Telephonic Experiments.

As a result of numerous experiments on induction in telephonic circuits, Prof. Cross, says the *Tech*, has found that the induction operating to produce telephonic disturbances is almost entirely electro-dynamic.

The effect of thin sheets of tin foil surrounding an insulated conducting wire is very slight. The diminution of inductive effect produced when a plate of metal or a spare wire is placed between the wires carrying the inducing and induced currents was found to be much greater than with the foil, and also greater with the overtones of the sounds transmitted than with the fundamental. That electrostatic induction is almost ineffective, so far as producing sounds in the receiving telephone is concerned, is shown by the fact that if a small secondary coil with a large and deep primary is held at right angles to its plane, the sound disappears; also, if the metal plate between the coils is slit radially, its effect in diminishing induction disappears.

If intermittent or variable currents are passed through a coil of wire forming a closed circuit, within which a second closed parallel coil is placed, the secondary current induced in the latter can be investigated to a certain extent by inserting a receiving telephone in the secondary circuit. If a closed wire coil is placed near to the other coils, there is a current induced in it, which, as Henry first showed, diminishes the strength of the current in the secondary coil. A heavy sheet of metal, as of brass, placed between the primary and secondary coils, also diminishes the current in the secondary for the same reason. Hence, in both of these cases, the sound produced in the telephone by induction is considerably reduced. The effect of brass, copper, and iron is very marked. Lead, also, contrary to an opinion that has been advanced, exerts a very decided effect. Thin foil, even if it completely envelops the secondary, produces but slight effect. The application of these important results to telephonic cables is obvious.

If, instead of being placed in a simple secondary coil, the telephone is placed in a double circuit of twisted wires, so arranged that the current induced in these will be in opposite directions, complete neutralization of currents is produced, and consequently cessation of sound.

Various other experiments have been performed to test the value of different "anti-induction" devices.

Prof. Cross has also found that a Hughes microphone and a Blake transmitter were capable of transmitting the sound of a high pitch bar giving 12,000 double vibrations per second, thus showing the excessive sensitiveness of the ordinary hand receiving telephone. If the capacity of the line were increased, it was found that its ability to transmit high vibrations was diminished. These experiments also showed that change in quality in the sounds transmitted is not due, as has been stated, to an inability of the microphone or any part of this circuit to respond rapidly enough to their higher overtones.

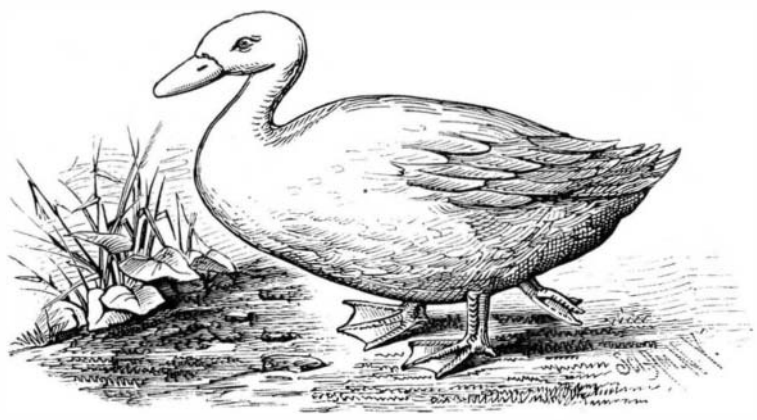
Preservation of Railway Ties.

Some interesting data are published showing the relative value of different methods of injecting railroad ties. On the route from Hanover and Cologne to Minden, for example, the pine ties injected with chloride of zinc required a renewal of twenty-one per cent, after a lapse of twenty-one years; beech ties injected with creosote required a renewal of forty-six per cent after twenty-two years' wear; oak ties injected with chloride of zinc required renewal to the extent of about twenty-one per cent after seventeen years; while the same kind of ties not injected necessitated fully forty-nine per cent of renewals. The conditions in all these cases were very favorable for reliable tests, and the road bed was good, permitting of easy desiccation; the unrenewed ties showed, on cutting, that they were in condition of perfect health. On another road, where the oak ties were not injected, as large a proportion as 74·48 per cent had to be renewed after twelve years; the same description of ties injected with chloride of zinc required only 3·29 per cent renewals after seven years, while similar ties injected with creosote involved, after six years, but 0·09 per cent.

