AN IMPROVED TYPE OF ZEISS FIELD GLASS.

The Galilean telescope, while an improvement over the ordinary astronomical telescope fitted with terrestrial eyepiece, possesses the disadvantage of having a small field and requires object lenses of considerable diameter and moderately long focus in order to give a fairly flat field with suitable illumination.

It has long been a live problem with opticians as to how the field might be enlarged and the bulk reduced while maintaining good illumination and sharp definition. The solution of the problem has been reached in a manner which increases the optical efficiency of the field glass in every possible way by the application of Porro's prism—invented independently by Porro and Prof. Abbe—in the new Zeiss field glasses, now being

BAUSCH & LOMB—ZEISS FIELD GLASS.

manufactured in this country by the Bausch & Lomb Optical Company, Rochester, N. Y.

These glasses are the invention of Prof. Abbe, of Jena, to whom optical science owes so many recent improvements.

It is only within the last few years that the optical manufacturer has attained the refinement which enables him to produce this class of work.

The illustration shows the Zeiss binocular field glass partly in section, with the Porro's prisms in position. It will be noticed that the light first passes through the objective lens, is reflected twice by the first prism, and enters the second prism placed at an angle of 45° to the first, where it is again twice reflected, emerging parallel to its original direction, where it is magnified by the eyepiece, which is of the compact Kellner construction.

The three principal defects of the ordinary binocular field glass are overcome by the use of these prisms, which have the effect of erecting the inverted image formed by the object glass, shortening the telescope by two-thirds, and at the same time giving a means of placing the object glasses farther apart than the eyepieces are.

The amount of this displacement is variable within wide limits and has the effect of increasing the stereoscopic effect possessed to a certain extent by ordinary binocular glasses, giving greater relief and appearance of solidity to the images of objects seen at a distance.

The relation of aperture to magnification has been so calculated that the largest possible amount of light is made to enter the pupil of the eye, the actual diameter of which has been taken into account in calculating the eyepieces. In order to reduce weight, the cases are made of aluminum covered with leather.

Adjustment for the correct pupillary distance of any user is made by moving the two parts of the binocular about the axis of the hinge. A click setting device enables any individual user to determine his own pupillary distance and set the click to that distance permanently. Each ocular is focused separately, so that in case there are differences in the foci of the eyes they may be compensated for in the field glass, giving correct coincidence of the two images and increasing the distinctness of the combined image.

The extraordinary depth of focus of these glasses makes it unnecessary to change the focus after it has been once determined for the eyes of the user, except for objects extremely close to the observer.

A NEW INSULATOR.

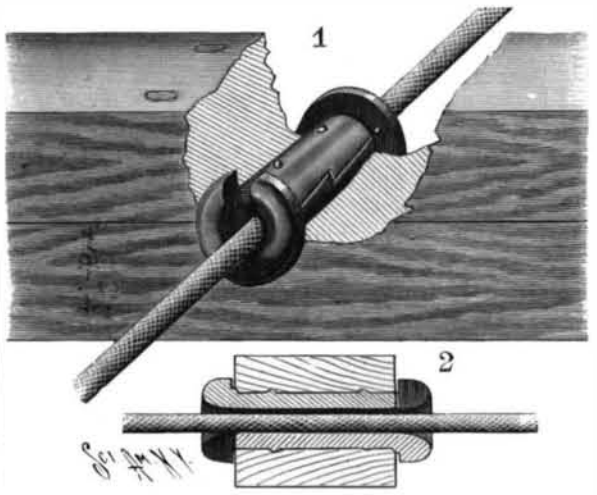
The insulator which forms the subject of the accompanying engraving is constructed in the form of a tube, divided into longitudinal sections, each of which has interlocking shoulders and a head at its outer end, so that the sections may be fitted together to form a continuous tube, securely and effectively holding the conductor.

Of our illustrations, Fig. 1 is a perspective view and Fig. 2 a sectional view, both showing the insulator in position.

The insulator is made in two duplicate sections, each having its edges provided with interlocking shoulders, as shown in Figs. 1 and 2. By this means the two sections can be made to fit exactly together. The head of each section is outwardly beveled to prevent chafing of the wire, and is provided with a notch through which the wire may be passed. Projections on the sections are adapted to be embedded in the material and hold the insulator, to prevent the sections from turning and, therefore, displacing the insulator. As indicated in the engraving, the insulator is adapted to be held in the joist or other framing of a building through which the wire is to be passed.

