with civilization is by a wagon road some fifteen miles long. Over this road, which for most of the distance is hardly more than a cart track of the roughest description, the rails and rolling stock were hauled. The locomotives were taken in pieces, with the exception of one, which was so urgently needed that, to save time it was fired up and run by its own steam, without any rails at all, over the dirt road to its destination. A force of men, equipped with levers to steer the engine round corners, went ahead, and wagons carrying water and fuel followed. The journey was made without accident and much to the amazement of the lumber choppers, who were not accustomed to see locomotives traveling through pine forests in search of a railroad.

Lake Tahoe, California, is a beautiful body of water surrounded by mountains. It is noted for its clearness and depth, and it is said that the bodies of those drowned in it never rise. It is now utilized for logging purposes, being reached by a chute one third of a mile long, down which the logs, weighing from five to ten tons each, slide in less than half a minute, followed by a track of smoke and flame. The report made when a log strikes the water is heard a mile away, and the spray is thrown into the air as high as a church steeple. These immense logs are all carried along the mountain sides to the top of the chute by a little logging locomotive whose weight is less than many of the logs it hauls.

At Dutch Flat, Cal., a novel and ingenious application of locomotive power is in use. The track of the logging railroad runs high up along the mountains, and a great part of the timber grows on the sides and bottoms of precipitous cañons. An inclined plane, 1,200 feet long, with a perpendicular descent of 600 feet, runs from the railroad down the mountain, and the locomotive is run on to a siding where friction rollers are set in the track. Resting on these rollers the locomotive driving wheels turn twenty miles an hour without advancing an inch, but the motion is communicated from the rollers by gear wheels to a drum on which is wound a steel wire rope. By this simple device a twelve-ton locomotive pulls up a load much heavier than itself. When enough logs have been hoisted to make a train load, the locomotive is run on to the main track again, and pursues the even tenor of its way just as if it had not been transformed into a stationary engine. The same attachment may be used to supply power to a sawmill or other machinery.

PLANTATION LOCOMOTIVES.

In tropical countries, where the soil is very soft and the sun's heat excessive, light locomotives have been introduced lately for carrying sugar cane from the fields to the crushing mills, hauling fuel and supplies, and doing other work as desired. For such roads the rails and cross ties are usually furnished by the manufacturer all put together ready to lay, so that the track is more or less of a portable character. Rails of about sixteen pounds weight per yard are used, and the track is not often kept in good order, especially in the rainy season, when it may be so covered with mud as to be invisible. Farm hands, coolies, Chinese, or negroes are likely to be pressed into service as engineers, and under such circumstances the simpler and stronger the machinery the better, while on the other hand the locomotive must be as light as possible. The manufacturers inform us that the plantation locomotive shown in the illustration meets the conflicting requirements of this service admirably. The cylinders of the smallest size are only five inches in diameter and ten inches in stroke, the driving wheels twenty-two inches diameter, and the entire weight, in running order, only about three tons. The water tanks are placed under the engineer's seats, and either coal or wood, or "bagasse" (the dry-pressed cane), may be used for fuel. Larger sizes, requiring heavier rails, are also built. Sometimes a pair of pony wheels support a water tank placed at the rear end, nd sometimes the tank is placed over the cylindrical parts of the boiler. These locomotives are used on the sugar plantations of the Southern States as well as in the West Indies. The gauge of track varies from two to three feet.

SHIFTING LOCOMOTIVES.

Nowadays almost every large establishment situated on a railroad, and having sidetracks for receiving and shipping by car loads, owns its own shifting locomotive. Some of the larger iron and steel works operate as many as a dozen locomotives of this class. Compared with shifting cars by a gang of men with pinch bars or by teams of horses, or with depending on the railroad company for placing cars where they are wanted, the economy and convenience of owning a shifting engine is very marked. Where a narrow gauge track is also used for hauling coal, ore, lumber, or other supplies, a third rail is often laid on the wide gauge siding, and the narrow gauge engine does the shifting and work for both tracks. One remarkable feature of these shifting locomotives is their great power as compared with their small size. This is due to the fact that all their weight is placed on the driving wheels, and is used for traction. They have repeatedly hauled trains that larger engines of usual construction could not move. This, to an ordinary observer, seems impossible, but is readily understood by a mathematical comparison of the proportions between the size of the driving wheels, the useful weight, and the cylinder capacity.

SPECIAL SERVICE LOCOMOTIVES.

Light locomotives of the same general styles of those made for logging railroads, plantations, and for shifting are also put to a great variety of uses, as, for instance, hauling mud from dredging machines to fill up low and worthless lands; pushing white-hot ingots of Bessemer steel at rail mills; carrying the crude material of the well known superphosphates; for moving stone and earth at great engineering works, such as the Hoosac and Musconetcong Tunnels, the Rapids Improvements near Keokuk, and the government works at Mussel Shoals; for removing cinder at blast furnaces, and for miscellaneous hauling at coal and iron works, quarries, and other places.

We present, also, illustrations of light locomotives specially designed for rapid transit on surface or elevated roads, for street railroads, and for narrow gauge railroads.

