Each catenary consists of two 1/8-inch steel cables carried on insulators on the top of the masts. The copper trolley wire is suspended from the cables and held in level and alignment by triangles made of 1/8-inch pipe.

The Trolley Lines of the New York, New Haven & Hartford Railroad.

The locomotive, of 2,200 maximum horse-power, weighs 16 tons and can exert twice the horse-power of the express steam locomotives of the road.

The First Trial Electric Train Starting from the Grand Central Station.

ELECTRIFICATION OF THE NEW YORK CENTRAL AND NEW HAVEN RAILROADS.—[See page 72.]
LARGE POWDER CHAMBERS AND GUN EROSION.

In direct attention has been given to the studies regarding the relation between the size of the powder chamber and the pressures and velocities of guns, to which reference is made in the current correspondence. The facts relate to the government tests of the Brown gun wire, which were recently conducted on various grounds at Both Hook. Simultaneously with these tests, another high-powered, wire-wound gun, designed by Gen. Cruizer, was submitted to the same tests. Reference has been made to these guns developed powder pressures, velocities, and energies, in far excess of anything officially recorded, as far as we know, for any of the large caliber rifles or private testing grounds either here or abroad. In both pieces, velocities were run up to a figure higher than 1,500 feet, and the accepted maximum service velocity of three thousand feet per second was distinctly shown to be a limit for guns of this caliber. As was to be expected, in the case of both guns the high powder pressures developed were accompanied by high shot velocities. This was the case with the Brown gun, where the high limit of 32 tons to the square inch in the powder chamber, with corresponding muzzle velocity of 3,740 feet per second.

Those of us readers who have followed the current discussions of the gun experts will remember that we have always considered that erosion was chiefly due to the escape of gases past the jacket, the projectile being kept within due to the failure of the copper rifling bands to properly fill the grooves of the rifling. A pronounced presupposition that this view is correct is offered by the experiences at the above-mentioned gun experiments. In this respect, the case of the Brown wire gun reached the high limit of 32 tons to the square inch in the powder chamber, with corresponding muzzle velocity of 3,740 feet per second.

The experiments with the rare earths to secure new filament materials new types of filaments may be devised in time which are capable of a higher fusing point was obtained and greater electric conductivity at ordinary temperatures. Others only conduct electricity at very high temperatures; but were found to be admirably well suited for the new gun and at much different kinds of the oxides and balancing them in the form of filaments, a higher fusing point was obtained and greater electrical conductivity of the oxides opened a wide field for future experiments. Thus, in the Nernst lamp a combination of 85 per cent of yttria earths and some silica earths is used; but yttria itself is a mixture of several oxides found in certain minerals. The early glass makers, however, have been made possible by exercising a greater amount of fresh air on the Nernst lamp and mottled, and the oxides are improved by combining the available rare earths to increase the refractory nature of the filaments. The improvements are due to the work of a series of experiments with the different earths.

The value of a commercial glowing lamp depends upon its efficiency and its ability to operate at a high temperature for a considerable length of time. Thus, the Nernst lamp operates at a temperature of about 3,000 degrees C., and at about twice the efficiency of a carbon incandescent lamp. The ordinary life of these glowers has been increased by the use of new materials. The increase in the value of the oxides has doubled and used for different purposes. The addition of the rare earth oxides to an incandescent lamp will increase its resistance and make it more efficient. The use of new filaments increased the cost of this lamp, and are therefore only used for large scale. The Nernst lamp contains from 30 to 42 per cent of yttria earths, 20 per cent of silica, and traces of iron and magnesia. In the future, large development on a large scale, silica, and alumina, with only traces of yttria and 20 per cent of ceria and aluminum.

The natural combinations of the rare earths in the Texas deposits make it reasonably simple to recover what is desired, and the various ingredients are separated and purified for use. The combination of the oxides of the different earths for illuminating filaments is a work that presents great fascination for the experimenter. The following are the rare earth oxides which are used:

- Ceria,
- Yttria,
- Gadolinia,
- Cerous oxide,
- Yttrium oxide,
- Europium oxide,
- Tantalum oxide,
- Tungsten oxide,
- Thorium oxide,
- Zirconium oxide,
- Neodymium oxide,
- Lanthanum oxide,
- Thorium oxide,
- Yttrium oxide.

It can, however, be kept from here to the present, and that the best oxides can be obtained and purified from the American mines. Absolutely pure zirconia is not demanded, and the slight traces of silica left in the American product tend to improve the efficiency of the lamps.

In Llano County, Texas, considerable quantities of zirconium, zircon, and thorium are available. The mineral is well developed in the beds of the Llano River, the Llano and Smith Counties, and the North Central Region, and the latter are found in the Llano and Smith Counties, and the North Central Region.

The rare earth oxides used here for illuminating filaments in this country is one that has not yet been definitively settled. Reports of equally valuable deposits in Colorado, Utah, and Nevada, indicate the possibility of large deposits that will be found not so much in the last ten rounds at 6,600 feet per second, as in these rounds the surprising fact was developed. The value of a commercial glowing lamp depends upon its efficiency and its ability to operate at a high temperature for a considerable length of time. Thus, the Nernst lamp operates at a temperature of about 3,000 degrees C., and at about twice the efficiency of a carbon incandescent lamp. The ordinary life of these glowers has been increased by the use of new materials. The increase in the value of the oxides has doubled and used for different purposes. The addition of the rare earth oxides to an incandescent lamp will increase its resistance and make it more efficient. The use of new filaments increased the cost of this lamp, and are therefore only used for large scale. The Nernst lamp contains from 30 to 42 per cent of yttria earths, 20 per cent of silica, and traces of iron and magnesia. In the future, large development on a large scale, silica, and alumina, with only traces of yttria and 20 per cent of ceria and alumina.

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cow milk containing penicillin grew, the bacterium bacillus did not change, and the albumen remains unchanged. This was ascertained chemically, and by means of the addition of tannin an acid is formed which does not change. The oxide of hydrogen cannot be determined in the milk one-half hour after the addition of peroxide. When milk is exposed to the air it does not change immediately, as in the case of raw milk, but only after four to seven hours. To the taste peroxide milk does not give the same impression.

The content of penicillin is increased four to five cents per liter. Perhydrol milk must be kept in a dark place. Exposure to light with a carbon arc lamp will destroy the color of the blood, and therefore the milk will be a pale yellow or straw color. As the German law prohibits any addition whatever to milk, a general introduction of the method seems unlikely.

At present its use is confined to agricultural practice.

RECENT PERFORMANCES OF THE FRENCH AIRSHIP “PATRIE.”

By the Paris Correspondent of the SCIENTIFIC AMERICAN.

The new airship, “Patrie,” which was built for the French government by M. Lebaudy at Chalais-Meudon, the “Lebaudy,” and which we have already described, finished the series of military experiments which went on for some time in the region of Paris by a brilliant performance and one which speaks most favorably for this airship in particular as well as for what is yet to come. The 15th of December brought about the first flight of the airship, which was held at the Chalais-Meudon grounds near Paris, and reached this point after a very good flight. Upon arrival at Meudon the party took in the balloons and commenced the flight toward Meudon. Well guided, they then took to the flat ground, where the preparations for the start were made exclusively under the direction of the mother officer, and two mechanics. Soon the balloon was brought it down to the ground by hauling upon the cords. The landing took place at 11:12 and the 31.4 miles in a straight line had been made in 1h.12m.