THE stock of ivory in London is estimated at about forty tons in dealers' private warehouses, whereas formerly they usually held about one hundred tons One-fourth of all imported into England goes to the Sheffield cutlers. No really satisfactory substitute for ivory has been found, and millions await the discoverer of one. The existing substitutes won't take the needed polish.

DUCK WITH THREE LEGS.

We give below a sketch of an ornithological curiosity, in the shape of a three-legged duck, kindly sent for our inspection by Mr. George Ely, Hill-road, Wimbleton. The following particulars may be interesting to some of our readers. The bird was of no particular breed, being of the nondescript species common to farm yards. That the redundant crural appendage did not interfere with the duck's bodily welfare was evident, for its condition was excellent, and it weighed nearly five pounds. The third leg was connected to the body about two inches behind the two ordinary legs merely by skin and flesh, without the intervention of the bone called the *tibia* (more commonly the "drumstick"), and, consequently, was of no practical use to the bird, but merely trailed behind it as it walked.—*Land and Water.*



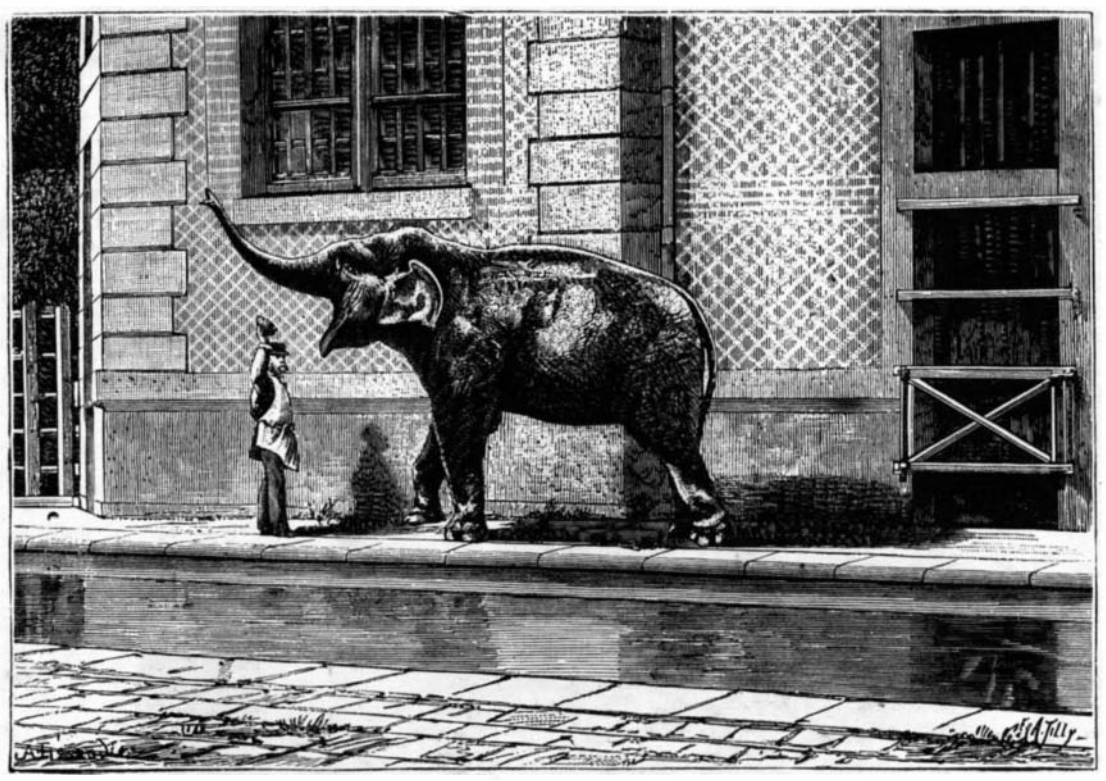
DUCK WITH THREE LEGS.

Leaf Copying.

Take a piece of thin muslin, and wrap it tightly round a ball of cotton-wool as big as an orange. This forms a *dabber*, and should have something to hold it by. Then squeeze on to the corner of a half-sheet of foolscap a little color from a tube of oil paint. Take up a very little color on the dabber, and work it about on the center of the paper for some time, till the dabber is evenly covered with a thin coating. A little oil can be used to dilute or moisten the color if necessary. Then put your leaf down on the paper and dab some color evenly *over both sides*. Place it then between the pages of a folded sheet of paper (unglazed is best), and rub the paper above it well all over with the finger. Open the sheet, remove the leaf, and you will have an impression of *each side* of the leaf. Any color may be used. Burnt or raw sienna works the most satisfactorily.—*Knowledge.*

THE ELEPHANT BY INSTANTANEOUS PHOTOGRAPHY.