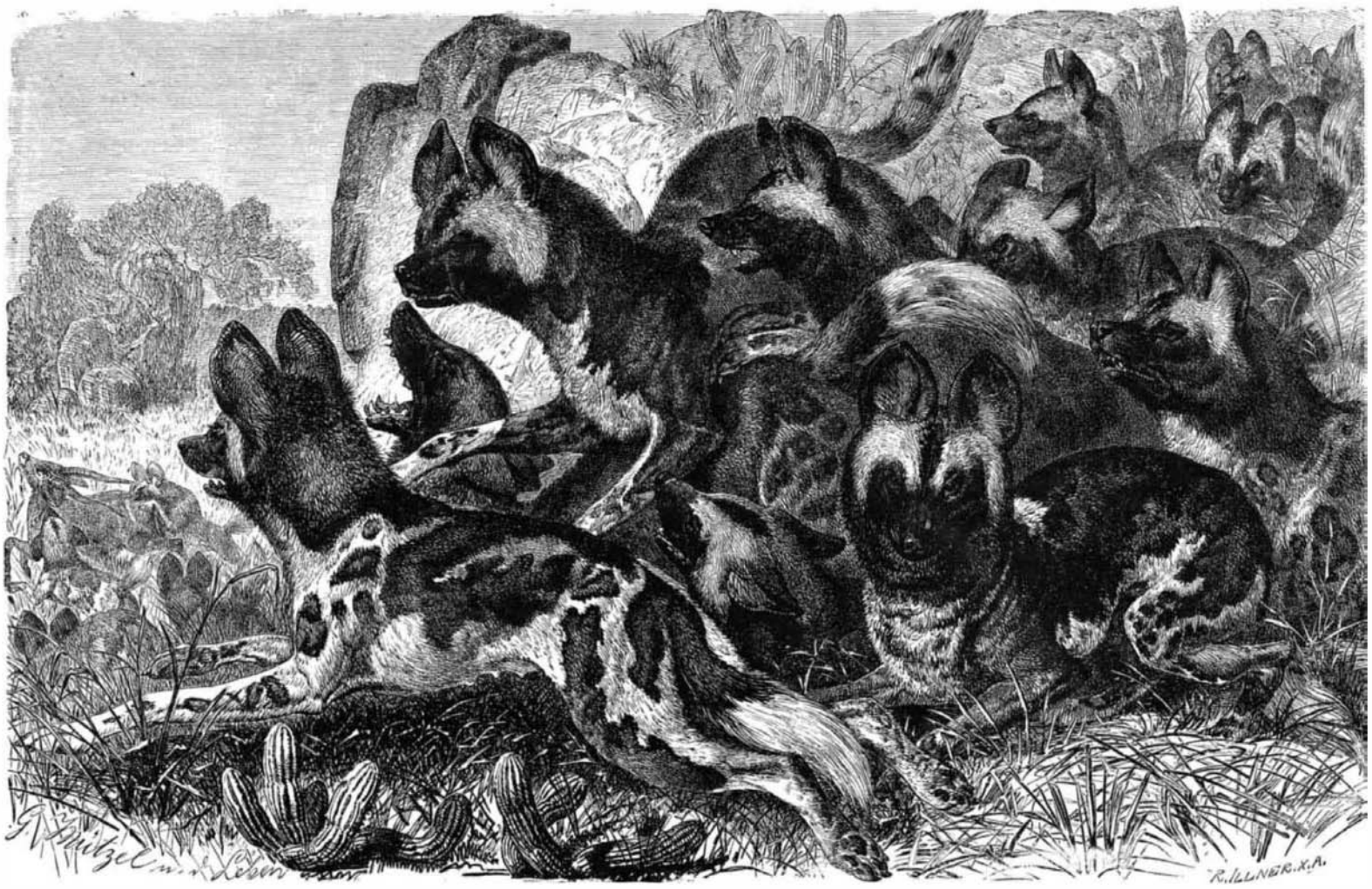
For more detailed description of the performances of light locomotives, their weight, dimensions, and general construction, and other items of general interest connected with their use, the reader is referred to the illustrated catalogue of Messrs. H. K. Porter & Co., of Pittsburg, Pa.

THE HYENA DOG.

Just as the Aard wolf appears to form the link between the civets and the hyænas, being with some difficulty referred to either group of animals, so the hunting dog seems to be the connecting link between the dogs and the hyænas. Its position, however, in the scale of animated nature is so very obscure that it has been placed by some zoologists among the dogs and by others among the hyænas. As, however, the leading characteristic of its formation appears to tend rather toward the canine than the hyænine type, the hunting dog has been provisionally placed at the end of the dogs rather than at the end of the hyænas.

In its general aspect there is much of the hyænine character, and the creature has often been mistaken for a hyæna, and described under that name. There is, however, less of the hyænine type than is seen in the Aard wolf, for the peculiar ridge of hair that decorates the neck of the hyæna is absent in the hunting dog, and the hinder quarters are not marked by that strange sloping form which is so characteristic of the hyæna and the Aard wolf itself. The teeth are almost precisely like those of the dogs, with the exception of a slight difference in the false molars, and therefore are quite distinct from those of the hyænas. But the feet are only furnished with four toes instead of five, which is a characteristic of the hyænas, and not of the dogs. Several other remarkable points of structure are found in this curious animal, some of them tending to give it a position among the dogs, and others appearing to refer it to the hyænas.

The general color of the hunting dog is a reddish or yellowish brown, marked at wide intervals with large patches of black and white. The nose and muzzle are black, and the central line of the head is marked with a well-defined black stripe, which reaches to the back of the head. The ears are extremely large, and are covered on both their faces with rather short black hairs. From their inside edge rises a large tuft of long white hair, which spreads over and nearly fills the cavity of the ear. The tail is covered with long bushy hair, which is for the greater part of a grayish-white hue, but is strongly tinged with black near its insertion. In nearly all specimens there is a whitish patch below each eye. These tints are somewhat variable in different individuals, but preserve the same general aspect in all.



HYENA DOG.—*Lycaon venaticus.*

There are many names by which this animal has been called; in the writings of some authors it is mentioned under the title of the painted hyæna, while by others it is termed the hyæna dog. The Dutch colonists of the Cape of Good Hope, where this creature is generally found, speak of it by the name of wilde hund, or wild dog; and it is also known under the names of simir and melbia.

Its title of hunting dog is earned by its habit of pursuing game by fair chase, and uniting in packs of considerable numbers for that purpose. As is the case with the generality of predaceous animals, it prefers the night for its season of attack, but will frequently undertake a chase in broad daylight. For the purpose of the chase it is well fitted, as it is gifted with long and agile limbs and with great endurance of fatigue.

A successful and practical sportsman, who has witnessed the performances of fox hounds and hunting dogs, is inclined to give the palm to the latter animals, for their almost in

variable success in the chase. He suggests that to the ample nostrils and the wide forehead of the hunting dog must be attributed much of the keen scent and the apt intelligence that renders these animals so successful in their united efforts. He also offers a further suggestion, that it appears as though freedom were a necessary adjunct to the hunting spirit, for we cannot train any animal to hunt with half the real zest which the same creature exhibits in its native or wild state.

When brought under human control, it is rather apt to retain its native ferocity, and to reject the companionship of mankind. Yet it has been known to enter into friendship with other animals, such as the hyæna and the lion, and was not more quarrelsome than is ordinarily the case among predaceous animals of different species. The experiment of its domestication has not as yet been fairly tried; and in all probability the creature will yield to the influence of man without any difficulty, whenever it may be subjected to the authority of a competent teacher.

The Long Island Scallop Fisheries.

In a detailed account of the scallop industry of New Suffolk, Long Island, prepared for the *Herald*, we find the following facts of general interest:

The favorite grounds for the fishing, or rather dredging, is in a line drawn from northwest to southeast across Peconic Bay from New Suffolk toward Southampton on the eastern shore. Here the scallops are always found. The dredging is done in waters from 3 or 4 feet in depth to 5 or 6 fathoms. The dredge is shaped like an old-fashioned dirt-road scoop. The lower rim or scraping iron is probably 2½ feet long, an inch wide, and a good ⅜ thick. To this is attached a piece of chain netting of 2 feet depth. Over this is the same length of cord netting, running from its attached end to the chains joined to a round bar of iron, which forms the upper part of this bag or pouch. A handle of iron, with an eye at the end, runs from where the upper and lower sides of the pouch are joined together. To the eye mentioned is attached the dragging rope. Thus equipped the vessels sail backward and forward over the beds, scooping in the shell fish as they lie huddled on the bottom. The scallop is a peculiar bivalve. Unlike the clam or the oyster, which seems incapable of progressive motion, the scallop is a rover.