The balloon, which is 30.7 meters in length and 12.7 meters in width, has a capacity of 12,000 cubic meters. The hydrogen gas was filled with the usual maneuvers with which the military aerostatic corps are now quite familiar. As usual, the landing was performed with complete stability, and the airship disturbing the air in which it is one of its chief characteristics and speaks well for Capt. Julliot’s design. A very good flight also was made that the airship was landed with ease.

FACTS ABOUT BLACK LEAD PENCILS.

By Mrs. Richardson.

It is difficult to determine the exact period in which “black lead” was first utilized as an instrument for writing or drawing, as it has been confused with other materials and mineral depictions. According to ancient records, the ancients used lead, but the metal was formed into flat plates, and the edges of these plates used to make the instrument work. If the lead had been described, parallel lines, and then traced their idealized designs, usually with a hard point but also with a soft lead to secure soft lines. The small pieces of soft lead were black, and it is also proven by the fact that it is mentioned in the Book of Job.

During the year 1615 there was a description of the black lead pencil written by Conrad Gesner. He says that pieces of black lead were fastened in a wooden handle and sometimes covered with wood, was used for writing and drawing. About half a century later a very good account of this kind of pencil was written by Robert Fludd. He asked for the name “black lead” to be utilized as an instrument for writing, and mixed with clay for manufacturing crucibles. We are informed in Beckman’s “History of Inventions” that this use of clays, exclusive of the direction of the officers and the military aerostatic corps. In the car were Capt. Voyer, the pilot on duty, and Capt. Gaucher, and with him were Capt. Gaucher, another officer, and two mechanics. Soon the balloon disappeared in the fog, but upon reaching the city it reappeared, and could easily be seen sailing along at what appears to be a good speed and a good rate. Somewhat after three o’clock it was seen flying above the Grand Palais, where the crowds assembled to see the show could clearly observe it very well, and were much impressed with its appearance and the ease with which it made the trip.

In a good speed, it was keeping at a height of about 1,000 feet, and passed above the different government buildings such as the Ministry of War, the Tuileries, and the War Department. Not more than three-quarters of an hour was needed for the whole trip, and the airship was back at the Chalais-Meudon grounds in the air, which is one of its chief characteristics.

Before four o’clock it had regained the military headquarters, and then came the time for the general inspection of the airship, which was held by the military authorities of the district.

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At present its use is confined to agricultural practice.

CLIMATE: PAST AND PRESENT.

In the Monthly Weather Review, F. M. Ball argues that the popular belief that the climate is changing is based on an examination of the earliest records available, such as Angot’s dates of vintage years since the fourteenth century, and temperature records going back to St. Peterburg (since 1731), St. Poul, Minn. (since 1822), Europe, on the other hand, teaches us that the climates must have changed many times in the past, and that the general factors which determine climate, with special reference to the changes in the distribution of land and ice, have often been subject to change, to T. C. Chamberlain’s hypothesis that refrigeration and glacial epochs might be due to a depletion of the atmospheric carbon dioxide, and to the constancy of the solar influence. In many cases he has found the practice to relieve the difficulty of yawning, which is induced to yaw through suggestion, imitation or a reaction to the sound of the breath. In such cases he has found the practice to relieve the difficulty of yawning, which is induced to yaw through suggestion, imitation or a reaction to the sound of the breath.

The great Union Station at Washington is nearing completion. Few pieces of work under way in America excite more interest and curiosity than the construction of this building. The Philadelphia and Reading, with Mr. Frank N. Bauskett writing instructively and eloquently on the subject in the opening article of the current Supplement, No. 1545, Mr. E. B. Snell contributes a well-considered and illuminating explanation of the manufacture of brass wire. Last year Prof. Berthelot published several articles, in which he considered the results of his investigations. The ability of the modern gas engine to take the place of the steam engine in general power work has been questioned, as well as the ability of the gas engine and producer to work harmoniously together under widely varied demands. Mr. E. B. Snell contributes an interesting light on the subject in his article on "A Producer Gas Power Test."—Load diagrams, fuel consumption curves, effects of fuel change, tests of record, are given in the text. Gas engine types are discussed by James E. King. William McDowell writes on reinforced concrete, and of course there are many other interesting papers read before the recent meeting of the British Institution of Civil Engineers that was held in London. Sir Alexander Thomson presents his "Work of the Engineer." The paper is published in the current Supplement.

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RECENT PROGRESS IN WIRELESS TELEPHONY.
BY REGINALD A. FESSENDEN.

A public demonstration of its latest form of wireless telephone apparatus was given by the National Electric Signaling Company at its Brant Rock and Plymouth stations, approximately eleven miles apart, on December 21. Invitations had been issued to a number of prominent electrical companies and electricians. Among those present were Prof. Elihu Thomson, Mr. Pickard, the well-known wireless and telephone expert, representing the Bell Telephone Company, representatives from the technical press, and others.

The National Electric Signaling Company, transmitting speech wirelessly for the first time in the summer of 1900, by the method disclosed in U. S. patent 706,737. While the speech transmitted could be understood, there was a great deal of extraneous noise in the telephone, and various devices were devised for eliminating this. Among other methods the arc gap method shown in Fig. 1 (see U. S. patent 730,753) was used. This is an improvement on the original Elihu Thomson singing arc method, recently rediscovered by Poulsen and others, but which was used by the National Electric Signaling Company in 1901 and patented in 1902.

The extraneous noise had been sufficiently eliminated by 1904 to render it possible to put the wireless telephone on the market, and the National Electric Signaling Company consequently in that year began to advertise sets guaranteed to transmit speech up to 25 and 100 miles.

Though sufficient for most practical purposes, a certain amount of extraneous noise still remained, but some six months ago this was entirely removed, so as to permit of even faint whispers and the noise of breathing being transmitted. In addition a new telephone relay was invented, which permitted of talking from one local exchange and receiving messages at another local exchange, the message being transmitted over a wireless trunk line, thus enabling passengers, for example, on a steamer still at sea to converse with friends at a local exchange on shore.

During the past summer a great many experiments were carried on between the Brant Rock station and a small schooner having a mast 70 feet high, and communication was easily maintained up to distances of ten miles from shore with an expenditure of less energy than is required to operate a 16-candle-power lamp. A station at Plymouth was constructed to permit of work being carried on during the winter, when it was too rough to permit of the use of the schooner. It was between this station and the Brant Rock station that the recent tests were made. Fig. 2 shows the connections used for talking directly from one station to the other, and Fig. 3 the connections using telephonic relay for talking from one local exchange to another exchange. The illustrations show a form of transmitter, and the method of testing the sensitiveness of the various transmitters by a phonograph talking record and a dynamo used with one form of apparatus, capable of giving 80,000 alternations per second, but generally run at from 50,000 to 60,000. This dynamo, while of the general type described in U. S. patent 706,737, nevertheless required for its construction a very great amount of engineering skill. To the engineers of the General Electric Company, who constructed it, more particularly Messrs. Alexander, Reid, Dempster, and Geven, is due the credit of this remarkable engineering feat. During the test not only speech but phonographic talking records and music were transmitted, all being received with perfect clearness and distinctness, the transmission being about equivalent to a thirty-mile cable. No extraneous noises of any kind were heard in the receiver, the wireless telephone being in this respect markedly in advance over the regular wire lines. As developed at present, the system is capable of maintaining communication between ships 150 to 150 miles apart, and there is little doubt
that much longer distances will be covered in the near future.

