

The Year's Progress in Agriculture.

The annual report of the Secretary of Agriculture, which will soon be ready for transmission to the President, will be looked for with interest. Under the present administration the highly important work of the department has been broadened, and there are many new fields which have never before been touched upon by the government departments or bureaus. We have already referred to the hybridization of the orange, which may be regarded as one of the most interesting and important of the experiments which have been carried on during the past year. The introduction of new seeds and plants to this country has been a strong feature of the year's work. Various crops, such as ginseng, chicory, and Bermuda lilies, which were formerly imported in large quantities, are now produced in the United States, and it is probable that in time the home demand will be covered.

Agents of the Department are engaged all over the world in gathering seeds and making examinations of the various plants and trees. For example, species of grass and forest plants have been found in Algeria which are proving of the greatest possible value to the southwestern part of the United States, where the soil and climatic conditions are similar to the arid conditions which obtain in Algeria. A new rice which will not break in the milling process has also been found, and will save large sums to the rice growers of the South. We have already described the fertilization of Smyrna figs, which operation is now being carried on in California in the same manner that is in use in Asia Minor. The report deals to a considerable extent with forestry, and the work of the new Forester of the Department shows that lumbermen can cut lumber as is their custom, but they can at the same time at a small expense leave the forests in such a condition as to be valuable for future timber instead of the present wasteful system, which bids fair to work serious injury to certain sections of our country.

We have also noted the interesting tobacco plant experiments which have been carried on by the Department. Irrigation investigations are treated in the report, and the problem is certainly a most important one, as it is said the recent rise in the price of beef was due, not only to an increased demand, but also to the diminished capacity of the Western grazing land, owing to an overstocking and killing out of the native grasses. The broadening of foreign markets is also dealt with. Cold storage shipments of butter are being made regularly, and other dairy products are fast becoming well known and liked in the markets of the world. A note of warning is sounded about our new possessions. The Secretary considers that an inspection law should be formulated and enforced, as when the Americans begin to settle in the islands they will undoubtedly import many new plants and seeds from all over the world. They will, perhaps, unwittingly introduce diseases and insect pests which may ruin the crops. This has been the history of the possessions of other countries. The attitude of the Department, as concerns our new island territory, is one of cordial cooperation.

Successful Trials of the Holland Submarine Boat.

The Naval Board appointed to inspect and report on the performance of the "Holland" submarine boat has reported that in the recent tests, held on November 6, in New York Harbor, she fulfilled all the requirements laid down by the Department. These requirements were that she should have three torpedoes in place in the boat, she should have all arrangements for charging torpedoes without delay, and that she should be prepared to fire a torpedo at full speed both when submerged and at the surface. Lastly, the "Holland" was to make a run for two miles under water, starting from one buoy, running submerged for a mile to a second buoy, rising to discharge a torpedo at a mark near the second buoy, and then after diving again return submerged to the starting point.

In his report Chief Engineer John Lowe, U. S. N., who was specially ordered to observe and report the preliminary trials, says:

"I report my belief, after full examination, that the "Holland" is a successful and veritable submarine torpedo boat, capable of making a veritable attack upon the enemy unseen and undetectable, and that, therefore, she is an engine of warfare of terrible potency which the government must necessarily adopt into its service."

He further says that "this government should at once purchase the 'Holland' and not let the secrets of the invention get out of the United States, and that the government ought to create a submarine torpedo boat station for the purpose of practice and drilling of crews, and that we need right off and right now fifty submarine torpedo vessels in Long Island Sound to protect New York, preserve the peace, and to give potency to our diplomacy."

While we cannot agree with Mr. Lowe in his opinion that we need and presumably should build a whole fleet of torpedo boats "right off and right now," we do think that the "Plunger," a larger boat of the

"Holland" type now building for the government, should be immediately completed and further trials of the system carried out.

HAMILTON YOUNG CASTNER.

BY MARCUS BENJAMIN, PH.D.

In his address on "The Advances of Chemistry," which Sir Frederick A. Abel delivered before the British Association in 1890, are to be found the following words: "The success which has culminated in the admirable Castner process constitutes one of the most interesting of recent illustrations of the progress made in technical chemistry, consequent upon the happy blending of chemical with mechanical science, through the labors of the chemical engineer."

