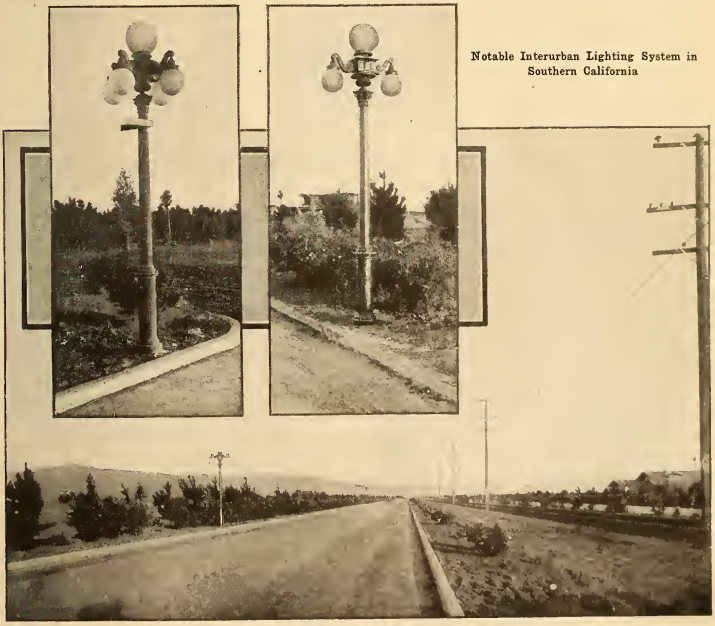
POPULAR ELECTRICITY
AND THE
WORLD'S ADVANCE

VOL. VI APRIL, 1914 No. 12

Rural Highway Lighting

By S. M. KENNEDY

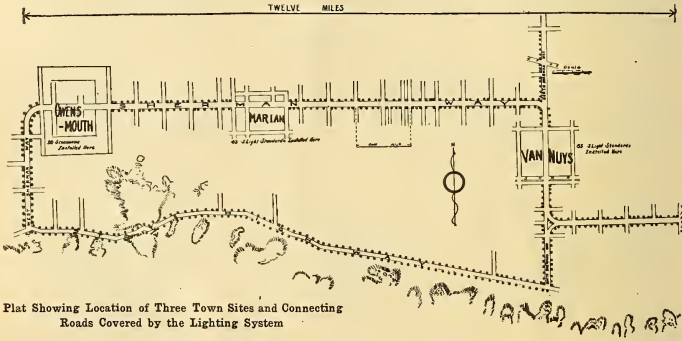
A remarkable installation for highway lighting has just been completed in the San Fernando Valley near the city of Los Angeles. This installation is notable for three reasons, namely: the high grade character of the standards and underground construction, the length of the system and large number of lights and the relatively small population of the lighted district, which



Notable Interurban Lighting System in Southern California

comprises 47,000 acres and includes three town sites.

The accompanying plat shows the location of the roads and town sites and the distances covered by the lighting system. About two-thirds of the work is already done and the lights burning every night; the balance contracted for will be installed and in operation by



Plat Showing Location of Three Town Sites and Connecting Roads Covered by the Lighting System

the first of April of this year. The posts are handsome in design as illustrated and the large picture gives some idea of the sparsely settled territory illuminated. However the population will doubtless increase rapidly in the near future.

Upon the application by petition of 25 or more residents of any town or village in the state of California, to the Board of Supervisors, praying for the formation of a public highway lighting district, the Board of Supervisors must order an election held within ten days and appoint three electors to conduct the election. Petitions must be filed on or before the first day in September of any year in order to include in the tax levy for the ensuing fiscal year sufficient funds to pay for the cost of installing and maintaining the lights asked for. The Board of Supervisors must advertise for bids on installation and maintenance and award the contract to the lowest responsible bidder. Contracts for maintenance must not be for greater periods than five years. This is in accordance with "An Act to Allow Unincorporated Towns and Villages to Establish Systems of Street Lights on Public Highways," a bill passed by the legislature of California about six years ago.

It is very probable that this San Fernando Valley installation is the longest interurban lighting system in America and considering its size, it is the most extravagant. In the town sites, five light ornamental standards are installed, each containing one 60 watt and four 40 watt tungsten lamps. On the highway outside the town sites, three light standards are used, each containing one 60 watt and two 40 watt tungsten lamps. When the contracts already awarded have been completed this district will have a total of 666 ornamental standards at an installation cost of $75,000. The hours of burning are as follows: in the town sites, all lights from half an hour after sunset until 1 a. m., the 60 watt lamp in each post burning all night. The three light posts outside the townsites burn from half an hour after sunset until 1 a. m. The Southern California Edison Company supplies the lighting service, renews

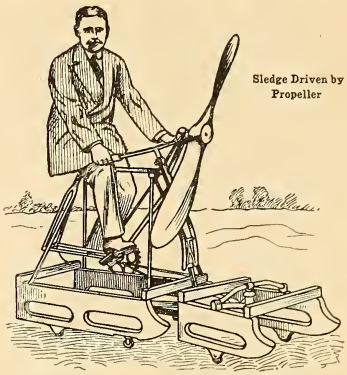
burned out or broken lamps and globes and maintains the posts in good condition.

On the highways the lamp standards are installed on each side of the road 330 feet apart, the total distance covered being 27 miles. The posts are connected by underground conduits carrying the distribution wires. The lighting service is supplied from an overhead system and feeds into the conduit every mile. The average cost to the district covering the installation of posts and underground distributing system is $114 per post. While the lights are spaced farther apart than is customary in most cities, the style of the electroliers and the method of installation are practically as good as in any large urban community. Already there is a project on foot to install similar posts on another ten miles of highway to connect this system with the limits of the city of Los Angeles.

Viewed from a distance at night the San Fernando lighting district resembles an interurban fairyland, the boulevards appearing like great white ways of magnificent proportions.

A MOTOR SLEDGE

The aerial propeller has been used for locomotion on water, on land and in the air. It has now been put to use to propel a sledge. A Frenchman, M. de Puiseux, has arranged a bicycle frame upon a sled in such a way that the propeller can be driven at high speed by the action of the pedals. A cross bar attached to the fore part of the sled, which is in two pieces, enables the rider to guide himself by means of the bicycle steering post, into which is brazed a stout tube which serves as a support for the shaft upon which the propeller rotates. The speed attainable is considerable, though of course it depends greatly upon the strength of the

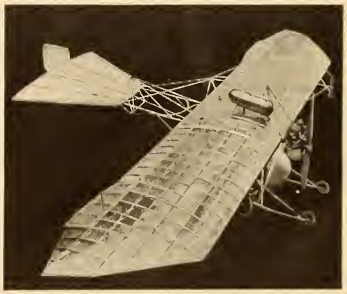


Sledge Driven by Propeller

rider, the condition of the ice and the direction of the wind.

TRANSPARENT AEROPLANE

Another refinement in army air machines is the transparent aeroplane. The wings or planes are made of tightly stretched fabric treated so that it will



Aeroplane for Army Use, Invisible in the Air

readily let light rays through. Thus the machine, aside from its skeleton framework is practically invisible and the latter quickly fades from view in the heights.

The Quest for Better Light

Announcement was made in the December issue of the new nitrogen-filled lamp, which will produce twice as much light, per unit of electrical energy, as any previous lamp. This development in lighting was made at the research laboratory of the General Electric Company, under the guidance of Dr. Irving Langmuir. The author of this article, also an investigator in this institution, and one having to do with many of the experiments leading up to the momentous discovery, has consented to tell of some of the very interesting things which go on there in the quest for better light.—EDITORIAL NOTE.

BY C. V. FERGUSON

We all like to think in millions or millionths, and it doesn't matter which. We who work in light like to say that, by the improvements in economy due to modern research, the light from electrical incandescent sources can now be generated with about a tenth of the energy (or cost) which was required ten years ago. When we see that this fails to convey the bigness, we then like to expand it to: This means that we can save in the United States a million dollars every night by using the most modern incandescent lamps in place of those of ten years ago.

To improve the vacuum in incandescent lamps, all sorts of methods have been employed during years of research. At first, these lamps had a vacuum of about a hundred-thousandth of an atmosphere pressure. The kinds of residual gases were carefully studied, together with their effect upon the lamp itself. This work is too complex to warrant recording here.

Vacua were produced and with them also the gauges to measure the pressure, down to the hundred-millionth of an atmosphere. From the purely physical point of view, such a vacuum is still teeming with countless molecules of gas, but for the most of the work on incandescent lamps this concentration is not very important.

Pioneer engineering or physical research is just like other pioneer work, with its explorations and expeditions. I see a quiet, unassuming, patient man standing before a complicated mass of glass piping and connected bulbs, with mercury gas traps and electric heaters, and with liquid air boiling and making frost in the room about a part of the apparatus. He is gently kicking a small lever with one foot, while with

The Most Efficient Electric Incandescent Lamp in the World

the squint of a sharpshooter he sights across the mercury level in a McLeod vacuum gauge.

I happen to know that he has been doing this very thing, on this identical spot of the laboratory, for hours, for days, and for years. He began that experiment many years ago. It is still under way. Don't ask us to tell all about it. Much of his collected data will never be read again, though it fills volumes of reports. Some of it has filled the long felt want. Some of it started other lines of exploration and some of it could not be understood at all.

Let us draw just a little closer to the big littleness of that one exploration. The apparatus with which he works

Dr. Irving Langmuir Whose Research Brought Out the Nitrogen-Filled Lamp

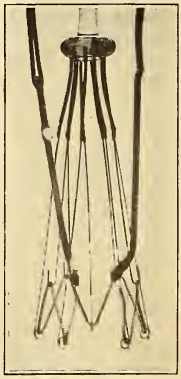
was constructed for the purpose of studying those gases that are in the evacuated bulb of incandescent lamps —the gases in the most gas-free space in the world. Of course, when he began the work, several years ago, there was no apparent reason for having any gases in the bulb at all and every effort was being expended by his brother pioneers to find the ways of creating better vacua.

There were many ways in which this residual gas might influence the quality of the lamp. It was found that the quantity of gas did not remain fixed. Sometimes more gas would be found in the bulb than was there when the bulb was sealed. Sometimes what had remained would gradually disappear. There were many different gases to consider, several sources of possible supply, and a lot of possibilities of loss. Ordinarily one would not see any reason for gas increasing within a glass sealed lamp bulb, and still less reason for its ever disappearing, if there. But there are so many known ways for each, that most of them will be omitted.

It is more interesting to see that this complicated apparatus has attached to it, entirely by systems of glass fused joints, parts in which delicate chemical analysis of all the ordinary gases can be carried out. These analyses can be carried out on quantities which would hardly form a visible bubble at atmospheric pressure. But as though this were not enough, there is also sealed to the apparatus, containers holding many kinds of common gases, all of which can be separately or collectively let into the lamp under investigation, and in any quantity.

Thus a means of studying the gases contained in lamp filaments, or the gas coming from or possibly through the glass itself, was supplied. So, too, could be studied the effects of gases at all pressures or vacua on the convection and radiation which one would naturally think of. Other phenomena, not so naturally conceived, were also exposed by these means. With this apparatus and similar ones, the foun-

dations were laid which permitted the new incandescent lamp construction based on "vacua filled full of gases," such as nitrogen.



Showing the Spiral Form of the Nitrogen Lamp Filament

I don't want to convey the impression that blind and eternal plodding along an unknown, unpredictable way led to success, though it sometimes seems to do it. The work which led to the nitrogen tungsten lamp was done by the highest trained physicists in the country. The explorations were carefully laid out before the expeditions started.

Those who have taught in college or technical school know how common is the complaint by the student against the abstract science, the theoretical chemistry, pure physics, the laws of probability, the calculus and almost everything else academic. It is because men fail to see that these essentials also have the earmarks of the monkey wrench and the hand lever that many ambitious fellows shun them. Almost everybody likes to touch the real metal. The days when most of the improvements in our complex arts are made by untrained men are growing more remote. Another way to put it is that the needs of the race call for the very best scientific training the country affords, use all it can get and call for more.

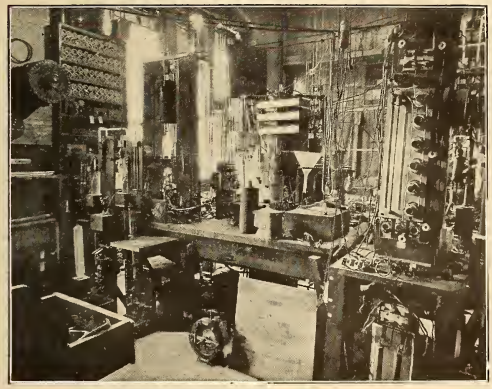
Any tyro in physics, and most fairly well trained men as well, would say that the suggestion of putting a lot of gas into the bulb of an incandescent lamp, to improve efficiency, at this late day, was ground for investigation by a sanity commission. The greatest possible effort had been expended for 40 years to keep gas out of incandescent lamps. Everybody knows that the vacuum is a heat-insulator and that gases are all heat conductors, etc., etc.

But it was in the study of the rate of heat conduction and convection from fine wires in gases that Dr. Irving Langmuir was led to the development of the new lamp. When he had cleared the underbrush, so to speak, it was evident that if anyone had tried the experiment before, he could most probably not have succeeded. Such a lamp as one would certainly naturally make for the experiment, if filled with nitrogen, would be a marked failure. There were several physical and chemical facts which had been accumulated by long continued work which made it possible to map out an advisable procedure. At the risk of seeming prolix, I will outline some of the essential points of the discovery.

