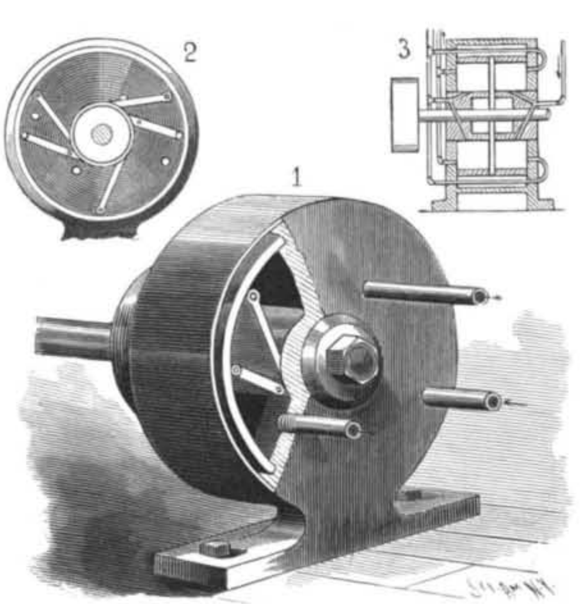
A NEW ROTARY ENGINE.

Of the accompanying illustrations, Fig. 1 represents a perspective view of a new rotary engine with a portion broken away to show the interior, Fig. 2 a sectional side elevation with the piston-heads and abutments in position, and Fig. 3 a modification in section, showing a compound engine.

The engine is provided with a casing formed with a hub against which abuts a wheel-like piston having a solid web and a rim concentric with the hub. The piston thus forms an annular working chamber with the casing. Piston-heads are pivoted near their outer ends to the web of the piston and are mounted to swing in the working chamber. The inner ends of the piston-heads are provided with friction rollers which travel on the surface of the hub. Abutments are pivoted near their inner ends to the hub at opposite points. At their outer ends the abutments carry friction rollers traveling on the inner surface of the piston rim. The abutments and piston-heads are so arranged that when the piston rotates, the piston-heads swing outwardly, so as to pass the inwardly swinging abutments. Oppositely arranged inlet ports open into the working chamber at a point forward of the abutments. Oppositely arranged outlet ports open into the working chamber at the rear of the abutments. When the steam enters the inlet ports, it presses against the piston heads, which have their rollers against the hub and their outer ends against the piston-rim. Similarly, the steam acts on the abutments so as to hold their friction rollers on the piston rim. The action of the steam on the piston-heads causes the piston to revolve. The piston simultaneously receives a like impulse from the steam passing into the space between the corresponding abutments and piston-heads. When each piston head passes an exhaust port, then the steam in the rear of the piston-head can exhaust. As each piston-head passes over an exhaust port, another piston-head passes the preceding inlet port, thus giving impulses imparting a continuous rotary motion to the piston.

The engine has been patented by William Willerton and Thomas Shortliff, of Blackfoot, Kipp P. O., Montana.



WILLERTON & SHORTLIFF'S ROTARY ENGINE.

AUTOMOBILE CARRIAGE FOR WINTER USE.

Our engraving shows an interesting modification of the automobile carriage for winter use on snow and ice. It is the Bollee gasoline carriage adapted for running on hard winter roads by being mounted on steel runners, and the driving wheel being provided with a wooden rim, studded with conical points, this rim being substituted for the pneumatic tire on the driving wheel. The carriage was rebuilt for winter use by Dr. E. Casgrain, of Quebec, Canada. It is an interesting development of the automobile vehicle and opens another field for those who are working on the important problem of automobile propulsion.

