the train is to be followed by another train on the same schedule with exactly the same rights. Two green flags are carried on the rear or last car to indicate that that is the last car in the train; in other words, that the train is complete. Should the green flags be not shown on the rear car of the train, it would indicate to the railroad man that the train had parted, and that there was only a part of the train together in the front portion, a car or two probably having been lost, which often happens by reason of the coupling breaking or the automatic coupling unlocking. This seldom occurs with a passenger train, but it is a daily occurrence with a freight train.

MODELS OF SOME OF THE EXTINCT LIZARDS OF WESTERN NORTH AMERICA.

BY E. O. HOVEY.

Among the new specimens on exhibition in the American Museum of Natural History in this city, in the department of Vertebrate Palæontology, are recently discovered fossils, as well as models and water color paintings to illustrate the supposed appearance of the great lizards which lived in Western North America in Permian, Jurassic and Cretaceous time. Through the kindness of Prof. H. F. Osborn, the curator of the department, we are enabled to present our readers with photographs of some of these models and of one of the great skeletons as it lay in the rock from which it was excavated and the facts concerning them.

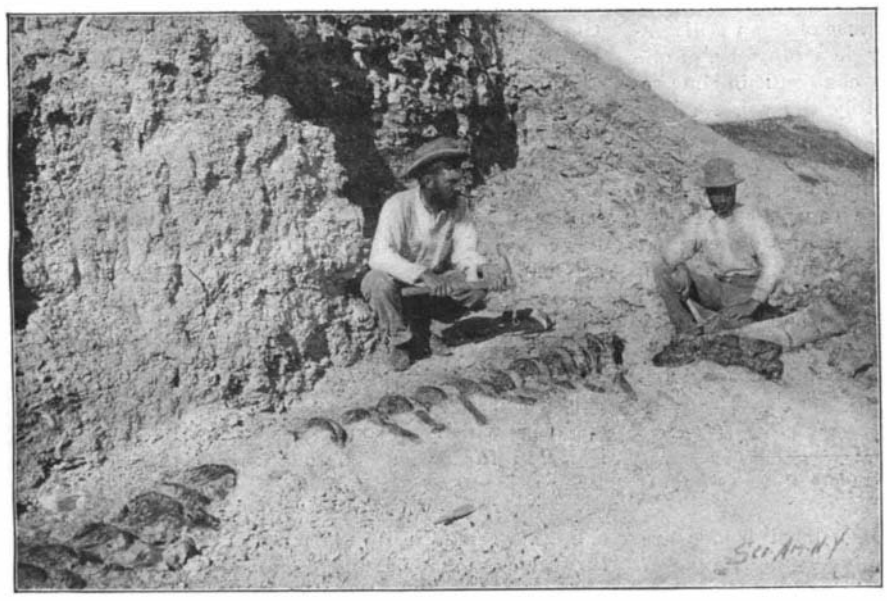

Fig. 1.—FOSSIL BONES IN MATRIX.

This department of the museum was established in the spring of 1891 for the purpose of procuring a representative collection of the fossil vertebrates from the successive geological horizons of the western part of this country for exhibition, research and publication. Every year since then expeditions have been sent out, mainly to the great Tertiary lake basins of the Rocky Mountain region, and an immense amount of material has been gotten together, much of which is now on exhibition in the museum. In the summer of 1897 the expeditions had extraordinary success, one of the parties making one of the most important discoveries ever made in vertebrate palæontology. This party, under the leadership of Dr. J. L. Wortman, was opening a quarry in southern Wyoming for obtaining specimens of the oldest form of mammals when it made the discovery, first of one and afterward of another reptile skeleton of enormous size, and in a remarkably good state of preservation. Fig. 1 is made from a photograph of the bones as they lay in their matrix before they were removed for transportation, giving some idea of the manner of working this form of excavation. The greatest care must be exercised not to injure the surface of the bones with rough implements. After the fossils have been excavated they are carefully wrapped in burlaps and plaster of Paris, to prevent, as far as possible, their crumbling to pieces on drying and to enable them to bear in safety the long journey to the museum. These bones are wonderfully well preserved, and show that the animals to which they belong must have been between fifty and seventy feet in length. The parts represented were the tail vertebræ and the limb bones.