When the tide is running fast and the water shallow it will rise from the bottom, with open shells, to the top of the water, squirt out the water contained between the shells, and by means of the impetus given and the force of the tide, will swim a yard or so at every spring. The motion is a laughable one, as the shells come together with a snap that can be heard some distance, and the motion is zigzag instead of direct. Some seasons the fish are much larger and finer than others. Thus this year they have been small. Last year they were twice the size. The catch is from twenty to a hundred bushels a day, according to the size of the boat and number of men engaged.

From November 1 till March is the fishing season. The catch varies; for the crop of scallops, like crops raised on land, changes with the season. Thus this year the catch has been a light one, and prices at the grounds have been as high as $1 for a gallon of meats, or, as the fishermen say, "eyes." The great crop, or bonanza year, was in 1877, when it was estimated that from the ports of Riverhead, Mattituck, New Suffolk, and Greenport the shipment to our city ran up to the large number of 40,000 gallons. The price, however, ran down as low as 50 cents per gallon, barely paying expenses.

Of the ports named New Suffolk is the chief, and has the largest number of individuals engaged in the trade. Fourteen vessels, in size from the cat rigged sailboat, of a couple of tons register, to the schooner rigged vessel of twenty, hail from New Suffolk, The crews run from a man and a boy on the smaller to a half dozen able-bodied men on the larger boats. The work is of the hardest and is of the coldest sort.

The number of those employed at New Suffolk—scallop headquarters—is about 150 of all ages, from men and women of sixty all the way down to boys and girls of ten and twelve. In the year 1877 the largest shipment ever made was forwarded; this was close to 40,000 gallons of eyes, or representing a catch of 80,000 bushels of scallops. Last year the catch was but half that, while this season it will not run so heavy as last. The old hands say that the scallop lives but three years; that the spawned fish is two years reaching maturity; the third year it is full grown and spawns, and then dies.

This multitude of scallops attracts to the waters of Peconic Bay thousands of water fowl. Black duck, geese, loons, and the common non-edible duck, such as coots, old squaws, and whistlers, are in immense numbers, while the gulls fairly whiten the sand bars when the receding tide leaves the sands bare.

The Croton Bug as a Library Pest.

At a meeting of the American Library Association, in Boston, Mr. Weston Flint made a brief statement of the injury done by the croton bug upon the covers of books. He stated that he had found these insects the worst pests that libraries have to suffer from in this latitude, and that he had noticed that they were often carried about in packages of books from the bindery. They attack the starch or sizing in the cloth covers, and often destroy the gold literally to secure the little albumen used in that work. After several trials, Mr. Flint found that the most effective remedy against these pests was a plentiful supply of a powder in which *Pyrethrum* was the principal ingredient. With a small bellows, this powder was thrown among the books on the shelves and allowed to remain. This operation performed once a year seems to be sufficient to keep them out. Mr. Flint having written to Prof. C. V. Riley in regard to the habits of the insect, that gentleman replies as follows: "The name of croton bug is *Blatta Germanica*, an insect originally introduced into this country from Europe, just as its larger conquerer, *B. Orientalis*, was. I have long considered it the worst pest we have in the libraries, and was not a little surprised that Dr. Hogen made no mention of it in his paper read before the American Library Association. The larger species (*Orientalis*) also helps in the work, as shown by what Dr. Hogen quotes from Mr. J. A. Lintner; but the croton bug is so much worse than any of the others, that all combined are not as mischievous. It shows a decided preference for books bound in green cloth, and seems to me to gnaw into and loosen the fibers of the fabric solely for the purpose of getting at the sizing or enameling. The worst of it is that this pest attacks books in the best kept libraries, and is indifferent whether the works be old and musty or just from the bindery; and the newly hatched roaches get through such a small crevice, that it is very difficult to get a bookcase tight enough to exclude them. I have been able to discover no remedy beyond diligence and the use of a little *Pyrethrum* occasionally sprinkled about on the shelves; but I make it a point nowadays to have all books bound in leather, such not being touched by the *Blattas*. This, and the other fact that it confines its injuries to the outside of the book and never affects the inside or more essential part thereof, form the only two redeeming traits in the little rascal's habits." Mr. Flint (who is librarian of the United States Patent Office) adds that one care should always be taken; and that is to open packages coming from the bindery before they are admitted to a library. This will keep them out, If they do get among the books, use the *Pyrethrum* powder immediately.

The Uses of the Potato.

In France the farina is largely used for culinary purposes. The famous gravies, sauces, and soups of France are largely indebted for their excellence to that source, and the bread and pastry equally so, while a great deal of the so-called cognac, imported into England from France, is distilled from the potato. Throughout Germany the same uses are common. In Poland the manufacture of spirits from the potato is a most extensive trade. "Stettin brandy," well known in commerce, is largely imported into England, and is sent from thence to many of our foreign possessions as the produce of the grape, and is placed on many a table of England as the same; while the fair ladies of our country perfume themselves with the spirit of potato under the designation of *eau de Cologne*. But there are other uses which this esculent is turned to abroad. After extracting the farina, the pulp is manufactured into ornamental articles, such as picture frames, snuff boxes, and several descriptions of toys, and the water that runs from it in the process of manufacture is a most valuable scourer.

For perfectly cleansing woolens, and such like articles, it is the housewife's panacea; and if the washerwoman happens to have chilblains she becomes cured by the operation.

Few persons are aware of the great demand for potato flour, and of the almost unlimited extent of the market that can be found for this product, which is simply the dry evaporated pulp of the ordinary potato—the whiter and more free from black specks the better. It is used for sizing and other manufacturing purposes, and by precipitation and with the aid of acid is turned into starch. In Europe it meets with a large and increasing demand in its primitive state, as potato flour, and in Lancashire alone 20,000 tons are sold annually, and as many more would be taken if put on the market. When calcined it is used largely for silk dressing and other purposes. At present the quotation for potato flour in Liverpool is nearly double that of wheat flour. Consignments to Liverpool are solicited by the brokers there, who promise to take all that can be furnished.

