A Great Steel Forging.

The steel forging for the fighting tower of the Italian armorclad Lepanto is 10 feet in outside diameter, 7 feet 11 inches inside diameter, 12½ inches thick, and 4 feet 9 inches high, and is intended to protect the captain of the ship in battle.

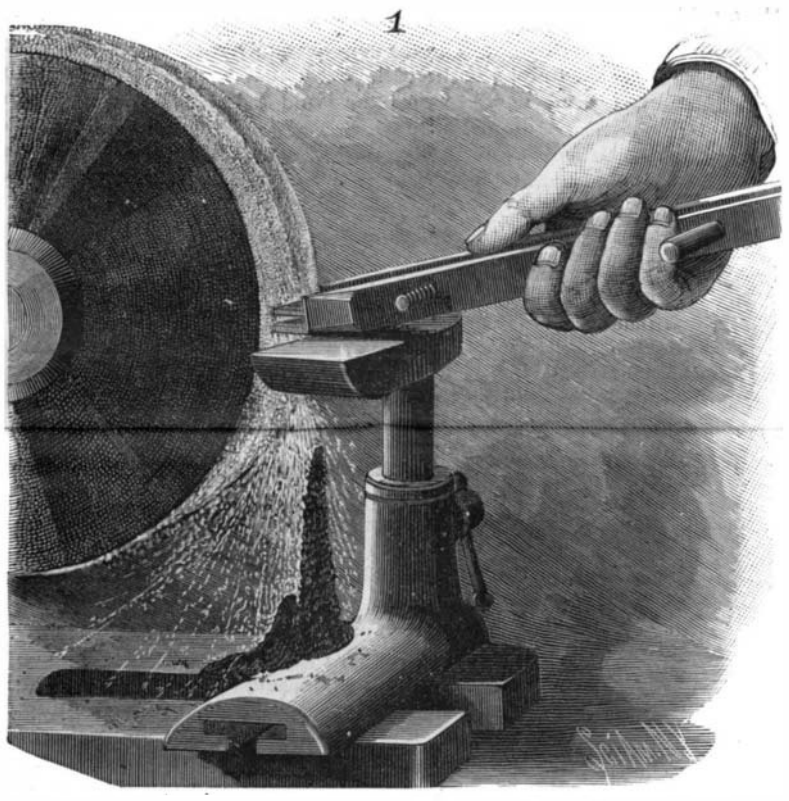
The weight of this huge block of steel is 30 tons, and the rough ingot from which it was forged was 65 tons. It was produced by the firm of Schneider & Cie., of Le Creusot, France. The ingot was worked to a diameter of about 6½ feet, then bored, and then worked by forging on a mandrel to the dimensions given above. It is the first fighting tower that has ever been made in one single piece.

CURIOUS ACCRETION OF EMERY WHEEL DUST.

The particles of material removed from solid bodies by the abrasive action of dry emery wheels are always more or less heated. Dust from metals is often fused, and sometimes dissipated altogether. Fused globules of metal are frequently found in emery wheel dust, but the stalagmitic formation consisting of particles welded together, as shown in our engraving, is not common.

These curious growths are formed almost hourly by a wheel 14 inches in diameter, revolving at the rate of 900 revolutions per minute, employed in shaping some of the steel parts of a sewing machine. The position of the stalagmite relative to the work and the wheel is shown in Fig. 1. Under the microscope the particles do not appear to have been entirely fused, but only sufficiently softened to cause them to stick together.

The mass of the aggregation is quite solid and strong. Except in color, it more nearly resembles a spire of coral than anything else.



CURIOUS STALAGMITIC FORMATION OF EMERY WHEEL DUST.

NEW ELECTRIC ORGAN MOVEMENT.

The introduction of the pneumatic movement for organs was one of the great steps in the development of this instrument. By it the strain of directly opening the pipe valves was removed from the fingers of the performer, and a light acting manual, as easily played upon as a piano keyboard, was placed at his command. In the illustrations accompanying this article we show another improvement, that is as distinct a step in advance as the one just mentioned. By it electricity is called into play, and the pneumatic movement is controlled by the electric current.

In Fig. 1 a section of the mechanism is shown. The details of the pneumatic movement will be at once recognized by those familiar with it. It is controlled by the electric attachment, that forms the subject of this article. Within a wind chest a hollow cored electro-magnet, indicated by B, is mounted in a vertical position. A cylindrical armature, A, plays up and down below it. The armature and core are made of soft iron. The armature fits loosely in a cylindrical chamber directly below the magnet. Its top and bottom are covered with disks of leather.

