 keys, which were an ell long and 3 inches broad, as will be seen figured in Prætorius' "Theatrum Instrumentorum seu Sciagraphia," Wolfenbuttel, 1620. Harmony was then unknown, and plain chant did not require more than 9 to 11 keys, which was nearly their greatest extent. The spring box soon followed the introduction of keys, which at first were several inches wide, and were played on like carillons, as in Belgium, France, and Holland, by striking them with a sharp blow of the fist—"Clarions loud Knellis Portatives ad bellis."†

Dom Bedos mentions some of these early organs as having keys 5 inches or 6 inches wide, whence, according to Seidel, arose the expression "organ beater."

\* See Dictionary of Music and Musicians, by Sir George Grove, p. 578.  
† Poem of the "Houlate," 1450.

From Franchinus Gaffurius' "Theorica Musica," printed at Milan in 1492, we reproduce an engraving showing an organist performing on an instrument with broad keys, which is very interesting; and it also shows long and short keys combined on one manual. Besides this, as Hopkins points out in his work on "The Organ," "the peculiar interest of the drawing represents the player using both hands independently of each other; the melody—possibly a plain song—being taken with the right hand, which appears to be proceeding sedately enough, while the left seems to be occupied in the prosecution of a contrapuntal figure." Regals or Portative organs, from the Italian "Rigabello," were used to give out the melody of plain song. A representation of a very early instrument of this kind figures in Lucinius' "Musurgia" (printed at Strassburg, 1536), and showing bellows fixed in the rear part, worked like that which M. Paul de la Roche has painted in his fine picture of Ste. Cecile, illustrated by us to-day from Forster's splendid engraving. One angel holds the instrument while the other blows the bellows as the Saint chants and plays upon the keys. The little Italian organ which we have sketched from the Brussels Conservatoire is another somewhat similar example. It is beautifully inlaid with ivory, and is richly engraved with figure sculpture. The use of "Portatives" or "Regals" seems to have been almost universal, and frequent mention of them is made by old poets, as, for example, Gavin Douglas says:

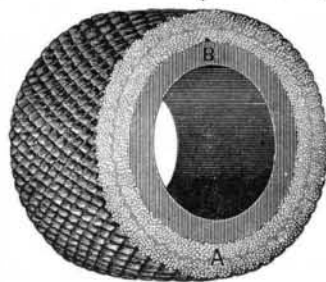
"On crowd lute, harpe, with monie gudlie spring,  
Schalmes, clariouns, portatives heard I ring."

At St. John's Church, Cirencester, and in the crosier of William of Wykeham at New College, Oxford, Regals are represented, showing the usual form then in use. The Italian chamber organ, drawn next to the last named specimen, is a curious and singularly pretty little instrument with painted doors, which open on rude cross-garnet hinges, discovering inside a boldly carved and foliated front, which is gilded with various golds in high effect. The body is black, relieved by natural colored woods for the mouldings and the legs. A drawer occupies a central place below the keyboard, and the lower part would make the instrument very difficult to sit at. It is, strictly speaking, a "box of whistles," as Sir Christopher Wren called Father Smith's organ at St. Paul's Cathedral.

Our last drawing represents by no means the least interesting subject of our various sketches. It shows an "upright grand piano." The instrument was made by Frederici de Gera in 1745, and it now belongs to the Brussels Conservatoire. The doors are nicely enriched with inlay veneer, and the center of the soundboard within the case is ornamented with a charmingly fret-cut rose, a detail of which figures by the side of the general view of the instrument. The total height of the piano is about 9 feet 6 inches. The keys are rounded, as shown by the detail sketch, reminding one of the manuals to the old organ in the church of St. Ægidien, in Brunswick, previously referred to, and which were, perhaps, the very first to foreshadow the modern keyboard, not only of our organs, but of our pianos also.—*Building News.*

#### COWEN STEAM HOSE.

An entirely new departure in steam hose is shown in the accompanying cut. The novelty lies in its being made with cotton jackets outside to hold a rubber tube



within. It depends for its strength to resist a bursting pressure upon the cotton jackets, A, which are woven with heavy filling threads running spirally the whole length of the hose. Thus it gets as great strength as marine-wound rubber hose, at less cost. The strength of rubber hose depends upon the adhesive power of the rubber between the different layers of duck, and after steam has run through it a short time the rubber between the plies begins to soften and give way. Then the hose swells or blisters and soon bursts. It is claimed that the "Cowen" hose cannot burst from this cause.