This tribute of praise to the young American chemical inventor, whose death occurred last week, makes it desirable that a brief notice of his career be given in these columns, and as it was my good fortune to be intimately acquainted with him during his early professional career, I am very glad of the opportunity to briefly tell the story of his short life.

Hamilton Young Castner was the second son of Samuel and Julia A. Castner, and was born in Brooklyn, N. Y., just forty years ago. After the usual common school education, during which he showed a predilection for scientific studies, he entered the Columbia College School of Mines with the class of 1879. He soon manifested such a marked preference for chemistry that he decided to devote himself exclusively to that study, completing the usual four years' course in three. It was in consequence of this that during the last two years of his laboratory work his desk was adjacent to the one where I was engaged and then began our friendship, which continued until his death. For his graduation thesis he made an exhaustive study of the water from the wells then still in use in the city,

**HAMILTON YOUNG CASTNER.**

and it was largely in consequence of the results obtained by him that the Board of Health, at that time under the direction of Professor Chandler, ordered all of these sources of disease to be abandoned.

Almost immediately after graduating he opened an analytical laboratory on Pine Street, and in consequence of his ability soon gathered around him a valuable following that accepted his advice on all chemical matters without question. Notwithstanding the fact that there were many competitors, he increased his business within a year so that larger quarters were necessary, and he then moved to Pearl Street, where he continued with his elder brother for several years. Meanwhile, however, his active mind sought for occupation in studying improvements on then existing chemical processes. The first important problem that he took up was a method by which carbon could be produced continuously. This he successfully accomplished, but was unable to find a market for the process owing to the depressed financial condition of the country at that time, and also from the fact that the larger firms engaged in that business consolidated and reduced the price below that on which his calculations were based. He then began the study of an improved process for the production of aluminium, and with his usual energy and ability devised a modification of great value on the then long and tedious process in existence, which received very great commendation from the leading chemists of the world. It was considered so valuable that he received favorable overtures to erect a plant in England, and in a short time the well-known works at Oldbury, near Birmingham, were built under his supervision. The electrolytic process soon after came into existence, and in consequence, for a time, the market for his aluminium was taken from him, but his resourceful mind soon saw the value of sodium peroxide, which was one of the products in his aluminium process, and he forth-

with created a demand for that article and put it on the market, thus commanding success when failure seemed inevitable. Later he devoted his attention to an electrolytic method for the manufacture of bicarbonate of soda, which was successful and increased his reputation.

It is not possible to follow the development of the different processes of which he was the originator, but besides being connected with the Aluminium Company of Oldbury, he was also associated with the Castner-Kellner Company, the Mathiessen Alkali Company, the Rheinfelsen Company, and more recently with the Niagara Chemical Company, whose works are near Buffalo in this country.

In the exercise of his peculiar ability I know of no one his equal in this country. In considering an improvement for a chemical process he first carefully studied the subject from books, and then laid down a course of investigation which he continued until success crowned his efforts. His reputation will grow as the years pass by, and the science of the world has met with a serious loss in his untimely death.

"DON COYOTE."

BY PROF. CHAS. FREDK. HOLDER.

One of the interesting and typical animals of the far West is the American wild dog, lowland wolf or coyote, *Canis latrans*, it being known under these and other titles. While a very common animal, it is rarely well figured in the books, and is made to look more foxlike than wolfish. A wolf the coyote is, a lowland form, and every traveler through the West who has wandered from the beaten paths or visited small places knows it well.

The accompanying photograph gives a very correct idea of a young male two-thirds grown. In general appearance it resembles the typical wolf, the fur being a dull yellowish gray with dark, even black, clouded spots; beneath it is sometimes reddish and white.

The coyote is virtually a wild dog and breeds with the domestic dog, and dogs will often refuse to injure the female coyote. The writer observed this once on the mesa near Pasadena when in full chase after a coyote with a pack of grey and stag hounds. One of the dogs reached the game, but instead of seizing it as usual ran along by the side of the coyote, which was a female. Huxley contends that there is no material difference between the skull of a coyote and that of a dog, and a cross between a collie and an Eskimo dog produces a very fair coyote, so far as appearances go.