During the Franco-German war the French Government purchased all the farina it could secure and mixed it with wheaten flour in "potato cakes" for the army. Farina at that time rose to £40 a ton, and even the supply fell far short of the demand. Since then an increased amount of farina has been regularly consumed in France, and farina mills have correspondingly multiplied in that country. The manufacture of potato flour is so simple, and the results so methodical, that it requires very little experience to reach a satisfactory issue. The potatoes are first steeped in water from six to twelve hours to soften the dirt and other matter adhering, after which they are thoroughly washed by mechanical means with the aid of either steam or water power. They are then reduced to a pulp by a rasping or grinding process in a properly constructed mill. A small stream of water is caused to flow on the upper surface of the rasp or grinder, to keep it clean of accumulation of pulp. From the grinder the pulp falls into a washing machine, through which the farina is forced by revolving brushes, the coarser pulp being thrown out at lateral openings. The granules of farina pass into a trough, and are conducted to vats, where the farina is permitted to deposit. After the proper number of filtrations, and depositions have occurred, until the last deposit, which is pure white farina, the latter becomes of sufficient consistency to cut into lumps, and place, either unsupported or in conical wire cases, to dry. The drying process can be accomplished in a building supplied with shelves, and capable of being heated from 60°, at which the farina begins to dry, up to 212°, which is as high a temperature as it will require. The heating apparatus may be such as is most convenient. In Europe the farina is packed in 200 to 212 pound fine sacks, but flour barrels are said to be preferable, as the wood protects it from damage, and allows it to be transported safely to the most distant regions.—*The Journal of Applied Science.*

Animal Tar.

Not many years ago the substance known as coal tar was regarded by chemists as well as by laymen in the light of an uninviting and almost hopelessly complex mixture. To-day, as is well known, it is the source of a large group of highly interesting bodies, and forms the basis of many important industries, some of which are still in their infancy. Certain recent developments in connection with animal tar seem to indicate that there is a future in store for this substance as interesting and as important as the present of coal tar. It is obtained in largest quantity as a secondary product in factories in which boneblack is made by dry distillation of bones and other animal material. By fractional distillation the tar can be divided into several distinct portions, among which are the bases known as pyridine, C_5H_5N, and picoline, C_6H_7N, which are the first two members of a homologous series. Now, through the researches of Dewar, Ramsay, Weidel, Hofmann, and others, it has been shown that these bases are intimately connected with such alkaloids as quinine, cinchonine, cinchonidine, berberine, piperine, and nicotine. All of these alkaloids when oxidized yield acids which are simple derivatives of pyridine or some other member of the series. The chemistry of the alkaloids is then, in all probability, to be discovered through a careful study of the bases of the pyridine series, and this probability has of late led a number of workers to turn their attention to these bases. It can fairly be prophesied that at no distant time our knowledge of the alkaloids will be materially increased through the aid of investigations now in progress.—*Amer. Chem. Journal.*

Glucose for Confectionery.

The *Confectioner's Journal*, in regard to glucose and its enormous product in this country, says: At first it was affirmed that the sugar made from corn was injurious. The learned chemists decided that it was perfectly harmless. The consequence is that vast quantities are now made and sold. Besides a great establishment in New York, there is another in Buffalo, another in Chicago, and several minor establishments in other cities. One of these great establishments used five million bushels of corn in the year 1878.

Confectioners are using great quantities of glucose sugar, because from its uncrystallizable quality it tends greatly to keep certain classes of goods soft for a greater length of time, and retards granulation in other kinds, and because it saves greatly in the cost of all articles with which it is combined.

It was proved before the Congressional Investigating Committees that vast quantities of glucose or corn-starch sugar were sold to sugar refiners; also, that it is sold in great quantities to confectioners. Glucose is now largely used in mixing with California honey, one gallon of glucose to one of honey. It is also used largely in the Eastern States in the manufacture of all sweet wines, lager beer, and all liquors requiring sirups. In fact, corn sugar is now used for all the various purposes for which any sugar is used, except for first-class confectionery. Glucose is also shipped in large quantities to Europe, where it is in great demand and in increasing quantities.

The Steamer Louisiana.

The new steamer Louisiana, of the Cromwell Line, is provided with engines said to possess the largest stroke of any direct-acting engines in the world; they are fitted with balance poppet valves, adjustable cut-offs on both high and low pressure cylinders. The high pressure cylinders having direct connection with one end of the working beam, which is located athwartships, the low pressure cylinder having connection with the opposite end. The engines work well. With eighty pounds pressure of steam they work up to sixty revolutions a minute. The propeller is 17 feet in diameter, and has 27 feet pitch. There are eight patent boilers, of Baird's make, and it is anticipated that the vessel will be a very fast one, as on her trial trip she averaged ten knots an hour with only four boilers at work. The steamer has two iron masts, and on each a "leg of mutton sail" is bent; she carries a jib and foresail and two skysails. The hull is divided by seven watertight bulkheads, which extend to the main deck, and four partial bulkheads. The main and lower decks are entirely of iron. Above is the hurricane or spar deck, on which are situated the wheelhouse filled with steam steering apparatus and the cabins of the captain and other officers. On the main deck is a house which extends from the forehatch to the stern, in which is situated the saloon.

The Louisiana was built by Roach & Son, of plates of extraordinary strength and thickness, the machinery being constructed by C. H. Delamater & Co., of this city. She will carry 100 first and second class passengers, and it is expected that 9,000 bales of cotton can easily be stowed in her hold.

The Hayden Trial.

Further expert testimony has recently been put in by the defense at the Hayden trial, and has furnished statements of considerable interest. In our previous comments on this trial, we mentioned that the three principal points upon which the testimony bore were: The symptoms and signs which may be produced by the presence of a small ovarian cyst; the tests for blood; and the possibility of distinguishing different samples of arsenic, by the proportion of crystals to amorphous particles seen under the microscope.

The victim, Mary Stannard, was found to have a small ovarian cyst, about three fourths of an inch in diameter. It was claimed by the prosecution that this had given rise to symptoms of pregnancy, and that she had been killed by the defendant in order to avoid the public exposure which her supposed pregnancy would cause.

It will at once appear that the idea of a cyst, so small in size, producing symptoms of pregnancy, can only be characterized as absurd. It cannot perhaps, be absolutely denied that such a tumor may produce some symptoms, since few things can be absolutely denied in medicine. But that such remote possibility of some ovarian irritation should be taken as the basis of a theory of prosecution, shows alike a poverty of theories and of medical knowledge. Such tumors are not very unfrequently found at the post-mortem table, no evidence of their presence having previously been given. They are even found before the age of puberty, and may sometimes remain stationary and undeveloped. The ingenuity of an imaginative legal mind may make it appear probable to the jury, that because the young woman had a small cyst, therefore she had the symptoms of pregnancy; but we do not see how they secured medical experts to help them along. She might have been hysterical, she might have been an excellent case for a gynecologist and a medicated pessary; but she could only by the rarest coincidence have furnished the signs of pregnancy. To this effect the experts for the defense testified.