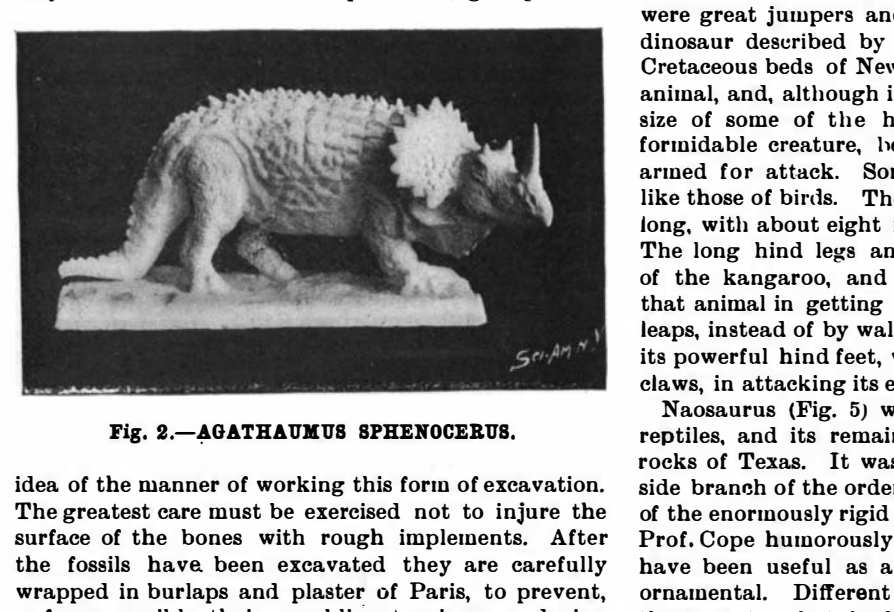

Fig. 2.—AGATHAUMUS SPHENOCERUS.

Many attempts have been made to clothe the skeletons of extinct vertebrates with flesh and blood, but the most life-like of all thus far have been the water-color paintings which Mr. Charles Knight has prepared under supervision of Prof. Osborn and Dr. Wortman. Lately Mr. Knight has turned his attention, under the same supervision, with many suggestions from the late Prof. Cope, to the preparation of a series of models on a reduced scale of some of these animals. The results of some of this work are shown in Figs. 2 to 5, which are from photographs of the models. These models are based upon published restorations of the skeletons and upon the study of the best material to be found in the collections of the American Museum, Princeton University and the late Prof. Cope. This material gives definite knowledge or inference upon the form and proportions of body and limbs, the shape and character of the head and the position of the sense-organs. The character of the skin is in some cases known to some extent, but in others it has been based upon that of the nearest related living species.

Agathaumus (Fig. 2) was a large, heavily armored dinosaur, or giant lizard, from the Upper Cretaceous beds of Western America, having one large and two comparatively small horns for weapons of attack. The animal was about twenty-five feet long, its feet were provided with hoofs, and the limbs were more symmetrically developed than they were in some other dinosaurs. It lived upon herbaceous food.

Hadrosaurus (Fig. 3) was a great lizard, thirty-eight feet long and provided with a long neck, flattened bill like that of a duck, weak teeth, small fore legs and heavy hind legs and tail. It probably was at home both on the land and in the water and fed upon soft water plants or small mud-loving animals. The animal was covered with a thick hide like that of a rhinoceros, as is known from specimens in the Cope collection in the museum. Its skeleton is found in the Laramie Cretaceous beds of the West.

Fig. 3.—HADROSAURUS MIRABILIS.

Fig. 4 represents two individuals of the genus Megalosaurus, Prof. Cope thinking that these animals were great jumpers and fighters. This was the first dinosaur described by Prof. Cope and was from the Cretaceous beds of New Jersey. It was a carnivorous animal, and, although it did not attain the enormous size of some of the herbivorous dinosaurs, it was a formidable creature, being light and active and well armed for attack. Some of the bones were hollow like those of birds. The animal was about fifteen feet long, with about eight feet of this length in the tail. The long hind legs and the strong tail remind one of the kangaroo, and it may even have resembled that animal in getting over the ground by means of leaps, instead of by walking or running, and in using its powerful hind feet, which were armed with heavy claws, in attacking its enemies or its prey.

Naosaurus (Fig. 5) was one of the more primitive reptiles, and its remains are found in the Permian rocks of Texas. It was evidently a highly specialized side branch of the order of reptiles, but the precise use of the enormously rigid fin along its back is not known. Prof. Cope humorously suggested that this fin might have been useful as a sail. It was, perhaps, chiefly ornamental. Different species of this lizard were from three to ten feet in length, and some of them had even longer dorsal fins than the one shown in the model.

Practical Lectures on the Treatment of Animals.