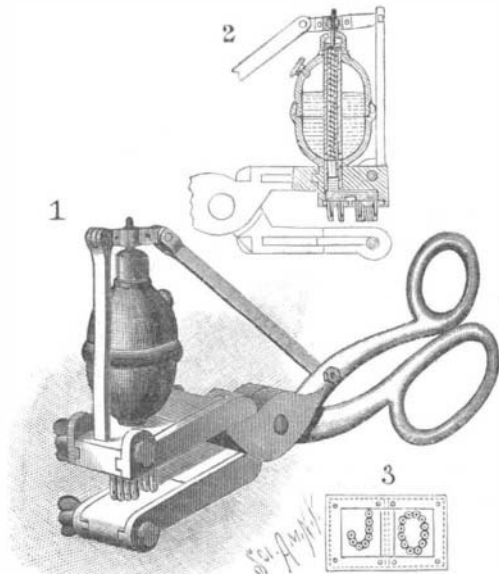
"Don Coyote" is essentially a night animal, and my observations of the living animal were made chiefly in the saddle in full chase after him in the dull early morning, and I can commend his speed, which is greater than that of the fox. When the sun goes down Don Coyote comes out of his haunts in the foothills and wanders down around or into the settlements. He lies in the spurs of the hills and mountains in Southern California, as in the San Gabriel Valley, in some safe and inaccessible point, and surveys the country, his vision perhaps directed to some henroost or the home of some fat turkey. At such times I have occasionally seen him, his fur an almost perfect protection in its resemblance to the rocks that surrounded him; and that he recognizes this was shown in one instance when I rode within thirty feet of one, pretending to look directly ahead, but watching him out of one corner of my eye. He crouched as I approached, and seemed confident that I did not see him imperceptibly moving, ever keeping his head pointed toward me; and few would have recognized in the gray rock a coyote.

On the outskirts of Pasadena, a city of fifteen thousand inhabitants, where my observations have been made, I often hear his weird ventriloquistic yelp in the deep-wooded Arroyo Seco, where the wildcat and lynx also roam. He comes boldly up the bordering streets, evading the dogs the best he can; now giving them a wild chase, then stopping in some vacant lot and defying the town, and with head aloft yelping to the moon. At such times, owing to the ventriloquistic qualities referred to, one coyote can create the impression in the mind of a householder or camper that he is surrounded by a pack; the yelps come in such quick succession that they fairly overrun one another and seem echoed back and repeated from every hill, rock, and bluff. In this way a single coyote will arouse the people as he sneaks along, every dog on the alert, yet on the morrow the remains of some plump turkey will be found in the road telling the story of this crafty foe.

In such trips the coyote is generally alone, and I have met him on the outskirts of the town, slinking home in the early morning, perhaps under the protection of the heavy fog. Often there is a mirage, and at a distance of a few hundred feet Don Coyote looks as large as a sheep looming up in the mist. Generally he stops, turns, and stands a rigid picture for a moment, perhaps wondering what the moving object is, then convinced that it is an enemy, he turns and runs for the Puente Hills with marvelous speed. I give Don Coyote credit for much intelligence, as on one occasion at least he led hounds and horses out of the

way to a barbed-wire fence, passing under it himself but witnessing the complete demoralization of the hunt as he bounded away.

While the coyote hunts singly in towns or villages, he runs in packs in the open, and it is here that he demonstrates his skill and cunning. A friend of mine observed a pack of coyotes on the edge of the desert manipulating a jack rabbit. They swept across the country in a line, soon starting a hare, then formed in two parallel lines about 200 feet apart. There was a regular plan of action, and none of the coyotes seemed over-excited, but when the hare was started they wheeled into columns like soldiers, the leading coyote running at the top of his speed. After a few moments he dropped to the rear and a fresh coyote took the lead; and this was kept up until the hare was run down.



CAMERON'S BRANDING INSTRUMENT.

The chase was a silent one. This method recalls the wild dogs of Australia, or dingo.

While the coyote is invariably written down as a coward, and it is true that either singly or in packs he will not attack man or beast larger than himself, when cornered he is a vicious fighter. I have seen one fight off a pack of greyhounds, wounding them so that to save the dogs the hunter was obliged to finish the animal. The coyote in this case had run at least two miles at race-horse speed, and when reached by the hunters was backed up against a rock, snapping his jaws at his crazed antagonist, his teeth sounding like a steel trap as they came together, and taking a piece of flesh whenever they hit the mark.