By means of this device, the wires may be securely held and leakage prevented. The insulator may be applied after the wiring is done, or the insulator may be first placed in position and the wire then run through it. When once in place the insulator cannot be accidentally removed.

The device is the invention of Charles L. Wingard, Walla Walla, Washington.



WINGARD'S INSULATOR.

THE CRITERION AUTOMATIC ACETYLENE HOUSE GENERATOR.

Herewith are presented illustrations of two styles of acetylene gas generators manufactured by J. B. Colt & Company, and especially intended for lighting single dwelling houses, country seats and outbuildings, small and medium manufacturing plants, etc., though the system can be made to embrace larger establishments. There appears to be no limit in this direction.

The first illustration represents machines with a single set of four carbide holders. The form shown in the second illustration shows the possibility of doubling the charge of carbide without increasing the floor space, by employing a double row of holders.

It is obvious that several stands, either with a single or double row of holders, may be used with the one gas holder and water valve, thus enabling a very large charge of carbide to be used.

These machines are so simple that they can be managed by any one having ordinary intelligence, and the convenience and rapidity with which they can be loaded are among the special advantages. The automatic arrangements whereby the production of gas and the regulation of its flow is governed in consonance with the necessities of demand and supply, are positive in their action, and no gas is wasted. The machines are strong and durable.

Each apparatus consists of a gasometer, a stand supporting the carbide holders, connections between the two being had by means of a pipe, one end of which springs from the top of the stand, the other joining the condenser at the bottom and left hand side of the tank and at the same time acting as a guide. A water pipe is connected in reverse order. In the generator shown in the larger engraving a water tank is added to the stand above the upper set of holders. Otherwise the details of the two machines are identical.

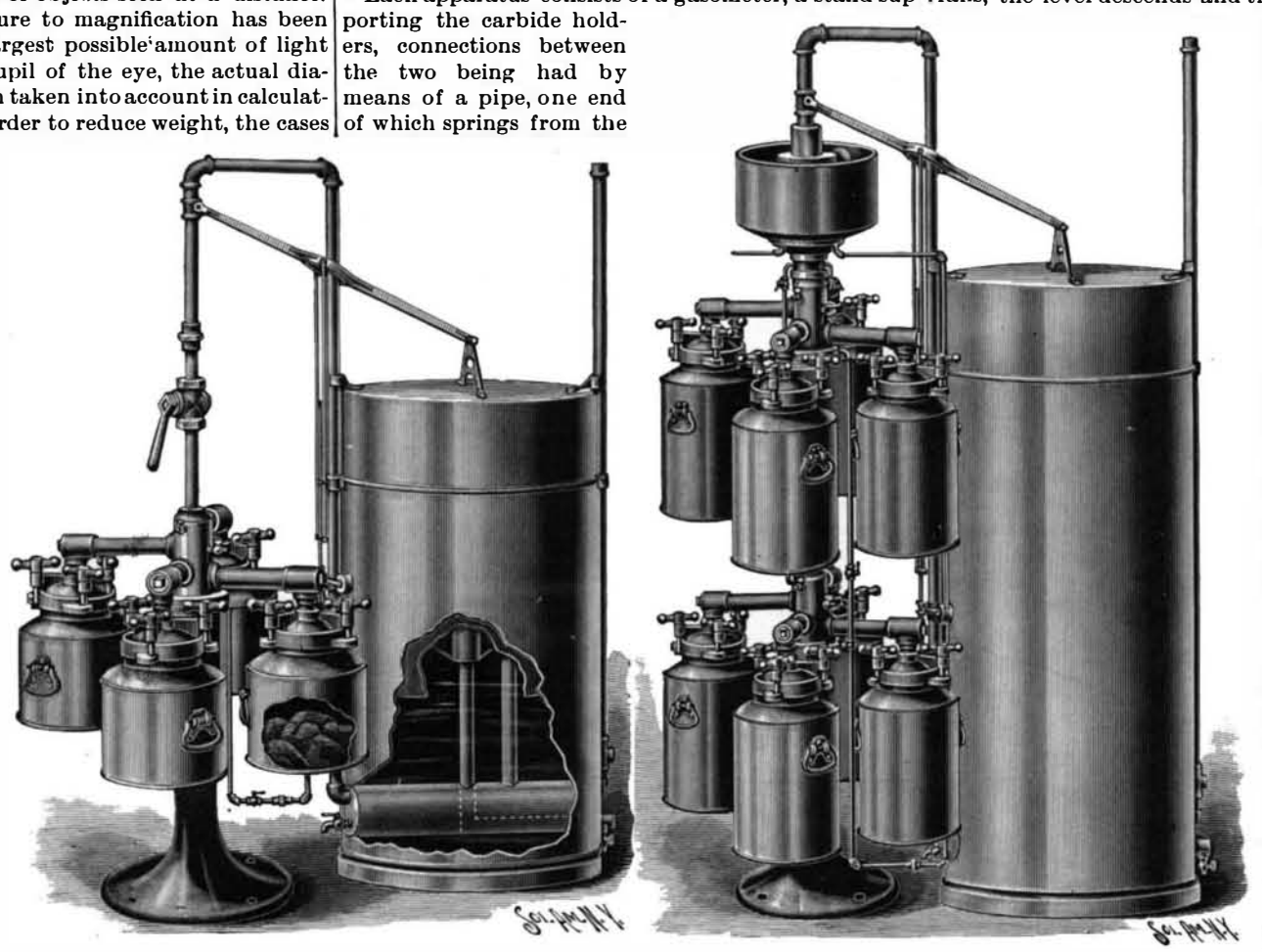
In setting up the Colt acetylene generator, the pipes between gasometer tank and stand are connected, and also the water supply pipes, carbide is introduced into the holders, and the water turned on. Meantime the stopcock and condenser drip is opened to allow free exit for contained air, permitting the gasometer to sink to its lowest level. Gas from the holder, entering the connecting pipes, expels the air from the machine, when stopcock and water regulator are closed, causing the gas to flow into the gasometer, which immediately begins to rise. When sufficient quantity of gas has been secured in this way, gas is admitted to the service pipe, the residual air is forced out through different burners which are opened for this purpose. When the flame no longer reveals a bluish tinge, the last trace of residual air has been got rid of.