The new nitrogen filled lamp consists of a tungsten filament enclosed in a bulb filled with about an atmosphere of pure nitrogen, and the better efficiency is obtained by running the filament several hundred degrees hotter than is done when the filament is in a vacuum. At this temperature the light emitted from the same area is about tenfold that at the lower efficiency.

Now the question arises, how does the presence of nitrogen in the bulb permit a higher temperature of the filament than was possible with the filament burning in a vacuum? The answer is this: The tungsten filament, when burning in a vacuum, evaporates, and tungsten is deposited on the glass. This deposit is the blackening we see in old lamps. If we increase the temperature of the filament, the evaporation increases very rapidly, so if we try to run a vacuum lamp at half a watt per candle, it blackens very quickly and is worthless as a lamp after a very few hours.

By filling the bulb with nitrogen, the tungsten does not evaporate as fast as before, so we can run the lamp at half a watt per candle and yet the filament is only evaporating about as fast as one in a vacuum would, at the lower temperature of one or one and a quarter watts per candle. Notwithstanding, if we put nitrogen in the ordinary tungsten lamp that we know, we would make the efficiency much poorer; and if we increased the temperature of the filament in this type of lamp until we obtained the higher efficiency, the life would be comparatively short. But by making the lamps of special design, it is possible to get better life with a nitrogen filled lamp running at the improved efficiency, than can be obtained with a vacuum lamp running at the lower efficiency.



Interior of Dr. Langmuir's Laboratory Where Much of the Development Work on the New Lamp was Done

The introduction of nitrogen not only reduces the rate of evaporation of the filament, but also carries the evaporated tungsten as tungsten nitride to the upper part of the bulb, where it deposits as a thin, brown film, which does not obscure the filament.

The action of the nitrogen in the bulb is to prevent the rapid diffusion, from the filament, of the evaporating tungsten. It does not change the vapor pressure of the tungsten, but does reduce the *rate* of evaporation very greatly.

For instance, consider a tungsten filament in a vacuum heated to such a temperature that it is operating at an efficiency of half a watt per candle. The tungsten evaporates just as ice or snow evaporates, though of course the rate at which the former loses weight is very much less, as the vapor pressure is about one one hundred thousandth that of ice at the freezing point.

Now in a vacuum the atoms of tungsten which leave the filament go straight to the bulb, where they remain. When the filament is surrounded by nitrogen, however, the tungsten atoms strike against the molecules of the gas, are therefore prevented from quickly leaving the vicinity of the filament and in large numbers rebound back to the metal. Hence the escaping *tendency* of the atoms is the same whether in vacuum or in a gas, but the repeated reflection of the atoms back to the metal retards the loss of material.

A common illustration of this effect is given by water. If we suddenly introduce water into a vacuum, the whole space is immediately filled with water vapor at a pressure of about two centimeters of mercury at ordinary temperature. The evaporation is so rapid that the water is at first frozen by the heat absorbed in the process. If, on the other hand, the water is introduced

into a vessel containing dry air, the vapor pressure of the water will ultimately rise to the same value; but on account of the interference of the gas, it will take a very much longer time before the whole space is saturated with water vapor at the same concentration. The *rate* of loss of water will therefore be much more rapid in the first case than in the second.

In experimenting on these lamps it was found that both the efficiency and life could be improved by increasing the diameter of the filament. This is due to the fact that the energy lost by conduction through the gas from a hot wire is very nearly independent of the diameter of the wire. From a large wire, then, we lose much less energy in this way, in comparison with the candlepower gained by the increase in surface area. Hence the efficiency is much better when using the larger wires.

It is not desirable, however, to use too large a wire, as too great a current would then be required. In order to get the advantages of large wire diameter without unduly increasing the necessary current, the filaments are made by winding the wire in the shape of a tightly coiled spiral. The use of this type of filament is found to increase the life of the lamp many times over that which is obtained with a straight filament of small diameter running at the same efficiency.

The new lamp, on account of the filament being run 400 to 600 degrees hotter than is done in the ordinary lamps, gives a very much whiter light than the others. Its light more nearly resembles daylight than any other artificial illuminant except the direct current arc and the special Moore tube. A good imitation of the color of the light may be obtained by running an ordinary tungsten lamp at double voltage.

These lamps will undoubtedly replace some arc lamps where lamps are desired that will run for long periods without attention, and also where absolute steadiness is a requisite. This same steadiness will make the lamps invaluable for motion picture work. The filament can be wound so that when lighted it forms a small, but very brilliant, spot, which makes it ideal for stereopticon and projection work.

The nitrogen tungsten lamp differs from other tungsten lamps in having a tightly wound, short spiral, in place of long, straight hairpins for filament, and contains the purest possible nitrogen at a pressure of about an atmosphere.

The greatest difference, however, is in the fact that thus far it is not made in small enough sizes to be of use to the housekeeper. All incandescent lamps, to be good, must burn nearly 1,000 hours. All nitrogen tungsten lamps below four or five amperes burn out, or die, before this time, when running at high efficiency. The lower the current, the shorter is the life. This means that until something still more strenuous is done in this research, the new lamps for standard voltages must be confined to sizes or units above 300 or 400 watts, or above 500 or 600 candle power. For this reason, the lamps will seek their natural field in street lighting, stores, halls, etc.

CANARY BIRDS CARRIED BY MINE RESCUERS

When a big mine explosion is reported to the government, Uncle Sam dispatches one of his Mine Rescue Cars to the scene. This car is fitted up with all kinds of life saving apparatus of use in rescuing entombed miners far below the earth's surface. There are carbide safety lamps, oxygen helmets and oxygen making machines, portable telephones which the men take into the mine's depths to establish communication with those at the surface, chests of instruments for testing gases, etc., but over in one corner of the car there

are dozens of canary birds in cages, warbling away the time in such strange surroundings. The first impression on entering the car is, "What! canary birds here?" These men who are giving every thought to saving the lives of the unfortunates buried in the mine's depths can have no time to listen to canary birds sing. But those little

The Canary Birds, if Taken into a Mine, Act as Barometers

canary birds are there to save the lives of those rescue men who risk their lives in order to save others by penetrating into the dangerous gas laden depths of a mine after an explosion has occurred.

It has just been proven to the satisfaction of the government's experts that the lungs of these little warblers are very susceptible to the dangerous atmospheres which gather in the depths of a mine where an explosion has occurred.

The canary birds if taken into the mine, act as barometers to the presence of the dangerous gases in the atmosphere before they can be detected by instruments on the human being. As long as the birds hop about in the cage, the atmosphere is satisfactory, but as soon as they display signs of drowsiness and droop their wings, it is a sure sign of dangerous gases not far ahead and only those equipped with oxygen helmets and oxygen making machines may venture farther with safety.

ELECTRIC COMPANY RUNS A NATATORIUM

The Oceanside Electric and Gas Company of Oceanside, Calif., has a novel method of heating the water for a salt water natatorium, which it runs as a money making venture. The plant, equipped with two engines, one of 125 horsepower and the other of 70 horsepower, furnishes electricity for lighting purposes to Oceanside and the San Luis Rey Valley, as well as power for irrigation pumping throughout the valley, which gets its name from the picturesque and historic old Mission that stands on the brow of a hill near Oceanside.

The pool, which is housed under the same roof as the engine room, is 40 by 60 feet in dimensions, and ranges from three to eight feet in depth. It is filled with sea water pumped directly from the Pacific by a centrifugal pump and circulated through coils of pipe in a condenser, where it is heated by the steam condensed from the exhaust of the engines. Thus the water is warmed at practically no expense, and yet the income from the pool is no little item in the company's statement of annual earnings.

The Bridge Over the Reservoir at Kensico

One-Hundred-Twenty Miles for a Drink

By ARTHUR MILLER

Photographs by the New York Edison Company

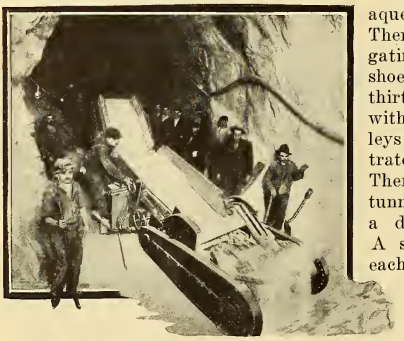
The greatest of all aqueducts is about to go down in history as completed. There remains but the lining of the city tunnels, the finishing of the Kensico reservoir and the construction of the crossing under the "Narrows" to render the stupendous Catskill water supply system for New York City an actual achievement—a dream come true. The last headings have met and the long bore is ended, but it will be well along in 1915 before the first rush of water will surge through the tunnel for New Yorkers to quench their thirst on the water from the shady glens of Rip Van Winkle land, 120 miles away in the "Kaaterskills."

This anxiously awaited moment can come none too soon for the present sources of water supply have about reached the limit of their capacity. The Croton Watershed, which supplies Manhattan and the Bronx, and the artesian wells which supply Brooklyn, Queens and Richmond, are taxed to the utmost to meet the demands of the 5,000,000 people who comprise the population of Greater New York and the 100,000 annual increase. It was to prevent the possibility of such a calamity as a water famine that brought about the present achievement. Shortly after the consolidation of the five boroughs that constitute the greater city, the "City Fathers" saw the danger and in 1905 authorized the project which has cost $162,000,000 but which will bring into New York half a billion gallons of water a day.

To build this wonderful aqueduct towns and villages have been wiped out, railroads torn down and rebuilt, mountain streams diverted from their courses; water collected 120 miles away from New York in reaching its destination will have been 500 feet above sea level and 1,200 feet below, will have passed beneath three rivers, the Hudson, the Harlem and the East River, and a score of other streams, both large

Preparing to Tear Away a Whole Hillside at One Blast. Hundreds of Holes are first Bored with These Electrically Operated Drills. Then the Charges are put in place and Wired, to be Fired Simultaneously by Electricity

and small, will have been in four reservoirs and passed under another and finally will have passed under an arm of the Atlantic Ocean, the Narrows, in entering Staten Island. It has meant the construction of four gigantic reservoirs, one of which alone, the Ashokan, cost $18,000,000, and is as large as all of Manhattan Island below One Hundred Sixteenth Street. This reservoir is 590 feet above water level and has a capacity of 132,000,000,000 gallons, enough to cover all Manhattan Island to a depth to 28 feet. In constructing Ashokan seven villages were submerged, 32 cemeteries removed, and 2,800 bodies reinterred, 64 miles of highway discontinued, 40 miles of new highway built, 2,936,000 cubic yards of earth and rock excavated and 984 cubic yards of masonry placed, for which 1,187,000 barrels of cement were used. The maximum depth is 190 feet.



A Mucking Machine at Work in The Tunnels—Far Ahead of Hand Labor for Rapidly Removing Excavated Material from the Working Face

There are four distinct types of aqueduct, cut-and-cover, grade tunnel, pressure tunnel and steel pipe siphon. The cut-and-cover type, which forms 55 miles of the aqueduct, is of horseshoe shape in cross section, seventeen feet high by seventeen feet six inches wide inside, and constructed of concrete. As completed it is covered with an earth embankment and, being the least expensive type, is used wherever the elevation and nature of the land will permit. Where mountains and hills crossed the path of the aqueduct it was found impossible to go around, so tunnels at the natural elevation of the aqueduct were driven through them. There are 24 of these tunnels, aggregating fourteen miles. They are horseshoe in shape, seventeen feet high by thirteen feet four inches wide and lined with concrete. Where broad deep valleys are crossed, circular tunnels penetrate the rock, lined with concrete. There are seven of these pressure tunnels, totaling seventeen miles, with a diameter of about fourteen feet. A shaft at each extremity connects each pressure tunnel with adjacent portions of the aqueduct. In valleys where the rock is not sound, steel pipe siphons are used. These are eleven feet in diameter, lined with two inches of cement mortar, embedded in concrete and covered with an earth embankment. There are fourteen siphons, in all six miles.

Seven-hundred-fifty Feet Under New York City in the Catskill Aqueduct

As Ashoken Dan Looks Today, Completed

One of the most startling and difficult parts of the whole project was the huge tunnel under the Hudson River at Storm King mountain. It begins six miles back

from the west bank, it being necessary to go this distance because the Moodna Creek also had to be siphoned and it was determined to pass the creek and the river all with one operation. The water makes a sheer drop of 1,200 feet as it enters the siphon under Storm King. Coming to the surface on the east bank the work is carried through a series of tunnels, siphons and cut-and-cover sections to the Kensico reservoir, the first of the storage places. Just before it enters the Kensico reservoir the aqueduct passes beneath the present Croton reservoir. The bottom of the reservoir and the conduit are separated by several hundred feet, but inlets and outlets have been constructed so that the Catskill water may be diverted to replenish the old reservoir. This is the first purpose to which it will be put in case the Croton supply gets low before the city sections of the aqueduct are ready to receive the water and may take place this summer or fall.

From the Kensico reservoir the aqueduct is carried to the Hill View reservoir, which is just beyond the city limits, and from there it enters the city. The tunnel is from 200 to 750 feet below the surface of the street so that the severest blast in the headings was never noticed above. These depths are also necessary to secure a substantial rock covering to withstand the bursting pressure. The work under the city was accomplished in four parts, each of which was again divided into 24 sections, every one with its own shaft. All of the drilling in the 34 miles under the city was done with electric drills, current being brought to the various parts of the work at 6600 volts direct from the Waterside generating stations of the Edison Company. Big compressor plants were operated at five points. Storage battery locomotives also figured largely in the work underground, replacing mules to a great extent.

