Notice.

A premium of $250 is offered by the SCIENTIFIC AMERICAN for the best essay on

THE PROGRESS OF INVENTION DURING THE PAST FIFTY YEARS.

This paper should not exceed in length 2,500 words.

The above-mentioned prize of $250 will be awarded for the best essay, and the prize paper will be published in the Special 50th Anniversary Number of the SCIENTIFIC AMERICAN of July 25. A selection of the five next best papers will be published in subsequent issues of the SCIENTIFIC AMERICAN SUPPLEMENT at our regular rates of compensation.

The papers will be submitted for adjudication to a select jury of three, consisting of—

Prof. R. H. Thurston, Cornell University.

Judge A. P. Greeley, Washington, D. C.

Prof. R. S. Woodward, Columbia University.

Rejected MSS. will be returned when accompanied by a stamped and addressed envelope.

Each paper should be signed by a fictitious name, and a card bearing the true name and the fictitious name of the author should accompany each paper, but in a separate sealed envelope.

All papers should be received at this office on or before June 20, 1896, addressed to

Editor of the SCIENTIFIC AMERICAN,
361 Broadway, New York.

Correspondence.

X Ray Experiments.

To the Editor of the SCIENTIFIC AMERICAN:

I have in my possession a Crookes tube, exactly identical in construction with the one described on page 342, SCIENTIFIC AMERICAN of May 30, excepting the glass bulb, which is pear-shaped.

Considering the fact that I am using this tube with an ordinary Wimshurst induction machine of my own construction, with 20 inch hard rubber plates, its work is simply marvelous.

For the benefit of your readers who desire to use this kind of apparatus, I would say that the condensers should be small, not over 16 or 18 square inches of foil surface on each side, and the outside coatings should be connected with each other; the anode of the Crookes tube should be connected to the positive pole of the machine and cathode to the negative pole, with a spark gap of not less than one-half inch. Gap should be made between ball terminals, as a good, clean spark is absolutely necessary; if air is so damp as to break it into a brush discharge, no effect will be obtained in the tube.

The light is, of course, intermittent, but if the machine is in good order and runs fast enough, the sparks follow each other in such rapid succession as to be practically continuous in lighting effect on a fluoroscope, which this tube illuminates brilliantly, bringing out the bones in the hand very distinctly. The tungstate calcium used in fluoroscope is sold by dealers as high as $5 per ounce; but an ounce of it—enough for two or three fluoroscopes—can be made for 30 or 40 cents, as follows: Mix about 1 ounce each of common salt, tungstate soda, and choride calcium; last two articles should be bought at retail for about 2 cents per ounce. Put the mixture in a common crucible, also obtainable for about 10 cents, fit a tin cover to it and bury to the lid in a good coal fire—the kitchen stove will do—so as to bring it to a full red heat; leave it for two or three hours, or until contents are fused to a clear liquid, then set it out to cool and crystallize. The resulting hard, glass-like mass should be broken out with an old chisel or by breaking the crucible—broken up and thrown into a jar of water, which will gradually dissolve the chloride of sodium formed, and the fine crystals of tungstate calcium will settle to bottom. Wash by decantation till all taste of salt is gone, and pour out on filter or blotting paper and dry.

Make your screen of thin wood or cardboard, coat with common prepared glue, and sift on the tungstate, shaking off all that does not stick when dry. Fasten to bottom of ordinary box of the fluoroscope form, and you will have as good a fluoroscope for a few cents as can be bought for a few dollars.

I think I have demonstrated, and with rather poor apparatus, that the X ray will produce a visible image on the sensitive plate in less than 1-1000 of a second.

When I run my static machine very slow, the sparks can be made to jump the gap arranged as described at about the rate of one or less per second. The fluoroscope then shows a distinct instantaneous flash of light as each spark passes, seeming to indicate that the X ray is produced only at or during the instant of the passage of the spark, which, according to Wheatstone, occupies about 1-24000 of a second of time.

