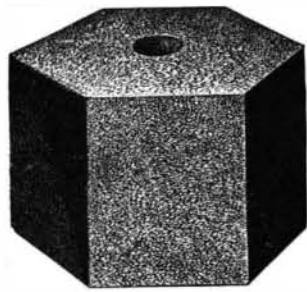


15 tons. This is the first cast steel gun that has been tested at the proving ground.



ACTUAL SIZE ONE GRAIN POWDER.

Another, of open hearth steel, by the Standard Steel Casting Co., awaits a trial, which will probably take place during the coming month.

The Brooks Under-ground System in Brooklyn.

The Brooks system of underground telephone conductors now being laid in Brooklyn by the New York and New Jersey Telephone Company consists in saturating the textile covering of the cables with a mixture of resin and resin oil and drawing the cables into the wrought iron pipes. The pipe is first prepared by scouring the inside sufficiently to remove the sharp edges or protuberances, and reaming the sharp ends in order that the covering of the cable will not be abraded when pulled into the pipes. Instead of using the ordinary socket or coupling, a T-coupling is used. For a pipe 2½ inches in diameter the T is provided with a 1 inch plug, and when the lengths are screwed together the plug of the T points upward. For every 500 or 1,000 feet length, or such length as may be most convenient, there is a splice box, and for the length to be pulled in there is another splice box, over which there is placed a winch. When the lengths of pipe are screwed together, the length is beaded over a wire, which is drawn from a reel as each successive length of pipe is added.

When a sufficient pulling length is formed, a few lumps of caustic lime fresh from the kilns are placed in the splice boxes, the object of which is to dry the air contained in the pipe. Every screw thread before screwing up is well covered with a mixture of white lead and linseed oil, such as is used to make an ordinary screw joint moisture-proof. The pipe is the common lap-welded wrought iron; the wire left in the pipe is for the purpose of drawing in the rope which is used for pulling in the cable.

Common resin of the heaviest quality is broken up and thrown into the caldron, and for a barrel of resin there is added a barrel of resin oil. The oil is known in the trade as "London oil" or "kidney oil." The cost of the resin is about \$1.50 per barrel; the oil costs about 11 cents per gallon.

When a sufficient amount of this mixture is placed in the caldron to cover the cable, the fire is kindled underneath, and the contents of the caldron heated to about 360° Fahrenheit.

When the mixture is heated to above the boiling point of water, 212° Fah., yellow or red bubbles begin to rise and float over the surface until the moisture is all evaporated. The heat is carried to about 360° Fah., and remains at that point until all floating bubbles cease. It takes two hours or more after the heat has reached 360° Fah. in the liquid for it to penetrate the coil of cable sufficient to drive out all moisture. When the floating bubbles cease to show themselves, the cable is ready for pulling into the pipes. In some cases fresh lime is pulverized in a mortar and introduced into each T-joint, which prevents the cable from adhering or sticking to the pipe when pulled in, and if that is not done, about a gallon of common illuminating oil, such as coal or kerosene, is put into the highest points of the pipe, and this keeps the cable from adhering to the pipe, as the resin and resin oil mixture is an exceedingly sticky substance. Two men with a winch can pull in 500 feet in 20 minutes; but with horses and without the aid of a winch, 520 feet was pulled in in Brooklyn in five minutes.

After the cable is introduced, and after the splices are made in the splice boxes, the mixture is drawn from a spigot in the caldron heated at a temperature of 400° Fah., and turned on to the splices until no more of the mixture can be introduced at that point. The splices are wrapped on the outside with a piece of canvas or coarse cloth, so that none of the splices will touch the iron of the boxes, otherwise the hot mixture will not drive away the moisture left on the splices from the hands of the splicer.

When the splices for a length of cable are made, the T-joints are unplugged, and the pipe filled with the mixture at a temperature of 360° Fah.—*Electrical World.*

GIGANTIC FOSSIL MAMMALS.

Mr. Strauch, the learned director of the museum of the St. Petersburg Academy of Sciences, has recently sent us a photograph of the celebrated mammoth which exists in the collection of that establishment. We reproduce it herewith.