The great rotunda of the Museum of Natural History, of Paris, gives shelter to the large mammiferæ. Here dwell especially the giraffes, camels, elephants, etc. We give herewith, from *La Nature*, a copy of an instantaneous photograph taken in this part of the Jardin. The elephant shown was taken just as he was in the act of opening his mouth to receive a piece of bread that his keeper was about to throw to him. Here is seen faithfully represented the reservoir for water that runs around the rotunda, and the external wall of the latter. We may recall the fact that six very similar parks that radiate from the rotunda permit of the large mammiferæ taking the air when the temperature is favorable. With each of these parks there is connected a stable, in which the animals are housed, cared for, and kept warm during winter.



INSTANTANEOUS PHOTOGRAPH OF AN ELEPHANT.

The Exhaust Injector.

On November 11, the members of the Manchester Association of Employers, Foremen, and Draughtsmen had an opportunity of inspecting, on the premises of Messrs. George Fraser, Son & Co., a feed water injector, which is actuated solely by the exhaust steam from the engine. The injector is the invention of Messrs. Davis, Hamer, and Metcalf, and the perfectly successful operation of the apparatus by steam drawn from the ordinary exhaust pipe was a matter of considerable surprise to many of the visitors. Afterward a paper descriptive of the injector was read before the members, at their ordinary meeting held in the Mechanics' Institute, by Mr. A. S. Savill, who, before explaining the invention, said it seemed to have been the opinion of engineers that it would not be possible to work an injector with steam at atmospheric pressure; that an injector must have a pressure of steam to work at; and that with the exhaust injector, this pressure must be got up in the exhaust pipe, which of course would act as a back pressure on the piston of the engine, under which conditions there would not be much, if any, economy in the adoption of an exhaust injector. This reasoning had, however, been proved entirely wrong, and the injector he had brought before them did not in any way put on back pressure, but, on the contrary, reduced or altogether removed it. The injector was simply fixed in a vertical position to a branch from the main exhaust pipe, and to start the injector all that was necessary was to turn on the steam and water. With regard to the apparatus itself, the most important point was its automatic action. As soon as the first puff of steam from the cylinders had cleared out the air from the exhaust pipe, the injector commenced to work, and kept on until the engine ceased to give out steam, restarting again as the engine restarted, without any manipulation being required. In the construction of the injector there were, as in the ordinary types, three nozzles—the steam nozzle, the combining or mixing nozzle, and the delivery nozzle. The steam nozzle was similar to the one in the Giffard injector, but of a very large bore, and inside was fixed a small spindle to concentrate the steam. The chief feature, however, was the combining nozzle, which was constructed to start the injector automatically. The nozzle was split from its smallest bore for rather more than half its length, one-half being solid with the nozzle itself, and the other half arranged to work freely on a hinge, by which it was enabled to enlarge or contract its area. The delivery nozzle was very similar to that of a Giffard injector. When not working, the hinged flap in the injector was open, and a large area was presented for the egress of steam and water When steam and water were turned on, some condensation took place, which instantly formed a partial vacuum, into which more steam and water were drawn until such a vacuum was formed that steam was attracted with a velocity so great as to impart to the water sufficient speed to enter the boiler, the flap being at the same moment sucked down, and forming to all intents and purposes a solid nozzle. Results from actual experience had shown that by one of these injectors, the feed water entering at 66° Fahr., and a minimum delivery of 960 gallons per hour, the temperature had been raised to 190° Fahr. The injector was capable of feeding against 70 pounds to 75 pounds pressure, but when the pressure was above this an arrangement was attached for supplementing "live" steam from the boiler, which in addition further increased the temperature of the feed water. In the discussion which followed, the injector met with general commendation, the results which had been seen in actual working being admitted as surprising; and Mr. Gresham, who has long been connected with the manufacture of injectors, said he considered the exhaust injector as great an advance upon the present methods as the introduction of the Giffard was upon the methods then in vogue. He thought, however, that automaticity might be carried too far, and that the exhaust injector would scarcely be suitable for locomotives, as it only delivered its feed when the engine was working. Mr. Savill in reply, however, stated that, by connecting the injector with the boiler steam, it could be worked when the engine was standing, and that, although it did not seem a very nice arrangement for locomotives, it had been worked successfully on a locomotive both when it was running and when it was standing.

IT is estimated that there passed through the booms of the St. John River, N. B., this season about 126,000,000 ft. of logs.