Desiring to test the effect of one spark and upward on a plate, I placed a common pocket comb in a metal edged case on a 4 × 5 plate holder, containing plate covering about three-quarters of an inch of holder, with a block of steel one inch thick, and machine slowly run till one spark passed the gap, then plate of steel was moved up three-eighths of an inch, and one more spark passed, thus giving two sparks exposure to remainder of plate; the steel block was then pushed up another three-eighths of an inch, and two more sparks passed, giving four to remainder of plate, and so on up through 8, 16, 32, 64, etc., to 512 on last three-eighths inch of plate. Plate was developed immediately, the print from same plainly showing the metal rim of comb case down to the seventh space from top, corresponding to eight sparks, equal to about 1-3000 of a second's exposure.

My machine works in the open air, which is very damp most of the time at this time of year, but with a properly cased powerful machine and a spark gap of one inch or more, I think it could be shown that one spark would produce a visible image on the plate.

H. C. OGDEN.

Middletown, N. Y.

[We have received from Mr. Ogden some specimens of his X ray photographs, which are very fine; also the photograph mentioned, which shows the images produced by exposures of different lengths.—Eds.]

The Utility of Colored Skin.

Man, no matter what country he inhabits and what are the exterior conditions that he undergoes, has an internal temperature that varies within very narrow limits. If the exterior temperature is very cold, the circulation becomes more active and the chemical changes that generate heat are more intense, while physical conditions, such as friction and perspiration, contribute also a large part toward maintaining this balance of temperature by modifying at the proper time the formation or emission of heat. Races and climate produce in these vital actions certain curious modifications which have hitherto received little attention. It would be, for instance, interesting to know whether the human temperature is the same in all latitudes and for every race. Davy was one of the first to take up this question in two voyages to Barbados and Ceylon. He concluded that the temperature varies with the race by several tenths of a degree as we approach the tropics. The observations of Jousset accord with those of Davy. While other authors have held a different opinion, M. C. Richet, who has summed up the work on this problem, concludes that "the temperature of men of different races, under the same conditions of environment, is sensibly the same." This racial influence is then no greater than that which some have attributed to sex; that is, it is practically null.

Dr. Eijkmann, director of the Pathological Institute of Weltevreden, Batavia, Java, has attacked this question anew. He has especially tried to find how a Malay and a European react under the influence of exterior temperature, and what, in particular, is the role played by the color of the skin in the physical regulation of temperature. He has performed, for the solution of this problem, the following experiments. . . . One means of regulating temperature is by the loss of heat by conduction and radiation. If we place a thermometer near the skin of the arm or the chest and surround it with a sort of guard, the thermometer will rise the faster as the heat given out by the body is greater. M. Eijkmann has made this experiment in both Europeans and Malays. The results differ slightly according to season. During the warm and dry season the advantage is with the natives; the temperature of the thermometer placed near the arm is 33·55° C. [92·39° F.] with Europeans and 34·05° [93·29° F.] with natives. On the contrary, during the cool, wet season, Europeans give 32·75° [90·95° F.], while natives give 32·55° [90·50° F.] The latter have thus radiated off less heat. Observations made at different hours of the day prove that, in general, the loss of heat by radiation is a little less with natives than with Europeans, and this difference is about 0·4° [0·7° F.]

What causes this difference? We must in the first place eliminate the color of the skin. To test this, the author used two exactly similar metal cylinders, covered with skin carefully removed from the shoulders of persons who had recently died. The one was from a European, the other from a Malay. On one cylinder the European's skin was placed outside the Malay's; on the other, the Malay's was outside the European's. This arrangement was to prevent all possible error due to a difference in the conductivity of the two skins. The two receptacles were then filled with water in such manner that the thermometers plunged in each marked at the outset the same temperature. The results of the experiments made under these conditions show that there is no appreciable difference in radiating power between the brown and the white skin. The bulbs of two similar thermometers were covered with a double layer of skin [as before]. . . . Thus disposed they were exposed in a damp chamber to the sun's rays. At the end of a certain time the temperatures were as follows: White skin on outside, 47·5° [117·5° F.]; brown skin on outside, 50·1° [122·18° F.] But we return to the radiation. The color of the skin has no influence, and cannot explain the fact that the loss of heat is a little less in Europeans than in Malays. Other experiments give us the true reasons, which relate to the evaporation that takes place at the surface of the skin, which is greater in Europeans because they drink more.—Paris Cosmos.