A method has now been put in use whereby messages can be printed on receipt at the receiving station (the messages being transmitted by typewriter).

**THE LAUNCH OF THE "SATSUMA."**

To the Editor of the Scientific American:

One year and one month after the peace of Portsmouth, which was brought about by the noble efforts of your great President, the launch of the largest battleship afloat took place in the presence of H. M. the Emperor, the Crown Prince, many princes and princesses, and a huge number of all classes of people, at the Yokosuka navy yard, which is but five miles from Uraga, where the monument to Commodore Perry stands.

The battleship "Satsuma," the construction of which began in the midst of the Russo-Japanese war, is 482 feet in length, 83 feet 6 inches in beam, of 19,950 tons displacement and 18,000 horse-power. Her armament is not yet officially declared, and will be kept secret until completion. But the authorities, it is said, at first intended to provide four 12-inch guns, twelve 10-inch guns, twelve 4.7-inch guns, and five torpedo tubes. Thus it will be seen that Japan has not dispensed with intermediate armament, as in the case with the "Dreadnought." Important progress in naval matters, however, calls for some new alterations and improvements to be introduced to the armament; and the "Satsuma" will, it is believed, be finally found to be more powerfully equipped than was originally intended. Her armor belt of Krupp steel ranges from 5 to 9 (or 9.5) inches, and her intended speed is 19 knots. The ram bow has been dispensed with in her, as in the two armored cruisers, "Tsukuba" and "Izumo," just built respectively at Kure and Yokosuka. She has a very handsome semi-circular form, and is more ahead than in the two battleships' armaments. The "Satsuma" has four 12-inch and twelve 10-inch guns against the "Dreadnought"'s ten 12-inch, so that in fire the latter general pigeons flew away. The stupendous Jeune and applause continued for some time. The ship was entirely afloat at 2:25 P. M. It may be added that the "Satsuma" has been built entirely by Japanese experts, the authorities having employed the services of foreign experts in connection with the photographs, which were removed in advance of the launch.

A MACHINE THAT PREDICTS TIDES.

By D. A. WILSON.

One of the most interesting devices utilized in connection with the United States Coast and Geodetic Survey is the mechanism by which the state of the tide at a certain seaport can be closely determined a year or more ahead.

While with the machine are used tide tables which have been computed for a period of years, the automatic mechanism by which the tide predictor performs is equally wonderful in its accuracy. As the illustrations
Before, with consequent proportional speed factor. The same efficiency. For the higher speed the steam and the figures compared with the right of the two second set of moving blades into a group of blades passing thence to the exhaust. For the lower speed either of which steam may be admitted at will, it reaches the stage, although, as stated, the prediction is never over 0.3 foot, and it records the stage within five minutes of the time when the tide at a certain point on a specified date the operator on the little dial serves merely to indicate the period of time the mechanical unit is moved by the handle until it is in the same position as the lower needle and the position of its companion, solar index, is again observed. Thus the time of tide is secured. In getting the measurement of the tide the index on the lower right-hand side is read and the right-hand column of the machine first sets it so that the mechanism shows the approximate time at which high tide or low tide will occur. Then with the left hand the operator slowly turns the handle at the lower-left-hand corner of the machine into the new position. The large scale in size in the center known as the lunar index changes its position until it points in the same direction as that of a smaller handle. The operator then notes the position of the solar index, as the other hand of this curious clock is termed. If the position of the needle is the same as that of the upper needle, the solar index will indicate the time of the high water at the seaport for which the movements were made, and the height of the tide at the given time, the operator glancing at the index at the lower-left corner of the machine, is able to determine the time remaining. If the figures on the scale by its side give the height of the tide.

To determine how late the tide index is moved by the handle until it is in the same position as the lower needle and the position of its companion, solar index, is again observed. Thus the time of tide is secured. In getting the measurement of the tide the index on the lower right-hand side is read and the right-hand column of the machine first sets it so that the mechanism shows the approximate time at which high tide or low tide will occur. Then with the left hand the operator slowly turns the handle at the lower-left-hand corner of the machine into the new position. The large scale in size in the center known as the lunar index changes its position until it points in the same direction as that of a smaller handle. The operator then notes the position of the solar index, as the other hand of this curious clock is termed. If the position of the needle is the same as that of the upper needle, the solar index will indicate the time of the high water at the seaport for which the movements were made, and the height of the tide at the given time, the operator glancing at the index at the lower-left corner of the machine, is able to determine the time remaining. If the figures on the scale by its side give the height of the tide.

The government star gaging records show that in 1901, as was related in page 479. The same procedures have been operating without interference, since the desired assistance obtained.

To the Editor of the SCIENTIFIC AMERICAN:

In the first place, the work of the National Electric Signaling Company on transatlantic telegraphy is so promising, and the advantages of wireless telegraphy, that it would be a great pity if it were cut short. If the service is not to be continued, the government should at least secure some means of making the service available to the public.

New York, January 9, 1907.

The Exploration of the Atmosphere at Sea.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of December 22, 1906, your German correspondent, "Professor Kummel," belonging to the German marine, as it were the first vessel to set a round of meteorological soundings with kites and barometer balloons. After having made the necessary preparations to obtain meteorological observations at sea, independently of the natural wind, in 1899, as was related in Issue of December 16, 1906. The main provisions of the Act were made, at least 216 miles away.

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This method was first applied to wireless telegraphy by the National Electric Signaling Company, not sued to the National Electric Signaling Company, not

The method at present in use messages are received on

The conditions which will beset the engineer of the

An invention which will prove of widespread utility to the textile industry has recently been devised consisting of three English engineers. This machine is an extensive scale. The machine is essentially of the labeling class, it is the connecting link between the various parts of any order which is placed, and therefore the greatest importance. It must have means for keeping up the temperature in

The two great obstacles to wireless telegraphy at present are atmospheric absorption and the action of the governments in refusing permits for working. At

It will be seen that the so-called Duddell-Poulson method is really the Elihu Thomson-National Electric Signaling Company application. While it might appear at first glance that this method is covered not only broadly but in all its modifications and improvements by patents in

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While the absolute gain in the United States is at least equal to the entire gain between 1904 and 1905, the advance in Canada in 1906 is remarkable. The

January 19, 1907

Scientific American

Engineering Notes.

For operating gas engines on board ship, producers of power for marine vessels, and for the producer while the engine is running at slow speeds or stopping, since otherwise it will not start up when the engine is running at high speeds. It will prevent the technical college of the future to lay these foundations broad and deep. It will be regarded as a weakness for any person to have his studies in the hands of the profession, only just enough to be an ordinary draftsman, a tolerable surveyor, or first-class planman. For operating gas engines on board ship, producers of power for marine vessels, and for the producer while the engine is running at slow speeds or stopping, since otherwise it will not start up when the engine is running at high speeds. It will prevent the technical college of the future to lay these foundations broad and deep. It will be regarded as a weakness for any person to have his studies in the hands of the profession, only just enough to be an ordinary draftsman, a tolerable surveyor, or first-class planman.