The counter testimony, in regard to the detection of various samples of arsenic, was not very extended. It was asserted that, owing to peculiarities in the grinding of arsenic, the same manufactory might send out lots in which the proportion of crystals would vary On the whole it seems likely that, as we have stated before, the determination of the source of arsenic by its microscopical appearance can rarely be a certain one. The value of the discovery, therefore, of a varying proportion of crystals in different lots, must, from a medico-legal point, be quite limited.

The question of the tests for blood was testified upon at considerable length. The experts secured for the defense were unanimously positive that human blood could only be distinguished from that of certain other mammals under rare and very favorable conditions, if at all. This was in direct contradiction to the evidence for the prosecution. Dr. Woodward testified that the size of human blood corpuscles in different persons was as variable as that of the individual; and that the size also varied greatly even in the same animal. The range was said to be greater in disease and in the young. This variability applied not only to man, but the lower mammals. It would take, said the witness, forty-two years to find the true average size of the corpuscles of any animal. Alluding to the history of such measurements, the great variance of opinions during different periods was shown. Thus Gulliver, in 1848, made the average size 1-3200 of an inch. In 1864 the average size was found to be 1-3000 to 1-3100 of an inch. The most recent authoritative measurements made the average diameter 1-3620 of an inch. Dr. Woodward took, in general, a very pessimistic view of micrometry. His statements are, however, to some extent misleading. When it was first undertaken to measure blood corpuscles there was no accurate and definite standard for the micrometers; nor is it until recently that this lack of a definite standard has been overcome.

The variation in measurements, therefore, by different observers, may indicate variation in micrometers rather than in the corpuscles. An examination of the different sets of measurements will show a substantial agreement as to the relative size of human corpuscles compared with that of other animals. The statements concerning the great variability in the size of the blood corpuscle are not in accordance with those of the majority of microscopists. Physiologists state that the red blood corpuscle varies less in size than other anatomical elements. Kölliker asserts that ninety-five per cent are of the same size. It is generally agreed that man's red blood corpuscles are larger than those of any of the ordinary domestic animals from which distinction has generally to be made.

In the present case the defendant testified that he had killed chickens with the knife in whose notch corpuscles were found. Since it would be comparatively easy to distinguish the oval corpuscles of the fowl, we were inclined to lay some weight on the testimony of the experts for the prosecution. The impression given by Dr. Woodward as to the exceeding vagueness and inaccuracy of microscopic measurements was unjustifiably strong.

The possibility of distinguishing, under proper conditions, the human blood from that of other animals, cannot be denied. The possibility of being able to do it, however, in any particular case with sufficient certainty to swear away a life, is another thing entirely, and the one in which we do not believe. In the present case, although the scalpel discovered an ovarian tumor, and the microscope arsenical crystals, and possibly human blood, there was nothing established by the expert testimony strong enough to warrant a verdict of guilty.—*Medical Record.*

How to Keep Teeth Clean and Healthful.

As I am not aware of anything practically new in the way of dentifrices, I can only allude to them as auxiliaries or assistants in promoting cleanliness, and in neutralizing the abnormal acidity so commonly present in the oral cavity. No one has yet discovered the magic prophylactic, notwithstanding the absurd claims of tho venders of various nostrums, such as "Sozodont." Of this article I will testify to what is also well known by most dentists, namely, that it destroys the color of the teeth, turning them to a decidedly dark yellow.

There is, of course, quite a general use of tooth brushes by the people, but not uncommonly an abuse of them for want of proper instruction. It is getting to be better understood by both dentists and patients now than formerly that a crosswise brushing is not wise, but that the upper teeth should be brushed downward, and the lower teeth upward. It is a common mistake not to brush thoroughly the buccal and posterior surfaces of the third molars, and the lingual surfaces of the lower front teeth. I am sure that nothing like an adequate amount of care is given to this preventive service. It cannot be too strongly impressed on the minds of the guardians of children that they should see that the practice of brushing the teeth thoroughly is begun as early as possible, so that it shall become a habit to be continued through life.

Concerning the forms of brushes, I will say that straight brushes are utterly impracticable on the surfaces to which I have referred as the ones most neglected. Curved brushes with a tuft end, bud-shaped or convex, are the best. There are several favored forms that are quite efficient in the line I have spoken of. One of these, named the "Windsor," I have faithfully tried for twenty months past, and introduced it very generally in my practice, and I feel that it meets the indications better than any other within my knowledge. The faithful use of floss silk between the teeth ought to be earnestly recommended; also the *quill* toothpick. The wood toothpicks so generally furnished at public eating places are a source of much evil to the soft tissues between the teeth. All kinds of metallic toothpicks are objectionable, though I am aware that it is the practice of some dentists to commend them to their patients.

The value of a decided polished surface of the tooth becomes very apparent to those who have had the operation performed; the facility with which such teeth can be kept clean is evident; and although this condition may have been secured at considerable expense, yet it is an investment that will pay a good rate of interest. I do not think many dentists have much idea of the beautiful polish that a human tooth will take. Many teeth are capable of a great improvement in this direction which are now a decided detriment to what might otherwise be a pleasing face. We know that the general idea among the people is, that interfering with the surfaces of the teeth destroys the enamel, but we also know that this is a popular error.—*G. A. Mills. in Dental Cosmos.*

Infectious Diseases among Live Stock.

Arguing in favor of general legislation with regard to infectious diseases among horses, cattle, sheep, and swine, Mr. Le Fevre said in Congress recently: We have today at least 100,000,000 head of the four principal classes of farm stock named above. If we average these at the low sum of $3 per head we have a money value of $300,000,000. These animals are all subject to deadly contagious and infectious diseases, and unless some general protective law can be passed, the increase of loss to the farming community must increase at an alarming ratio with each recurring year. An eminent veterinarian, in summing up the losses occasioned by the ravages of pleuro-pneumonia among cattle in Europe, says that England imported lung fever of cattle in 1842, just one year before it was brought to the United States, where it has continued up to the present time. Up to 1869 it is estimated that Great Britain had lost, almost exclusively from this disease, 5,549,780 head of cattle, worth £83,616,854, or, say, $400,000,000. For the succeeding nine years, up to 1878, the losses have been equally as heavy, making a total loss of perhaps $500,000,000 in deaths alone, without counting the contingent expenses of deteriorated health, loss of markets, progeny, crops, disinfection, quarantine, etc. And yet England has a contagious disease (animals) act. What might have been the losses from this one isolated disease had it not been surrounded with all the safeguards of a law drawn with the greatest care and carried out with the strictest fidelity?

