MOSCOW AND THE CORONATION OF THE CZAR.

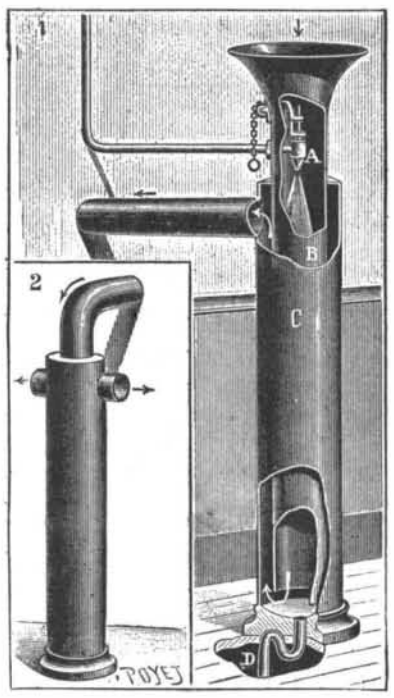
(Continued from first page.)

Resurrection, according to the immemorial custom, in order to venerate the picture of the Iberian Madonna, which is kept in a chapel at the side of the gate. Here their Imperial Majesties were met by the Metropolitan of Moscow, and after kissing the crucifix and making the sign of the cross with holy water, they entered the chapel and knelt before the sacred picture. They then passed through the Holy Gate of the Saviour into the Kremlin. (For our engraving of this event we are indebted to The London Graphic.) The imperial party prayed in the cathedrals and after a short rest left for the suburban palace of Alexandria. The next day their Imperial Majesties received the envoys of France, Spain, Japan, Corea and the United States, and that evening the foreign minister, Prince Lobanof, gave a reception to the foreign guests. On Saturday, May 23, the Czar received the representatives of Holland, Portugal, Turkey, Servia and Mexico, and Sunday the Czar and other members of the family were present at the consecration of the banner of the empire. On Monday the Emperor and Empress attended privately at the Church of the Saviour, in the Kremlin. On Monday afternoon, the transfer of the regalia from the armory of the Kremlin to the throne room of the palace took place. The regalia were carried in procession and reverently deposited on a table at the right of the throne, where they were guarded by high officials.

Very early on Tuesday, May 26, most of the inhabitants of Moscow were moving toward the Kremlin. The weather was glorious; the sun pouring upon the many gilded cupolas of Moscow and the Kremlin produced an indescribable effect. The regulation twenty-one guns announced the approaching event, and the signal was taken up by the bells of the cathedral, which was followed by all the other bells of the city. The Cathedral of the Assumption, in which the coronation took place, is unfortunately very small, eight hundred people standing elbow to elbow in a place intended for one hundred. Many of the costumes were superb.

The coronation took place at ten o'clock in the morning; but long before that hour the Church of the Assumption had been filled with the distinguished guests and representatives who had come from the four quarters of the globe to do honor in the name of their respective countries to the young Emperor and Empress. The United States were represented by Clifton R. Breckenridge the American minister, Gen. A. G. McCook, special representative of the American government, and Admiral Selfridge. At nine o'clock the imperial party approached the church amid the pealing of bells and the thunderous applause of the multitude. The first to enter the portal was the Dowager Czarina, mother of the Emperor, who ascended her throne on a dais level with the throne of the Emperor. Behind her came the Emperor and Empress, who were received at the portal by the clergy and escorted to the altar.

The Metropolitan of Moscow addressed a brief allocution, while that of St. Petersburg held a jeweled crucifix to their lips, and that of Kieff sprinkled them with holy water. After a few prayers the Czar stood to read his confession of faith. He was dressed in the uniform of the Preobragensky regiment. Then the actual coronation ceremonies began. One by one the Czar took the various papal insignia and the state mantle from the ecclesiastics. The crown was handed



BESSIERE'S HYDRAULIC VENTILATOR.

to the Emperor by the Metropolitan of St. Petersburg. Standing forth before the congregation and in front of the altar, he with both hands placed the crown upon his head: then taking the scepter in his right hand and the globe of empire in his left, he ascended the dais and seated himself upon the throne to the united accompaniment of salvos of artillery, martial music and the clash of the city's bells. He then arose, took off his crown, and touched the forehead of the Empress with it, after which she knelt before him and he placed her own crown upon her head. The Metropolitan then stepped forward to the foot of the dais and made a short address to the Czar on the importance and duties of his office, ending with these words: "With this visible and corporal adornment of thy head is clear proof that Christ the King of Honors invisibly crowns thee head of the Russian empire."