The Bollee carriage has an enviable reputation in France, where it is made, as a thoroughly practical vehicle. The ordinary Bollee carriage is illustrated in the SCIENTIFIC AMERICAN for October 17, 1896. It is a machine of the tricycle order, with two steering wheels in front and the driving wheel behind, but in Dr. Casgrain's modification steel runners are substituted for the front wheels. It is characterized by a very low form, which assures great stability, which is an added advantage for use in winter, when the inequalities of the road are more apparent than in summer. There are two seats; and the motor and the gasoline reservoir are in the rear, the former being upon each side of the driving wheel. The frame of the carriage is formed entirely of hollow tubes. The gasoline reservoir has a capacity of seven quarts—sufficient for a run of fifty miles. The gasoline descends to the carbureter by gravitation, passing through a Panhard and Levassor flow regulator containing a hollow brass float that follows the movement of the liquid. A conical plug closes the inlet orifices when the influx of the liquid is too great. After the gasoline reaches the carbureter it spreads over a bronze cap and is reduced to an extremely fine state of division, and in this form is carried along by a current of air regulated by a clack valve. By means of a rod it is possible to uncover the holes of this valve more or less, thus modifying the composition of the gaseous mixture in such a way as to render it explosible, thus adapting the explosive mixture so as to run the motor at the desired speed. Ignition is effected by means of a platinum igniter heated by an external burner. The motor is of the four-cycle type and it develops two horse power. The cooling is effected through heat regulators having lugs cast upon them as shown in the engraving. The connecting rod and crank move in a bath of oil. The velocity of the motor is regulated by an apparatus which acts upon the exhaust valve, which, when the motor is running wild, prevents the lifting of this valve and, consequently, an expulsion of the burned gases and the introduction of a new charge at the succeeding revolution.

DR. CASGRAIN'S BOLLEE CARRIAGE FOR WINTER USE.

While the motor runs normally, the valve is directly controlled through the medium of the levers and rods by a box fixed upon an axle parallel with the driving one. This box actuates a link and transmits motion to the valve. The valve is pulled back by means of springs. The gases, after their egress from the cylinder, pass into an exhaust cylinder designed to deaden the noise and are finally expelled. The motor is stopped and started by an ingenious device. The axle of the driving wheel is movable backward and forward through the intermedium of a lever placed at the left of the driver. This lever moves opposite a toothed sector at whose notches it may be arrested. The motion of the driving axle is communicated to the wheel by means of a drum keyed to a hollow shaft that receives its motion from the driving axle. This drum, through a rubber belt, carries along another and larger one that is dependent upon the wheel. When the lever is shoved backward, the driving wheel moves forward and loosens the belt, which can then no longer rotate the wheel. At the same time the latter applies itself against the fixed brake block and is arrested on the spot. But if, on the contrary, the lever is shoved forward, the wheel moves backward and stretches the belt, and an opposite effect is produced. This arrangement has the advantage of obviating the inconvenience of the stretching of the belt, since, in order to tighten it, it suffices, upon starting, to push the lever one notch forward. The carriage is provided with a train of three different gearings, that permit of obtaining speeds for five, nine and fifteen miles an hour. As may be seen, the person who sits in front does not aid in the steering of the vehicle. The steersman sits behind, his feet resting on each side upon a platform provided with a straw mat. He merely has to move his foot backward in order to press the lever of a powerful brake whose block is tangent to the circumference of the driving wheel. With his right hand he steers the vehicle through a hand wheel, which, by a very simple gearing, turns the fore wheels to the right or left.

The Perplexing Gas Meter.

Most gas consumers on this side of the Atlantic have like experience to a facetious correspondent in The London Graphic, who asks as follows: Can anyone tell me if gas meters suffer from aberration of intellect, and if so whether there is such an institution as an Asylum for Demented Gas Meters? If so, I should be very glad to hear of it, and at once institute a commission de lunatico inquirendo, and have the case of my especial meter thoroughly investigated. I have spoken before of the difficulty of tackling even a sane meter. I know a great many very clever people, but there is not one among the lot understands the language of a meter, even when it is in its right mind. Give the most well-informed person of your acquaintance a ladder and a candle and tell him to climb to your meter and inform you how much gas you have burned, and you will find him absolutely puzzled. What then can you do with a mad meter, one that persists in registering an increase of gas every quarter, though you feel certain that you consume nearly the same quantity in every corresponding period of each year? If the management of meters and the reading of the same were taught in schools, it would be better than much of the useless learning which is crammed into children's heads.

Science Notes.

A prize for an essay on "The Duty of Kindness to Animals," offered by the S. P. C. A. and competed for by London public school children, brought the society 136,465 essays this year.