Perhaps never in the history of illustrated lectures was one given amid such queer surroundings as the one which was delivered on June 22, by Mrs. Myles Standish, president of "Our Animal Protective League," an association which was founded a short time ago, and which has for its object the teaching of those who have to deal with animals, and especially with horses, that kindness to our dumb dependents is not only a duty, but it also pays. Some of the New York east side drivers were informed of the organization of the society and its object, and they invited members of the society to visit them, and the drivers offered to furnish the expense of the stereopticon and also to provide accommodation for the lecturers. A large stable and stable-yard were secured and were thoroughly cleaned in honor of the occasion. An audience which numbered about 700 made its way between two rows of trucks and carts to the yard in the rear. Here the vehicles were stood on end with the exception of a truck which rested on its wheels, which served as a lecture platform. A sheet was nailed on the wall of a building and 150 views were projected, the talk being given by Mrs. Standish and other members of the society. They told them the proper way of harnessing and treating horses and showed that cruelty was very often caused by ignorance. Views of the horses of the fire, police, and street cleaning departments were shown. The remarks of the lecturers were listened to with great attention by the drivers, and it is thought that the meeting will be productive of great good. Work of this kind is of the most practical nature and deserves the warm support of all who love animals.

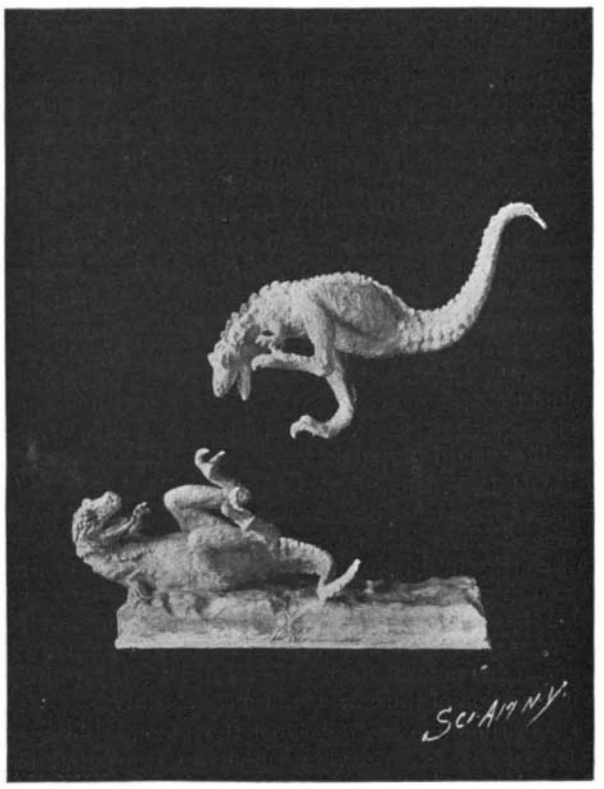

Fig. 4.—MEGALOSAURUS AQUILUNGIUS.

A CLASS for the instruction of hospital-corps men in preparing food for the sick has been organized at the Washington Arsenal, according to The Boston Cooking School Magazine. The work is to be carried on under military regulations, and the aim is to provide a corps of men who can provide for the sick such food as is available. The plan involves also the establishment of a school or schools for army cooks to be conducted by regular officers at some convenient recruiting station.

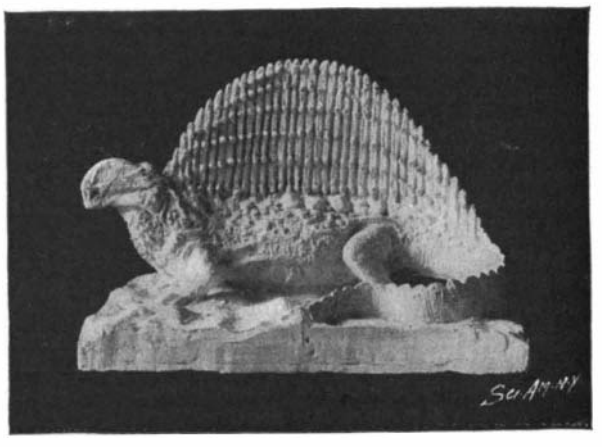

Fig. 5.—NAOSAURUS CLAVIGER.

TELEGRAPHIC communication will be established between the Scottish islands of Muck, Egg, Canna and Rum. They are all to be connected with the mainland and with the Isle of Skye.

Science Notes.

A small exhibition will be held in Belgium under the name of "Electricité à la Maison."

In Boston, policemen in citizens' clothes are mounted on bicycles and patrol the different streets of the Back Bay district. They make practically no noise and would be considered by thieves to be ordinary wheelmen returning from some of the fine bicycle runs in the environs.

The Duke of Abruzzi sailed, on June 12, for Barents Sea and Franz Josef Land. Walter Wellman has a year's start of the Italian explorer. The Smith Sound or American route, which is chosen by Peary and Sverdrup, is now again in favor among geographers and Arctic explorers.

An interesting discovery has just been made in the Bibliothèque Nationale at Paris. This is a calendar of the cases in the criminal court known as the Chambre de la Tournalle, which goes back to the fifteenth century. Among the papers are official notes of the arrest of Joan of Arc and of her final execution.