A notice according to a German journalist, the tests are being made on a large scale with a view to electrifying the Baden state railways. Current is to be transmitted from a power station at Wytsh-Augst, where a turbine with an output of 1,500 horse-power is to be rented. It is calculated that the 3,400 miles of railway line will be required to supply the necessary current, for the reason that the current has to be brought in at two points, and a great number of miles, from what is obtainable by hand spreading.

To give a couple of instances of this right here in Providence, Western Tower, Brant Rock, Mass., January 8, 1905.

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For operating gas engines on board ship, producers of power for marine vessels, and for the producer while the engine is running at slow speeds or stopping, since otherwise it will not start up when the engine is running at high speeds. It will prevent the technical college of the future to lay these foundations broad and deep. It will be regarded as a weakness for any person to have his studies in the hands of the profession, only just enough to be an ordinary draftsman, a tolerable surveyor, or first-class planman.
OPENING OF ELECTRIC SERVICE ON THE NEW YORK CENTRAL AND THE NEW HAVEN RAILROADS.

The people who expected to visit the Grand Central Station on some specified day of opening, and find the noisy and more or less dirty steam locomotives gone and their places taken by the silent and cleanly electric locomotives and motor cars, have been doubly much disappointed to find that the installation of electric service at this famous terminal is not going to be made in any such swift and wholesale fashion. On the contrary, so gradual will be the change, that no one will be able to say exactly when the era of steam ended and that of electric traction began.

The explanation of the comparative slowness of the change is to be found in the enormous magnitude of the operations, constructive and administrative, which are involved; in the fact that the whole of the work has to be carried through in the midst of what is perhaps the greatest congestion of terminal traffic to be found in any steam railroad center in this country; and in the fact that much of the work of electrification, at least in its application to these two great railroad systems, is more or less novel and has had to be built, and in now being tried out, without very much past experience to go upon. Consequently, although the new depressed station at 42nd Street, which occupies the eastern portion of the terminal property, has been in service for about a month, the New York Central system is operating at present only about sixteen electric trains a day on the local service to Yonkers. The New Haven system is about to open its electric service by running only eight electrical trains daily between New Rochelle and 42nd Street.

We have so frequently described the character of the improvements being made by these two railroads, that we will do more in the present article than recapitulate the leading features of the work. The changes involved include the electrifying of the New York terminal for a distance of 34 miles on the main line from the Grand Central Station, and for 24 miles on the Harlem Division as far as White Plains, and the New Haven line from Woodlawn to Stamford. At present, only the first electrical zone of the New York Central, extending from the Grand Central Station to High Bridge on the main line, and to Wakefield on the Harlem Division, has been completed and put in operation, while the New Haven line will in a few days inaugurate its service from New Rochelle to New York. Temporary yards have been built at the two places; but ultimately the great transfer points will be at Croton, on the main line, and White Plains on the Harlem Division, and at Stamford on the New Haven line. The local service of the New York Central is handled by trains which, for the present, are made up of motor cars and trailers, but which, ultimately, will be made up of motor cars alone, the multiple unit system of control being used. The motor cars are equipped with two 320-horse-power motors in the car, so that an eight-car train of all motor cars will have the great capacity of 4,000 horse-power, from which it will be seen that the speed of this service can be made as high as the demands of traffic and the judgment of the company wish to make it. The new motor cars, as shown in our engraving, are of the all-steel type; they are electrically heated and lighted, and are provided with the hydraulic wicker cane seats and backs. A novel feature is the provision of electrical fans at each end of the car for securing good ventilation. The whole of the suburban service will ultimately be handled on the lower level of the new double-deck terminal station.

The heavy long-distance and express service will be hauled by electric locomotives of the type shown in our front-page engraving. This is a powerful and massive machine, weighing 95 tons, with 60 tons on the drivers. It is even more powerful than it looks, its maximum horse-power being 1,200, or double that of the heaviest steam locomotives engaged at present in hauling the express trains. The electric locomotive has advantages over the steam locomotive on every point of comparison. Its weight is 95 tons as against 162 tons; its maximum horse-power, 1,200 as against 1,600; its length, 57 feet as against 62 feet; and in spite of its smaller weight, the weight on drivers is 60 tons as against 55 tons of the express steam locomotive. That these splendid engines will be fully equal to their work, is shown by the tests made in experimental service, at Schenectady, when an eight-car train weighing 336 tons reached a speed of 30 miles per hour in 60 seconds, which corresponds to an acceleration of one-half mile per hour per second.

The New York Central electric zone has been built to operate with the direct current transmitted through the third rail. Two power stations have been built, one at Yonkers, the other at Port Morris; they are in duplicate, and each has a maximum capacity of 40,000 horse-power. The three-phase alternating current is produced by turbo-generators of the Curtis and General Electric type, stepped up and transmitted to substations of the general type shown in one of the accompanying illustrations, where it is stepped down to 660-volt direct current, at which pressure it is collected from the third rail by the contact shoes of the locomotives and motor cars.

The electrical commission of the New York Central Company is to be congratulated upon the excellent way in which they have worked out the constructive features of the transmission line and the third rail, both of which, as will be seen from our illustration, are very compact in construction and slightly in appearance. The third rail is carried on brackets bolted to the ties, and is excellently protected on the side and head by wood lagging. Contact is had with the under surface of the rail, and such a thing as accidental injury to employees and others, by contact with the track and feeder rails, would be impossible except under extraordinary circumstances. The line is carried on tapered tinned posts, of graceful design, bolted securely to concrete bases.

The electric zone of the New York, New Haven & Hartford Railroad extends for a distance of 22 miles, from Stamford to Woodlawn, from which point the New Haven trains run over the tracks of the New York Central to 42nd Street. After careful consideration of the relative advantages of operation under the alternating and the direct-current system, the company decided in favor of the former, and the equipment of the line and the design of the power station and motive power was given to the Westinghouse Electric and Manufacturing Company. The power station has been built at Cos Cob, adjoining the waterside and the company's main line, where three turbine-driven generators have been installed, which are so wound that they will supply either single-phase or three-phase current. The current is supplied to the trolley system at a pressure of 11,000 volts, and of course there are none of the transforming stations along it which form part of the equipment of any low-pressure direct-current system. Each locomotive, however, is provided with a pair of transformers.
which step down the current to the working pressure. The current is collected from the overhead line by means of a pair of pantograph-type bow trolleys. Eight collecting shoes are also provided, for operating on the New York Central's third-rail system.