Family congratulations followed and a salute of 100 guns were fired. Next, mass began, and the Czar and Czarina went to the gates of the altar, where both were solemnly anointed with the holy chrism. The Czar was anointed in seven places, the Czarina only on the forehead. The Czar then used his privilege as head of the Greek Church and entered the sanctuary to receive the holy communion, the Czarina communicating outside the gates, like the ordinary laity. After the service was finished the imperial party left the cathedral, the Czar and Czarina going to pray at the tombs of their ancestors and various important shrines. At night the illuminations were on a magnificent scale. A bouquet was presented to the Empress at 9 o'clock, and, on her Majesty taking the pressure of her hand on the stem, instantly illuminated the flowers and simultaneously the whole Kremlin with electricity. Towers, cupolas, and walls of the palaces were ablaze with many colored lights till long after midnight, and search lights from towers threw their rays far over the city. Then followed a succession of fêtes, banquets, and receptions such as even Russia has rarely seen, and the congratulations of the foreign nations poured in.

Unfortunately, the round of festivities which followed has been marked by one of the most tragic calamities of the century. The popular fete of the coronation ceremonies was held on the Hodynsky Plain, opposite the Petroffsky Palace, where a free distribution of food and drink was made to the peasants. It is estimated that several hundreds of thousands were present, and in their eagerness to get near the distributing booths, the crowds surged forward, crushing those in front against the barriers, which yielded to the enormous pressure and were swept away. Hundreds of men, women and children were thrown down and trampled to death beneath the immense throng as it rolled forward. Including those who have since died in the hospitals, the fatalities will run into the thousands; and it is thought many have dragged themselves off the field to die, or have been carried away by their friends, of whom no account will ever be taken.

BESSIERE'S HYDRAULIC VENTILATOR.

Ventilation in premises inhabited by a large number of persons in common has for a long time occupied the attention of hygienists as well as of very many eminent scientists and distinguished investigators, and the problems that it involves have been well studied. In manufactories, barracks, hospitals, schools, and private houses, even, the air vitiated by respiration and all sorts of emanations must be constantly renewed; but it is also necessary that such renewal shall be done judiciously, and that in winter it shall not be attended with a lowering of the temperature. Many systems have been proposed—some of them automatic and based upon the difference of density of warm and cold air, such, for example, as perforated or movable panes of glass, etc. Others lay mechanical methods under

THE MONUMENT OF NICHOLAS I AT MOSCOW

THE GREAT BELL OF MOSCOW.

contribution. In many theaters the air is now renewed by electric fans. All such methods are good, and it is solely a question of selecting the one that is best adapted to the place in which it is proposed to establish the ventilation. Despite the already large number of processes known, however, it is often found difficult to effect a constant renewal of air at slight expense, either because automatic methods do not give an adequate movement or because motive power is lacking. It is in order to obviate such difficulty that Mr. Bessiere has devised the system which we figure herewith and which operates through a simple water cock arranged in the form of an atomizer which consumes very little liquid.

As seen in the figure, the apparatus consists of a tube, B, open at both ends and inclosed in a second tube, C, closed at each extremity, from which start one or more exhaust conduits.

An atomizer, A, situated near the top of the internal tube projects a thin sheet of water having the form of an inverted funnel whose edges come into contact with the walls of the tube. The result is that there occurs a forcing of the air contained in the lower part and a section of that contained in the upper. The current of air thus established, finding no other outlet, escapes through the conduits starting from the outer tube, and is naturally proportional to the pressure and to the velocity with which the water flows. The ordinary pressure of city mains, which always reaches from two to three atmospheres, is sufficient. The water that has been used flows out through a siphon, D, and may, if desired, be employed for other purposes.

It will be seen that it is possible by this means, at will and according to circumstances, to suck the air from a room and force it out of doors, or, conversely, to suck in air from the exterior in order to introduce it into a room. Fig. 1 represents the first arrangement, and Fig. 2 the second.

It will be remarked that, by its very principle, when the apparatus operates as indicated in Fig. 2, it supplies air that is slightly moist, which, moreover, is desired in the majority of cases. But if it were necessary to have dry air, nothing would be easier than to obtain it by causing the current to pass over desiccating substances, such, for example, as chloride of calcium. If it is a question of purifying the air of a room, some such disinfectant as formol may be so arranged that the current shall pass over it.