When water is admitted to a carbide holder, gas is immediately but slowly and gradually evolved. Water, however, can only reach one holder at a time, and it is only when the carbide has been thoroughly exhausted, and its receptacle filled with water, that the water can enter the next one of the series; and whenever the flow of the gas is too great, or the gas too rapidly evolved, water ceases to flow into the holder, it being forced back by the flow of the gas.

The gas produced in the holder passes out through the pipe connecting to the stand and is conveyed into condenser, where it is cooled and parts with its moisture. It then rises into the gasometer, where it is stored, or passes on through the service pipes for combustion. When an excess of gas is being sent to the gasometer it rises, and by means of levers closes the water supply, when the production of gas ceases; but when consumption is again begun and the gasometer falls, the lever descends and the water is again turned on. The complete isolation of the holders is effected without the use of valves. By this means the carbide in each holder is entirely protected from moisture until it is required for the production of gas.

The gas pressure may be increased by placing weights on top of the gasometer; this is often rendered necessary when gas has to be forced to considerable distances, or through many diverging service pipes. The gas is preferably used under a pressure of from two to three inches of water. Water requires to be renewed in the tank only as often as the holders are charged with carbide. The carbide expands when slaked to twice its volume; therefore, the receptacle should be filled only about one-half.

The greatest convenience about the machine is the ease of reloading it is not necessary to



AUTOMATIC MULTICHARGE ACETYLENE GENERATOR.

transfer the residue from the holders, but each holder may be carried out independently, thus avoiding soiling the clothes and hands.

These machines are manufactured by Messrs. J. B. Colt & Company, of 125 West Thirty-seventh Street, New York, with branches in Chicago and San Francisco.

Danger in New Hunting Rifles.