The lighthouse on Armish Rock, in the Hebrides, is about 500 feet from the shore. To avoid having an attendant on the rock, the light is produced on the shore and projected across the water upon a mirror in the lighthouse, the mirror reflecting the light in the desired direction.—Der Westfale.

American scholars go over to Germany to acquire scholarship, but German professors come to America for new ideas in the way of illustrative apparatus. Prof. Magnus, who holds the chair of botany in the University of Berlin, was the guest of Prof. Atkinson at Cornell University for a week or two last fall. He was much interested in the photographic collection of the department, and made arrangements to have sent to him a list of photographs of mushrooms and a series showing the effects of fungi in producing decay of forest trees—duplicates of those used at Cornell. Word has just been received from him acknowledging the receipt of the photographs, and returning his thanks for them, saying: They are of very great use for my lectures, and the students have seen them with great interest.

Much attention has been paid to the boarders, welcome and unwelcome, in ants' nests, says The Independent. It is well known that ants keep cows, i. e., the aphides, whose "honey" they feed upon. Various beetles, mites, pill bugs, etc., only occur in ants' nests. One beetle (Claviger testaceus) found in the anthills of Paris is so dependent that it perishes on being removed from the care of the ants. Janet now tells us that the "silver pit" or "slick," as they are called locally in New England (Lepisma), enter ants' nests and live what Janet calls a myrmecocteptic life. When the ants (in confinement) were fed with small drops of honey and pairs of them became locked together by their jaws, the Lepismæ would rush in between them and intercept the drop or a portion of it in its passage and then precipitately retreat, but only to beat another pair in a similar way, and so on until its hunger was satisfied. Hence the Lepisma is a dietetic sneak thief.

The transfer of bacteria by subsurface water has lately been tested by a number of experiments in a clearing of the forests bordering the Rhine near Strasburg. In an elaborate article by Prof. E. Pfuhl in the Zeitschrift fuer Hygiene, it is stated that two pits were used in the tests. One was 3·3 feet deep, and in it the ground water rose to within about 1·6 feet of the surface. The other was 24 feet distant in a line perpendicular to the direction of the flow of the subsurface water. This second pit was 4·9 feet deep, 3·3 feet wide and 39 feet long. Two species of bacteria, Micrococcus prodigiosus and the fluorescent vibrio, which do not occur in the Rhine, were selected for the experiments. The cultures of these species were introduced into the first pit, and at intervals of about half an hour samples were taken from the second pit and cultivated in the usual way on gelatine or agar plates. It was found that in an hour the micrococci and in two hours the vibrios had passed through the 24 feet of gravel separating the pits. In other experiments, the micrococci were found to pass into the supply of a tube well drawing its supply through gravel from a distance of 12 feet from the place where cultures of the bacteria were inserted in the water near the surface.

As is well known, Americans born of foreign parentage are larger than their ancestors, whether English, Irish, German or French; and Dr. Bowditch has shown that the children of Americans of both sexes, born in the United States, are larger than those of foreign races, says The Independent. This is generally attributable to difference in the climate of the Old and New Worlds, our American climate being drier, more changeable and stimulating than that of Europe. It appears that the introduced English sparrow has undergone a gradual modification since its introduction, about thirty years ago, into this country. Dr. H. C. Bumpus has critically examined over 1,700 eggs of this bird, one-half from England and the other half from Providence, R. I. It was, says Science, found that the eggs of the American race, or breed, vary much more than the European, that they are smaller and of a strikingly different shape, being more rounded and with a much greater amount of color variation. This is attributed by the author to a suspension of natural selection. However this may be, it belongs with the class of facts which show that the modification is primarily due to the change from one climate to another. Cockerell has found that common European snails introduced into this country soon begin to present variations not known to exist in England, while in the introduced butterfly, Pieris napi, twelve American varieties, and of P. rapæ four varieties, have appeared on American soil, within the few years which have elapsed since their appearance and spread on this continent.

Miscellaneous Notes and Receipts.

Production of Etching Varnish.—Melt together 4 parts of wax and 2 parts of black pitch and add gradually 4 parts of powdered asphaltum. The whole is carefully boiled, which is kept up until a sample put on tin breaks on bending between the fingers, whereupon balls are formed from the mass.—Seifensieder Zeitung.