A Baltimorean who has been a close student of household economics has recently made a comparison of the weight of paper with the weight of food supplies purchased. In one day's purchase it is said that the paper wrapping amounted to about ten per cent of the total. In a list of supplies costing about $1.40, he found that the paper which was weighed with the provisions cost 14¾ cents. He claimed that this was altogether out of proportion.

Mr. C. D. P. Gibson, of Jersey City, N. J., has built a motor carriage which is run by carbonic acid gas. In many ways this is a most alluring motive agent, but usually inventors have not been able to control it and they could not prevent the valves of the agent from freezing, owing to its too rapid expansion. Its expense was also against it; the latter has been overcome at the present time. We shall probably publish a description of the carriage in a short time.

Some time ago we described the remarkable operation of Dr. Schlatter, in which he extirpated the stomach of a female patient. It is interesting to know that she lived fourteen months after the operation and that there was no difficulty in keeping up the nutrition of the patient. The food taken passed directly from the esophagus into the intestines, and the intestinal digestion was sufficient to satisfy her wants. This was shown by the long continuance of her life after the operation.

The United States Geological Survey has recently published a valuable map of New York city and vicinity. It is a revised edition. The original survey was made ten years ago, and an edition of the map was issued at that time, but the territory covered by the map was considerably different from the territory shown in the new map. Like all the other maps issued by the Survey, it is well adapted for scientific and popular uses and in accordance with the law is sold at the cost of printing.

The Sleep Problem.

In these days of rush and excitement, when the nervous system is too often stretched to its utmost tension, and when neurasthenia is rampant everywhere, the question of rest and sleep must be considered. The mode of living has so altered, even within the past thirty years, and especially in this country, that the sleep problem is the matter of the first importance. This being the case, the fact that little is definitely known as to the cause of sleep is decidedly curious. Sleep—perhaps the most marvelous phenomenon in the world—may rightly be termed a mystery.

But, as with everything to which by long use we have become accustomed, we regard it with indifference. In some journals and magazines in this country and in Great Britain instructive articles have been of late contributed in regard to sleep. Dr. Andrew Wilson, in the April issue of Harper's Magazine, takes the popular view that it is in the brain cells that we shall probably find such explanation of sleep as science can afford. Madam de Manaceine, who has in an essay published some few months ago collected and presented in an attractive form the principal facts dealing with the causation of sleep, says:

"The truth is that although the problems of sleep have exercised some of the greatest intellects of ancient and modern lines from Aristotle downward, all that we really know of sleep is due to the labors of a comparatively small number of workers." The vasomotor theory of sleep is the one most widely accepted. Cerebral anæmia is one of the most potent predisposing factors. Fluger contends that carbonic acid plays a very important part in the causation of sleep. Nerve histologists have put forward the principal theories with regard to sleep, of which those advanced by Howell of Johns Hopkins have perhaps obtained the most credence.

Leonard Hill thus summarizes the facts which are known concerning sleep: 1. Respiration. (a) The number per minute remains unaltered, the movement becomes shallow and thoracic in type; (b) the amount of inspired air per minute is lessened by from one-half to two-thirds; (c) the output of carbonic acid gas is diminished by one-half to two-thirds. 2. Circulation. (a) The blood congests in the limbs; (b) the venous system is engorged; (c) the arterial pressure falls; (d) the pulse rate diminishes; and (e) the velocity of blood flow decreases. 3. Temperature. The temperature falls during the night. The production of heat is estimated to diminish by from half to two-thirds. 4. Nervous system. (a) The blood-flow through the brain is diminished; (b) the acidity of the cortex decreases; (c) the excitability of consciousness to external stimuli steadily decreases during the first one to two hours of sound sleep. After that period the excitability rapidly becomes almost as great as it is toward the end of sleep; and (d) consciousness alone seems to be abrogated during sleep. The nerves and the special senses continue to transmit impulses and produce reflex movements. Cerebral anæmia is the theory which has the most wide acceptance, but as Leonard Hill remarks, such speculations do not carry us far, and the causation of sleep must still be regarded as metaphysical. While, however, the cause of sleep still continues to be enveloped in more or less mystery, of one truth we are much too frequently cognizant in the present age—that of insomnia, possibly the worst misery to be imagined.

Highly wrought nervous organizations, produced by the high pressure living of our times, are in this country rather the rule than the exception. Therefore the absolute need for a period of repose spent among healthy, invigorating surroundings, which should be a sine qua non with the fagged-out brain workers of our cities. This question is undoubtedly one of the most serious confronting the rising generation who dwell in the busy centers of trade, and becomes more and more menacing as the years roll on. —The Medical Record.

The Rare Woods of Our Philippine Possessions.

BY GEORGE E. WALSH.