Study of a Swiss Avalanche.

Natural Science gives a summary of the report made by Profs. Heim, Forell and Chodat on the great Gemmi Passavalanche of September 11, 1895. The detailed description of the results of the catastrophe made by men of good standing in the scientific world is of great value. The avalanche was caused primarily by the splitting away of the lower parts of the Altels glacier.

The Abstract says: "On reaching the foot of the Altels, the avalanche, which up to this point must have consisted of one vast moving block of ice, measuring one and a quarter millions of cubic meters [4,000,000 cubic feet], was reduced to fragments, at the same time that the heat generated by the shock converted these into a semi-fluid condition. Among the debris were to be seen some blocks of considerable size, but only a few exceeded two meters [6½ feet] in diameter. With the velocity acquired in its descent, this river of ice rushed across the pasturage and up the western slope of the valley to a height of 1,300 feet along the rocky wall of the Weissfluhgrat. Not being completely able to surmount this barrier, the main mass came surging back—like a vast sea wave recoiling from the cliffs—with such force that some of it returned to a height of one hundred feet up the eastern side. Isolated blocks, however, were hurled clear over the ridge into the adjoining valley, the Uschinenthal.

"The avalanche was preceded by a terrific blast of wind which swept away chalets, trees, men, and cattle as though they had been feathers. This is proved by the fact that, far above the limit reached by the avalanche, hundreds of trees have been uprooted, and lie in regular rows, indicating with mathematical exactitude the direction of the aerial current. These trees are for the most part of great size, several indeed having trunks one meter in diameter. Such as were protected by a large rock or a reverse dip on the hillside have been spared. Others, standing with only half their height above such hollows, have had the exposed part blown off, while the subsequent oncoming of the avalanche has not succeeded in tearing up what was left of them, even when it has enveloped their base. This wind produced a veritable bombardment of ice dust mixed with stones, which has stripped the roots and branches of the trees laid low by the wind itself, and which must have killed man and beast before ever the real avalanche overwhelmed them. Further away the trees have only been denuded of their upper portion, the branches composing which were transported to a great distance, and now form a compact line of debris among the far-off scattered trees, like the bank of sea wreck left on open coasts after a fierce storm. Ice bombs, too, round like cannon balls, out with an average diameter of one foot, which lay all about in the neighborhood of the fallen mass, bore eloquent testimony to the extreme violence of the wind. On the way from the Hotel Schwarenbach, before coming to the Bernese frontier, the green pasture was strewn with these balls like a battle field in old muzzle-loading times.

"The true avalanche, in its recoil from the rock wall, has formed an immense rampart, separated from the rock by a deep trench. On the sides, under the stress of the enormous power of the wind, which, like the avalanche itself, was deflected by the Weissfluhgrat, blocks of considerable size were driven around as in a whirlpool, so as, at least on the northern edge, to have been forced back up the slopes of the Altels toward the entrance of the gorge leading to Kandersteg. These different atmospheric motions were well marked, owing to the disposition of the materials which came under their influence. Near the Winteregg, the trees, shrubs, and grasses were all bent toward the north, forming an exterior zone, which was more and more thickly covered with the dust, etc., raised by the catastrophe as the central mass was approached. A second zone, within the first, was found to consist of the loose rocks, etc., thrust aside by the head of the ice mass as it dashed up the west slope; the inner edge of this zone was itself covered by a layer of ice and snow, representing the matter that kept pouring off from the sides of the central body in its upward progress, and also the results of the reflux which took place when its further advance was barred. Some of the ice and stones hurled against the Weissfluhgrat had adhered to it, being plastered, as it were, into the fissures and gullies. These masses were being constantly detached from their precarious position, and kept descending in roaring avalanches."