The mammoth (*Elephas primigenius*) of this museum is the one whose entire carcass was found in 1799 on the

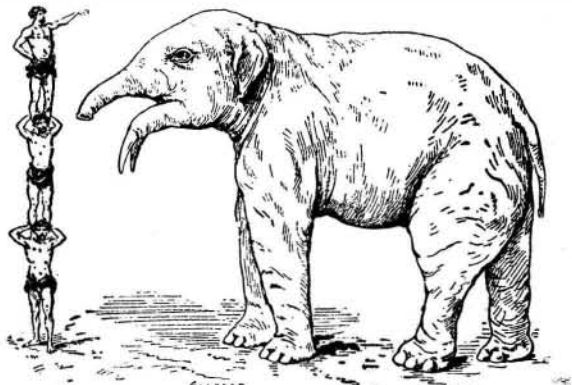


Fig. 2.

shores of the Arctic ocean near the mouth of the Lena. As seven years elapsed between its discovery and its shipment to St. Petersburg, a portion of its flesh was devoured by dogs and wild beasts. The greater portion of what remained was removed from the bones by Adams because it rendered carriage too difficult. The photograph shows that the skin and flesh have been preserved only upon the head and around the feet.

According to Tilesius, the skeleton is 11¼ ft. in height from the top of the head to the bottom of the feet. It is smaller than the skeleton of the *Elephas meridionalis* of the pliocene of Durfort, which is in the new gallery of the Paris museum. The Durfort skeleton is 12¼ ft. in height at the shoulder bones, and 13¼ ft. from the top of the head. It is 21½ ft. long from the end of the tusks to the posterior edge of the pelvis, and 17½ ft. from the front of the head to the back of the pelvis. These dimensions much exceed those of the skeleton of the Sangan mastodon, and even surpass those of the gigantic American mastodons. The Durfort skeleton is the largest entire skeleton of a fossil mammal thus far known.

We have isolated bones that announce still more powerful animals. Thus, Mr. Haussmann, while prefect of the Seine, gave the museum a humerus of the *Elephas antiquus* found very near Paris in the quaternary of Montreuil-sous-Bois. This bone measures 4¼ feet, while that of the Durfort skeleton measures but 4 feet. We have brought from Pikermi the tibia of a

of the head, and that the dinotherium reached 13 feet at the shoulders and 16 at the top of the head.

So, two human giants, one standing upon the other, would not reach the top of the head of the Durfort elephant; and three six-foot men, standing one on the shoulders of the other, would scarcely reach the top of the head of the Pikermi dinotherium.

It is natural to find the maximum of size in the Pikermi dinotherium, for this majestic creature lived, along with two species of mastodon and anchylotherium, and a giraffe and a helladotherium, at the epoch of the upper miocene; that is to say, at the moment when the animal had its apogee.

The *Elephas meridionalis* and the *E. antiquus* lived in company with hippopotami in the warm phases of the pliocene and quaternary, in which there must have existed a rich vegetation. If there is anything astonishing, it is that the mammoth of the glacial regions of Siberia, doubtless living in districts too cold for the development of an arboreal vegetation, reached the large stature exhibited by the skeleton in the St. Petersburg museum.

It will be seen from what has just been said that if we wished to classify some of the largest mammals by order of size, it would be necessary to establish the following ranks:

1. *Dinotherium giganteum* of the upper miocene of Attica.
2. *Elephas antiquus* of the quaternary of the environs of Paris.
3. *Elephas meridionalis* of the upper pliocene of Durfort.
4. *Mastodon Americanus* of the quaternary of the United States.
5. *Elephas primigenius* of the quaternary of Siberia, and the present elephants.

It is not likely that man has seen the dinotherium, but it is certain that he has come face to face with the *Elephas antiquus* and the mammoth. In order to fight them, he had but stone axes, and yet he conquered them. This allows us to believe that our ancestors of quaternary times had spirit and courage.—*La Nature.*

Coal Oil and Natural Gas.

People often talk of the advantages of natural gas as a fuel without having an adequate idea of its importance. It is to-day the greatest commercial wonder of the age. No one can ponder over the following figures without being deeply impressed: It is only fifteen years ago, says the editor of *Stoves and Hardware*, published at St. Louis, that natural gas was first used as a fuel, yet to-day there is required to pipe it 27,350 miles of mains. In Pittsburg alone 500 miles supply 42,698 private houses, 40 iron mills, 37 glass works, 83 foundries and machine shops, and 422 miscellaneous industrial establishments. An idea of its value as fuel can best be obtained when the value of 7,000,000 tons of coal is estimated, as it is asserted that this amount of coal is annually displaced by natural gas. An idea of the effect a retarded production has in advancing prices can be seen in the shut-down movement in oil production.