The apparatus may be installed in each room to be ventilated by connecting each of them with the water conduit of the house, and, when the room is of very large dimensions, it is possible to install a battery of several ventilators placed side by side. The essential and even indispensable condition for obtaining a good rendering is to have an adequate pressure of water at hand. In case this did not exist in the city mains, it would be necessary to create it artificially, either by means of a pump or by placing a reservoir on the roof of the house.

The starting and stopping of the ventilators of this system are very simple matters, since it suffices to open or close a cock in order to effect one or the other. It is, therefore, possible to intrust the manipulation of them to anybody.—La Nature.

Concerning Crookes Tubes.*

We would offer the following contribution to the rapidly increasing literature on the X rays of Roentgen. It has to do with a part of the subject upon which very little has been written, and for that reason may be helpful to other experimenters.

One of the chief difficulties in the way of experimenting has been the cost of the bulbs or tubes. We have proved to our own satisfaction that the making of them need not be beyond the resources of the ordinary laboratory, for within a few weeks time we have made and tested more than one hundred tubes, and have frequently made one and exhausted it and used it, all within an hour's time. All that is required is some little skill in gas blowing and in the manipulation of the pump.

The Glass.—A hard German glass or its equivalent, free from lead, has proved the best. It gives a strong green fluorescence under the action of the current, and, what is of great importance, resists without softening the heat generated by the cathode ray at its point of impact. Unfortunately it is not to be had free from bubbles, and these are the cause of the destruction of many tubes, the glass being chipped away into the bubble by the action of the current and the tube ruined. It is also rather difficult to put in the electrodes so that they will stay, and it may be necessary to use three kinds of glass—first the tube itself, then a bit of softer glass, and upon that very soft lead glass for the seal.

Shape of the Tube.—A good tube should throw shadows as sharp as possible and develop the rays as powerfully as possible. It should easily appear that the ordinary spherical form meets neither of these conditions.

To produce a sharp shadow the radiant must be small. It was found that a picture could be taken upon any side of a spherical bulb, making it probable at least that the entire surface is a source of radiation.

In the matter of strong action also the spherical form is inferior. This is for two reasons. First, glass more or less extinguishes the rays, according to its thickness, therefore the larger the bulb the more opaque it must be, for it must be thick enough to stand the atmospheric pressure.

Secondly, there is a comparatively large amount of radiant or conducting matter within the spherical bulb which diffuses the energy of the discharge.

Proof of the second point was obtained as follows: A moderately thick bulb about three inches in diameter was blown, and upon this a spot one inch across was blown out very thin, forming a smaller hemispherical bulb upon the first. Opposite this thin window was the concave cathode. This bulb proved better than the ordinary sort, but far inferior to tubes about to be described. A second experiment was made with a tube blown thin along one side for a space of three inches, and opposite to this was the cathode in the form of a quarter cylinder. The performance of this was also inferior.

Without going into the details of many similar experiments, it will be sufficient to say that we have found that a simple straight tube from one-half to one inch in diameter, having a small and very thin bulb for a cathode window, has given the most satisfactory results. In length it may be from four to eight inches. The bulb may be blown at the bottom of the tube, the cathode placed at the top and the anode across the tube just above the bulb. Better results are, however, produced by using a bit of platinum foil for an anode, inclining it about forty-five degrees to the cathode ray. In this case the small bulb may simply be blown out upon the side of the tube and the electrodes put in at the two ends, so that the cathode ray will be reflected into the bulb.

Shape and Disposition of the Electrodes.—We have made the cathode in the form of a wire, a flat plate, a convex plate and a concave plate. The concave form proves the best in every case. We have made it of varying size up to an inch or more in diameter and have not come to any conclusion as to which is best. It is very difficult to have other conditions sufficiently uniform to enable one to judge where differences are small.

We have made the anode in the form of a wire of aluminum, a flattened strip of it, and, as stated above, in the form of a platinum reflector. As yet we have got our best results from the platinum. One rather interesting result obtained was that when the anode was in the form of an aluminum disk parallel to the cathode and nearly large enough to close the tube, it gave little or no interference with the X ray. We made one on a hinge so that it could be swung out of the path of the ray or in at pleasure, and the effect on the photographic plate was the same in either position.