Seven or eight years ago Southern and Central California abounded in coyotes that to a certain extent annoyed the rancher. A sentiment was gradually worked up against the animal, so successfully, indeed, that the State legislature passed an anti-coyote act, putting a price upon his head or scalp. I had the temerity to oppose this and at the time made several appeals for the animal through local papers and The San Francisco Chronicle, pointing out the reasons. I was evidently in the minority, but time has shown the fallacy of killing all the coyotes, and the act, which bade fair to bankrupt the State, was repealed, and the coyote is once more increasing, though it will be years before he will make the welkin ring as of yore. My argument, especially applied to the localities mentioned, was that as the coyote was the only enemy of the jack rabbit and ground squirrel, his destruction by wholesale would result in a vast increase of rabbits and squirrels. I also pointed out that a scalp bounty in California would open up frauds innumerable, and that coyotes would be exterminated in California, then imported from Arizona, New Mexico and Utah; and this was the case. Coyote killing became so profitable a business that many men devoted themselves to it, and an increase in the pests, jack rabbits and ground squirrels was soon noticed; the law was repealed, but not before the taxpayers of California were looted to a large amount.

The jack rabbit, a famous girdler of young trees and an all-around enemy to the agriculturist, without a redeeming feature, is the natural food of the coyote, which does not disdain the ground squirrel. The coyote is also a snake eater, even attacking the rattlesnake; in a word, he is a valuable scavenger and an animal to be preserved. It is true he has a weakness for turkeys and chickens, and sometimes dines upon small lambs on the edge of large flocks, yet the losses are inconsiderable compared to the ravages the rabbits are guilty of in the San Joaquin and San Gabriel valleys and which they would accomplish if not kept down by the coyote.

Don Coyote can be tamed, and I knew of one instance where a herder kept one that was apparently as tame as a dog. The near allies of the coyote are the maikongs or crab-eating dogs of South America, that hunt in packs and resemble

the coyote in appearance. There are several species in South America that call to mind the coyote, as the Guara Canis jubatus, a large, powerful, ferocious dog-wolf five feet in length. Like the coyote, it frequents the lowland countries, especially in Paraguay.

AN IMPROVED BRANDING INSTRUMENT.

Our illustrations represent an improved device for branding and marking the ears of animals and simultaneously injecting an indelible fluid into the wound. The device has been patented by Walter A. Cameron, Stacey, Mont.

Fig. 1 is a perspective view of the complete instrument; Fig. 2 is a partial section; and Fig. 3 is a cross-section taken just above the marking devices.

The branding instrument consists of two levers pivoted together and provided with jaws. On the lower jaw a soft metal impression block is secured; and on the upper jaw a block is carried, having a chamber communicating by means of a tube with a reservoir containing the indelible fluid. The tube incloses a plunger operated from the upper lever and is provided with lateral ports at its upper and lower ends. The lower ports permit the liquid to flow into the chambered block when the plunger is raised; and the upper ports permit the liquid above the plunger to be forced back into the reservoir.

Symbol-carrying plates (Fig. 3) are removably secured to the chambered block. The symbols consist of letters, figures, or other characters, and are formed of tubular pins.

In using the instrument, the levers are operated to separate the jaws. By reason of this motion, the plunger will be drawn upward to permit the liquid from the reservoir to flow into the chamber. After placing the impression-block carried by the lower jaw against the outer side of the animal's ear, the levers are operated to force the tubular pins into the ear, thereby causing the plunger to inject liquid into the wound.

A spring within the tube holds the plunger normally below the lower ports, so that the liquid will not escape when the device is not in use.

A SIMPLE SLIDE-VALVE FOR STEAM-ENGINES.