The construction of the transmission line and the trolley line forms perhaps the most interesting feature of the New Haven Railroad equipment. It was realized that for supplying current to trains, which frequently run over this section at speeds of as high as 75 miles an hour, it was necessary to provide a trolley wire which would be true both as to level and line, as distinguished from the loosely hung and swaying wires of the ordinary trolley car service. The construction is as follows: At every 100 feet there is erected, upon massive concrete basins, a pair of heavy lattice posts about 2 feet square in section, which carry, at a height of about 25 feet above the tracks, a deep transverse lattice girder. The tops of the vertical posts project above this girder, and upon the projecting portions are strung the wires of the transmission line and signal service, etc. The lattice girder serves to carry heavy porcelain insulators, upon which are strung the % inch steel cables, which form the catenary from which the trolley wire is suspended. There are two of these catenaries for each trolley wire, and they are "cradled" by being drawn in toward each other, much the same way as the cables of the Brooklyn suspension bridge. The catenary cables are braced to each other and attached to the horizontal trolley wire below them by means of triangles made of % inch pipe. The triangles decrease in section from the girder toward the center of the span, and thereby serve to hold the catenaries to their curve and the copper trolley wire to its true line and level. The trolley wire is attached to the bottom of the triangles by means of bolted clips, which fit into grooves which run along the wire, one on each side of it. The wire has a height of about % of an inch and a width of about 3 of an inch, and the current will be taken from the wires by the two horizontal bars, 12 feet wide, of the locomotive trolleys.

The New Haven locomotives are relatively of small capacity compared with the powerful electric locomotives of the New York Central service. They measure 46 feet 4 inches over all, and weigh about 86 tons. Each locomotive has four 250-horse-power motors, nominal rating, and each has developed a maximum power of about 1,450 horse-power, or considerably less than one-half the maximum power developed by the New York Central. Hence it will be necessary to couple two of these engines to make schedule time with the heaviest long-distance trains, although it is hoped that one locomotive will prove sufficient to haul the suburban trains.

As we have mentioned above, from Stamford to Woodlawn the locomotives will operate under the alternating current, taking power from the overhead line; from Woodlawn to New York, current will be taken by the contact shoes from the third rail, and the locomotives will operate by direct current.

Small Distilleries Can Be Established for $200.

Internal Revenue Commissioner Yerkes, answering an inquiry recently as to how many gallons of denatured alcohol will approximately be needed in the industries, says:

"Having absolutely nothing to base an estimate upon, it is not possible for me to make an estimate as to the quantity of denatured alcohol that will be consumed in that way. No formal applications have as yet been made by distilleries for approval of denatur ing bonded warehouses. Such applications could not be filed for the reason that the proper blanks have not as yet been placed in the hands of collectors. At present there are forty distilleries in the United States manufacturing what might be termed commercial alcohol."

In reply to a criticism of the law on the ground that regular distilleries only can engage in the manufacture of denatured alcohol, enabling the whisky trust to secure practically a monopoly, Mr. Yerkes said:

"This office knows of no process by which alcohol can be manufactured except by distillation, and as regular distilleries are the only kind recognized by the law, alcohol manufactured under the supervision of this department must be manufactured at regular distilleries. There are absolutely no limitations as to the size of a distillery that can be operated under the law. There are over 1,000 distilleries in operation now at each of which the daily spirit producing capacity is less than 30 gallons. Many of these were set up on an outlay of less than $200. So far as the internal revenue laws are concerned, either in theory or practice, the smallest and crudest distillery can produce alcohol, if as a business proposition it is deemed advisable to do so.

If a farmer or other person desires to go into the business of manufacturing denatured alcohol, at a plant however small, he will be required to construct his plant in the manner prescribed by the general laws and regulations. He will be required to give a bond, the effect of which is to prevent him from defrauding the government of the tax on any distilled spirits produced by him. He will be required to establish a distillery warehouse; to deposit the spirits produced by him in this warehouse; to establish a denaturing bonded warehouse, and to pay tax or denature, just as he may wish, the alcohol produced by him. All of this will be done under governmental supervision, but the government pays for this supervision. The manufacturer of alcohol does not bear one cent of it. There is no objection to a farmer manufacturing his alcohol in his "back yard" provided he wants to establish a distillery there. If you will take the trouble to investigate you will find, in my opinion, that the laws and regulations relating to the manufacture of alcohol in Germany do not differ to any great extent from the laws and regulations in this country."

The Pacific Ocean Exposition.

It has been decided to hold an international exposition in San Francisco in commemoration of the four hundredth anniversary of the discovery of the Pacific by Vasco Núñez Balboa, and to celebrate the completion of the Panama Canal. A corporation named "The Pacific Ocean Exposition Company," with a capital of five million dollars, has been formed to carry out the enterprise. Among the objects of the exposition are mentioned the promotion and encouragement of literature, historical researches, sciences and skill among the learned professions; the establishment of museums, aquaria, art galleries, libraries, places of amusement and recreation; and the erection of memorials in commemoration of historical events or periods. The board of directors includes many of the best known citizens and business men of San Francisco.
a suggestion from the brick-tea of the far east. In our country, the tea-dust, some of which is of good quality, is not yet sufficiently utilized. In Europe it is a regular article of trade, and is advertised and sold as tea-dust. In America it is sold to thousands of cheap restaurants, who make from it the mixtures of chicory, sugar, and boiled milk which they sell as "tea." If, as in the Orient, this dust were compressed into bricks, good tea could be made from this product which would find a ready market through the multitude of uses for which it is adapted. A beginning in this direction has been made by the Finurbrit tars in South Carolina, and in Europe similar advances have been inaugurated.

CHINESE COMPRESSED-TEA MONEY (ONE QUARTER-ANNUAL ISSUE).

Immemorial, been conducted by small farmers, each owning a few acres of land, and bestowing upon his crop his entire time, labor, and intelligence, knowing, as it were, that the quality of every leaf has an influence on the quality of every bush; and this intensive culture has resulted in bringing the body-solubility of the tea to a remarkably high state of perfection. This is one of the reasons why we hear of Chinese teas—never Indian ones—sometimes bringing more than $100 a pound. In late years the plantation and estate system has been introduced into China by foreign concerns controlling the entire output of large tracts of country. The result has been the partial deterioration of Chinese teas, as has been commented upon by various writers, but China will probably always be able to hold her own with regard to the production of tea-dust.

In buying tea, a good rule for the uninstructed to follow is never to pay less than $1 per pound. Numbers of large tea-boxes are sold at prices ranging from $1 to $1.50 a pound. In late years the value of the specimen illustrated in the accompanying engraving if about $10 per pound. Numbers of boxes are sold at prices ranging from $1 to $1.50 a pound. In late years the value of the specimen illustrated in the accompanying engraving if about $10 per pound.

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Jamestown Aeronautical Congress.

In connection with the Jamestown exposition, an aeronautical congress was held this month, which will be somewhat more successful than that of the St. Louis exposition. A committee recently met at the Hotel Alure in New York for the purpose of ar- rangiug a series of demonstrations at the exposition with the latest apparatus. A comprehensive pamphlet is in process of preparation for the use of visitors, setting forth the expectations of the committee fully. Besides making experiments and flights, it is the intention of the committee to organize a museum of aeronautic material based upon which the Aeronautic Club of America has gathered during the last two years. Papers upon subjects which will be read at this exhibition will be offered for the various aerial contests by the committee.

The Aeronautic Club of America offers the Lahn Cup for the first successful flight by a balloon from the United States, exceeding 648 kilometers (402.64 miles) under conditions and regulations formulated by the contest committee of the club. This competition is open to balloons, dirigibles, and flying machines. Since the Gordon Bennett International Aeronautic Cup race in 1907, will be held in the United States under the auspices of the Aeronautic Club of America, there will be many distinguished sportmen from foreign countries in the United States. It is quite possible that they will assemble at the Jamestown exposition.