DR. ROENTGEN has published some new facts about his rays. He finds that all solid bodies can generate them; the only difference being in the intensity, the greatest intensity being produced by platinum. He finds that the insertion of a Tesla coil between the Ruhmkorff coil and the ray-producing apparatus is very advantageous, and that the X rays and the air traversed by them can discharge electric bodies.

Meat and Milk from Sewage Farms.

If a cow is fed on turnips, within twenty-four hours her milk will taste of turnips, and if butter be churned from the cream, the butter will taste too. The intensity of the turnip flavor is the measure of the quantity of turnips taken. In like manner, if pigs be fed on horseflesh, as they often are, their bacon will taste of the horseflesh; if they be fed on fish, the bacon has a fishy taste. The same is true of hens and their eggs. Feed hens on decaying animal matter, which they will eat greedily, and both their eggs and flesh will be most unpleasant and unwholesome eating. In the case of ducks the facts are much more striking. Ducks are very unclean feeders. Give them abundance of garbage, and they will refuse corn and similar food. Their flesh is then most pungent to the taste, and in many people is so potently poisoning as to produce diarrhœa. Animals fed on sewage farms under certain conditions are liable to have their flesh and secretions changed in character by the sewage-produced herbs and grasses upon which they feed. If the sewage on a given farm be so managed that no more of it be put into the soil than any given crop can adequately deal with, then the crop will be sweet and natural, and the cattle or other animals fed on it will be sweet and natural too. But if the soil be gorged to repletion with sewage, then the crops will be surcharged with sewage elements, and unfit for food, and the meat and milk of animals fed on such crops will be like the crops, and very unpleasant to the taste as well as dangerous to the health. It is in the last resort all a question of the intelligence and conscience of the managers of sewage farms.—Hospital.

ARCHIMEDEAN SCREW USED FOR DRAWING WATER.

The principal contrivance in this machine consists of a sort of covered screw (or Archimedean screw) placed diagonally upon its axis, the lower end of which enters the water of the reservoir, A, and the upper one of which ends in the reservoir, B, which is the one to which it is desired to raise the water.

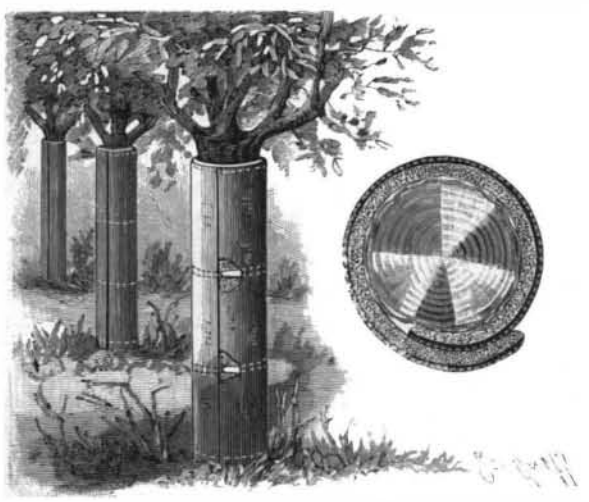
Around the long piece of wood, C, that we call an axle, it is necessary to wind tubes of lead or other metal (marked D and E in the figure), the mouth of which will be in the reservoir, A, and their outlet a little above the reservoir, B.

When this Archimedean screw revolves in the proper direction, the parts of the pipes that enter the reservoir, A, will become filled with water through the mouths of the tubes, and, through the revolution of the tubes, the liquid will be gradually carried from the lower to the upper part of the screw, where it will empty into the reservoir, B.