It was indeed a long ways to go for a drink of water at a cost of $162,000,000—but then—things have changed somewhat since the days when the Manhattan villagers were wont to go out in the back yard and draw a bucket or so of water from the squeaky old well.

FLY PAPER DETECTS ORCHARD INSECTS

To prove that spraying your own orchard does not insure you against the ravages of the red spider, E. E. Munger of Yuba City, Calif., used sticky fly paper to catch the insects which he believed were blown great distances by the wind.

Sticky Fly Paper Used as Trap for Insects Borne by the Wind

The results showed that the air may be literally full of the pests to a considerable height from the ground. In the first test he placed a sheet of sticky fly paper on a post 20 feet from an infested tree. In 24 hours the paper was covered with red spiders. The next test was made with the paper twelve feet from the ground and 100 feet from the tree. The results were the same.

Later tests were made as shown in the accompanying picture. Sixteen sheets of fly paper were tacked to a fruit drying tray and mounted on top of a step ladder which was set in cans of oil to make sure that no insects could crawl onto the trap. This was placed 650 feet from the orchard and the next day spiders were found in

abundance. It has been known for some time that the insects that infest orchards might be transmitted from one tree to another by the wind, but proof was not at hand before to show that the insects could be carried such a distance as this.

FOUNDATIONS FOR CONCRETE COLUMNS

The increasing use of concrete columns for building purposes has created a demand for a foundation which is both cheap and effective. M. Wilhelmi, a German engineer, has hit upon an ingenious plan for constructing a foundation by means of an explosion. A hollow metal tube is driven into the earth to the required depth and a dynamite cartridge is dropped into it. The cartridge being connected by wires to a battery, the tube is filled up with plastic cement. On firing the cartridge the hole in the ground produced by the explosion is immediately filled up by the settling down of the soft cement. The tube is now filled up, and when the cement has set and sufficiently hardened the tube is withdrawn.

In addition to producing a foundation of considerable area, it is found that the surrounding soil is also hardened by the explosion, which increases the bearing power of the foundation. This method has been found to be particularly satisfactory in the construction of permanent concrete foundations under water.

PEOPLE WHO LIVE IN HIVES

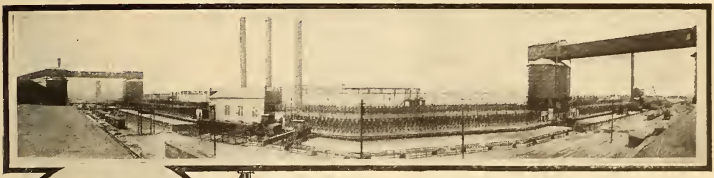
In Mesopotamia a decidedly quaint form of dwelling, built of mud and bricks in the form of a hive may be seen. Villages and whole towns in this peculiar form of architecture are met with. As the country is destitute of trees from which to hew rafters, and also devoid, in some parts, of stone, the natives build their habitations of sun dried mud bricks with high and steep domes, similar in shape to a conical bee hive.

A Bee Hive Village Near Aleppo, Syria

Our illustration depicts one of these bee hive villages not far from Aleppo, on the route of the famous Bagdad Railway. Each home consists of several of these hives standing near together and surrounded by a wall of similar material. One or more is used to live in, another for the animals, and still another serves as a granary and so on, according to the possessions of the proprietor.

Saving the By-Products in Coke Making

By GUY E. MITCHELL



By-product Coke Plant at Gary, Ind.

Sir William Siemens, Inventor of the By-product Oven

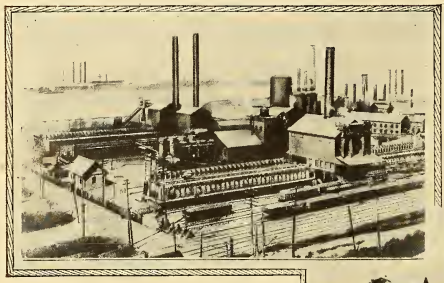
A CLEAN saving of $16,070,000 was effected last year in the United States through the use of improved coke ovens. The saving might have been $65,000,000, if all the coke had been made in these ovens, by the use of which the by-products of gas, tar, ammonia, etc., saved from a ton of coal, are worth half as much as the coke itself. For many years American coke manufacturers have made their coke in "bee-hive" ovens, which have allowed from $20,000,000 to $50,000,000 worth of valuable materials to dissipate into the atmosphere.

Now just what is coke? Is it the residue of coal after the illuminating gas has been extracted and used by the housewife in the summer time when she wishes a quick, light fire in the kitchen range? This is the coke with which probably most of us are familiar, but this coke is an unimportant product as compared with the 42,000,000 tons produced last year in the great coke fields of Pennsylvania, West Virginia, Alabama and other states. It is this metallurgical coke which has been such a prime factor in the country's industrial development, for use in large quantities in the blast furnace, the foundry and the smelter.

Everybody who has traveled through the coke making states has been struck with the great lines of coke ovens pouring out thick smoke and flames, and at night lighting up the sky with their red glare—picturesque and breathing of industry and prosperity, but in reality highly wasteful. Nearly 500,000,000 tons of coke have been made in this manner since 1880, and $725,000,000 worth of by-products have been totally wasted.

The modern by-product ovens, on the other hand, emit no smoke or gas. In 1912 the by-products recovered from the 1,000,000 tons of coke produced in by-product ovens consisted of 54,491,000,000 cubic feet of gas, 94,000,000 gallons of tar and more than $9,000,000

Building the Ordinary Type of Bee Hive Coke Oven



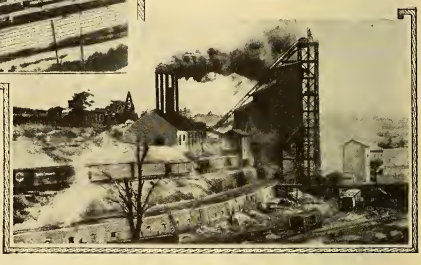
Above is Shown a Modern, By-product Coke Making Plant in Full Operation—Clean, Efficient

worth of ammonia and other by-products, all highly useful—the gas, of course, for fuel, the tar for good roads work and the ammonia as a powerful fertilizer. The value of the by-products was more than the value at the mines of the coal used.

The manufacturing of coke in these by-product ovens is rapidly gaining over bee hive production. In 1901 it was only five per cent of the total coke production; in 1912 it was over 25 per cent; but we are still a long way off from making all our coke in this manner. There seems to be every reason why the modern by-product oven should supplant the old and crude beehive type, but the investment in the latter represents millions of dollars, and radical changes are ever slowly effected.

As far back as 1881, Sir William Siemens made the startling statement that raw coal should not be used as fuel for any purpose whatsoever, and closely following this, the Siemens by-product oven came rapidly into use in Europe, and the improved type has since entirely supplanted the beehive type. Eventually, of course, it will do so in the United States. E. W. Parker, of the United States Geological Survey, states that 1,350,000 horsepower in the form of gas alone is going to waste every day from the beehive ovens of the coke regions of the United States.

Below is a Bee Hive Plant in Wasteful Operation, with Smoking, Fuming Chimneys



HE GOT HIS NUMBER

One of the fellows at the Press Club of Chicago had a busy time of it a few evenings ago. He wanted to 'phone a friend. Central, with long waits between whiles, asked him seven times "What number are you calling?" Then gave him five wrong numbers. Then stalled him three times with "I'll ring 'em again," and twice with "Party doesn't answer." He knew better than that, for the call was by appointment.

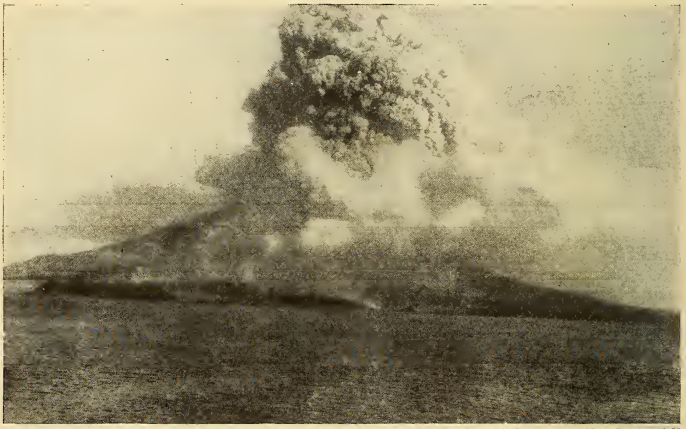
Now, this lad is meek. Job's patience would not have made a beauty spot on his. He did not swear, he did not jiggle the hook. But he called Western Union for a messenger, and sent this wire:

"Theodore N. Vail, President Bell Telephone Company, Broadway and Dey street, New York.—If you have any influence with your Chicago office will you please see that I get Oakland umpty-steen?" and signed his name and address.

Next morning he was called up early. Central had the number for him.—*The Scoop.*

Underwood & Underwood, N. Y.

The picturesque Western Boulevard at Santa Barbara, Cal., as it appeared during the worst storm known at this place for years. All the boats which were in the harbor, were sunk and the steamer, Santa Clara, was in great peril three miles from shore unable to proceed on her journey to San Francisco and unable to make her dock at Santa Barbara. Great sea walls were overwhelmed and parts of the boulevard gouged out by the sea.



The volcano of the Island of Sakurashima, ("Cherry Island") Japan, in eruption. According to first reports 34,000 lives were lost—though later indications are that the disaster was not as great. The Japanese believe the calamity was sent upon the island as a retribution for the immorality of its inhabitants.

This view was taken from Kogoshima which is only 2¼ miles from the volcanic island. It shows the volcano in eruption in the background and also a portion of the ruins of the town caused by the severe earthquakes.

Refugees arriving at Kogoshima from across the bay where the volcanic mountain is located.

Refugees taking shelter in the bamboo bush in Kogoshima, opposite the volcanic mountain. The Japanese believe that the bamboo bush is a safe shelter from earthquakes.

H. J. Shepstone, London

This photograph depicts a tourist floating on the surface of the Dead Sea, that strange inland sheet of water in Palestine, noted for its wonderful buoyancy.

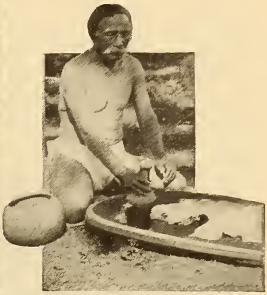
Ernest Darling, socialist, lecturer, nature man, on a stroll up Mission Street, San Francisco.

American Colony, Jerusalem

The River Jordon, Palestine, may well be called the most sacred stream in the world. It is the most important river in Palestine and one of the most serpentine rivers on the globe. Some portions of it are exceedingly lovely and picturesque. It is hallowed because of its many Biblical associations.

Geo. F. Wortz

Leper settlement on the island of Molokai, Hawaii. It is reported that a successful cure for leprosy has been introduced from similar settlements of India which should prove a boon to unfortunatee suffering from thie dread disease.



G. F. Wortz

Poi ie a gummy substance made from the root of the taro lily, the rootsteck of thie plant being a food staple in the Pacific islands. It is variously cooked and in Hawaii is made into this fermented paste.

American Press Association, N. Y.

A fantastic statue in memory of the great German poet, Goethe, is to be erected in Chicago by the Goethe Society of that city. The sculptor, Herman Hahn of Munich, Germany, ie seen in the picture by the side of hie work. The statue weighs 80 tons and the figure without the base stande eighteen feet high. The statue ie being made at Munich.

Here is a little glimpse into the locksmith room of the Vanderbilt Hotel, N. Y., showing George M. Gear, expert lockemith, who hae charge of a multitude of keys.

Underwood & Underwood, N. Y.

Underwood & Underwood, N. Y.

Here is the Delaware, one of Uncle Sam's greatest dreadnaughts, fighting for very life in a "cup" made by the mountainous seas, which threaten to engulf her. The depth of the "cup" may be judged by what is seen of the vessel, fighting masts, smokestacks and guns. The decks of the mighty one are all awash from stem to stern.

Copyright by Underwood & Underwood, N. Y.

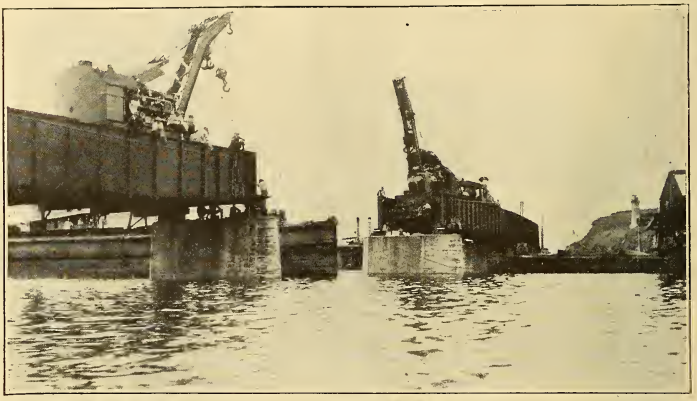
This remarkable photograph shows the wrecked steamer "Cobequid" on Trinity Ledge in Bay of Fundy, Nova Scotia. It is covered with ice and almost submerged. Boats from the Steamers "West port," "John L. Cann" and "Aberdeen" are rescuing the passengers and recovering the mails. All on board (108) were saved.

The French aviator Gibert and his wrecked machine on top of the building into the roof of which his aeroplane crashed.