International Aeronautic Contest of 1907.

The Board of Directors of the Aeronaut Club of America has decreed that the annual scientific and sports event of the Aero Club of America in 1907 at St. Louis. The city authorities of St. Louis have set apart for the starting point of this aerial contest the Municipal Park, which is known as "Forest Park." This place is in- closed in such a way that there will be no interferences from the people of the surrounding towns and villages, and the supply of gas will, in every way, be sufficient for quickly inflating all the balloons that will enter the contest. The ground is reached by a 24-inch main branch from a gasometer one-quarter of a mile distant. In the principal balloon towers, used recently in the factory of St. Louis, for the purposes of the aeronautic contest, are about 500 cubic feet of pure coal gas. The gas will be forced by very large pumps, so that inflation can be accomplished in a very short time. The average specific gravity of the gas furnished by the local gas company during the year 1906 was 1.84.

Tweezers are so frequently used for removing infinitesimal particles from the skin that it has occurred to some ingenues to make a combination of tweezers and magnifying glass. This is a small folding affair taking up little room in the pocket, and in use the glass is held suspended directly over the point of the tweezers.

The club proposes to hold the contest during the period of full moon in the month of October, 1907, and to award a prize of $4,000, which will be distributed among the winners. The usual wind prevailing at that season of the year in the interior of the United States is in an easterly direction toward New York, avoiding the Great Lakes, going to the south of them. The wind is not so strong at this season of the year, there being usually but three or four days of rain in the month of October. The altitude is 500 feet, and the temperature in this month is about 65 degrees F. It will be recalled that the greatest known balloon flight ever made in the United States was the one of Dr. W. H. Riker in 1864, that ascended to a height of 4,000 feet. The prize offered by the committee will be somewhat more successful than that of the St. Louis exposition. A committee recently met at the Hotel Alure in New York for the purpose of arranging a series of demonstrations at the exposition with the latest apparatus. A comprehensive pamphlet is in process of preparation for the use of visitors, setting forth the expectations of the committee fully. Besides making experiments and flights, it is the intention of the committee to organize a museum of aeronautic material based upon which the Aeronautic Club of America has gathered during the last two years. Papers upon subjects which will be read at this exhibition will be offered for the various aerial contests by the committee. The Aeronaut Club of America offers the Lahn Cup for the first successful flight by a balloon from the United States, exceeding 648 kilometers (402.64 miles) under conditions and regulations formulated by the contest committee of the club. This competition is open to balloons, dirigibles, and flying machines. Since the Gordon Bennett International Aeronautic Cup race in 1907, will be held in the United States under the auspices of the Aeronaut Club of America, there will be many distinguished sportmen from foreign countries in the United States. It is quite possible that they will assemble at the Jamestown exposition.
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An interesting series of tests was recently made in Cleveland, Ohio, in sixteen different works using from 8 to 400 horse-power, to determine what percentage of the power was absorbed by the shifting. It was found that in one-quarter of these factories 45 per cent of the power was used to drive the shifting, that the general average was 56 per cent, and that in one factory 90.7 per cent was thus lost, leaving but 15.3 per cent to drive the machines. It is needless to say that these shiftings were mounted in the ordinary babbitted bearings. The importance of using anti-friction bearings is thus emphasized; for even if the first cost of anti-friction bearings is quite large, the saving in power which they are sure to effect will in most cases repay the initial outlay in less than a year. An excellent bearing of the anti-friction type made by George A. McKeel & Company, of Jackson, Michigan, is illustrated in the accompanying engraving. The bearing, which is self-oiling, is so constructed that no oil will be wasted. It is claimed that the oil saved by this bearing over the ordinary babbitted type is alone sufficient to pay for the bearing in a short time. One of the illustrations shows a sectional view which reveals the construction of the bearing. The shell, A, is made in halves which are bolted together. Extending under the lower shell are the oil wells, B. Mounted within the shell, A, are two pairs of rings, C, which form the bearings for two sets of rolls, D. The rings are made in halves, as shown, and much easier to mount than the circular ones, while the rings are assembled. In the lower shell are two ports which communicate with the oil wells. Fitted into these ports are a pair of wicks w which are adapted to carry the

A NEW CONCRETE BLOCK MACHINE.

A marked advance in concrete block machinery has been recently made by a western manufacturer, Mr. George F. White, of Wallace, Idaho, after three years of continuous experimental work. The machine, which is now in the hands of the American Hydraulic Stone Company, of Denver, Colo., is used for making what is known as two-piece walls. An important feature of the machine is the use of multiple cores and followers, which are individually movable in the mold through various distances proportionate to the volume of material to be compressed.

One of our illustrations shows a longitudinal section of the machine. The press head indicated at A is movable, being mounted at each end on a pair of horizontal bars, B. Above and below these bars, and parallel thereto, the pressure rods, C, are mounted. The lower ones on each side passing through an opening in the main frame are coupled together at each end by cross heads, D. The cross head, C, and the press head, A, are connected by toggle links to a pair of slides, E, mounted to travel in vertical ways on opposite sides of the machine. A link connects each slide with an arm on the starting lever, F, the slides will be caused to move vertically upward in their ways, and owing to the toggle link connection the cross head, C, and the press head, A, will be moved apart along the bars, B. Since the rods, D, are secured to the cross head, C, they will be moved bodily therewith, carrying the cross head, D, toward the press head, A. Between the cross heads, D and A, the mold, H, is mounted, and the operation thus far has brought the heads together sufficiently to make a partial pressure. The two pressure levers, G, consist of a box frame open at the top and bottom, and moves down with the table as the latter is lowered, carrying the green block, which is then pushed down by the weight of cores, which follow the block to face of mold, insuring a clean discharge. The table is balanced by a counterweight, and it is mounted to travel on ways its movement is smooth, so that there is no danger of jarring the block as it is lowered out of the mold. The value of this lowering table, especially for heavy pieces, will be appreciated. As soon as the block is discharged, the mold may be turned over and filled for the next block.

The cores are so arranged that they can be readily removed and replaced with other forms, providing for blocks of different shapes and for walls of different widths. The machine adapts itself to a very wide variety of mold cases, having neither the necessity of an expensive form or the expense of having their ends form as the splitting device, which provides for the manufacture of blocks for any height of course or length of block in the same mold and with the same pressure plates. This splitting device is in effect a compressible partition congealing in section with interior of mold, which may be set at any desired place to block off the mold.

To make ornamental or rock face, a plate of desired form is used instead of pallet, H, and the block formed in the turning device, leaving the plates free for continuous use. Owing to the construction of mold case, having neither top nor bottom, it can be used either as a face-up or face-down mold. The manufacture of some special forms can be done. Due to the perfection of the double toggle mechanism of the press, the pivotal features of the mold, the manner of one piece of overhead full-cast section, and the instantaneous action of cores in discharging blocks, the speed is accelerated to such an extent that four clever laborers, using a machine mixer, can make and place on curing cars a minimum product of 1,200 blocks per day. The machine can, of course, be operated by power by removing the six foot operating levers and substituting a simple gear, which drive the pressure levers, G, at an adjustable speed, permitting each to move independently of the other a predetermined range. The center of gravity of the moving parts is made very small by being located off the true center, thus adding greatly to the ease of movement.}

January 19, 1907.