This screw is revolved through the intermedium of the large wheel, F, which is at the upper end of the axle, C, and which is actuated by manual power in pulling the rope, G, just as one pulls a bell rope. Our engraving is from an old print.

ORANGE TREE JACKET.

A jacket for protecting orange trees against the action of frost has been patented by Mr. Philip F. Brown, of Blue Ridge Springs, Va. By reference to the illustration it will be seen to consist of a tubular, longitudinally split waterproof jacket, which is formed of an inner layer of woolen goods or other suitable non-conducting material, and an outer coating of rubber. Arranged between the two layers are several coil springs, whose ends are held in the longitudinal edges of the



BROWN'S ORANGE TREE JACKET.

jackets, so that under their action said edges will be caused to overlap and the jacket given the form of a roll or coil.

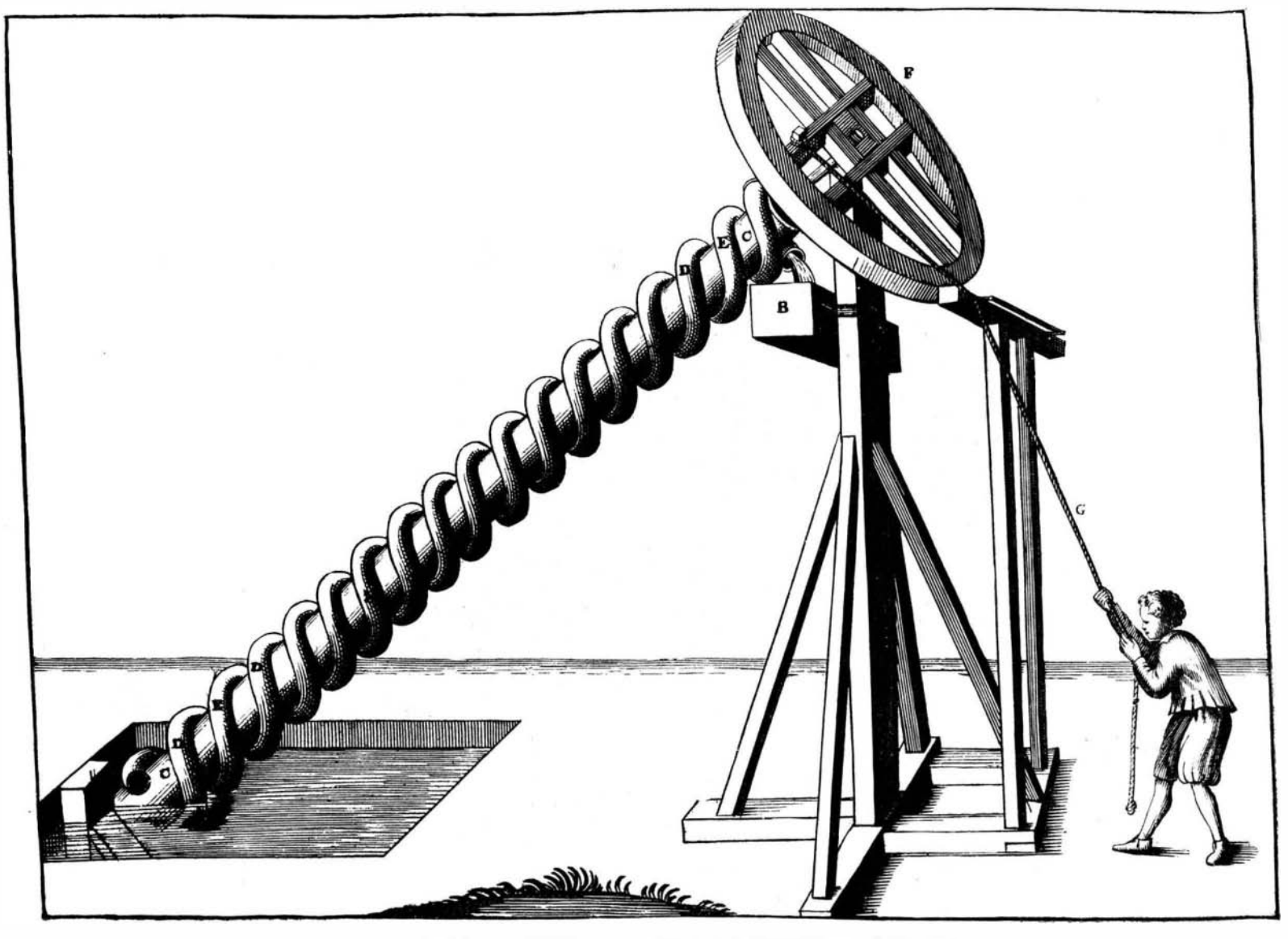
To place the jacket in position, the edges are sprung apart and it is then drawn around the trunk, the springs causing it to close upon the tree and snugly embrace it. By keeping a stock of various sizes of these jackets on hand the orange grower can jacket his grove at very short notice and thus prevent the great loss due to freezing. The use of this device makes it possible to grow the semitropical trees in the parks of the North.