French bicycle support which holds the machine stationary so that a gun may be fired without dismounting.

Photos by Underwood & Underwood

The latest addition to the transportation facilities of the French army is the flying auto. Note monster propeller attached to rear which helps auto to attain speed of 50 miles an hour over desert sands.



Lifting a bridge span to permit dredge to enter Chagres River, Panama, the dredge passing through the opening after a span of the Panama railroad bridge was removed. So quickly was the work of removing the span and replacing it done, that not a single train was delayed.

The great St. Bernard Monastery, the famous religious house in the Alps is here shown with a statue of St. Bernard in the foreground. A monk, with one of the famous St. Bernard dogs and her litter, are depicted. These dogs are kept by the monks for the rescue of Alpine travellers; in days when mountain travel was more perilous than now, the wonderful sagacity of these dogs enabled them to perform remarkable rescues.

A soft maple is growing on the tower of the court house in Greensburg, Ind., 110 feet above the ground. The tree, which is now over fifteen feet high and about four inches in diameter, obtained a foothold about 35 years ago, in the leaves and soil which had collected in crevices, and it has thriven ever since.

Fred Telford

Geo. F. Wertz

Method of handling cattle and bulky objects in some parts of the Hawaiian Islands where traffic is not sufficient to warrant building wharves and the water too shallow for boats to approach close inshore.

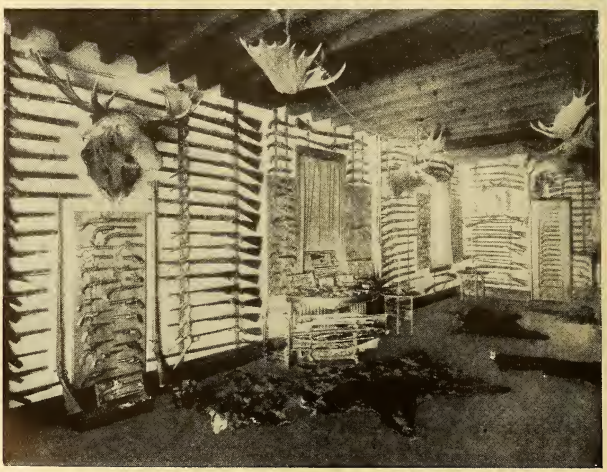
A new safety appliance on Berlin street cars, a fender which, in a few weeks, has saved 20 persons from being run over. The appliance will be placed on more cars.

Below is a view of the Ellsworth-Klaver steam shovel surface coal mining works south of Pittsburg, Kan. Note the curious appearance of the earth thrown up which resembles foot hills of the mountains.

C. L. Bishoff

Every year during the hunting season, sportsmen flock to Hamilton County, N. Y., for the big game which abounds there. It would not always be possible to bring in the big black bear, were it not for an improvised cable strung across the Sacandaga River.

The great collection of fire arms owned by Charles N. Daly of New York, said to be the most complete in the country; numbers more than 1000 guns and pistols dating from the matchlock of the Fifteenth Century to the modern automatic. The collection includes such historical pieces as the repeating flint lock pistol of Lord Nelson, the hero of Trafalgar, the duelling pistols of George IV, and the revolving flint lock saddle gun of William of Orange.



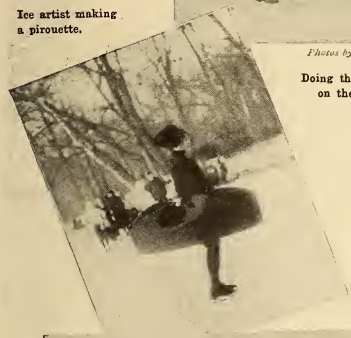
Photos by Underwood & Underwood, N. Y.

The well known Berlin Kokowski making an ice jump.

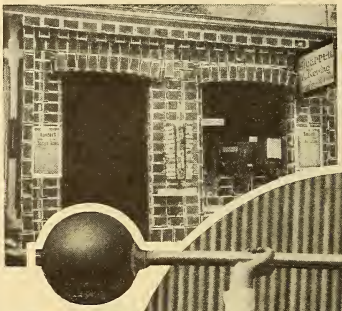
Ice artist making a pirouette.

Photos by Paul Thompson

Doing the tango on the ice.



Grotesque figures made of snow at Swiss winter resorts. The Swiss do everything in their power to entertain and amuse tourists, who represent a very important source of income.



This is a warning board at the entrance to an electric railway bridge at the end of one of Honolulu's main streets. Reading from top down the languages are English, Hawaiian, Portuguese, Japanese, Chinese and Korean.

Geo. F. Worts

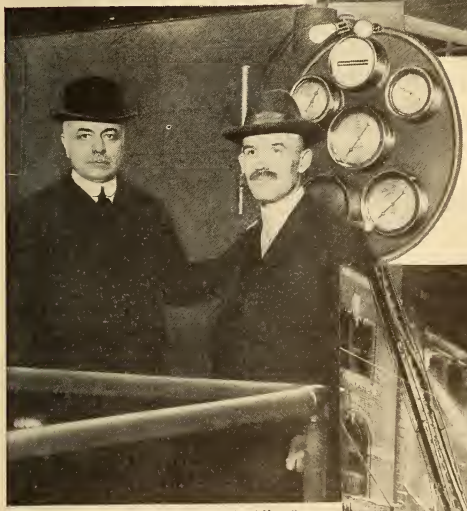
A peculiar store front composed entirely of cigar boxes. It makes a novel advertising medium for the owner.

Paul Thompson

Special life jackets for all children endorsed by delegates of all the maritime powers. They will doubtless be found on all liners in the future on which children are carried.

Miss Carolina Bowman of 53 E. 38th Street, N. Y. lifts 125 pound ball with ease. She is 20 years old and was considered a weakling at one time.

The bow of the Nantucket after it hit the Monroe.



Fighting an opera house fire at Trenton, N. J., under difficult weather conditions.

Geo. B. Cortelyou (left) starting the turbine at the new generating station of the United Electric Light & Power Company in New York City. This station is one of the largest of its kind and will supply the greater part of northern Manhattan.

Federal troops and camp followers waiting to take trains for southern points following Huerta's plans for defense of Mexico City.

A typical Mexican miss, a camp follower, dressed as she expects to be should she be called upon to do actual fighting.

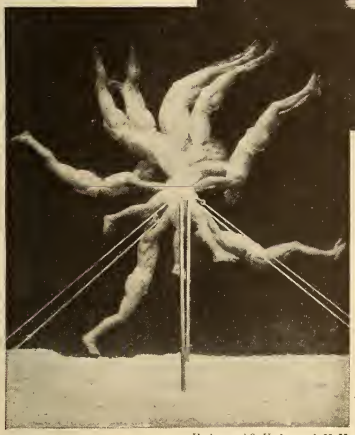
Showing a fort at Tres Marias, Mexico, made of mud, straw, grass, etc.—hardly fulfilling the requirements for a modern fort.

Photos by the International News Service, N. Y.

Packing guns at New Orleans for shipment to rebel forces in Mexico after President Wilson lifted the embargo upon arms and ammunition. Large orders were received by manufacturers with agencies at New Orleans.

Mayor and Mrs. Harrison of Chicago registering Tuesday, Feb. 3rd. Mrs. Carter Harrison is at the left and the Mayor is next to her. The family cook and chauffeur are also in line. They are registering for the first primary election in which women are to be allowed to express their political preference.

International News Service



Underwood & Underwood, N. Y.

Remarkable photographic discovery that splits up motion on a single plate. This photograph shows the same individual in successive moves of the giant swing, from the first to its completion and was made on one plate; the result of recent invention by Marey of Paris, France.

International News Service

Giles and Moisant standing by the machine which Giles used in his marvelous flight, Feb. 2nd, 1914, when he flew upside down for a long time.

International News Service

Mrs. Ben Lindsey, wife of the famous Denver juvenile jurist, sitting with her husband in the juvenile court. She is a great lover of children and spends a large part of her time helping her husband to dispose of the many cases that come before him.

Gurrey, Honolulu

Duke Kahanamoku, Hawaiian swimmer, riding a surf board and carrying a boy on his shoulders.

International News Service

Contestants for Ambassador Jusserand's fencing trophy, entitled the "Fighting Gaul", a bronze statue which was donated by the ambassador four years ago to the Washington Fencing Club.

Dentist extracts tooth from tigress, "Princess" in Cincinnati Zoo. Note partition drawn up by ropes and holding the patient firmly for the operation.

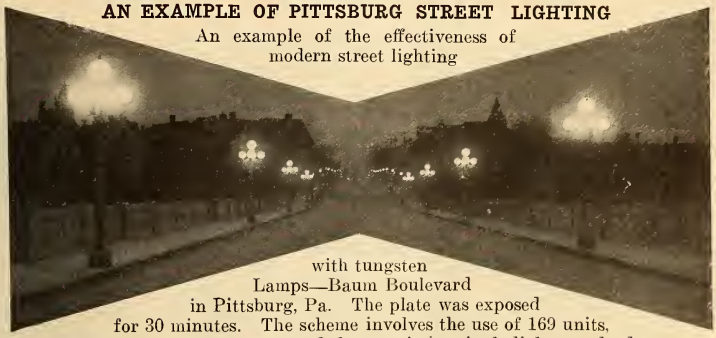
F. R. Schmidt, Cincinnati

The late J. Pierpont Morgan's yacht, Kharget, reported to have been purchased by the Khedive of Egypt. It is the finest vessel of its kind on the Nile. The Khedive is said to have paid $50,000 for the yacht.

A big watch dog of the Panama Canal, one of the twelve inch disappearing guns which will be mounted at each entrance to the Panama Canal.

Underwood & Underwood, N. Y.

AN EXAMPLE OF PITTSBURG STREET LIGHTING



An example of the effectiveness of modern street lighting with tungsten Lamps—Baum Boulevard in Pittsburg, Pa. The plate was exposed for 30 minutes. The scheme involves the use of 169 units, partly five lamp clusters and the remainder single light standards.

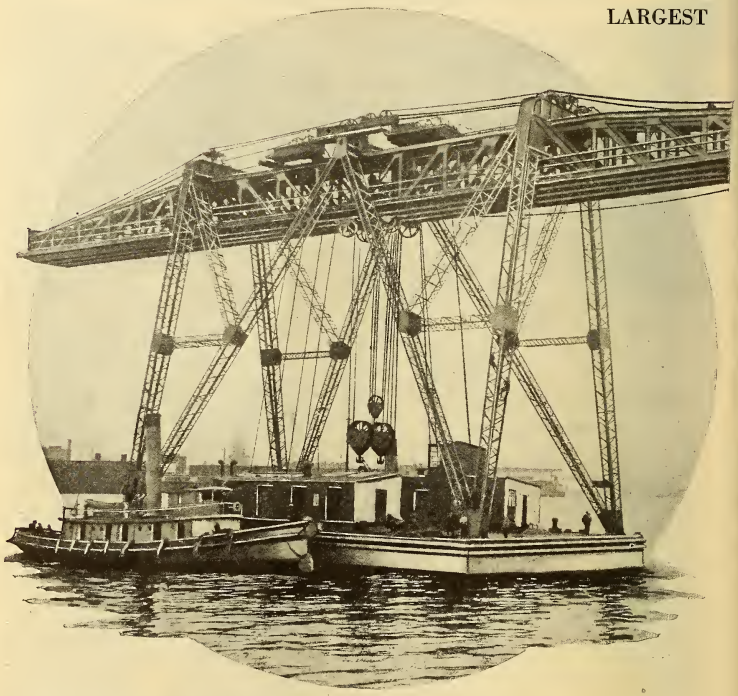
WEATHER FORECASTS FROM SUN'S SPOTS

The Rev. Father Jerome Ricard, a member of the faculty of the University of Santa Clara, has startled the scientific world with a series of long range weather forecasts for the Pacific Coast from Southern Alaska to Northern Mexico. He bases his forecasts, which are given out the first of each month for five weeks in advance, on the action and appearance of the sun's spots. The apparatus with which he studies the sun's spots is shown in the picture.

TELEPHONES OF THE WORLD

At the close of 1912 the whole world contained 12,318,000 telephones, of which the United States had 8,357,625, and all Europe only 3,153,000. The city of New York alone possessed 441,128, almost exactly double the number possessed by London. Chicago stood third among the great cities of the world with 279,383 telephones. But Los Angeles and San Francisco held the percentage record, each having one telephone for about every four inhabitants.

LARGEST



ELECTRICITY IN AFRICAN MINING

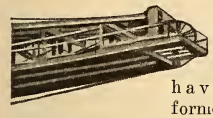
Among the wonderful things that electricity has accomplished, few seem more remarkable or more admirable than its abolition of darkness in a coal mine, and its employment at the same time to replace hand or animal power in hauling the coal to the shafts. In some African mines plants set on the surface successfully operate trolley lines, lights and shaft elevators below. The wires are strung overhead along the entries and penetrate to the farthest depths of the mine. The miners, working by electric light, load the cars in their respective rooms; the cars are then connected with the trolleys and are whisked away to the bottom of the shaft to be hoisted above.

The rapidity of the transportation is another thing which greatly astonishes the visitor. A car containing several men is pulled by the trolley a distance of a mile in two minutes.

The general use of electricity in the lighting and in the transportation methods in mines would greatly ameliorate the lot of miners. It would diminish the danger of explosion, accelerate the work, and save much pollution of the air caused by the use of lamps and animals.