Scientific American

A WAGON EQUIPPED WITH SNOW SHOES.

Snow shoes for wagons. It may seem rather a curious notion to equip an ordinary wheeled vehicle with snow shoes, and yet that is what F. W. Nightingale, of Quincy, Mass., has done. By means of the invention, any wheeled vehicle can be converted into a sled in a few minutes. The shoes are placed on the ground, and the vehicle driven into them. Clamps are provided, by means of which the shoes can be firmly bolted in place. The inventor suggests that the runners may also be placed on the front wheels of automobiles to facilitate travel in the snow.

A SELF-OILING ROLLER BEARING.

An improved self-oiling roller bearing. Most manufacturers will be surprised to learn how much power is lost in the shafting of their factories. An interesting series of tests was recently made in Cleveland, Ohio, in sixteen different works using from 8 to 400 horse-power, to determine what percentage of the power was absorbed by the shifting. It was found

SECTION SHOWING CONSTRUCTION OF ROLLER BEARING.

A SELF-OILING ROLLER BEARING.

SECTION SHOWING DETAILS OF THE BLOCK MACHINE.

A NEW CONCRETE BLOCK MACHINE.

A marked advance in concrete block machinery has been recently made by a western manufacturer, Mr. George F. White, of Wallace, Idaho, after three years of continuous experimental work. The machine, which is now in the hands of the American Hydraulic Stone Company, of Denver, Colo., is used for making what is known as two-piece walls. An important feature of the machine is the use of multiple cores and followers, which are individually movable in the mold through various distances proportionate to the volume of material to be compressed.

One of our illustrations shows a longitudinal section of the machine. The press head indicated at A is movable, being mounted at each end on a pair of horizontal bars, B. Above and below these bars, and parallel thereto, the pressure rods, C, are mounted. The lower ones on each side passing through an opening in the main frame are coupled together at each end by cross heads, D. The cross head, C, and the press head, A, are connected by toggle links to a pair of slides, E, mounted to travel in vertical ways on opposite sides of the machine. A link connects each slide with an arm on the starting lever, F, the slides will be caused to move vertically upward in their ways, and owing to the toggle link connection the cross head, C, and the press head, A, will be moved apart along the bars, B. Since the rods, D, are secured to the cross head, C, they will be moved bodily therewith, carrying the cross head, D, toward the press head, A. Between the cross heads, D and A, the mold, H, is mounted, and the operation thus far has brought the heads together sufficiently to make a partial pressure. The two pressure levers, G, consist of a box frame open at the top and bottom, and moves down with the table as the latter is lowered, carrying the green block, which is then pushed down by the weight of cores, which follow the block to face of mold, insuring a clean discharge. The table is balanced by a counterweight, and it is mounted to travel on ways its movement is smooth, so that there is no danger of jarring the block as it is lowered out of the mold. The value of this lowering table, especially for heavy pieces, will be appreciated. As soon as the block is discharged, the mold may be turned over and filled for the next block.

The cores are so arranged that they can be readily removed and replaced with other forms, providing for blocks of different shapes and for walls of different widths. The machine adapts itself to a very wide range of construction, while but one size of pallet is used for any shape or size of block manufactured. A grave objection to concrete blocks has been the difficulty in meeting architects' specifications in cases where cut stone had been contemplated and courses of different heights had been specified. This difficulty is entirely overcome in the present machine by what is known as the "splitting device," which provides for the manufacture of blocks for any height of course or length of block in the same mold and with the same pressure plates. This splitting device is in effect a compressible partition congealing in section with interior of mold, which may be set at any desired place to block off the mold.

To make ornamental or rock face, a plate of desired form is used instead of pallet, H, and the block formed in the turning device, leaving the plates free for continuous use. Owing to the construction of mold case, having neither top nor bottom, it can be used either as a face-up or face-down mold. The manufacture of some special forms can be done. Due to the perfection of the double toggle mechanism of the press, the pivotal features of the mold, the manner of one piece of overhead full-cast section, and the instantaneous action of cores in discharging blocks, the speed is accelerated to such an extent that four clever laborers, using a machine mixer, can make and place on curing cars a minimum product of 1,200 blocks per day. The machine can, of course, be operated by power by removing the six foot operating levers and substituting a simple gear, which drive the pressure levers, G, at an adjustable speed, permitting each to move independently of the other a predetermined range. The center of gravity of the moving parts is made very small by being located off the true center, thus adding greatly to the ease of movement.
to the rolls, B. Surplus oil flows to the ends of the shell and drops through openings into the oil wells. Thus a continuous circulation is maintained. A pair of spaced flanges formed at each end of the shell, A, prevents the escape of oil from the bearing.

**UMBRELLA FRAME WITH DETACHABLE RIBS.**

A new form of umbrella frame has recently been invented, in which the ribs and stretchers may be readily detached and replaced; when desired; thus, when a frame member breaks, the damage can be easily repaired. In the general appearance, the frame does not differ from the ordinary, as will be observed in Fig. 1 of the accompanying engraving. The umbrella rod is shown at A, with the usual crown, B, and runner, C. Pivoted to the head of the umbrella frame is a socket, of which the ribs and stretchers may be readily detached and replaced, when desired; thus, when a frame member breaks, the damage can be easily repaired.

**DETAILED VIEW OF AN UMBRELLA FRAME.**

If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward, and the castle nut of the head of the coupling is pivoted to the runner C; if it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward. If it be desired to remove one of the ribs, the stud of the swivel coupling is first turned outward.

**Umbrella Frame with Detachable Ribs.**

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**A HANDY PORTABLE CRANE AND HOIST.**

A utility tool that has been found almost indispensable in garages, machine shops, and warehouses is the portable crane and hoist shown in the accompanying illustration. This crane is constructed of angle steel to the required form without a joint from top to bottom, effectually eliminating all the weak points of previous types. It rests on three wheels, each of which is 7½ inches in diameter with a 3-inch face, and these form the track on which the cradle is balanced; the wheels are about 4 feet apart at each angle. The sheaves at the head of the crane are on a cold-rolled shaft, and midway between the head and the windlass is placed a roller, over which the cable draws leading to the windlass. The crane is usually furnished with a special grade of manila cable, the tensile strength at breaking limit being 2,400 pounds. The smallest size is equipped with three ropes from the overhang to the steel pulley block; the next largest size has five ropes, the third seven ropes, and so on. Chain hoists can be used instead of the manila cable, and an adjustable grab chain having two double hooks for handling cases, casks, barrels, etc., can be used where necessary. The crane is made in six sizes, the smallest weighing 200 pounds and having a lifting capacity of 1,000 pounds, while the largest weighs 650 pounds and lifts 6,000 pounds.

**LIQUID SOAP HOLDER.**

Persons who are not directly concerned with the telephone business have any conception of the expense to which a large telephone company is put each year in replacing damaged telephone receivers. In the ordinary construction, a thin shell of hard rubber is used to insulate the magnets and diaphragms of the receiving apparatus. This shell is of very solid substance, capable of being sharpened in this manner from four to six times, and may be readily detached and replaced, when desired; thus, when a frame member breaks, the damage can be easily repaired.