The Ruins of Ang-Kor Wat.*

Around the ruin, and some three or four hundred yards away from it, there is a wall twelve or fifteen feet high, and in an excellent state of preservation. It is impossible to follow this wall all throughout, on account of the dense jungle growing about it here and there. But I followed the outside of it as well as I could from the southwest corner to the south gate, and counted seven hundred and fifty-three steps, representing half the length of the wall in a west-east direction. Making due allowance for the more or less tortuous way that I was compelled to take, this rough measurement would make the wall in this direction something like three-quarters of a mile long. Our Kumer guide said that the walls, as well as the buildings, were square, with equal length of sides; but whether he was right or wrong about the walls, which we were not able to measure thoroughly, we found that he was quite wrong about the buildings themselves; for I measured them afterward, and found that, with the exception of the central platform, they were really oblong in figure, with the longer sides directed east and west and the shorter ones north and south. Inside the parklike wall is another wall, only a few feet high; and inside this again, only a short distance from it, is the magnificent ruin itself. I happened to have a measuring tape with me, twelve yards long, but by attaching a piece of twine to it we were enabled to get a length of twenty-seven yards. With this combination we measured the building, and the measurements may be relied on as correct enough for all practical purposes. . . .

The bass reliefs are raised three or four feet above the ground, and are about four or four and a half feet wide. Speaking roughly, they look to the naked eye about half as wide again as the frieze of the Greek Parthenon, to be seen in the Elgin rooms of the British Museum. The sculptures are somewhat less "relieved" from the general surface than the bass reliefs just mentioned, but they are apparently quite as finely chiseled, and in a much better state of preservation. It was on this inner wall that the measurements of 705 feet by 588 feet were taken, extending from the outer door post on the one side of the building to that on the opposite side. Bass reliefs abound on the walls almost everywhere throughout the ruin; but it is on the outside of this inner wall of the corridor that they are particularly abundant and extensive. Taking the sum of the four sides, there is nearly half a mile of almost continual sculpture on these four walls alone, and representing various scenes, most of which are of a warlike character, while one side in particular is occupied by what appears to be a tug of war on a large and ancient scale. Scores of men on one side are doing their utmost to pull over exactly the same number of men on the other side, while the umpire, or whoever he may be, represented by a larger figure than the rest, is seen in the middle between the two contending parties, and sitting on the back of a turtle, whatever allegorical meaning that fact may contain.—Public Opinion.

*These, the most inaccessible and most interesting ruins in Further Asia—sometimes known as Nakkon-Wat—are admirably and fully described in Surgeon-Major MacGregor's book, "Through the Buffer State."



ARCHIMEDEAN SCREW USED FOR DRAINING A MARSH.