Below the armature a nozzle communicates with the open air. Thus, when the armature rises, the opening in the magnet core is closed. When it falls, it closes the opening of the nozzle, C. The wind chest is in constant communication with the organ bellows, so that the air within it is maintained at a pressure above that of the atmosphere. Within it is a bellows that is held open normally by a spring. It will be seen that when the armature has fallen the bellows is filled with air from the wind chest. The pressure is carried down through the hollow core and space surrounding the armature and through the passage, W. The bellows, under the circumstances, remains distended and closes the valve, K, and keeps the valve, L, open. This leaves the outer bellows free to remain open or shut. The tracker attached to the arm at M, acted on by the pipe valve, pulls it shut, and no air is admitted to the pipe.

When it is desired to sound the pipe a current of electricity is passed through the wire. This draws up the armature, and closes the opening in the magnetic core, and at the same time opens the nozzle, C. The bellows in the wind chest, having its interior put in communication with the outer air, at once closes under the effect of the air pressure within the box. This opens the valve, K, and closes the valve, L, so that the outer bellows is forced open by the pressure from the wind chest. The tracker is caused thereby to open the pipe valve, and the pipe begins to speak. In Figs. 2, 3, and 4 different modifications of the magnets and armatures are shown.

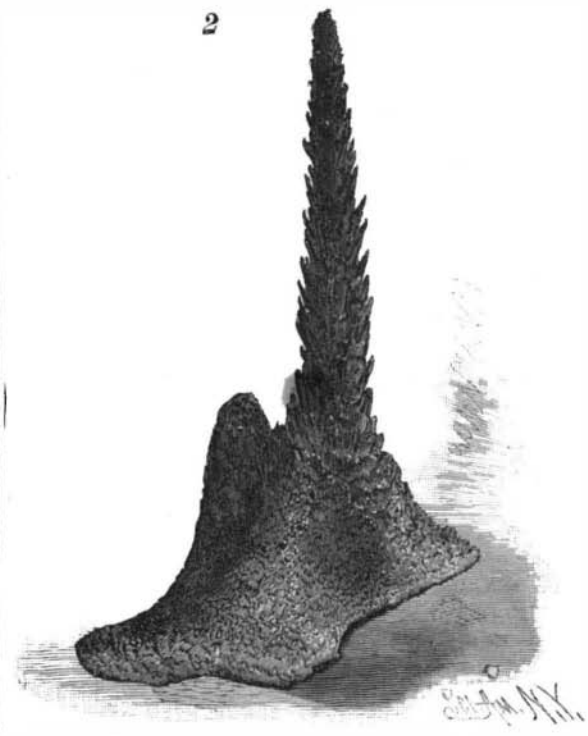
All this is done so quickly that a sensitive pipe can be made to speak six hundred times a minute.

These are the pipe movements, and one such magnet and attachments are supplied for each key in the manual and for each pedal key. For the draw stops a somewhat different apparatus is provided.