Many valuable and little known hard woods are found growing wild in the Philippine Islands, some of which will become important articles of export when better known. The tropical nature of the climate, and the wonderful fertility of the soil, make the growth of these woods merely a matter of planting and time for them to develop and mature. The sapan wood is probably the best known of the merchantable timber, but this product does not equal the sapan wood of Pernambuco. It is a short and unattractive tree, and the wood is generally hard, heavy, crooked, and full of knots. When first cut it is white, but it assumes a deep red color on exposure to the air, and is susceptible of a very fine polish. The heart of the branch contains coloring matter, which is extracted by boiling, and is known in the trade as "false crimson." It is not as good or permanent as cochineal dye.

There are some fifty varieties of hard woods found in the islands, but many of them do not grow to a sufficient size to be of commercial use, as squared logs cannot be cut from them. A variety of Herculia amboformis called dungon is sometimes sold as ironwood. It is a hard, durable wood, and is much used on the islands where great strength is required. It is used for the keels of the native boats, and its great durability partly accounts for the strength and staunchness of these craft. In Manila it is employed for buildings to support the roofs or other heavy weights. It cannot be procured in sufficient lengths to answer many purposes, as it rarely grows higher than fifty feet, giving logs up to 20 inches square.

The tropical nature of the water surrounding the islands makes the danger to wooden ships and piles from the sea worms (Teredo navalis) and the white ants (termes) very great, and it has required years to construct works that will last. There are at least two different woods which successfully resist these injurious insects. The molave (Vitex geniculata) not only resists the attacks of both insects, but also the destructive action of the climate. Consequently this wood has great local value. It is used in marine work where the teredo is likely to attack it, and also underground where the soil is wet and soggy. It is frequently employed for the frames of vessels, and its peculiar tendency to grow crooked enables ship-builders to secure good sticks already bent for them. It will also prove of great value for railroad sleepers, as its imperviousness makes it remarkably long-lived. The natives call the wood the "Queen of the Woods."

Another good wood that resists the Teredo navalis and the effects of the climate is the antipolo (Artocarpus incisa). In other respects this is a better wood than the first. For instance, when it has been properly seasoned it never warps. It is remarkably strong, and resists great lateral pressure. It is highly prized by shipbuilders, who use it for the outside planking of their ships and for keels. Although strong, this wood is comparatively light.

Two woods that are used extensively for piling in both salt and fresh water are the aranga (Homalium) and betis (Azaola). The first produces logs 75 feet in length and 24 inches square. It is a favorite wood for sea piling and all rough marine work. The second wood gives logs about 60 feet in length and 20 inches square. It is a better class of wood than the first, and besides being employed for sea piling, piers, and wharves, it enters quite largely into the construction of ships.

A fine wood that is employed extensively in house building is the Mimosa acle, which gives logs 32 feet long. This wood is very hard to burn, and houses built of it do not succumb to flames nearly as quickly as other woods. Its power of resisting fire is almost equal to bricks. For this reason house-builders use considerable of it. It is also very strong and durable, and susceptible to a high polish.

A strong, tough and elastic wood comes from the batitinan (Lagerstrœmia batitinan) tree. It has a variety of uses, from making furniture to planking the sides of ships. It makes a fine substitute for mahogany or black walnut for cabinet work. It is even stronger than the Chinese teak wood, and it could be used wherever this wood is now employed. When properly seasoned, it stands the climate very well, but it is not proof against the sea worms or the climate when buried underground. Probably one of the hardest woods is the bansalague (Mimusops elengi. Lin.), which is commonly known in Europe as the bullet-tree wood. Its grain is very close and compact, making it excellent for turning purposes. The wood is so tough that it can be shaped like a nail and driven into other woods with a mallet. In the ship-building yards at Manila it is employed as treenails. Nearly all of the local ax and tool handles are made of this wood.

The mahogany of the Philippines is the narra (Pterocarpus palidus santalinus), which gives logs up to 35 feet long and 26 inches square. It has a rather open grain, but it polishes well and is very prettily marked. The wood from different trees presents a variety of colorings which can sometimes be arranged very artistically in furniture. The markings run from a light straw color to a clear blood red. It has been exported to London for many years, where it is used in fine cabinet work. In Manila most of the best grades of furniture are made from this wood. Of the same order as the mahogany is a cedar called botanically Cedrela odorata, but known in the islands as calantas. It is a very handsome wood when polished, and it is used for inside finishing in the houses. But its principal use in a commercial way is for making cigar boxes. It is not equal for this purpose to the Spanish cedar used for boxing Havana cigars, but it is a fair substitute, and about the only satisfactory one found in the Philippine archipelago. It can be obtained in pretty fair logs, some running up as high as 40 feet in length and 35 inches square.