FLOATING ELECTRIC CRANE

Not infrequently is it argued that the Ancients were more advanced in mechanics than we are at the present day. People who have been misinformed will declare: "Why, there are stones in the Pyramids which no machine today can lift. How did they get there?" Yet the great floating crane shown in this illustration will easily lift a weight very much greater than that of any stone in the Pyramids.



James Baike, Egyptologist, a very painstaking and scientific man and a recognized authority has stated that, after careful investigation and measurements, the largest stones so far discovered in the Pyramids do not weigh over 40 to 50 tons. This floating crane will pick up a weight of 75 tons, however, with perfect ease. And if this be not enough to make Ramases turn over in his niche or wherever he may be, it might further be added that this floating crane is not the largest crane by any means; only the largest of its kind. The stationary electric crane used in building the Imperator could lift 250 tons.

This floating electric crane is used at the Charleston Navy Yard. The trolley travels the full length of the bridge. The pontoon on which it floats is 70 feet by 125 feet and draws normally seven feet of water. The overhang of the boom, that is, the maximum reach is 64 feet 3½ inches to the center of the block. The maximum lift of the crane is 77 feet above water level to eighteen feet below water level. The hoisting equipment consists of two main hoists capable of operating simultaneously, capacity 75 long tons each or a total of 150 long tons, and one auxiliary trolley and hoist, with a capacity of fifteen long tons. The power equipment consists of one Diesel fuel oil engine, direct connected to electric generators; also an Edison storage battery. All machinery has electric drive, direct connected. The crane cost $294,397.92.

FAT TAILED SHEEP OF THE LEBANONS

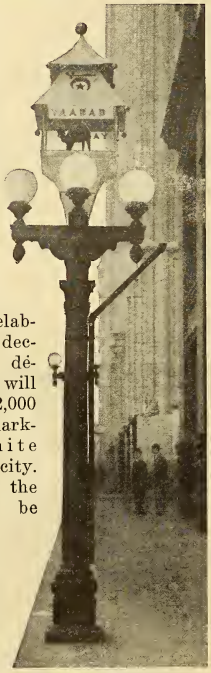
The Lebanons, in Northern Syria, have always been famous for a breed of fat tailed sheep. They are also raised in other parts of the East. The shepherds fatten them excessively by forcing mulberry leaves and other food down their throats, so that their tails become of enormous size. To such a size do they grow that they often become an impediment to the animal's movements. In this case the natives

Fat Tailed Sheep with a Charm Hung Around its Neck

build a little wheeled truck to which the tail is fastened, the sheep being thereby relieved of the weight and freedom of movement is secured. In our photograph of one of these fat tailed sheep may be seen a charm hung round its neck to ward off the "evil eye."

DECORATIONS FOR 2,000 LAMP POSTS

In Atlanta, Ga., they have a way of doing things right when they set out to do them at all. Consequently, wishing to pay a compliment to the order of the Mystic Shrine, during its pilgrimage to that city this spring, an elaborate lamp post decoration was designed, which will be placed on 2,000 of the posts marking the "White Way" of the city. The base of the ornament will be fitted over the fifth lamp of the post, being thus illuminated from the interior, to bring out the Oriental design effectively.



Lamp Post Decoration of Oriental Design

SIGNAL LAMPS INSTEAD OF OFFICE BUZZERS

There has lately been installed in the office of Mr. S. E. Doane, a prominent incandescent lamp engineer of Cleveland, a simple but efficient system of miniature, electric signal lamps, taking the place of the noisy buzzers often used for inter-office calling, and at the same time offering the advantage of a quick and definite answer to the call.

The system consists of small mahogany desk bases for each of the office force, and control switches and lamps placed on the executive's desk. The desk bases, five inches square by two inches high, contain the small lamps and push switches; the lamps are sunk into the base, only the small caps similar to those used on telephone switchboards being visible. A flexible cable permits of their being moved anywhere about the desk. The entire system is controlled from the executive or main desk; here pilot lamps corresponding to each individual are sunk in the front edge of the top, while the control switch for each is directly underneath, on the under side of the desk top.

Three systems of signals are used: the private, general stenographer and in-busy-out. With the private system, if the executive wishes one of his assistants, he pushes that individual's switch, thus lighting the pilot light above the switch and the lamp on the assistant's desk base. The assistant acknowledges the signal by pushing his switch, which extinguishes both lamps. If he is not there both lamps remain burning until the switch at the main desk is again pushed. If the person called does not see the signal, his attention is called to it by a low clicking in the base.

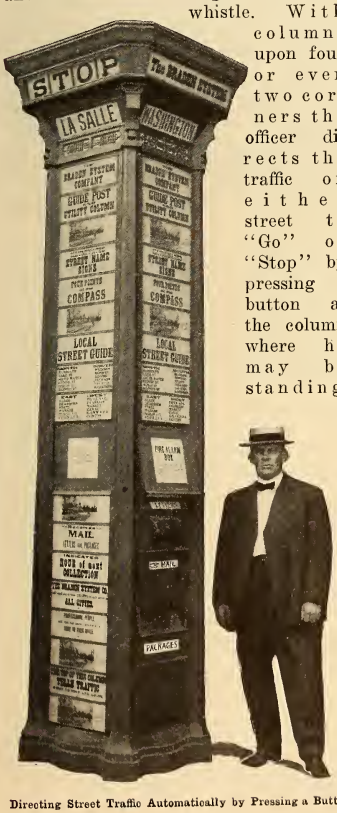
Using the general stenographer system, if the executive wishes a stenographer, but is not particular which one, he pushes the general stenographer switch, lighting his pilot lamp and all of the stenographers' lamps. Any stenographer may answer the call by pushing her general stenographer switch, which extinguishes all the lamps showing all that the call is being answered.

For the in-busy-out system, each base has a red and green lamp. If the executive is available for conference, he throws his "in" switch, lighting green lamps on all the bases. If he is busy, the "busy" switch lights the red lights. If out, both lights out is the signal.

For the head assistant, a special lamp is provided whereby he may let the executive know if he wishes to see him.

SILENTLY DIRECTS STREET TRAFFIC

The Braden guide post and utility column offers the crossing policeman of the large city an aid in directing traffic and at the same time gets rid of the whistle. With columns upon four or even two corners the officer directs the traffic on either street to "Go" or "Stop" by pressing a button at the column where he may be standing, this causing the display of the words of command at the top of the pillars which are electrically connected by wires under the street.



Directing Street Traffic Automatically by Pressing a Button

The column serves as a place for posting the names of the streets where they are erected and also for the names of near by thoroughfares. At night the columns are illuminated from within, displaying the street names on glass near the top. Housed in the column is a fire alarm, a mail box and a telephone for public use. The designer has arranged the fire alarm so that the "pulling" of a box sounds a horn which continues to alarm the neighborhood until shut off by firemen or the police. At the same time a red light is also turned on. If the central station desires to talk to the officer on the beat a switch closed at the station turns on a red light at every column on his beat.

The column is twelve feet high and 30 inches square and is designed for artistic effect as well as service.

COOLING ELECTRICAL MACHINERY

The usual method of cooling electrical machinery by means of a current of air is unsatisfactory in many ways. If the air is not filtered dust is carried into the machine, often resulting in damage to insulators and short circuiting. If filters are used, the frames on which they are stretched being generally of wood, they are liable to cause fire and in any case they are cumbersome and occupy valuable space. In England a number of firms have installed water filters for this purpose. A thin curtain of water is maintained by means of a centrifugal pump and the ventilating air is drawn through this. In this way the air is effectually cleaned and cooled and although saturated with moisture, as its temperature is immediately raised on entering the machine, this does no harm.

Fitting a Dreadnaught for Sea

UNDER the swiftly moving hands of nearly 2,000 workmen the business of fitting the world's greatest dreadnaught for sea progresses by leaps and bounds. The observer at the New York Navy Yard believes that he can see the jumbled tangle of steel parts slowly assemble itself into the whole—the new battleship New York. The terrific noise and bustle is completely forgotten in the myriad moving things one sees. A three ring circus does not begin to compare with fitting a dreadnaught for sea for continuous, ever-changing activity.

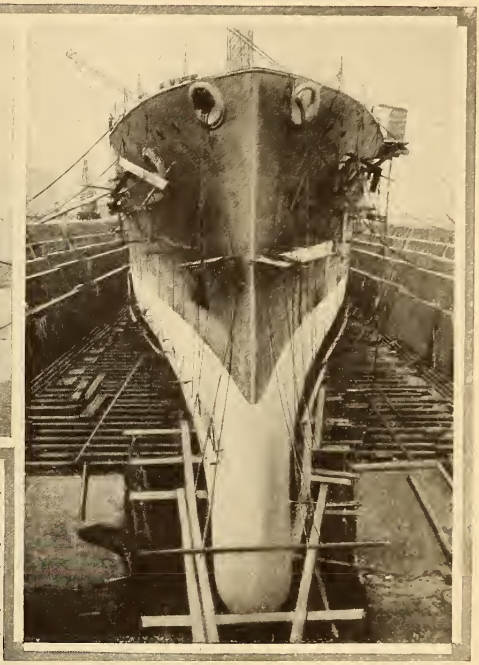
There they are, all night long, working under powerful arc lights, hammering, heaving ropes and cables, shouting and straining—all because Uncle Sam demands that his new dreadnaught be delivered on time.

Fitting the fighting ship for sea is a tremendous undertaking. When it is launched, it is but half completed. When, to the casual observer, it is ready to take its place in battle, the real work of finishing the craft effectively to protect the Stars and Stripes at sea has but begun. The intricate electrical system of the modern dreadnaught is its very life, and to properly install it many men work hard for months. Save for the hull, there is hardly a part, machine, instrument or device that is not in some manner linked up to that great factor—electricity.

Every gun — the monster dreadnaught of today has ten or twelve of them—has two motors which raise and lower it. Each turret has a pair of motors which trains it from one side of the ship to the other. For each gun there is an ammunition hoist consisting of two parts, each part requiring a separate motor. In the rear of the turrets, behind each gun, are electrically operated telescope rammers which drive the thousand pound shell into the breech and force it into firing position.

When equipping the turrets of a new ship, none but tried, experienced men are permitted to do the wiring and connect up the motors. This is an undertaking fit only for the

Stark and Bare, without Armament or Equipment, the Dreadnaught is Towed into Drydock as soon as it is Launched



Bow of the Dreadnaught New York; in Effect a Huge Ram Capable of Sending an Ocean Liner to the Bottom

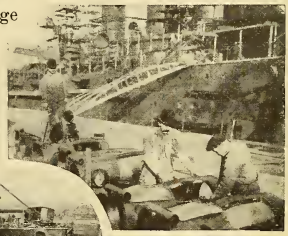
master hand. Everything possible must be done to provide against grounds, and all wire is doubly insulated and drawn through iron conduits. Fuses are placed in metal boxes near the motor operator. The necessity for great care in wiring turrets can be readily seen, for should anything happen to the electrical apparatus of the turret during battle, that battery of guns which it shelters would be useless.

Ships are steered by electrical steering engines. In the old navy this work was performed by steam. In the event of something happening to the ship's steering device, the vessel would be in peril until some score of husky bluejackets could scamper far below the water line to man the spokes of the emergency steering wheels.

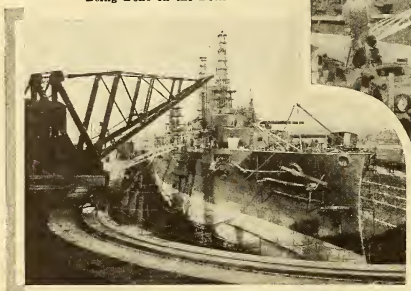
Anchors are hoisted by electricity. The winches are controlled from the forecastle. This mechanism is extremely powerful for it must move a mass through the water weighing more than 30,000 tons—the weight of the ship. It consists of a greater motor geared to a large drum over which the anchor chain is drawn. A clutch disconnects the motor and the drum, enabling the anchor chain to run free when the anchor is to be "let go."

The real care of the ship fitters is the electrical ventilating apparatus for the great powder magazines. The failure of this system to work might put the whole ship in danger of an ex-

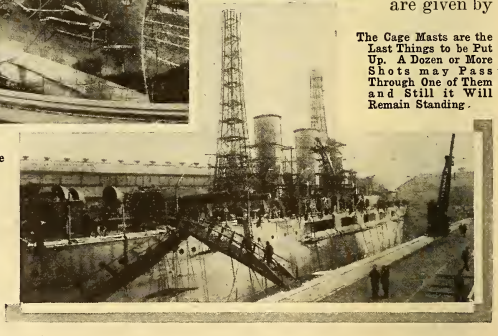
plosion of the immense quantity of powder stored in the armored magazines many feet below the water line. The ordinary civilian has no conception of the vast amount of powder and high explosive carried by a battleship. There is enough smokeless powder on hand to destroy 40 city blocks and enough other explosive to last a large mining company for several months of extensive operation. One motor fan draws fresh air into the magazine while another forces it out again. An effort is made to keep the temperature of the magazines as nearly at 65 degrees as possible. In warm latitudes, pipes from the ice machine are often connected to the magazines. The intake and uptake pipes end in large ventilators on the main deck which in heavy weather are screwed down tight to keep out the water. Then the magazines are supplied with fresh, cool air from between decks.



Machinists Working on Gun Parts for the Secondary Battery, such Finishing Being Done on the Dock



Fifty Ton Cranes Travel around the Ship on Rails



The Cage Masts are the Last Things to be Put Up. A Dozen or More Shots may Pass Through One of Them and Still it Will Remain Standing.