Source of the Rays.—Being able to construct tubes of any form, we have made many experiments as to the source of the rays, whether from the cathode or anode. One was in this way: Two tubes were joined together parallel so that they were exhausted together. The cathode rays could be made to pass down one tube and the anode rays (if such existed) down the other, and either screened off at will. We found that the anode rays affected the plate but slightly, and that practically all the effect came from the cathode.

Intensity of Effect.—We do not intend to convey the impression that these home-made tubes we have described are simply good enough for experiment and valuable from their cheapness. We believe also that they are more effective than others. We have made good negatives of bones of the hand, arm, including the elbow, foot, ankle, etc., all with remarkably short exposures; have taken impressions perfectly distinct through nine inches of wood in less than five minutes; have taken perfectly the bones of the hand through thin sheet zinc in two minutes and through the slide of the plate holder in five seconds. The ordinary coin and key impression requires not over one or two seconds with our best tubes.

Remarks upon Pumping.—The interest in the subject at present may make some remarks upon pumping here in place, most of all, since many have found great difficulty in this respect.

It is here supposed that the pump has a three-way cock above its bulb, opening in its two positions between the bulb and fork and the bulb and outer air; and that above this three-way cock are one or two cocks of the ordinary kind. Let the three-way cock be called A, the others B and C in order. Let the position in which A puts the bulb in communication with the fork be position 1; and that in which it puts the bulb in connection with B, C, and the outer air, position 2. The ordinary process of pumping with the use of A alone is supposed to be understood. After a greater or less number of strokes it is observed that no more air is obtained. The pump contains air, however, condensed upon the glass walls. To remove this A is put in position 2, and the mercury raised until a drop passes B. B is then shut and the mercury dropped until only a drop remains above A. A is then shut and the movable mercury tank dropped to its lowest point, when A is put in position 1. Pumping now goes on as before only with B shut, and the tank is raised only a third as high as before. After four or five strokes it is well to pass the mercury again above B.

If the highest possible degree of exhaustion is desired, this process can be repeated between B and C, but this is not necessary in exhausting a Crookes tube.

As soon as the stage of pumping with B shut is reached, the tube which is being exhausted must be strongly heated, moving the lamp flame over every part of it, and after two or three strokes more the current from the coil is turned into the tube. By the combined action of the heat and current the occluded air is driven from the glass and exhaustion proceeds rapidly. It should not occupy over twenty or thirty minutes for a moderate sized tube.

Allowing the tube to cool, if short sparks can be drawn from the bulb and there is little or nothing to be seen in it except green light, the exhaustion is complete. There is danger of carrying it too far, for the vacuum very much increases during the first hour that the tube is used; but of these matters a little experience is the best teacher.

*By C. C. Hutchins and F. C. Robinson, in American Journal of Science.

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A Dog Iron Worker.

Keys, the canine employe of the Union Iron Works, met with an accident recently by which his front right leg was broken, says the San Francisco Examiner. Keys has been looked upon by the officers of the iron works as one of the regular workmen for about four years. He is a dog of no particular beauty, and his pedigree would not be considered by dog fanciers, but he possesses wonderful intelligence. He makes the Potrero Police Station his home, and he is the pet of Lieut. Bennet, but nearly every workman in the ship building concern claims the friendship of the dog.

At the first tap of the gong every morning Keys has reported for duty at the gates of the Union Iron Works, and he has never left until a full day's work had been accomplished. He was particularly useful in the ship yard and in the boiler shop, and the foremen of these departments say he was more valuable to them than a man for doing certain kinds of work. He could crawl through small holes in boilers and about ships, and his particular work was to carry tools, bolts, nuts, rivets and other small articles needed by workmen who had crawled into such places, and to have them creep back and forth for which would have caused considerable loss of time. Keys thoroughly understood his work, and he was always on hand when needed. Recently a steamer was placed on the dry dock for repairs, and the dog, realizing that his services might be needed by the workmen, was climbing a ladder to the deck when he slipped and fell about twenty feet. The men picked him up, and making a stretcher of some pieces of canvas carried him to the police station and sent for a physician to set the broken limb.

ACCORDING to Mr. Dewar, a liter of liquid air placed in a globular silver vacuum vessel and subjected to exhaustion, will produce as much as half a liter of solid air, which can be maintained in this condition for half an hour. In its solid state air is comparable to a jelly. When examined in a magnetic field, the liquid oxygen is drawn out of it to the poles. If pure, the jelly is clear and transparent. If it contains carbonic acid, it is milky.