When one comes to discuss rifles, range, and the average distance at which game is shot, he is likely to strike contradictory opinions. A prominent hunter, in speaking recently of the great effectiveness of the American rifle, said that in his experience, elk, moose, bear, and white-tailed deer were most generally killed within a range of 175 yards; and that this was so because they were apt to be discovered within this distance, not because of any lack of carrying power in the rifle. When this statement is contrasted with the prospectus of the latest rifle, which has a first sight of 250 yards, a flat trajectory, and a maximum range of 2,200 yards, what is the average hunter to think?

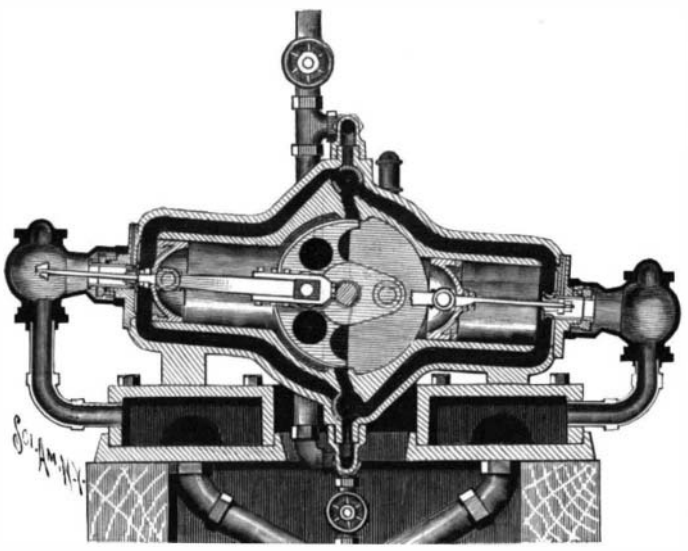
Of one thing there is no room for doubt, and that is that this year many people are preparing to go to the woods deer shooting, and will take with them the new rifle. Its wonderful range and penetration are due to the new smokeless powder employed in conjunction with a bullet sheathed in copper so as to present a harder surface to the rifling than lead. This projectile is forced through a barrel from 20 to 24 inches long, the rifling of which has about one turn to every 8 inches. The great objection raised by experienced hunters to such an arm as this is, that with the long range one never knows where the bullet is likely to bring up once it has left the gun. A few years ago a hunter fired at a deer at a distance of 183 yards as measured after death. The animal was standing at the foot of a slight bluff of loamy sand in which not a stone or rock was to be seen. The rifle was fired and the deer fell, the bullet having gone clear through the heart, missing the ribs on both sides. Immediately after a hall was heard from a point about 200 yards back of the shooters, and an angry man was heard asking where in thunder they were shooting, as the bullet had just skimmed over his head. A close examination showed graze and leaf holes four feet above the heads of the other party of hunters, and it would seem that the bullet had traversed two sides of a triangle, from the rifle to the quarry, and back from the quarry to the other base corner of the triangle. If such a thing is possible with an ordinary rifle sighted to 100, 150, 300, and 500 yards, what would be the possible result with the copper-sheathed bullet, low trajectory, and 2,200-yard range in a wooded district?

In still another case a well known hunting writer from the West, now residing in New York, chanced upon a moose feeding about 200 yards away, and, with the idea of taking the second shot himself, told his companion, an amateur, to try the first shot. The bullet was seen to strike the ground nearly four feet in front of and about six feet short of the moose. When an examination was made, it was found that there had been two moose feeding within 100 yards of each other, and that on the trail of the far one was blood. Following the trail the moose was eventually bagged, and it was found that the bullet had entered at the lower side of the stomach, and was lodged in the fat of the hump, showing clearly that the animal had been hit by the ricocheting missile. An examination of the spot where the turf flew showed a flat piece of rock, an inch or so under the surface, which the bullet had hit and glanced from. Many similar stories might be related of the vagaries of glancing bullets, and the possible dangers are making a number of hunters very chary of going out with these new rifles, which, whatever advantages they may have in other places, are not believed to be suitable for deer shooting in the Eastern States. Apparently, English sportsmen are also entertaining similar fears, for a prominent big game shot recently advocated a restriction in the matter of the rifling.