About twenty-five years ago a disease made its appearance among hogs in some of the great hog-growing States of the West. It attracted but little attention at first, but as it continued to spread from one State to another, and seemed to become more fatal with every recurring year, farmers and stock-growers, and occasionally a physician and surgeon, would devote a little attention to a cursory investigation of the malady, but no definite results were obtained until very recently—not until congress made an appropriation to commence and carry forward an investigation which should result in revealing the true nature and cause of this disease. The investigation has not yet been completed, but the infectious and contagious character of swine plague has been determined beyond question. For several years past the losses from this disease have been estimated at from $20,000,000 to $25,000,000 per annum. The disease has prevailed in this country for near a quarter of a century, and if we place the annual losses during the past decade at $15,000,000 per annum, we have a total loss, sustained principally by the farmers of the country, of $150,000,000. For the other fifteen years of the comparative infancy of the disease the losses no doubt amounted to as much more, making the total loss from this one disease of $300,000,000.

New Coloring Matters.

The new acid green, we learn, can be used for wool by dyeing with oxalic acid in the dye bath. On cotton it is dyed by mordanting first with sumac over night, then passing through tartar emetic, and dyeing in a tepid bath with the necessary amount of coloring matter. On calico it is printed with tannic acid or sumac extract, like methyl green; it is then steamed and, we understand, passed through tartar emetic. The acid green has the advantage that it does not run in steaming if used in connection with picric acid, a fact of great importance in printing; and furthermore, it resists the action of the heat without losing its shade. To print on wool, take 2½ gallons boiling water for 1 lb. green; filter and add 2½ gallons gum water and 3 lb. glycerine.

The Austrian firm, Przybran & Co., patented some time ago the production of a sulpho derivative of alizarine and purpurine, under the name of *alizarin carmine*, which they have now introduced into the market. The new coloring matter is used for dyeing wool, and is recommended as a substitute for madder in all its applications for wool dyeing. It is said to give nicer and purer shades. The alizarin carmine dyes wool of a red color when the latter is mordanted with tin crystals or alum. The sulpho-acids form salts with different bases. The alum salt can be used direct for dyeing wool; however, it is better to use the soda salt on previously mordanted wool by adding tartar to the bath. Different shades are obtained with different mordants.

We see in a foreign contemporary that the firm of Guinon, Jne. & Picard, in Lyon, have lately brought out a product under the name of hematine (*hæmateine*) a derivative of logwood. Hemateine ($C_{16}H_{12}O_6$) is formed from the chromogen of logwood, or hæmatoxyline ($C_{16}H_{14}O_4+3H_2O$) by treating it with ammonia. By this reaction hemateine-ammonia is formed, which gives hemateine either by evaporation in vacuo, or by boiling with acetic acid. Hemateine forms in this case a brownish red, and almost black precipitate, which assumes when dry a greenish metallic appearance like that of some of the anilin colors. When sharply ground and passed through a sieve it takes a redder coloration. It is soluble in water, alcohol, and ether. Hæmatoxyline is with hæmateine the coloring substance of a solution of logwood, which contains as well all the soluble substance of the dyewood. Hæmatoxyline gives with ammonia, hæmatein; the latter is also formed by sprinkling logwood with urin and by fermentation. The product has already been known for a considerable time; its cost, however, was so high that it precluded its application in dyeing, but the above firm have discovered a process by means of which the hæmateine is obtained much more cheaply than hitherto, and the product has already found its way into the dye houses of France, Switzerland, and Austria to such an extent that 2,000 kilos are daily produced in the works of Messrs. Guion, Jne. & Picard, and they are making alterations in order to more than double their output. The brownish black product is completely soluble in water like logwood; it dyes blue blacks, and does not rub off; 15 kilos hæmateine are said to be equal to 100 kilos best logwood, over which it is said to possess great advantages, as well as over logwood extracts.

CAULINE.—Messrs. Savigny & Collineaux have exposed, in an Exhibition of Science as applied to Industry in Paris, samples of

Cauline (the dye from cabbage) in powder, for solution in the dye bath, and as violet, lilacs, blue and green lakes, and as cauline black for leather dyeing. The two coloring matters, *alneine* and *ericine*, we alluded to in our October issue, have also been exhibited in powder, solution, and in paste; the latter also as dry lakes for calico printers and paper stainers.

The *alneine* can be employed instead of cachou in all its applications. On silk, wool, cotton, and jute it is said to give brown, salmon, and mouse gray shades, which are especially beautiful on jute; the shades are of great brightness and solidity, resisting chlorine and any amount of washing.

Cauline, which is extracted from red cabbage, is prepared dry or in sirupy extracts. On wool grayish colors are obtained, varying from silver grays to dark slate. Grayish and gray lilacs, as well as moss greens, can be obtained by cauline without the aid of any other dyestuff. Every metallic salt gives a different but constant shade with cauline, so that by using different mordants several shades can be obtained by dyeing in the same bath, and this latter can be kept and used for a considerable time. Wool dyed with cauline has great affinity for indigo, and very dark blues can be obtained by first dyeing with it, and then adding carmine of indigo to the bath.

On cotton the mordants used for wool give exactly the same shades when used with cauline, a fact of great importance in dyeing mixed goods. Used alone, it gives on cotton a violet and a peculiar blue shade, called cauline blue. For furniture articles, those of jute especially, it is reported that the three coloring matters we have described will be found of very great advantage either for dyeing or printing.

Further, from cauline a black extract can be produced, which dyes leather blue black. Besides these coloring matters, Messrs. Savigny & Collineaux exhibited at the same time a great variety of tasteful patterns dyed with their new products.—*Textile Manufacturer.*

Precautions against Photographic Forgeries.

Recently a number of London banks have printed in color on their checks their names in microscopic characters, repeated over and over so as to form a sort of pattern. The object of this microscopic printing is twofold. The erasing of a word or figure upon a surface of small print of this kind cannot be done without erasing some of the tiny words as well, and as these obviously cannot be restored, there is no way of covering up such erasure; in the second place the printing in color of such tiny letters is deemed sufficient to baffle any attempt to copy a check by means of photography. No doubt the bank authorities are right in their conjecture that it would be impossible to secure a copy of one of their checks before the camera, printed as the document now is; but for all that, the *Photographic News* deliberately expresses the opinion that a check of this kind is not nearly so safe as the finely executed checks in plain black and white of the Bank of England. Proof of this assertion is found in the recent successful use of photography in France in imitating colored checks. Even the blue notes of the Bank of France have not escaped these *chevaliers de l'industrie;* and it is but a year or two ago that the French police were enabled to make a seizure

Just after the Franco-German war, when bank notes were exceedingly prolific with the French, there were large numbers of the spurious blue notes in circulation; and on the principle of setting a thief to catch a thief, the Direction of the Bank of France at once invoked the aid of photography to detect photographic forgeries. M. Gobert, a well known member of the French Photographic Society, and an accomplished photographic chemist, was retained by the Bank of France as adviser, and it is in a great measure due to him that abatement of photographic forgeries in France is due. Many years ago Mr. Spiller was called in as scientific referee in the matter of color printing upon checks, and gave much excellent advice upon this subject; but, unfortunately, English banks do not keep pace with the times, and what was impossible twenty years ago, is perfectly feasible at the present moment.