Colored Aluminum Alloys.—A purple composition scintillating in the reflexes of the ruby is produced by an alloyage of 78 parts gold and 22 parts aluminum. With platinum, a gold-colored alloy is obtained; with palladium, a copper-colored one; and with cobalt and nickel, a yellow one. Easily fusible metals of the color of aluminum give white alloys. Metals difficult of fusion, such as iridium, osmium, titanium, etc., appear in abnormal tones of color through such alloyages.—Werkstatt.

According to a French patent of Anquetil, ink of the following composition gives copies on unmoistened copying paper without application of pressure:

Aniline color	30 grammes.
Water	2000 "
Glycerine	1000 "
Alum	15 "

It suffices, in order to obtain good copies, to lay a sheet of paper written on with such ink in the copy book, and to close the latter. It is only necessary to see to it that the writing comes into contact with the copying paper throughout.—Papier Zeitung.

Improved Method of Mercerizing Cotton.—C. Ahnert, of Paris, has received a French patent for a method of imparting a silky gloss to cotton not in a state of tension. He says the tension of cotton in the treatment with soda lye for producing such luster is unnecessary if it has, before entering into the lye bath, been saturated with soap solution. His improved method is as follows: The well-boiled cotton is impregnated with a concentrated soap solution at 122° F., and entered into the alkali bath of a concentration of 25° to 35° B. and a temperature of 86° to 104° F.; the cotton is taken out in two and a half to three hours and rinsed with water, to which an acid may be added. It is next bleached.

Plated Sheet Aluminum.—Wachwitz has invented a process for plating sheet aluminum which is said to remove the difficulties heretofore connected with the working up of aluminum. Copper-plated sheet aluminum can be worked up like copper plate and can be soldered, folded, tinned, nickel-plated, etc. The copper adheres in a thin layer on the aluminum, so that hardly any increase in weight is caused, and the coherence of the two metals is such that no separation ensues on rolling or stretching. The plating also renders the aluminum more resisting to bending, to blows and knocks. Copper-plated aluminum wires, which can be readily silvered and gilded, are likely, under the above suppositions, to gain importance in the wire industry and electrotechnics. As regards the latter, it is very important that aluminum is non-magnetic and possesses great conducting power for heat and electricity.—Dampf.

Bronzes from Metallic Oxides.—As a rule, bronzes for decorative purposes are produced in the shape of finely powdered metals or metallic alloys. By the following methods handsomely colored bronzes can be obtained from metallic oxides and solutions:

White Bronze.—Chemically pure zinc sulphate, free from iron, is subjected for some time to calcination in an earthen retort.

Silver Bronze.—Mix 1 kilo of a concentrated solution of zinc sulphate with 30 grammes of cobalt nitrate, 30 grammes of nickel nitrate and 10 to 15 grammes of copper nitrate, all in solutions of 15° to 16° B. density, and calcine after evaporation. The longer calcination is carried on, the darker the color becomes.

Light Pink.—Mix 1 kilo of zinc sulphate solution with 30 grammes of iron nitrate solution of 20° to 25° B. and calcine after evaporation.

Leather Color (Yellow).—Treat 1 kilo of zinc sulphate solution and 12 to 30 grammes of an iron sulphate solution of 28° to 30° B. as above described.

Yellow Gold.—Treat as above 1 kilo of zinc sulphate solution and 28 grammes of manganese nitrate solution of 12° to 14° B. The duration of the calcination regulates the shade.

Yellow Green is obtained from 1 kilo of zinc sulphate solution and 25 grammes of nickel nitrate solution of 15° to 16° density, with slight admixture of silver nitrate solution.

Greenish Vermilion.—Dissolve 90 grammes of iron sulphate, filter, and add to the filtered solution 120 grammes of ferrocyanide, whereupon a bluish green precipitate results. Now a concentrated solution of 400 grammes of alum is stirred in and subsequently 100 grammes of finely powdered lime are added, and after the effervescing is over, 900 grammes of lead acetate. The precipitate obtained is washed, dried at moderate heat and finely pulverized. These pulverulent colors give good bronzes with bronze oil; ground in varnish, they furnish paints of good covering power.—Färben Zeitung.