This commenced in earnest just about a year ago, and the following is the result: In 1886, when no attempt was made to lessen production, the average run from wells was 70,666 barrels per day. In 1887, when there was less than two months' organized effort in this direction, the average daily run was 63,545 barrels. In ten months of 1887, ending November 1, when the movement was on foot in earnest, it was less than 44,000 barrels per day. The average price of certificates for the first ten months of 1887 was 64¼ cents, for the first ten months of 1888 it was 87 cents, an increase in value of 34½ per cent.

Vacuum Drying.

Mr. Beauder has applied the vacuum principle for the partial drying of fabric. The cloth is passed in full width on a horizontal cylinder, supplied with a slit through its entire length, just on the place where the cloth is allowed to pass. The cylinder is in communication with another tube, by means of which steam is introduced, which, by going out on the other side, creates a kind of vacuum in the cylinder, and by compelling the air to pass through the fabric and through the slit of the cylinder, effects a partial drying. The cloth is allowed to pass over the cylinder slowly only in order that a sufficient amount of moisture may be removed.

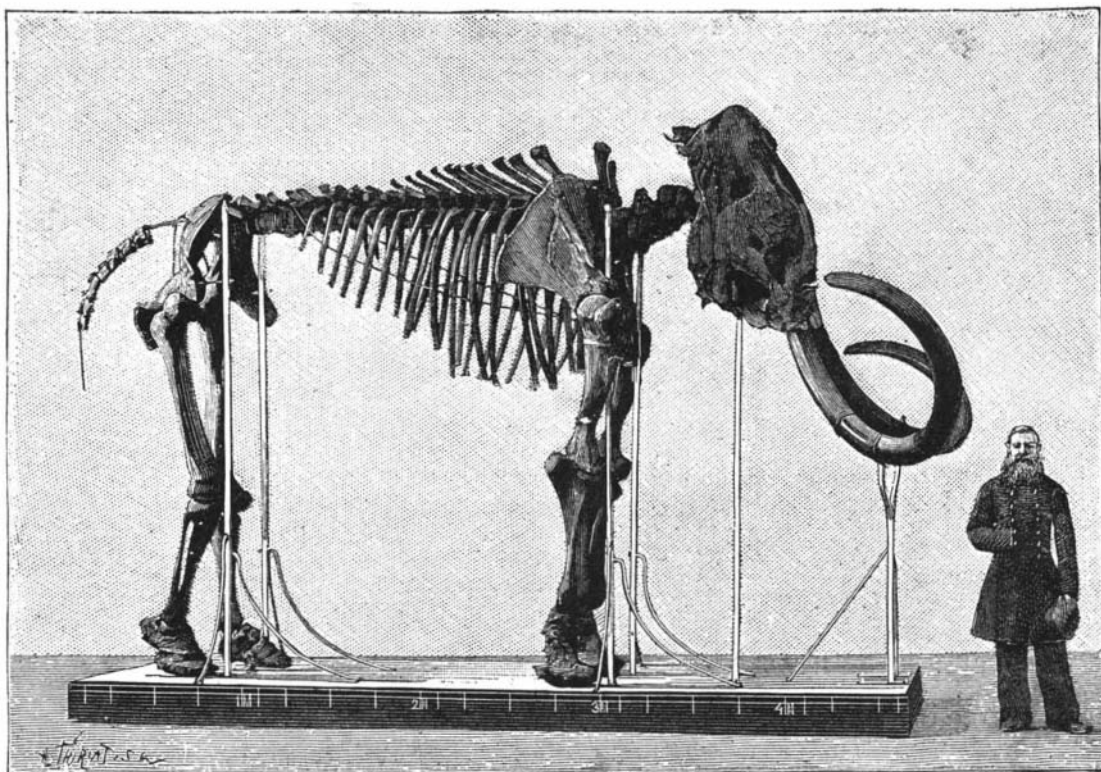


Fig. 1.—SKELETON OF THE SIBERIAN MAMMOTH.

dinotherium which measures 3 feet, while that of the Durfort elephant is but 2'6, and also some metacarpals that present just as great a difference.

If the proportions of the tibias, humeri, and metacarpals and total height of the skeletons were the same in the *Elephas antiquus* and the *Dinotherium giganteum* as in the Durfort *Elephas meridionalis*, it would be necessary to suppose that the *E. antiquus* attained a height of 13 feet at the shoulders and 14¼ at the top