A peculiar-looking wood for cabinet and furniture manufacturing is the camagon or mabolo, a variety of Diospyros philoshantera, and it is used quite extensively for the purposes it is adapted for. It takes an excellent polish, and when finished vivid black with yellow streaks are the predominating colors. This combination makes very effective work for certain kinds of furniture. It is a close-grained and brittle wood, but rarely comes in lengths over 9 feet. Another good furniture wood, and a substitute for black walnut, is the dinglas (Eugenia sp.), which is hard, strong and durable. Its markings are good, and it polishes beautifully. Ebony is found in limited quantities, but it can hardly be called an important commercial wood. Dipterocarpus guijo is the wood used by the wheelwrights in Manila. Both carriage wheels and the shafts are usually made of this wood. It is naturally very tough and elastic—two necessary qualities for carriage building in any country. A great deal of this wood is exported to Hong Kong, where it is employed for flooring the wharf decks. Mangachapuy is a strong elastic wood that equals teak for withstanding the climate. In ship-building it furnishes the masts and spars, and it holds high favor among those who have used it. When exposed to the hot sun and rains, which is very hard on all woods in such a climate, it holds its own with the best that can be produced. It must be seasoned properly for the purpose, however, or will show signs of decay much earlier.

Many of the trees of the Philippines produce fragrant sap that is used for different purposes. Some of them yield a sap that is very valuable for polishing the smooth surfaces of other woods. Thus the sap of the ipil tree gives a glazed polish or covering that is very effective. In the hands of an expert it is sometimes put on so successfully that it resembles the varnish used on japan-ware. Hot weather affects the polish made by the sap more than cold weather. The wood of the supa tree produces an oil which is extracted for commercial uses, and the wood then used for house-building. The apiton yields a gum which the natives collect for incense burning. It has an agreeable odor.

PROF. REGINALD A. FESSENDEN, of the Western University of Pennsylvania, has invented a telescope which it is said will tend to lessen the efficiency of smokeless powder in warfare by locating the flash when the powder is discharged. The War Department will make a test of the instrument before the examining board.

Miscellaneous Notes and Receipts.

Hardening Powder for Steel Tools.—The Zeitschrift fuer Maschinen bau und Schlosserei is authority for the following process: Powdered stag's hoof, 500 parts; Peruvian bark, 500 parts; cooking salt, 250 parts; refined saltpeter, 150 parts; potassium cyanide, 150 parts; all powdered well, mixed and made into a paste with 1,000 parts of black soap. The tools are made red hot, the powder is applied, and the tools are next hardened. For tempering the following lead baths are recommended: Tin 4 parts, lead 7 parts; tin 4 parts, lead 8 parts; tin 4 parts, lead 14 parts; tin 4 parts, lead 19 parts; tin 4 parts, lead 48 parts; tin 2 parts, lead 50 parts.

Gold and Silver Bronze on Leather.—In order to render bronzes on leather durable, it must first be saturated with a solution of sugar of lead or cupric acetate, and then exposed to the action of hydrogen sulphide. The bronzing may be done by applying the solution with the sponge or by the galvanic process. In the former case the following solutions are used. For gold: Gold chloride solution (containing 15 grammes of gold chloride), 21 grammes; soda solution (40 grammes of soda to 1 liter), ½ liter; glycerine, 15 grammes. For silver: Water, 10 liters; silver nitrate, 100 grammes; ammonia, 65 grammes; tartaric acid, 15 grammes; or water, 10 liters; glucose, 100 grammes; silver nitrate, 10 grammes (?) For nickel: Nickel nitrate, 400 grammes; ammonia, 400 grammes; water, 15 liters; Glauber's salt, 5 kilos. For cobalt: Water, 1,000 liters; cobalt-ammonium sulphate, 1 liter.—Schuh und Leder, 1899, No. 7, 35.

To Transfer Pictures on Wood.—For transferring pictures (copper prints, etc.) to wood, it is best to choose soft kinds of wood, such as poplar, linden, or maple. The surface is rubbed smooth with bleached linseed oil and warmed over a coal fire. Then the surface is coated three times with varnish from sandarac, 30 grammes; shellac, 15 grammes; turpentine, 15 grammes: and alcohol (90 per cent), 375 grammes. This varnish may be colored as desired—red with dragon's blood, or yellow with curcuma. The copper print, etc., is now soaked thoroughly in salt water, then laid on blotting paper so that the moisture is drawn off and the picture only remains damp. Next, coat the wooden surface again with varnish, likewise the print, and lay the latter on the wood with the printed side; lay on a piece of flannel and on the flannel a smooth, warmed piece of wood, and squeeze the whole firmly together in a screw clamp. After a few hours the work is dry and the back of the paper is carefully rubbed off with a linen rag saturated with water. The transferred picture is rubbed lightly with linseed oil and coated a few more times with the varnish.—Maler Zeitung.