The "Cowen" hose has a lining, B, which is cured just enough to stick to the fabric strongly, and is thoroughly cured by the passing of the steam when in use. It thus has a much longer life than the ordinary steam hose, for when it gets cured to the point where the rubber hose is before being used, it will then have lasted as long as the ordinary rubber steam hose.

It is impossible to put such a tube into rubber hose, for you must cure the tube and the friction between the duck at the same time; and if the tube is undercured, the friction will be also, and so will have no strength whatever.

It is especially adapted for rock drills and dredging machines, and will stand at least double the water pressure of ordinary hose, and has been tested on a dredging machine for over three months where a hundred pounds steam pressure is used.

It is used by many of the contractors on the new Croton Aqueduct, and is guaranteed to stand a steam pressure of 50 pounds three months.

The Boston Woven Hose Co., of 234 Devonshire St., Boston, are the sole owners and manufacturers.

#### The Telephone Caveat of Antonio Meucci.

As a matter of curiosity, we give below the caveat of Antonio Meucci, the Italian who claims to have been the original inventor of the telephone. This caveat was filed December 28, 1871; renewed December 9, 1872; renewed December 15, 1873.

The following is a description of the invention, sufficiently in detail for the purposes of this caveat:

I employ the well-known conducting effect of continuous metallic conductors as a medium for sound, and increase the effect by electrically insulating both the conductor and the parties who are communicating. It forms a speaking telegraph without the necessity for any hollow tube. I claim that a portion or the whole of the effect may be also realized by a corresponding arrangement with a metallic tube.

I believe that some metals will serve better than others, but propose to try all kinds of metals.

The system on which I propose to operate, and calculate for, consists in isolating two persons separated at considerable distances from each other by placing them upon glass insulators, employing glass, for example, at the feet of the chair or bench on which each sits, and putting them in communication by means of a telegraph wire. I believe it preferable to have the wire of a larger area than that ordinarily employed in the electric telegraph, but will experiment on this. Each of these persons holds to his mouth an instrument analogous to a speaking trumpet, in which the word may be easily pronounced and the sound concentrated upon the wire. Another instrument is also applied to the ears, in order to receive the voice of the opposite party.

All these, to wit, the mouth utensil and the ear instrument, communicate to the wire at a short distance from the persons. The ear utensils being of a convex form, like a clock glass, inclose the whole exterior part of the ear, and make it easy and comfortable for the operator. The object is to bring distinctly to the hearing the words of the person at the opposite end of the telegraph.

To call attention, the party at the other end of the line may be warned by an electric telegraph signal or a series of them. The apparatus for this purpose and the skill in operating it need be much less than for the ordinary telegraphing.

When my sound telegraph is in operation, the parties should remain alone in their respective rooms, and every practicable precaution should be taken to have the surroundings perfectly quiet.

The closed mouth utensil, or trumpet, and the inclosing the persons also in a room alone, both tend to prevent undue publicity to the communication. I think it will be easy by these means to prevent the communication being understood by any but the proper persons.

It may be found practicable to work with the person sending the messages insulated and with the person receiving it in free electrical communication with the ground, or these conditions may possibly be reversed, and still operate with some success. Both the conductors or utensils for mouth and ears should be—in fact, I may say, must be—metallic, and be so conditioned as to be good conductors of electricity.

I claim as my invention, and desire to have considered as such for all the purposes of this caveat—

The new invention herein set forth in all its details, combinations, and sub-combinations.

And more, specifically, I claim—

*First.*—A continuous sound conductor electrically insulated.

*Second.*—The same adapted for telegraphing by sound or for conversation between distant parties electrically insulated.

*Third.*—The employment of a sound conductor which is also an electrical conductor, as a means of communication by sound between distant points.

*Fourth.*—The same in combination with provisions for electrically insulating the sending and receiving parties.

*Fifth.*—The mouth piece or speaking utensil in combination with an electrically insulating conductor.

*Sixth.*—The ear utensils or receiving vessels adapted to apply upon the ears in combination with an electrically insulating sound conductor.

*Seventh.*—The entire system comprising the electrical and sound conductor insulated and furnished with a mouth piece and ear pieces at each end, adapted to serve as specified.

In testimony whereof, I have hereunto set my name in presence of two subscribing witnesses.

ANTONIO MEUCCI.

Witnesses:

SHIRLEY MCANDREW.

FRED'K HARPER.