The telephone and signal system on a battleship is very intricate and every precaution is taken by naval constructors to provide safe conduits for the wires. Every effort is made to place the conduits where they will be least liable to be injured by a bursting shell during an engagement. On the ship of today there are upwards of 75 telephone instruments. One man is on duty at all times at the telephone exchange which is located in the central station of the ship under heavy armor and near the bottom.

All signals to men in the turrets are given by electric devices and checked up by the telephone. The indicator, which flashes the distance of the target or enemy's ship from the firing ship, consists of a metal box enclosing electrical apparatus so that any number from 500 to 20,000 can be flashed from the conning tower of the ship. The sight setter reads the range and sets his sights, making alterations from time to time.

Some twenty miles of wiring are woven about a battleship. Much of this goes into the lighting system. At times, especially when the ship is dressed at night, with strings of

twinkling lights about its frame and up both masts, the dynamo room must supply nearly 2,000 lights.

The wires are the very arteries of a dreadnaught. Destroy the electrical system and the ship is practically helpless. Knowing this Uncle Sam is sure of his workmen. He keeps tab on their efforts by countless inspections and so perfect must be the finished product that not one mistake or not one bit of defective workmanship must be discovered after the ship has been turned over to the Commander-in-Chief of the Fleet.

A NOVEL AUTO TRUCK AND TELEPHER SYSTEM

It is pointed out that in order to make delivery by auto truck a saving feature to the fullest extent, it is necessary to keep the trucks waiting as short a time as possible at the store during the loading of outgoing goods and the handling of incoming freight. For this purpose, removable truck bodies have been designed which can easily be taken off or put on the chassis by means of the electric telepher.

The electric overhead rail equipment is installed throughout the entire establishment, shown in the illustrations, including the elevators, so that it is possible to remove the truck body containing incoming freight and deposit it next to the place where the goods are to be stacked upon the different floors. The saving in time and labor is evident.

It will be noted that the loading of the truck bodies, of which there are duplicates for each truck, with outgoing goods is all done on the inside, while the trucks are out delivering and the loaded trucks are placed on the chassis by the telephers as soon as the trucks return from their trips.

The entire operation of removing the bodies from the trucks and replacing them with loaded bodies averages about five minutes instead of 30 to 75 minutes as was often the case when loading and unloading the old way.

Loading Truck Bodies from Cars and Removing Them by the Telepher

The Loading of a Truck by the Telepher System Using Removable Truck Bodies

DIRECTOR OF HARMONY • DISTRIBUTOR OF ENERGY

Mr. Morgan L. Eastman the subject of this short sketch has been rightly termed the livest wire in musical circles in Chicago and the most harmonious wire in the local electrical field. By day he is a load dispatcher and directs the distribution of energy over Chicago's central station system. By night and indeed during parts of many days he directs the Commonwealth Edison Orchestra, one of the best in the city, and coaches and drills the members unceasingly in perfection of technique and delicate appreciation of harmonies. He is in truth a veritable D. D.—a double director. He is also considered a "prince of good fellows" by a host of friends.

Now a few words as to Mr. Eastman's double duties will certainly prove very interesting to the public. First, as to his daily bread and butter involved in the duties of load dispatcher. These are decidedly prosaic and most exacting, yet with an inside source of information as to the good citizen's comings and goings that is illuminative, decidedly the right word, as it depends mainly on the light used by the citizen and the time of using it and also the amount of power used by firms and when.

Load dispatchers go on in relays so to say. On them depends the proper movement of energy over the central station system. If there is a break down in a unit at one plant it is up to the load dispatcher at the time on duty to obtain relief from another station; to see that heavily charged wires are connected properly; that if open and a menace to the public they are properly guarded; to watch every upward or lowering movement of the amount of energy needed. Thus the day before Christmas the demands for power en ergy slow down early in the day, or again in the summer the lights on the front porch are more in evidence in the evening hours than the lights in the rooms of the house itself.

In front of the load dispatcher as he sits at his work of direction, is a board on which by means of pegs and differently colored lights the movements of current, the condition of wires and the happenings at all stations and substations day and night are faithfully recorded. It is a strenuous life for a man while he is on duty and the safety and efficiency of the company's workings and the comfort of the public depends very greatly on Mr. Eastman as he sits at his desk just as depicted in the illustration.

Then, presto change! The double director becomes the musician with load dispatching far away and his mind concentrated on the next rehearsal or the next concert, or the choice of pieces to

be practiced up or set for the program.

The Commonwealth Edison Orchestra is formed entirely from men who are musicians and who are drawn from all branches of the company's service. It is, it may be said right away, one of the best orchestras in the city. There are over 90 members, representing the full complement of orchestral instruments, and the whole gathering together of them and intense work necessary to keep them up to perfect concert pitch is due the unflagging zeal and knowledge of their director added to his personal sympathy and understanding, not to mention perfect taste.

Mr. Eastman is a young man but he has had a very thorough musical instruction and experience. Some years ago before he was a D. D.; that is, either a load dispatcher or leader of an orchestra, he was secretary to the American Consulate-General at Budapest. While there he studied music and played in orchestras even that of the Grand Opera House. He played with the famous Hungarian bands and, as he himself has observed, was the only member probably who had to have the score, the others playing without notes.

Mr. Eastman Shown in His Two Capacities—Load Dispatcher and Musical Director. He is in Truth a Veritable D. D.

Mr. Eastman is one of the most pleasant and unassuming of men; he is also one of the busiest. His orchestra is a unique institution of very few years' existence and his work in connection with it is also quite unique. February 12 last the orchestra under his leadership gave a most successful concert in Orchestra Hall, Chicago. The house was packed with all sorts and conditions of people and from the most distinguished in the city to some of the humblest they all gave him enthusiastic

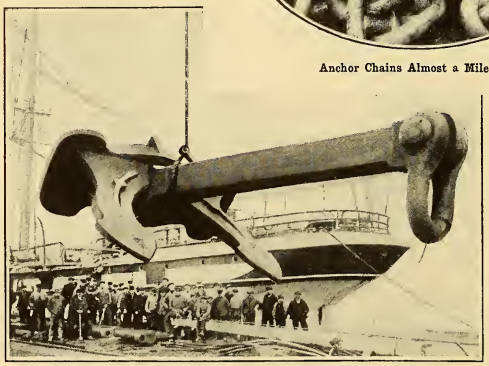
support. It was the second annual benefit concert, only the second, but the program rendered was very much worthy of the occasion.

LIFEBOATS AND ANCHORS OF THE IMPERATOR

The control of lifeboats on the modern ocean liners has been brought to a science. The best engineering skill has devised apparatus which will lower the boats from the highest decks quickly, under every possible condition. On the SS. Imperator, the world's largest ship, derricks have been installed which will lower the lifeboats from either side of the ship. Electricity operates the mechanism and makes it possible to raise and lower a boat filled with passengers in less than 70 seconds. A number of the boats are collapsible and nested one above the other to economize space, so that eighteen large lifeboats are stowed on the upper deck between two of the funnels within reach of the cranes. An ingenious device is used for suspending boats on the lower decks, which allows them to be swung outward and lowered in a few seconds. This great liner carries 84 boats, two of which are high powered motor boats that could take the others in tow. The power boats are equipped with wireless telegraph apparatus having a 200 mile range.

The Imperator carries no less than five great anchors. Her main anchor weighs 26,445 pounds and is the biggest in the world. Anchor chains are provided big and strong enough to hold the great ship. Every link of the chains is of hardened steel designed with a crossbar that they may not tangle. The combined length of these chains is about three-quarters of a mile.

Anchor Chains Almost a Mile Long

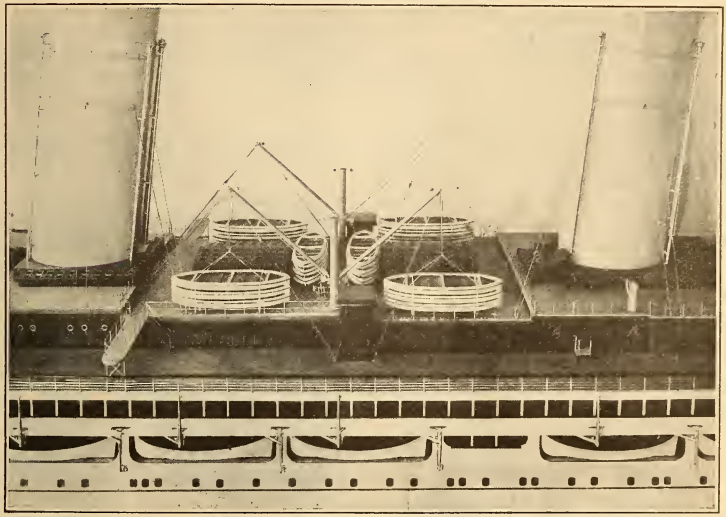


The Imperator's Massive Anchor, the Biggest in the World

PRESCRIBING FOR A PUMP

One of the big pumps at a California pumping station got out of repair, and just what had caused the trouble no one could tell. Now the pump had been made years before by a New York Company, and to call a man across the country for the purpose of making repairs was too expensive a proposition to be considered. Happily an ingenious device was employed.

A phonograph was called into requi-



Collapsible Boats Nested Between the Funnels of the S. S. Imperator, Arranged to Economize Space

sition. The manager spoke into the receiver, describing the symptoms of the ailing pump, and further to indicate the ease, he placed the receiver so that the pulsations of the pump could be recorded.

Just as a physician listens to the action of the heart or lungs in the human body by means of a stethoscope, so the "pump doctor" listens by means of a phonograph to the throbs and pulsations of a pump and is by that means enabled to diagnose the disease.

Those who listened to the strange communication at the New York office of the company said that the voice of the Californian from the phonograph was heard first, giving in a clear, precise and distinct way, the symptoms of the pump. Then was heard the b-r-bang! b-r-bang! of the pump, and an occasional wheezing sound which might be made by escaping steam.

The engineer to whom the phonograph was submitted said that the whole record was so perfect that he felt tempted sometimes to ask additional questions. The experiment proved entirely successful. The proper remedy was suggested, and the pump was soon running once more, as good as new.

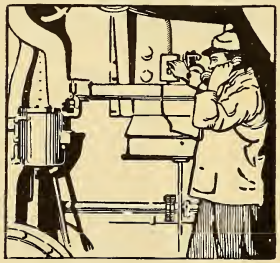
ELECTRICITY PREVENTS BOILER CORROSION

A patent has recently been taken out in England for a process for the prevention of the corrosion and scaling of boilers. An electrode is fixed inside the boiler and the boiler shell itself is connected with the other terminal of the source of electricity. In this way there is maintained on the inside surface of the shell a film of hydrogen which prevents the adhesion of the scale and preserves the plates from corrosion. The apparatus has been installed at the U. S. Navy yard at Brooklyn, and is giving good results. The current used is direct, from six to ten volts.

TEACHING AN OLD SEA DOG NEW TRICKS

With the inborn prejudice of an old sea dog against new fangled ideas, the captain of a certain sea going tug for a long time objected to the use of a telephone on his boat. Finally he was won over and this is how he explained his conversion:

"I never believed in putting telephones on a boat like this and you couldn't get me to use the things when they put them in. Didn't think they were seaworthy. Then something happened to make me change my mind and mighty quick, too! We were pulling along off the Maine coast with a long tow of coal barges when we struck the worst sou'wester I've run into in my 30 years of sea going. I wanted to tell

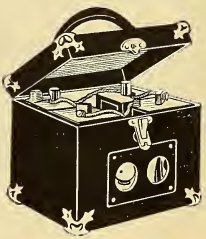


"Without Knowing it I found Myself Using the Inter-Phone"

the engineer something—something important that my signal bells couldn't tell him. You couldn't hear a sound through the tube so I started to send the cabin boy down with the message. But the sea was too high and I was afraid he'd be washed over the side. Without knowing it, I found myself using my inter-phone, and all of the next few days while we were riding out the gale I used that thing all the time. You could understand everything in spite of the racket made by the wind and engines. Pretty hard to teach an old sea dog new tricks, but I'm glad I learned that new one. Now I wouldn't be without it; use the inter-phone for everything; and the crew, including the cook, feels the same way about it."

HOTELS MAY BE SURE OF FRESH EGGS

This device for testing eggs to see if they are fresh, by means of a Mazda lamp, will be especially welcomed by hotelkeepers who wish to safeguard the feelings of their favorite guests. The lamp is wired through a brass disconnecting contact to four large dry cells. A leather diaphragm in front of the lamp contains two round holes each large enough to admit the small end of an egg. Placing the eggs in the holes presses the disconnect-contact against a second contact which completes the circuit, lighting the lamp. The test on the eggs is the same as the old process of "candling."



Mazda Lamp "Candles" Eggs

TRY ONE IN A COLD BATH ROOM

The luminous electric radiator has achieved quite a reputation for itself in the way of being a romantic little article to have around whenever it is time for the evening stories or when the wind is howling outside. But there is another side to the life of an electric radiator which has to do with the extremely practical and comfortable, which every one who has taken them for their cheerful glow has discovered. Although they do look very cosy and cheerful they will, at the same time they are so looking, throw out heat

enough to make a lot of difference in a cold room. Those people who appreciate the difference between a warm bath room and a cold bath room will

The Cheerful Difference Between a Cold Bath Room and a Cozy Glower

appreciate the electric radiator when the heating system of the house is not bending its best energies in that direction.