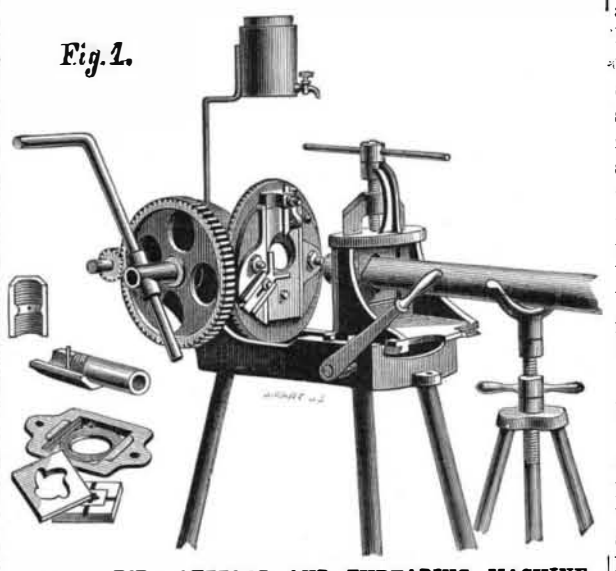
The German authorities used to consider that they had altogether defied imitation by having recourse to very fine printing at the back of their bank notes—similar to that on the checks of the Check Bank, London and Westminster, London and County, etc.—this fine printing, which was in black, setting forth the severe penalties which would be visited upon those who endeavored to forge such documents. This fine print, rather than acting as a barrier, resolved itself rather into a premium for copying by photography. The bank note was put under a microscope or magnifier, and the tiny printing thus enlarged, it could then be imitated by an engraver, and the photographer had simply to photograph the copy in order to produce the small printing. And so, the *News* is inclined to believe, the microscopic printing in color, rather than acting as a safeguard against the production of spurious checks, will render the matter somewhat more easy. The color—whether it is applied as a simple tint, or in the form of microscopic words—serves the purpose in a forgery of covering up defects in the engraving of the check. Rather, therefore, than adding to the difficulty of copying, it rather lightens it, since the work not being in pure black and white need not be so faultlessly executed. This is why the blue applied to the Bank of France was no protection.

Photographers, nowadays, know a good deal about the sensitiveness of various collodion films for different colors, and are also well versed in what may be done by under-exposure and over-intensifying, and *vice versa*, and there are few tints or designs that they cannot copy one way or another; and by having recourse to combination printing, a skilled operator will overcome the most stubborn opportunities. But there would be no need, of course, in order to imitate a modern check to copy the minute blue or pink printing upon them. This would be produced of large size; a reduced negative, executed with the type of proper dimensions, and impressed upon a colloid film, would be capable of yielding any number of impressions and in any color; while as to fineness of the type and freedom from blurring, the result would simply be more perfect than the majority of checks with which the public deal. Any one who has seen the fine details of a map reproduced upon a colloid film, the delicate shading and minute lines, will readily believe this, while we may point out that scarcely less perfect work is produced nowadays by a phototype process. The finely executed drawings we see upon the *Graphic Programme* and other theatrical publications, which are as delicate as anything done by engraving, are all prepared by the aid of photography, the original sketches, in the first instance, being produced many inches high. The lines are fine and black in the originals, and in the course of reduction become, of course, exceedingly delicate; thus it is that the drawings appear so refined beside an ordinary woodcut. These facts are recited to show how the graphic arts have improved of late by the aid of photography, and to point out that what might have been impossible some years ago is perfectly possible at the present day; and to this fact the bank authorities should give attention. Certainly, microscopic printing in colors cannot be relied upon at the present moment as a safeguard against the forging of checks; for a skilled hand would have more difficulty in counterfeiting the black and white document issued by the Bank of England than one in which a combination of colors is to be found.

A LABOR-SAVING TOOL.

The annexed engraving represents a very effective and simple pipe cutting and threading tool manufactured by the Chase Machine Company, New York city. This invention enables the workman to perform with ease one of the most tedious and laborious operations in mechanics, and it does its work expeditiously and perfectly. It is capable of cutting regular chips in the same manner as a lathe, leaving the work smooth and perfect. It will form a thread on all sizes of pipe from ¼ inch to 2 inches inclusive. To steam fitters, gas fitters, and machinists it will prove of great value, and car shops, steamers, sugar refineries, distilleries, should be furnished with these machines. Wherever it is required to thread pipes or bolts, or to tap nuts, this machine will be found efficient and satisfactory. The machine is capable of making nipples, and is provided with an automatic cut-off. In its construction it is very strong and well adapted to the work for which it is intended. All the gears are cut and it is well finished in every part. It may be

Fig. 1.



CHASE'S PIPE CUTTING AND THREADING MACHINE.

worked by hand or by any convenient power, and it may be readily adapted to different kinds of work. It will operate equally well on wrought iron gas and steam pipes, boiler tubes, oil well tubes, brass and copper tubes, rods, bolts, etc. For further particulars, address The Chase Machine Company, No. 120 Front St., New York city.

Torpedo Investigations.

Brevet Brigadier General H. L. Abbot read a paper on "The School of Submarine Mining at Willett's Point" at the recent meeting of the United States Military Service Institution on Governor's Island. The paper contained the following information of general interest:

The first subject of study was to secure the best explosives for submarine warfare, and types of all explosives known to science were used with the result of finding the best for the service to be dynamite, consisting of 75 per cent of glycerine and 25 per cent of Keiselguhr. The element of time proved to be one of extraordinary importance with explosive compounds. Nitroglycerine under water develops but about eight tenths the intensity of No. 1 dynamite. The interposition of a wooden case between the charge and the water was found to greatly reduce the kinematic energy available. In order to discover the laws of transmission of a shock horizontally through water a wrought iron frame was used, and the charge secured at the central part, and gauges placed symmetrically with respect to a horizontal plane passing through it were secured at angles between the transverse frames. The results proved that the same formula can be used for all modern explosives by substituting the right numerical value for one constant. By this the relative value of explosive compounds can be fixed and the intensity of action computed. To learn completely the destructive range for subaqueous explosions, it was necessary to learn the intensity of action needful to destroy a first class ship of war. For this purpose an iron target twenty feet square was used to represent the bottom of a vessel made on the double cellular principle; and a numerical value for the intensity of action needed was found. From English tests, by aid of the previously mentioned formula, a second value of this element was reached, and some trials on a very strong wooden raft gave a third value. The three were so accordant that the value adopted by the Board of Engineers is satisfactory, and the size and range of the charge have been accordingly fixed.