Indelible Red Ink.—The Hannoversche Gewerbeblatt gives a formula for the production of a red ink, which is said to excel in great resistance to washing and bleaching mediums. This is the recipe: Prepare three solutions. 1. Soda, 3 parts; gum arabic, 3 parts; water, 12 parts. 2. Platinum chloride, 1 part; distilled water, 24 parts. 3. Zinc chloride, 1 part; distilled water, 4 parts.

The spot where the writing is to be applied is moistened with solution 1, and rubbed with a warm iron. Now put on the letters by means of a pen or pencil dipped in solution 2. After this has become dry moisten the place with solution 3.

For linen goods the following process is also very useful: White of egg is dissolved in an equal quantity of water and stirred with a glass rod until the solution froths, when it is filtered through a linen cloth. The filtrate is made into a thick paste with finely ground cochineal red. With this mass the monogram, etc., may be applied on the linen, using a drawing pen or quill. The place is then treated from the back with a hot flat-iron until the albumen has coagulated.—Farben Zeitung.

Production of Tarsia Material.—This new process makes it possible to produce the insertions necessary in the manufacture of tarsia material, in large quantities, by means of ordinary stenciling machines.

As a substance capable of imparting to wood the necessary pliancy without detracting from the color, and without changing the structure of the fiber, an alum solution has been found very valuable, the veneers to be cut in the aforesaid process being saturated with it. The alum combines with the dyestuff in the wood into a lake possessing the same color, so that the shade of the wood is preserved by this treatment, while the other organic constituents of the wood are also kept from decomposition by the admixture of alum. The veneers produced with it show very sharp outlines, and remain entirely free from cracks and warping, even if stored for a long time, because the alum does not change the structure of the wood, and is not sufficiently hygroscopic to absorb water when stored, as is the case with the use of other salts, such as calcium chloride, which is frequently employed.

When alum was heretofore employed in the wood-working branch, it was merely for the purpose of precipitating on the fiber agents such as logwood, used for staining the wood, the wood fiber being first given the last stain, and then treated with the alum solution, or else shades produced in the wood, such as the one obtained by the use of green vitriol, were moderated by boiling with alum, in consequence of its acid reaction. In the present process the dyeing is not concerned, but merely a peculiar treatment of the wood fiber for the purpose of a simultaneous production of large quantities of veneers of faultless cut and durability.

For carrying out the process the veneering leaves are simply boiled in an alum solution until one has satisfied one's self by a sample that the transformation has taken place. The leaves cut out are then used in the customary manner for inlaying, without any fear of distortion.—Neueste Erfindungen und Erfahrungen.

The Kachin Developer.

SIMULTANEOUS DEVELOPMENT AND FIXATION.

Kachin, about to be put on the market as a developer, is a white crystalline powder easily soluble in water, and does not stain plates, skin, or nails. Its makers recommend the use of sodium sulphite with it as a preservative, and sodium hydrate or sodium carbonate as the accelerator.

Several brands of plates of different speeds were exposed upon a variety of subjects. The exposures varied from half the estimated correct exposure to four times that which would have been sufficient for the subject in hand, the object being to submit the developer to the tests which would be likely to occur in practical work.

After a number of experiments upon correctly exposed plates, during which the constituent parts of the developer were frequently modified, a formula was evolved which gave excellent results with all the plates tested, and which is capable of being easily adjusted either previous to development or while development is proceeding, to correct errors in development within wide limits, and so obtain the best possible results.

STOCK SOLUTIONS.

A—Kachin	120 grains.
Sodium sulphite	1,200 "
Water to make	10 ounces.
B—Sodium hydrate	80 grains.
Water to make	10 ounces.
C—Sodium carbonate	1 ounce.
Water to make	4 ounces.
D—Sodium sulphite	1,200 grains.
Water to make	10 ounces.

For use with correctly exposed subjects, such as ordinary landscapes, in which a fair amount of contrast is required, take—

A solution	160 minims.
B solution	30 "
Water to make	1 ounce.

Each ounce of the mixed developer will contain kachin 4 grains, sodium sulphite 40 grains, and sodium hydrate ½ grain.

This developer will give ample density and contrast without causing any veil upon the edges of the plate without the use of bromide. For a correctly exposed subject, such as portraiture, in which less contrast is required, the developer may be altered as follows:

A solution	80 minims.
B solution	30 "
D solution	80 "
Water to make	1 ounce.

In this developer the proportion of kachin has been reduced to two grains to the ounce, the proportions of the other constituents remaining the same.

When sodium carbonate is preferred to sodium hydrate, twenty minims of the C solution should be substituted for the thirty minims of B, in which case each ounce of developer will contain five grains of sodium carbonate. In cases of under-exposure, where the action of the light has been sufficient to impress detail upon the plate, the following modifications will do all that is possible with any developer in the way of giving strength to the shadows without undue density in the lights.