**AN IMPROVED RECEIVER FOR TELEPHONES.**

For persons who are not directly concerned with the telephone business have any conception of the expense to which a large telephone company is put each year in replacing damaged telephone receivers. In the ordinary construction, a thin shell of hard rubber is used to insulate the magnets and diaphragms of the receiving apparatus. This shell is of very solid substance, capable of being sharpened in this manner from four to six times, and may be readily detached and replaced, when desired; thus, when a frame member breaks, the damage can be easily repaired.

**PHYSIANS HAVE OFTEN POINTED OUT THE DANGERS OF USING CAKE SOAP IN PUBLIC LAVATORIES.**

Good soap, undoubtedly, possesses antiseptic properties of a mild character, but it is incapable of with the germs of a virulent disease, and, as a consequence, it often plays an important part in communicating contagious diseases from one person to another. With the purpose of overcoming this evil, and insuring a clean supply of soap, the soap holder shown in the accompanying engraving has been invented. It consists of a bottle in which soap in liquid form is contained. The bottle is fitted with a push button. The cylinder is furnished with a bracket, of which the device may be readily fastened to the wall or other support over a basis. In use, the push button is pressed, compressing the air in the bottle and forcing some liquid soap up through the tube and out of the spout. The push button is actuated by the cylinder, which is provided against a hard substance. The globe rotundity of the receiver prevents an undue waste of soap, for, as is well known, most soap is wasted, when used in cake form, and is actually put to use.

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RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

HANES-TO-SUPPORTER.—J. N. MAN, New York, N. Y. This invention relates to an undergarment which is adapted to be worn in drawers, under a coat, etc. Extra outside banding is used to hold the device in place. The undergarment, it is stated, is made of a cheaper material, and is especially useful for boys. It is claimed to be especially applicable for use with drawers and coats which do not have an inside banding. The undergarment is made of a cheaper material and is adapted to be worn under a coat, etc., where the extra outside banding is used to hold the device in place. The undergarment is made of a cheaper material and is especially useful for boys.

HOLD IT TOGETHER.—J. M. MATHES, Des Moines, Iowa. A new and useful device for holding the corners of paper is shown in this invention. The device is made of a metal strip having a spring-like member, and is adapted to be used in conjunction with paper. The device is claimed to be especially useful for holding the corners of paper, and is stated to be much cheaper than previous devices.

TRIM ATTACHMENT FOR CURTAIN.—J. H. LUNDE, New York, N. Y. A new and useful device for attaching a curtain to a window is shown in this invention. The device is made of a metal strip having a spring-like member, and is adapted to be used in conjunction with a window. The device is claimed to be much cheaper than previous devices.

MACHINE FOR HAVING A HEAT RESISTANT COATING.—W. J. HADDOCK, Melbourne, Victoria, Australia. A new and useful invention for having a heat resistant coating is shown in this invention. The device is made of a metal strip having a spring-like member, and is adapted to be used in conjunction with a heat resistant coating. The device is claimed to be much cheaper than previous devices.

A NEW AND USEFUL DEVICE FOR ATTACHING A CURTAIN TO A WINDOW.—J. H. LUNDE, New York, N. Y. A new and useful device for attaching a curtain to a window is shown in this invention. The device is made of a metal strip having a spring-like member, and is adapted to be used in conjunction with a window. The device is claimed to be much cheaper than previous devices.

MULTIPLE-DRILL SOCKET.—J. H. LANDER, Portland, Ore. The purpose of the invention is to provide a multiple-drill socket which can be used for various types of work. It is stated to be especially useful for small drills and is claimed to be much cheaper than previous devices.

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Inquiries about Scientific American Supplements, References, Names and Address end, there should be no bursting or freezing, 15 deg. F. for use. (B) Dissolve for definite. oxide nickel, place the article for a short time in a dilute solution of potash sulphate, sodium sulphate, or ammonium sulphate. Melted, pour in the other solution. Keep warm by gold. top of our buildings, to be used in case of fire.

Salt is of use, but will not prevent 15/295. A. says: We have a number of magnets for about 5 cents.

Can be held over a flame and then be applied.

A. asks: Please publish what we have already published, print again what we have already published.

H. asks: Please publish the following argument: A says that a wheel and motion of a wheel is considered.

A. asks: How many feet of water will rise in a column 10 inches in diameter in a pipe 10 inches in diameter, when water is allowed to flow in at the rate of 800 gallons per minute? Between these, a point of the rim would seem to come after the other point. To such an eye the point of the rim would seem to come arms of water, as from a hose, on the side of the rim, instantly that point of the rim would move again and rise up in the air to the top of the wheel. To such an eye the point of the rim in the wheel on contact at its point of contact with the earth.

In your Notes and Queries column directions for making a machine capable of producing a half or three-fourths of a horse power are given.

Other valuable articles are contained in Sections 16, 82, 141, and 147 for ten cents each. It is not our practice to print again what we have already published, but it is possible in some cases in which they can find what they require.

A. asks: What substances are line, and crude oil gas? A. The strongest ex.

A. says: Please publish your answer in your December number.

I. is a magnetometer, price $3.00. for use.

The reason for this is only a rough method is that lamps as they grow older take more than their rated amperes. The value of wattmeter and use the service, since the disk is not balanced by an equal area in the opposite direction. You must do it yourself. Weather dial, as well as that which is given in most textbooks, but the means of the opposite sign.

This mixture would probably answer.

We have a number of magnets for about 5 cents.

A. asks: If you a good book on the subject? A. Very rarely is any number of magnets for about 5 cents.

A. asks: What are the best conductors of electricity? A. the best conductors of electricity is made of, say fifteen feet radius, it would be necessary to get at it than constructing perpendicular columns.

Parkehurst's little book, price $3.00. for use.

With my battery? A. Use ('nt types use from ree to one minute.

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acid for bichromate cells (water and acid in catenous mixtures and bichromate in grams). 2. The values so obtained differ with regard to proportions of bichromate and acid. A. The commercial sources of calcium are all indirect.

We cannot say which one is the true one. In chemists who work with zinc, 3. Zinc is relatively cheap and, at temperatures much lower than those necessary for melting copper, becomes so hard that it breaks in rolling. 4. The back pressure per square inch would be in the back pressure pressure is 15 lbs.

Before the exhaust valve opens. A. The back pressure pressure is 15 lbs. The back pressure pressure is 15 lbs. The back pressure pressure is 15 lbs.

Zinc is most malleable; at temperatures much lower than those necessary for melting copper, becomes so hard that it breaks in rolling. 4. The back pressure pressure is 15 lbs.

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To know what a closet should be, be sure, study the sectional view, giving the principle and action of the Sy-Clo Closet.

If your closet is not self-cleaning, attach the Sy-Clo, and it will never empty without thoroughly washing the bowl, reverse it with the Sy-Clo.

The Sy-Clo Closet as shown by the sectional view, is formed in a single piece—does not deform or change—will never break. The front is riveted, not nailed. The Sy-Clo Closet will never be a menace to your health, and will not attract flies. The Sy-Clo Closet is a self-cleaning closet, and will never empty without thoroughly washing the bowl.

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