The three essential conditions of a torpedo are endurance in sea water, power to resist shocks of explosions in the vicinity, and strength to resist the blows of friendly vessels in passing. Experiments to secure these objects have been carried on for six years, and a torpedo has been adopted finally which is believed to be superior to any abroad. Ground torpedoes are cast iron spheres resting on the bottom on their truncated base. Buoyant torpedoes are spheres of steel of a size suited to the strength of the current. For firing mines the active agent is electricity. The subject of the fuse has been exhaustively studied and new methods of research undertaken. Over eighty patterns of foreign and domestic varieties have been compared and are now in the museum at Willett's Point. The one finally adopted retains its action after years in a torpedo and is absolutely certain.

For the operation of mines a very superior system has been adopted and is kept secret. It allows the safe passage of friendly vessels, and causes explosions when struck by the enemy; or any one can be fired, every part can be tested, and an injury determined. In important harbors the electric light will be used in the system of defense. The form of lens adopted throws a concentrated light to any desired spot, but its use is impaired when the air is rendered opaque by moisture or smoke, as the particles in the air are brightly illuminated and form a screen to hide the object. Experiments with fish torpedoes have also been made, and one recently tried showed excellent results. The control of the fish was perfect, as it could be stopped, started, or turned in any direction.

The New System of Signaling at Sea.

The following system of ocean and river signaling has been agreed to by the governments of Great Britain, France, Germany, Russia, Italy, Spain, Portugal, Belgium, Denmark, Sweden, Netherlands, Austro-Hungary, Greece, Chili, and the United States of America. Besides the usual colored lights, a steamer discerning another steamer or sailing vessel in sight has to sound with the steam whistle or fog horn a short blast, which will mean "I am directing my course to starboard;" two short blasts will signify "I am directing my course to port," and three short blasts, "I am going full speed astern." In fog, mist, or falling snow the signals are to be repeated every two minutes, a prolonged blast indicating that the vessel is under way; an ordinary blast, that the vessel from which it proceeds is on the starboard tack; two blasts in succession, "I am on the port tack;" and three blasts in succession, the wind abaft the beam. A vessel in fog, not under way, has to ring the bell every two minutes. Concurrent with the foregoing are ocean signals. The Thames Conservancy are issuing rules of road, which are to take effect on British and foreign ships entering the River Thames. Where steamers are proceeding one up and one down the river, involving a risk of collision, they are to pass port side to port side. If there be no risk of collision they will both keep their course and pass either starboard side to starboard side or port side to port side. In rounding a point, like that where the Princess Alice collision occurred, the steamer going against the tide is to wait under the point until the vessel going with the tide has passed clear. Where a steamer and a sailing vessel are proceeding in a direction likely to involve a collision, the steamer has to slacken speed to keep out of the way of the sailing vessel and let the latter pursue her course. If the steamer cannot possibly or safely get out of the way she is to blow four blasts and slacken speed, and the sailing vessel is to keep out of the steamer's way.

Influence of Plants on the Products of the Dairy.

The Agricultural Museum, of Berlin, lately exhibited at the Dairy Exhibition a collection of plants which may influence the different products of the dairy. The catalogue gave the following list:

1. Plants which coagulate milk: the milky juice of the fruit of *Aspidosperma quebracho*, Lor., used in the Argentine Republic; the milky juice of the unripe fruit of *Carica papaya*, L., Papaw tree; *Cirsium arvense*, Lam., Canada thistle; *Cynara cardunculus*, L., Chardoon; *Ficus carica*, L., Fig; *Oxalis acetosella*, L., Wood sorrel; *Piper nigrum*, L., Black Pepper; *Quercus infectoria*, Oliv., Gall Oak; *Rumex patientia*, L., Garden Patience.

2. Plants which prevent the coagulation of milk: *Cochlearia armoracia*, L., Horseradish; *Pinguiculavulgaris*, L., Common Butterwort; *Sanicula Europœa*, L., Wood Sanicle.

3. Plants which are used to color butter and cheese: *Bixa orellana*, L., Annatto; *Calendula officinalis*, L., Marigold; *Carthamus tinctorius*, L., Safflower; *Crocus sativus*, L., Saffron; *Curcuma longa*, L., Turmeric; *Crozophora tinctoria*, Ad. Juss., Turnsol; *Daucus carota*, L., Carrot; *Morus tinctoria*, L., Fustic. [Also *Galium verum*, L., Cheese-renning Bedstraw, or Yellow Bedstraw.

4. Plants which are used to flavor cheese: *Melilotus cœrulea*, L., Blue Melilot; *Penicillum glaucum*, Lk., Blue Penicillum.

5. Plants used to prevent rancidity in butter: *Rumex Abyssinicus*, Hochst., Abyssinian Sorrel.

6. Plants which impart to milk a peculiar color, after being eaten by cows: (*a.*) reddish: *Galium verum*, L., Yellow Bedstraw; *Rubia tinctorum*, L., Madder. The same is said of species of *Carex, Scirpus, Equisetum, Ranunculus, Euphorbia*, and of young twigs of pine, etc. (*b.*) yellowish: *Daucus carota*, L., Carrot; *Rheum palmatum*, L., Rhubarb. (*c.*) blue: *Anchusa officinalis*, L., and *A. tinctoria*, L., Alkanet; *Butomus umbellatus*, L., Water Violet; *Melampyrum arvense*, L., Purple Cow-wheat; *Mercurialis perennis*, L., Perennial Mercury; *Polygonum aviculare*, L., Common Knot Grass; *Polygonum Fagopyrum*, L., Buckwheat; *Rhinanthus major*, L., Yellow Rattle.

7. Plants which impart a peculiar, often acrid taste to milk: *Allium ursinum*, L., Ramsons; *Artemisia absinthium*, L., Wormwood; *Brassica napus*, L., Rape; *Brassica rapa*, L., Wild Turnip; *Euphorbia cyparissias*, L., Cypress Spurge; *Gratiola officinalis*, L., Hedge Hyssop; *Helleborus niger*, L., Black Hellebore; *Matricaria Chamomilla*, L., German Chamomile; *Zea mays*, L., Maize; —*From Industrie Blätter.—New Remedies.*