A solution	80 minims.
B solution	60 "
D solution	80 "
Water to make	1 ounce.

A further addition of sodium hydrate will induce veil over the shadows, but if sodium carbonate is used the amount may be increased to twenty grains (eighty minims of C solution) with advantage.

In all these modifications the proportion of sodium sulphite should remain constant to the ounce of developer. Unless sufficient of the D solution is added to make up the deficiency, the quality of the negative will be impaired. A reduction in the quantity of sodium sulphite may, unless the amount of sodium hydrate is also decreased, lead to a slight veil over the shadows, and if the proportions of both are lessened, there will be difficulty in obtaining density.

A single drop of a ten per cent solution of potassium bromide will slow the action of the developer considerably, so that it is not necessary. In cases of slight over-exposure, all that is necessary is to make an addition to the proportion of kachin from the stock solution, which carries with it an addition to the proportion of sodium sulphite. This with a slight decrease in the amount of sodium hydrate or sodium carbonate at the beginning of the development will keep the shadows clear, and allow sufficient density and contrast to be obtained.

A method of dealing with over-exposure is to take advantage of an attribute peculiar to this developer. Kachin may have sodium hyposulphite added to it in such a quantity that *development and fixation proceed simultaneously.*

This can be done in all cases except when under-exposure is suspected, as it has a tendency to give brilliant results, but this tendency is of great service in case of over-exposure.

For correct exposures the following formula will give admirable results, and will serve as a basis to be modified for other conditions.

E—Stock solution of sodium hyposulphite:

Sodium hyposulphite	1 ounce.
Water to make	2 ounces.

Working solution for simultaneous development and fixation:

A solution	160 minims.
B solution	240 "
E solution	20 "
Water to make	1 ounce.

In using this solution for a correctly exposed plate fixation will have taken place by the time development is complete.

In cases of over-exposure the proportion of B may be reduced to one-half, and when development has proceeded some time, the proportion of hyposulphite may be increased, but in no case should the proportion at the beginning of development be greater than that stated above. When specially soft results are required, the proportion of kachin may be reduced to half with an addition of D solution to make up for the deficiency of sodium sulphite, and B solution may be increased to hasten development.

In addition to the saving of time effected by this method of working, it is possible—after the plate has been some time in the developer, and the image is clearly seen—to increase the amount of light. It is possible to complete the development of the most rapid plates by the light of an unshielded gas flame without grave risk of fog, if a little care is used, but such a proceeding is not to be recommended. A single sheet of orange glass or canary fabric will remove the danger, and allow sufficient light to pass for all purposes. With the increased amount of light, and the removal of the silver bromide during development, the estimation of density becomes a simple matter.

Sodium carbonate cannot be used in the developer in conjunction with hyposulphite. Even when forty grains of sodium carbonate were used to the ounce of developer, the fixation outran development. When the proportion of hyposulphite was reduced to one-half that stated, a curious result took place. Development was extremely slow, and at first it appeared as if no image would be formed, but after an hour's action a positive image was formed strong in the shadows, but with a deposit of semi-opaque white silver in the lights. This deposit was not dissolved when the plate was transferred to the ordinary fixing bath. With fuller knowledge it may be possible to obtain good reversed negatives in this way. The color of the negatives produced by kachin is a good black, free from any tint of blue.

In its power of giving contrasts, gradation, or extreme softness at will, with the entire absence of stain, kachin compares very favorably with pyro.—J. McIntosh in Photography.

What Constitutes a Healthy Man.

One of our medical contemporaries, The Texas Medical News, thus sums up the qualities which constitute a perfectly healthy man. He should have a strong, healthy heart; one not weak from disuse or the excessive use of tobacco, alcohol or other causes; lungs well developed and that expand rhythmically with ample breathing space for health and a surplus for work or disease; muscles well rounded and elastic, made hard and strong by use and carrying, like the camel's hump, reserve energy for trying journeys: nerves, nature's electric wires properly insulated and connected, bringing all the various organs of the body into one perfect system, and all under the control of a brain of just proportions, well balanced and convoluted, not soft from disuse or destroyed for the need of rest; educated for the high duties it was intended to perform, not only to stand guard over and protect the health and life of the individual, but at the same time to furnish feeling and thought and pleasure for the human being. All of these organs, when properly constructed and adjusted and perfect in every detail, go to make up a healthy individual and one possessing within himself a power of resistance not easily overcome by disease-producing organisms.

DR. TARLETON H. BEAN has been appointed Director of Forestry and Fisheries of the United States Commission to the Paris Exposition of 1900. The appointment was made by Commissioner-General Peck.