RAILROAD CROSSING SIGNALS ILLUMINATED

On the Rochester division of the New York State Railways a new scheme has been devised for lighting railroads at intersection of country roads. Six electric lamps are placed on each side of the ordinary "Railroad Crossing" sign, one lamp at each end of each cross arm and two lamps in the middle. It is said that by this scheme the signs are discernible at a distance of one and a fourth miles, and, from their characteristic shape are easily read as far as they can be seen.

A Warning in the Night

"THE MACHINE CALLED THE TELEPHONE"

The wife of the former German Ambassador to Washington, von Hegermann-Lindencrone, writes in a recently published book describing life in America in the '70s, of the introduction of the telephone. In the free translation is here described what she saw and heard:

"Johann has just come from Boston and brings incredible news about a machine called the telephone. It was nothing but a wire with one end in Boston and the other in Cambridge. He says that he could hear quite plainly what the person in Cambridge said. Our neighbor, Mr. Graham Bell, invented it.

"How wonderful it must be! So far, he has stretched his wire only as far as Cambridge. 'What!' cried the people. 'You think you can, by means of a wire in the air, hear persons speak at such distance?' 'Let me try; I will pay half the expenses,' said Bell, 'if the authorities will pay the other half.' He was very certain of success, and when he spoke with his brother in Cambridge from Boston, to invite him to dinner, and added, 'Bring your mother-in-law along,' he heard plainly, although not very loudly, the voice of the old lady remarking:

" 'That fellow must have his joke, even now.'

"There is another invention, called the phonograph, by means of which the human voice is reproduced. I sang in one of the things through a horn (it was received by a platinum roller) and then I heard—my voice. If that was my voice, then I never want to hear it again!

"It was a nasal, creaking tone. I was ashamed of myself. And the faster the man turned, the higher and quackier the voice. Pronunciation and expression exactly my own—but the voice—God protect me therefrom!"

Porch Furnishings Should Include Wicker Fixtures

Courtesy Central Electric Co.

PORCH LIGHTING

Since outdoor living became an art, porch furnishings should include fixtures in wicker. They are efficient lighting units and not merely decorative fixtures. The wicker bowl may be fitted with luminous bowl equipment. A convenient way to control porch lights is to install two three-way switches, one on the porch, the other in the hall; by means of this two-point control the porch light may be turned on from within or without. The extra expense is slight, covering two wires between the switches which are really close together.

A porch light should be installed just outside the entrance door and there may be other outlets for the use of electric fans.

Comparison of Lamps for Photographic Purposes

The chemical value of the ultra-violet rays of the spectrum is well known, and a member of the French Academy of Sciences has even suggested that they may be used to assist digestion in persons suffering from a weak stomach. In the domain of photography they are all important. A writer in the German review, *Licht und Lamp*, gives the following table of the values of the chemical rays from the different forms of light, taking as a standard the 110 volt carbon filament incandescent lamp:—

Petroleum lamp with Adonis burner	53
110 volt carbon filament incandescent lamp	100
110 volt metallic filament incandescent lamp	134
Auer lamp with glass cylinder	150
Auer lamp without glass cylinder	185
Nernst lamp without covering	120
Five ampere arc lamp	734
Mercury vapor lamp, 220 volts opal glass covering	1384
Regina arc lamp, 120 volts, without covering	3230
Diffuse daylight, Jan. 31, 10 a. m. weather snowy, dull	920

According to the report of an American consular officer in India, there is a rapidly increasing use of aluminum ware for water vessels, cooking utensils, etc., in that country. This has given rise to a demand for small electric induction furnaces for fashioning the raw material of ingots and sheets to suit the native tastes.

What Happens to the Scenario

Ingenious methods, short cuts and tricks without number are employed in filming even the ordinary scenario portraying more or less everyday affairs. In this the fourth article of the series, some of these methods will be described, which, although they do not all come exactly in the category of "trick pictures," will perhaps more directly interest the scenario writer.

Almost equally interesting are some of the short cut methods—tricks they might be called—which are employed in order to accomplish seemingly impossible feats in staging thrilling struggles, headlong plunges to the ground from lofty heights, etc. Illusive scenery or "stop and start" camera work nearly always furnishes the true explanation of these seeming impossibilities.

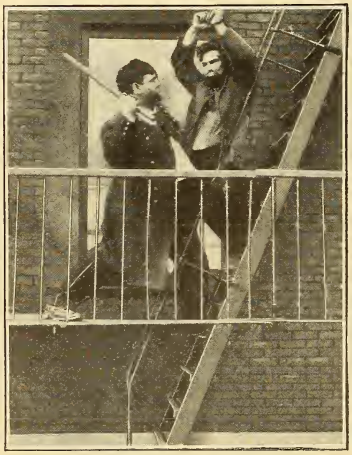
By way of illustrating how one or two of these tricks are accomplished let us turn for a moment to certain specific film subjects. For instance, not many weeks ago Vitagraph produced a two reel subject entitled "The Ancient Order of Good Fellows." In one scene of this production a policeman and the man he had arrested engaged in a thrilling hand to hand combat on what appeared to be a lofty fire escape many stories above ground.

Distant views were given of the two men struggling high up on the side of a real skyscraper, and then close-up scenes were shown of the combatants still fighting on the balcony of the fire escape. The struggle ended with one of the men being hurled over the railing of the balcony and dashed to death on the ground below. It sent a thrill through every audience witnessing it and yet it was easy of accomplishment.

When the "close-up" scenes were taken the men were posed not on the real fire escape of the real skyscraper, but on a fire escape constructed so similarly to the real one that the substitution was never noted. This built-up fire escape was erected on the floor of the Vitagraph studio as shown in the accompanying illustration and the floor of the balcony was not over two feet from the studio floor. The camera only registered down to about twelve inches above the floor level and so when the man was hurled over he disappeared from sight—dropped out of the picture as it were—and appeared to have been hurled to his death.

A quick "flash" back to the scene of the real skyscraper and a close-up view of the injured man lying where he had fallen completed the illusion; and every mind in the theater pictured the actual fall as having taken place and gasps of surprise at the nerve and daring of the photoplayers went up.

In an Essanay war drama released some time ago, the hero was seen to climb a telegraph pole, cut the wires, thus preventing the enemy from using them, and then was shot by the ad-



A Scene that Thrilled Every Audience, yet was Easy to Accomplish

vancing Confederates before he could descend from the pole. As the bullet took effect and the hero reeled in mid-air and crashed down to his death at the foot of the pole, everyone in the audience was thrilled and awed. Some who recall that just before the fall the camera "panaramed"—that is, started at the top and followed all the way down the length of the pole—will doubtless feel sure that there could have been no deception here as in the case of the fire escape described above, for the reason that they actually saw the whole length of the pole and knew for a fact that the pole was many feet in height. Yet in spite of that, the clever producer by a trick of photography and substitution did fool them.

Here is how it was done. The hero in cutting the wires was posed on the cross arms of a telephone pole that stood some six feet from the ground. The camera was so mounted that it showed only the upper part of the pole and a distant skyline, which indicated that the man was some 30 feet from the ground. When the camera "panoramed" it was pointed at a real telegraph pole of the ordinary height. The hero was posed atop that, just as he had been on the top of the short pole, and as the camera swept towards the ground and the hero went out of sight the audience was convinced that they were looking at the same pole they saw a moment later when the camera was shifted back to the short pole where the hero was shot and toppled off to meet his death below.

Though the actual fall was but a few feet only, its start was recorded by the camera. The hero arose and hurried over to the tall pole, at whose base he curled up in a limp looking heap. The camera then got into action again and because you could see 30 feet of pole rising above the body of the dead hero you felt sure he must have fallen from the top of that same pole.

In the same way hairbreadth leaps from the tops of tall cliffs, jumps from lofty precipices, etc., are carefully staged against the background of a real cliff of gigantic height and then the player makes a jump off a little mound of earth and falls a few feet, so that he disappears from the camera's range of vision, thus convincing the picture fan that a feat of an amazing sort has been performed.

Once in awhile, of course, the real thing is attempted successfully, so that it is not fair to assume the pictures are always tricks. One of the most notable examples of the real thing in recent releases is the four reel subject "The Great Leap" on the Mutual program. In this picture a man and a girl, mounted on a horse, actually jump off a cliff from a surprising height and plunge into a deep pool below.

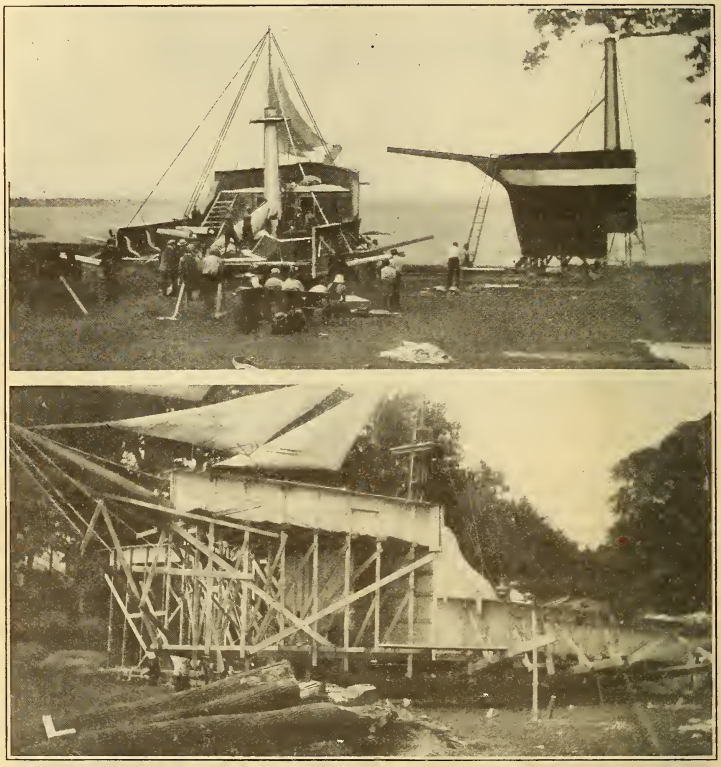
As is well known, the store fronts, burning houses, and palatial palaces seen on the picture screens are frequently nothing but painted scenery or built up structures of the most fragile character. In the accompanying scene

A Glimpse of a Hold-up in the Roadway. Note the Chubby Proprietor Awaiting His Cue Behind the Flimsy Front of His Tavern

from Edison's "A Good Sport" one glimpses the hold-up in the roadway, while the cameraman stands in the left foreground of the picture and in the background we see the flimsy front of the "Idle Hour" tavern, and the chubby proprietor, awaiting his cue behind the canvas door of his place of business.

The tottering ruins of a burning home in another illustration show how comparatively small was the built-up

The Ruins of a Burning Home in the Wilds of Africa—Filmed at Los Angeles Studios



Showing Construction of Two Sailing Vessels Used in Edison's "Hard Cash". They were Built on Rockers or Cradles so They Could be Tilted Back and Forth

structure which was really burned to the ground for picture purposes. It was filmed at the Los Angeles studios of the Selig Polyscope Company and represents the home of an Englishman in the wilds of Africa, which was attacked and burned by a band of Kaffirs. When the camera was brought up close enough so that its widest range still retained the structure in its vision, the English home was a most convincing sort of building, but the "still" picture which is here reproduced was taken from much farther back and so shows more than the artistic director permitted to creep into the motion picture.

Much more difficult of accomplishment and requiring the utmost care are scenes laid aboard ship in a high sea when the whole boat has to pitch and roll with the action of the waves. In Edison's "Hard Cash" it was necessary to construct portions of two sailing vessels, of a type corresponding to

the period in which the story was laid, and so build them on rockers or cradles that a score or more of men, applying all their strength to the ends of these rockers, were able to tilt the vessels now this way and now that. The vessels were built close to the shore of a huge bay and the camera was so mounted that it took in only the deck level and the stretch of bay which can be seen just beyond the bow of the vessel.

The completed film creates a perfect illusion, as one sees the deck tilt high on one side and then on the other, while ahead and in the distance one is absolutely certain that nothing but water and sky can be seen. Those sportily inclined and who did not know the real secret of this particular picture would undoubtedly be willing to bet large sums that the film was made in mid-ocean, so realistic is the rocking of the ships, and yet the illustration shows it all to have been staged ashore, with only the sea for a background.

A TRUE LUBIN ROMANCE

A few months ago the Lubin scenario editor handed out a romantic war picture entitled "Fitzhugh's Ride" to Director Edgar Jones. Being leading man of his own company, Jones cast himself for "Fitzhugh" and selected for his picture sweetheart Louise Huff, who is listed as "the Kate Greenaway girl" of the studio. Miss Huff is a fair little doll with blonde hair and a pair of beautiful blue eyes. Jones considered her in the photoplay to be a bride well worth fighting for.

As the plot ran, Jones as "Fitzhugh," who was supposed to be dead, hears that his sweetheart is about to be married to a rival. Fitzhugh mounts his horse and gallops to the church, where he rides up the aisle in time to prevent the ceremony. Snatching the girl in one arm he draws her up beside him on the saddle, turns his steed and flees, outdistancing all pursuers. During the wild ride Miss Huff held Jones tightly with her arms and Jones, still in the character of Fitzhugh, clasped her waist with his own stalwart arm. There was love in the situation which neither could resist and the sequel was consummated the day following, when at the little country church at Oaks, near Norristown, Rev. George W. Barnes, who assisted at the wedding scene in the photoplay, married the little "Kate Greenaway girl" to her director, Edgar Jones.