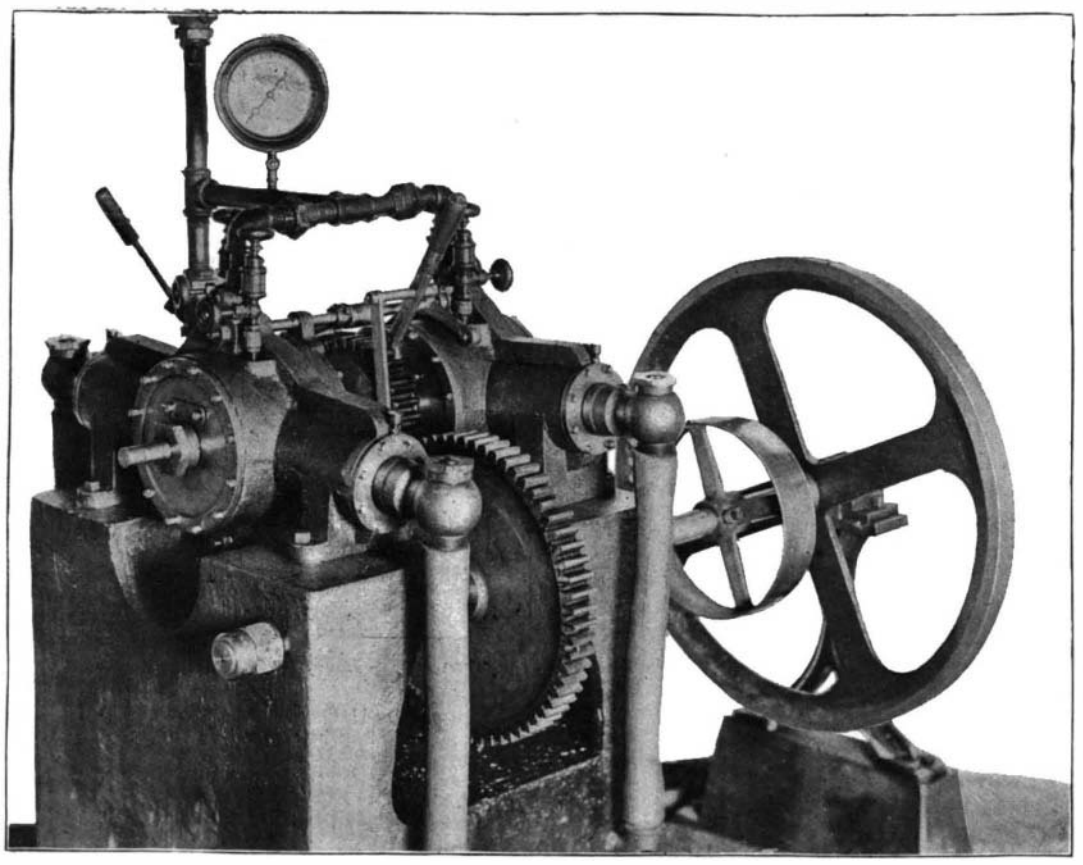
Both English and American hunters appear to hold the idea that the wound inflicted by the metal-sheathed bulled fired from the exceedingly long range rifle, is not of the type best calculated to stop the game, but that the bullet will, rather, pass completely through the body without shattering opposing bones, or tearing a large hole in the softer opposing substances, so that if the animal be not hit in the brain or heart it may travel a long way before loss of blood brings it down. The experience of most hunters is in favor of a 45-caliber bullet composed of one part tin and forty of lead, weighing 350 grains, propelled by from 90 to 110 grains of good black powder. This bullet will not have the same ricocheting power as the other.—New York Sun.

A NEW STEAM MOTOR.

We give engravings of a steam motor recently finished and tested at the works of The Merrell Manufacturing Company, Toledo, Ohio. It has been called a rotary engine by its makers, on account of the intimate connection of the reciprocating parts with the revolving parts, and the perfect balancing, which insures a smooth action. The engine is very compact, and, as it runs at high speed, it can be used to advantage in driving dynamos and other machines running at high velocity.



LONGITUDINAL SECTION OF ENGINE.



SINGLE CYLINDER DOUBLE EXPANSION ENGINE.