German Shipbuilding in 1897.

The Kolnische Zeitung of January 16 has an interesting summary of the results of shipbuilding in Germany in 1897, of which the following précis has been forwarded to the Foreign Office by H. M. Ambassador at Berlin:

Shipbuilding, like all other industries in the past year, has every reason to be satisfied with its development. It has been said that German shipbuilding can now consider itself to be on an equal standing with that of other countries; but this opinion applies rather to special ships constructed than to shipbuilding as a whole.

It is very instructive to consider for the past year the figures for ships and tonnage built. It will then be seen that, though Germans have much reason to be satisfied with the results, they must yet acknowledge that they are far behind Great Britain, and have no reason to rest on their present laurels.

In 1897, seventy-nine ships were launched from 28 yards, in which figures are included only seagoing vessels of at least 100 registered tons. This represents a total of 185,000 tons. The bulk of this tonnage is in passenger steamers, about 40,000 in eight men-of-war, and 2,600 in sailing ships. This shows that the construction of sailing craft, being only about 1 per cent of the whole, is practically at an end. And this small tonnage built at home has only been increased by some 500 tons of foreign built sailing ships. This consideration is unsatisfactory from the point of view of training up crews for sea service.

Turning now to the construction of steamers, it is seen that for merchant shipping German yards have tried many varied types, and not only for special designs. Large steamships have been built with their powerful machinery and complete fittings fulfilling all the many requirements of the passenger steamers of the day, in which branch the two large companies of Hamburg and Bremen (the Hamburg-American and North German Lloyd Companies) take the lead. German yards are also turning out special kinds of ships, such as ice breakers (of which many are for Russian account), petroleum steamers and steamers for high-sea fisheries. Whereas Holland and England have earned enormous sums by fishing on the high seas, Germany stands in this respect even behind France and Belgium, on account of the protection accorded to this industry by the government and by the activity of patriotic companies. Fisheries of the high seas are now gaining some importance, and there are over one hundred steamers employed in fishing, all of which have been built in Germany.

With the exception of a few orders from Russia, the merchant vessels were built for the account of Germans. Such a result, viz., that Germans can, to a great extent, now supply their own requirements, must be regarded as most satisfactory, when one remembers the well merited standing and renown of British yards, and their advantages as regards low prices for coal and iron.

Thus the Germans have reached the first stage which should encourage them to strive for the second step, which is the attainment of orders from abroad for German built vessels. With regard to men-of-war, they have already succeeded in this respect. Of the 50,000 tons of men-of-war built in late years, 23,000 were constructed in private yards and 27,000 by the government. Besides the seventy-nine ships of 185,000 tons built at home, there were ordered abroad thirteen other ships of 32,000 tons. A torpedo destroyer of 500 tons was also ordered in England. The present position is therefore a most satisfactory one for Germany when her former dependence upon foreign countries is remembered.

Quick Journeys Made Now.

A French statistician has just drawn up an interesting document showing at various periods in what time certain frontier towns could be reached from Paris. The years chosen are 1650, 1782, 1834, 1854 and 1897. In 1650 it took five days to go from Paris to Calais. One hundred and thirty-two years later, in 1782, the duration of the journey had been reduced to sixty hours. In 1834 it had fallen to twenty-eight hours, and in 1854 to six hours forty minutes. To-day one of the boat expresses takes three hours forty-two minutes.

The journey to Strasburg took two hundred and eighteen hours in 1650, one hundred and eight hours in 1782, ten hours forty minutes in 1854, and to-day a matter of eight hours twenty minutes.

The difference for Marseilles is still more phenomenal. From fifteen days in 1650, the duration of the journey was reduced to eighty hours in 1834, and to-day it takes twelve and one-half hours. The distance from Paris to Bayonne two centuries ago took three hundred and eighty-eight hours; to-day it occupies eleven hours eleven minutes. Brest can be reached in thirteen hours thirty-seven minutes, while in 1650 it took two hundred and seventy hours. Finally, for Havre, ninety-seven hours was considered quick traveling in 1650. It took fifteen hours in 1782 and seventeen hours in 1834. To-day it is a matter of three hours fifteen minutes.