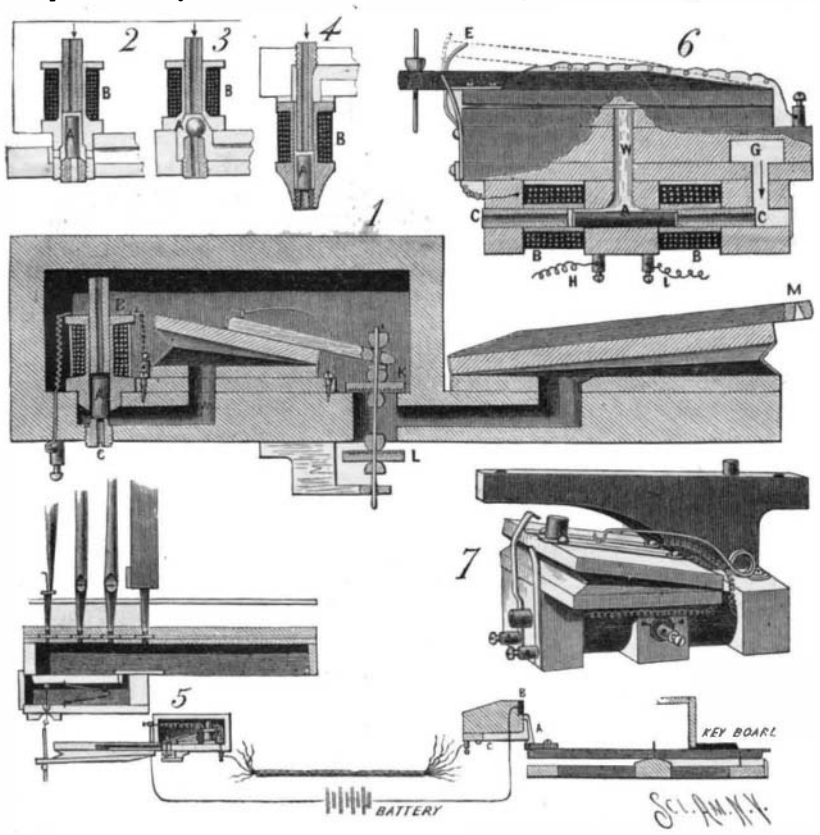
It is clear that what has been described would answer for them, but with the attendant disadvantage that electricity would have to be supplied as long as the stop was kept open. In Figs. 6 and 7 a section and elevation of the draw stop mechanism are given, by which arrangement this difficulty is avoided completely. Referring to the section, two magnets, BB, wound in the same way are shown arranged horizontally, and supplied with a horizontal cylindrical armature, which is permanently magnetized. It is attracted to one or the other of the magnets, according to the one the current is caused to pass through. Air pressure from the organ bellows comes through the passage, G. When the armature, A, is attracted toward the left, as a current passes through the left hand magnet, this air pressure raises the bellows and opens the stop. As the bellows rises, the spring, F, breaks contact with the piece, D. This cuts off the left hand magnet from the line, but the polarization or magnetization of the armature causes it to retain its place. Hence the bellows stays open. But in rising by means of the spring, E, and another contact piece corresponding to it, it throws the right hand magnet into its own circuit. Then, when another pulse of electricity is sent by the opposite movement of the stop handle, it passes through the other magnet, and draws the armature to the right. The bellows under the influence of the spring shown in Fig. 7 collapses, closes the draw stop, and at the same time cuts off the current of electricity. A separate wire is provided for each magnet going from the draw stop handle, but a single return wire acts for both. The horizontal position of the magnets in conjunction with the polarized armature are the distinguishing features of this mechanism. The bellows acts by a tracker directly on the stop valve.

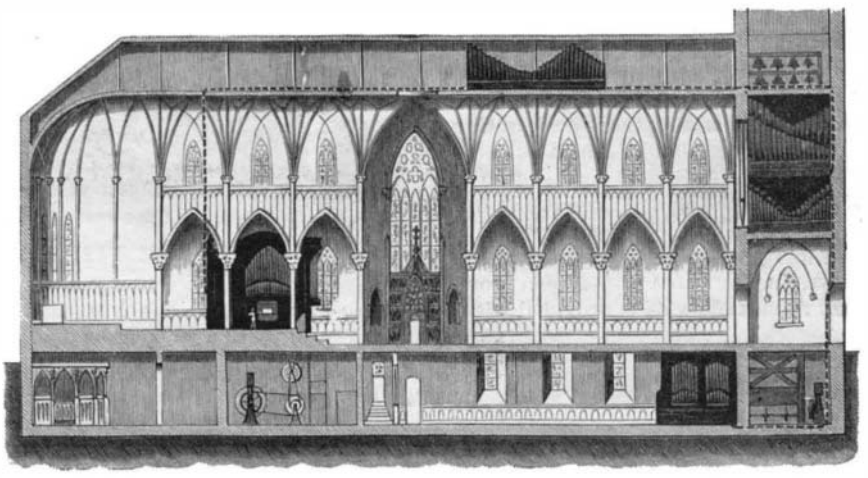
One of these movements is supplied for each stop, and thus the whole range is controlled by electricity. Very little current is required, as the draw stops are worked by a current of a second's duration. The manual consumes but little.

To give some idea of the connection between manual and soundboard, the section shown in Fig. 5 has been given. To the right is a key in its normal position. When depressed by the finger, it makes an electrical connection between the oscillating piece, A, and the contact piece, B. All the magnets connect at one terminal with a single wire, running from them to the contact piece, B, and including in its course the battery. Each of the other terminals of the magnets has its own wire which runs to the manual, each wire being connected by the binding screw and spring, C, to its own key. Hence, when a key is depressed it actuates the magnet connected with it, and makes the corresponding pipe give its note. On the left of the draw-



STALAGMITIC ACCRETION OF EMERY WHEEL DUST.





WACKER'S IMPROVEMENTS IN ELECTRIC ORGANS AS APPLIED IN THE CATHEDRAL, GARDEN CITY.