One of the views shows the motor in perspective; the other shows a longitudinal section of the motor. In operation, the steam or air is admitted from the bottom and enters between the pistons, driving them outward to the position shown at the left. When the pistons are in this position, the cam-valve opens the top port and closes the feed port, thus allowing the steam or air to escape from between the pistons and pass to the opposite side of the pistons, driving them inward to the position shown at the right hand. When this stroke is completed, the extension-stems on the piston open the end or exhaust valves, which remain open until the pistons complete their outward stroke. To reverse the motor, steam is supplied from the top instead of the bottom. The motor, as shown, is so arranged as to admit of using the steam or air but once and exhausting, or it can be used twice as above explained. It is stated that, with a 5-pound pressure, using the steam but once, the motors run at a speed of 80; and with the same pressure, using the steam twice, the speed was increased to 176 revolutions. When this motor was connected with a dynamo the voltmeter showed 75 volts when the motor was run on the compound system, and but 20 volts without the compound, the pressure remaining the same.

The engine, as built, was made simply for the purpose of demonstrating the principle involved. The motors have been tested by a brake test to 9½ horse power with but 35 pounds of steam. The engines were designed by R. D. Watson, of Toledo, and patents covering same have been issued.

The Romance of Aluminum.

In "Naturæ Historiarum" (lib. 36, cap. 26), in which reference is made to an incident in Roman history which, up to the time of Sainte-Claire Deville, had been overlooked by scientists for many centuries, it is related by Pliny (23 A. D. to 79 A. D.) that during the reign of the Emperor Tiberius (41 B. C. to 37 A. D.) a certain worker in metals (faber) appeared at the palace and showed a beautiful cup composed of a brilliant white metal that shone like silver. When the artificer was presenting it to the Emperor he purposely dropped it on the floor of the chamber. The goblet was so bruised by the fall that it seemed to be irretrievably injured; but the workman took his hammer, and in the presence of the court repaired the damage without delay. It was evident that this metal was not silver, though it had almost the same brilliancy, besides being much more ductile and considerably lighter. The Emperor questioned the artificer closely, and learned from him that he had extracted the metal from an argillaceous earth — probably the clay known to modern chemists as alumina. Tiberius then asked if anyone besides himself knew the process, and received the proud reply that the secret was known only to himself and Jupiter. This answer was sufficient. The Emperor had reflected that if it were possible to obtain this metal from so common a substance as clay the value of gold and silver would be greatly reduced, so he determined to avert such a lamentable catastrophe. He caused the workshops of the discoverer to be wholly destroyed, and the luckless artificer was seized and decapitated, so that his secret might perish with him. M. Sainte-Claire Deville had no doubt that this metal was aluminum, and he asserted that the wanton cruelty of Tiberius had deprived the world of this valuable metal, which remained unknown for eighteen centuries. The extracting of aluminum, discovered by the Roman craftsman in the first century of the Christian era, thus became one of the lost arts. —Aluminum and Electrolysis.

The "Oregon's" Brave Men in the Fireroom.

Sergt. Frederick A. Ramsey of the battleship "Oregon" writes in a letter to his father, in McMinnville, Ore., under date of July 7: "When the 'Maria Teresa' had beached herself and hauled down her colors, we shaped our course for the 'Vizcaya,' which was about 500 yards ahead of us and steaming her best. We opened fire on her with our two forward 13-inch, four 8-inch, and two 6-inch guns. The gunners kept firing as fast as they could. All the time the fight was going on we were steaming under forced draught, which was very hard on our fireroom force. The heat in the fireroom was 165 degrees. You will wonder how men can stand such heat, but they did it, and we give them the credit which they are justly entitled to. The officers sent down dozens and dozens of bottles of iced beer to revive them, and we stationed men along the passages leading down to the firerooms to herald the news to them; and every time we sent a ship to the beach or shot away her colors, they were told, and the cheers came up to our ears through the ventilators, which run up on deck. They would say, 'Sink them; sink them,' 'Remember the "Maine," boys,' and 'We will catch them or blow the boilers out trying.'"

CONTRACTS for the four new boats to be built for the North German Lloyd Company have now been placed. Two cargo boats, each of about 8,100 tons carrying capacity, are to be constructed at the Tecklenborg Shipbuilding Yard, Bremerhaven, for the Bremen-Baltimore service, and two cargo and passenger boats of about 10,000 tons capacity, each will be built at the Blohn & Voss Company's yard, Hamburg, for the New York line.