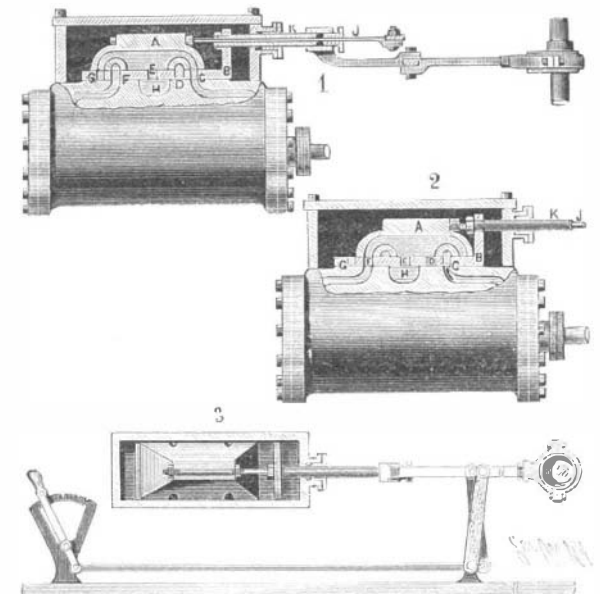
The improved slide valve which forms the subject of our engravings consists of two parts, a distributing valve, A, and an independently movable section, B, interposed between the ports of the cylinder and the distributing-valve, A. The distributing-valve is independently adjusted by a stem, J, passing through a sleeve, K, connected with the slide-section, B, and with the eccentric. The sleeve, K, is offset in the form of an arm; while the stem, J, extends straight through the offset. Two independent connections are thus obtained for working the parts of the compound valve together or separately.

The distributing-valve is formed with a large exhaust-chamber opening inwardly in the middle and through ports near its ends, and with two induction ports opening into the steam-chest to admit steam through the passages, G, F, D, C, into the cylinder ports.

The distributing-valve rod, J, as shown in Fig. 3, representing a side view of the valve-shifting mechanism, is jointed to the upper end of a lever fulcrumed at its middle to an arm and connected at its lower end with a rod pivoted to an adjusting lever; the upper end of the arm is connected with the eccentric rod.

When the ports are in the position shown in Fig. 1,

steam enters through the proper induction opening and passes through F and the port communicating therewith into the cylinder, forcing the piston to the right. The steam is expelled through the other cylinder-port, through C, through the center exhaust chamber, through E, to exhaust, H. When the rods are together moved to the right by the eccentric, the valve, A, B, shifts to the right and the port, G, is over the left cylinder port, D is over the other cylinder port, and live steam passes through D to the cylinder port, forcing the piston to the left; the steam passes out through the left cylinder port, through G, to the central exhaust chamber through E, to the exhaust, H. To reverse the motion of the engine, the relation of the distributing-valve, A, and the slide-section, B, is changed by means



DAMERELL'S SLIDE-VALVE FOR STEAM-ENGINES.

of the rod, J, and sleeve, K; for this purpose the distributing valve is slid to the right on the section, B, as shown in Fig. 2, by means of the shifting mechanism. As before, the parts, A and B, are reciprocated by the eccentric; but G and C are now changed to live ports and D and F to exhaust ports, which changes the direction of the engine's motion. The valve is the invention of Henry Damerell, Ludlow, Mo.

THERE are indications that in the near future mercury will be one of the important metallic products of New South Wales. Several tons of ore have been brought to Sydney, and quantities of it distributed among the various government departments, in order that it may be thoroughly tested. Should the results of the experimental plant which is now being built prove satisfactory, the quicksilver trade of the world will become revolutionized, as the poorest assays show the ore to be richer than those of the American and Spanish mines. The subject is considered in the current number of our SUPPLEMENT.

The Current Supplement.

The current SUPPLEMENT No. 1247 has many articles of unusual interest. "The Land of the Boers" is an illustrated paper dealing with some of the interesting scenes in the Transvaal. "A Problem in American Anthropology" is by Prof. F. W. Putnam. "Recent Work Against the Gypsy Moth" describes the wonderful fight which is being waged in Massachusetts against this insect pest. "Experiments with High Frequency Currents at the Charlottenburg Technical Schools" is an article illustrating some curious experiments. "Electrical Propulsion at Tours" is an article describing the Diatto system, which bids fair to rival the underground trolley. Sir William White's splendid address on "Mechanical Science," before the British Association, is concluded in this number. "The Schneider-Canet Naval Turrets" describes the barbette turrets on this system for the iron-clad "Marceau." "Report of the Chief of the Bureau of Ordnance" is the annual report of Admiral O'Neil. "American Railroads," by George H. Daniels, is concluded in this number.

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Photograph by Brewster, Ventura, Cal.

THE COYOTE OF THE WESTERN PLAINS.