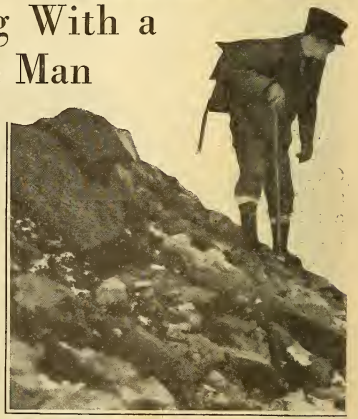
A Film Romance that Ended in a Real Wedding

So when you see the wedding interrupted in "Fitzhugh's Ride" as that film is thrown on the screen you will know you are witnessing the beginning of a real romance.

Mountain Trailing With a Famous Camera Man

To secure the first winter scenes in Glacier National Park in Northwestern Montana, Ralph R. Earle, Pathe Weekly cameraman, recently spent twelve days in the nation's newest playground. Weather conditions were ideal and static was evidently on a vacation, since Mr. Earle came out of the park with 2,000 feet of perfect film. A feature of the trip was the climb to the summit of White Calf Mountain, it being the first time that mountain peak had ever been scaled in the winter months. A recent issue of Pathe Weekly featured this part of the trip and Mr. Earle's work will no doubt shortly appear as a scenic reel, in keeping with the Pathe Freres policy of putting out at various times scenic subjects in the "seeing America first" series.

With the Great Northern railway extending for more than 60 miles along the southern border of the great national reservation, the park is easy of access and can be entered at numerous places, though the official gateway has been designated at Glacier Park station. It was at this point that the Pathe man secured his guides and commenced the winter trip through the park. The chalets owned by the railroad company, which serve as a convenience for tourists viewing the wonders of the park in the summer months, were placed at the disposal of the party and the trip was successful throughout.



A Scene During the Descent of Rising Wolf Mountain in Glacier National Park

At the Summit of White Calf Mountain, After a Long, Steady Climb. From this Point More than 75 Mountain Peaks can be Seen

Some idea of the experiences of the cameraman in the Northwest may be had when it is known that on this trip Mr. Earle made the long jump from the sunny climate of Los Angeles to cool crisp winter weather in the park. At the hotel he left his low shoes and silk socks for woolen clothing and snow shoes, but in ten days was back securing a negative of the tournament of roses in Pasadena.

Mr. Earle was the first cameraman representing the licensed companies to make pictures in Glacier National Park and has made three trips by stage, automobile and horseback to film the beauties of the new national park. He was the only cameraman to secure pictures of ex-president Taft's children, who were in the park while their father was the chief executive of the nation, and also secured the negatives of the first visit of Secretary of the Interior Lane to Glacier National as well as Mount Rainier National park last August. Mr. Earle made the motion picture record of the end of the 1913 Glidden tour at Glacier park and has secured some valuable and interesting films of the Glacier park Indians.

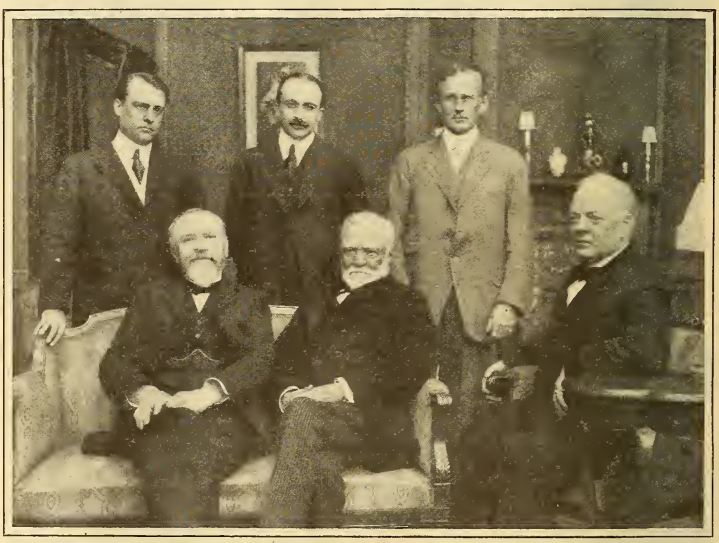
The American Northwest offers a wide field for the scenic artist with the motion picture camera and since Mr. Earle has been assigned to the field which covers Montana, Oregon, Washington, Idaho, Colorado, Arizona and California he has many subjects of interest to keep him busy. At the time the Pathe representative paid his visit to the park, skiing, snowshoeing, skating and other winter sports were at their height and the scenes secured by Mr. Earle will show the mountains in their winter mantle, frozen waterfalls, trails through the snow covered forests, the party climbing the mountains, the descent of Mt. Elizabeth in a snow storm, snowshoeing and a general scenic record of rare beauty.

CARNEGIE AS AN ACTOR

Andrew Carnegie, the famous Laird of Skibo, recently made his *debut* as an actor for motion pictures and "made good" to such an extent that hardened directors found nothing to criticize in his playing and are seriously considering making him an offer to repeat his performance on another occasion.

Immediately upon his arrival at the Edison studios Mr. Carnegie proceeded to post himself upon the duties of an actor. A handsome library set had been made and Mr. Carnegie took his place beside a table. When he got the work he proceeded to give his lecture in the most business like way imaginable. He seemed utterly oblivious of the camera and discussed the subject of the distribution of wealth and the obligations which great wealth imposes upon a person as if he were talking to a friend.

The film and talking machine record which he made will be exhibited in vaudeville and a record and print of the film will be placed in the archives of the Modern Historic Society. One of Edison players who was an interested spectator remarked that it was a great pity Mr. Carnegie had turned his attention to steel and libraries as the stage thereby lost a great actor. Never had he seen such self possession on the part of a man who faced the motion picture camera for the first time.



"It was a Pity," Remarked an Edison Player, "That Mr. Carnegie had Given His Attention to Steel and Libraries, as the Stage Thereby Lost a Great Actor"

The group shown in the picture is as follows: Standing from left to right—M. R. Hutchison, chief engineer of the Edison laboratory; J. A. Poynton, secretary to Mr. Carnegie; Horace G. Plimpton, manager of the Edison studio. Sitting from left to right—Henry Phipps, Andrew Carnegie and Charles Sumner Graham.

ANOTHER DANCING PICTURE

Mention was made in these columns recently of a film released by the Kalem Company in which the new dancing steps were taught by experts in the terpsichorean art. Unfortunately on account of the newness of the subject and the many protests which have been made against the Tango dances, even in pictures, the film was not exhibited in Chicago after the board of police censors had witnessed a private showing of it.

Now, however, a new dancing film produced by the Victor company, called "Modern Dances," is released, in which Sebastian and Allen, two of New York City's most popular dancing teachers are seen in a series of the most modern dances. The teachers have been brought close up to the camera in order that every movement may be plainly distinguished by the spectator.

Among the dances illustrated in detail in the film are the modern turkey trot, the hesitation waltz, the maxixe Brazilian, the Sebastian maxixe and the Sebastian tango.

CAT BREAKS UP THE SCENE

Black Tom, the cat which makes his home in the Kalem studio in New York, has conceived a special fondness for Irene Boyle, the popular leading lady, but that this friendship has occasional drawbacks was recently demonstrated while Miss Boyle was seated in a chair in a contemplative attitude, before a fireplace, in one of the big scenes of "A Modern Jekyll and Hyde." Tom saw his mistress, calmly walked across the stage and hopped into her lap, thus breaking up the scene and making a "retake" necessary. Now Tom is confined in one of the dressing rooms when Miss Boyle poses before the camera.

Mr. Sebastian and Miss Allen Two of New York's Popular Dancing Teachers are Filmed in a Series of Modern Dances

GREAT FIRE OF LONDON RE-ENACTED

The Clarendon Company in England has Recently Filmed the Fire of London with Unusual Fidelity to Detail. Three of the Scenes Here Reproduced Show the Incendiary Lighting His Bomb at a Lantern, Inhabitants Fleeing Before the Flames and Burning Furniture Thrown from a House

UP TO HIS EARS

Directors of motion picture productions immediately upon finishing a scene in the studio or outdoors are themselves accustomed to step before the camera for an instant while the cameraman takes a foot or more of negative. This is done for purposes of identifying various parts of the negative when it reaches the assembling room, for thousand foot subjects are taken in short 150 or 200 foot lengths of film, and these are later gathered into one long reel of 1,000 or more feet in length.

Unique Effect Obtained When Director Kendall of the Edison Studios Stepped into a Scene for Purposes of Identification

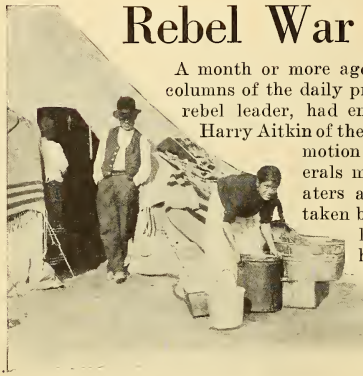
The director's assistant usually holds up a printed card on which the number of the scene in question is shown in large figures and this also is used to help in identifying that particular scene or piece of negative when it reaches the assembling room. On account of the odd and varied character of the scenes taken in film productions some extremely unique effects are sometimes obtained when the director steps into a scene for purposes of identification. One of the oddest is shown above.

Director Preston Kendall of the Edison studios is here seen apparently going down for the last time, though in reality he is standing on the studio floor in front of the black background and small ocean liner seen floating on the surface of the water. The water part of the picture was taken weeks before and Director Kendall was engaged in filming the ocean liner at the time he registered his identity on the negative.

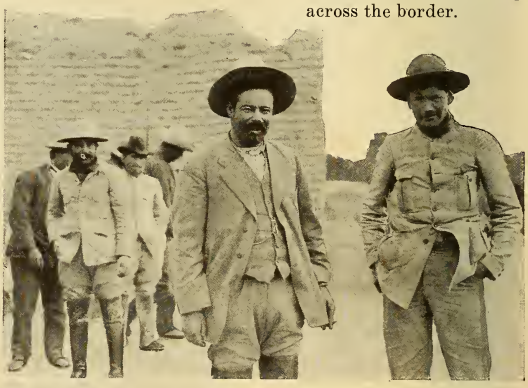
HE'LL KNOW BETTER NEXT TIME

In directing the production of a motion picture when a director wishes the actors to pause, to give time for the reading of a letter or some other stage business, which will later be inserted in that part of the film, he calls "Hold it!" meaning to hold the action. During the production of Director Henry MacRae's picture, "The Vagabond Soldier," at the Universal Pacific Coast studios, Mr. MacRae gave a new property man a bomb, with instructions when it was to be lighted and when it was to be thrown into the scene. The action in the scene progressed and finally reached the property man's cue for lighting the bomb. He lit it. The director instructed the actors as the scene progressed and finally called, "Hold it, hold it!" The new property man thought he was being addressed. He obeyed instructions and is now in the hospital at Universal City recovering from a badly burned hand and arm.

Rebel War Pictures Shown



A month or more ago announcement was made through the columns of the daily press that General Pancho Villa, Mexican rebel leader, had entered into partnership with President Harry Aitkin of the Mutual Film Corporation, to the end that motion pictures of his campaign against the federals might be recorded and exhibited in theaters all over the world. Recently the films taken by the Mutual's cameramen on the firing line began to arrive and wherever shown have aroused the greatest interest. First prints from the negative were shipped direct to Washington that President Wilson and his cabinet might see exactly what has been occurring across the border.



Some of the first "Mutual" War Pictures from Mexico—at the Top is Shown a Group of Refugees Washing at Camp Cotton, El Paso; Next Comes General Villa in the Center of the Middle Picture; Below, General Villa Reviewing Troops after the Battle of Ojiniga

Among the pictures which have to date been released are films showing the rebel forces on their way to the battle of Ojiniga, views of Mexican refugees encamped on American soil whither they had gone following the approach of federal troops, and unusually interesting close-up views of General Villa himself. Other and still more interesting pictures will probably follow as the campaign against President Huerta's troops progresses.

Big Game Hunting in Real Jungles

Those who enjoy animal pictures—films in which the savage beasts of the jungle are strongly featured—will find sufficient excitement in the latest Kleine, multiple reel feature, entitled "Between Savage and Tiger."

This six reel production of the Cines Company in Rome, Italy, makers of such celebrated pictures as "Quo Vadis" and "Antony and Cleopatra," contains a thrill in every reel, but interest centers about the shooting of a huge Bengal tiger within a few yards of the motion picture camera. This tiger, be it understood, is not a half tame beast, acquired from somebody's circus and dragged forth before the camera, but is a real man eating tiger filmed in its native wilds in the jungles of India.

Anthony Novelli, the same player who enacted the role of "Vinitius" in "Quo Vadis?" and "Antony" in "Antony and Cleopatra," in this picture plays the part of "Lieutenant James Ross," a hunter of big game, and it is he who shoots the tiger as it is leaping toward the camera. So close-up are the pictures taken that you get all the thrill and excitement of yourself being present when the shooting occurs, and your blood is sure to flow a bit faster through your veins as you behold the gigantic tiger coming straight toward you in huge leaps. His head is down, his tail switching, his nostrils expanding, ready for the fatal spring. Then suddenly the beautiful body hurtles through the air straight toward you! A dimly seen puff of smoke belches forth from the rifle barrel of the hunter in the foreground of the picture and the great tiger plunges forward on his head, rolls over and twists

No Playing with Drugged and Toothless Beasts in this Case—A Wild Tiger in a Real Jungle was Dropped in His Tracks Before the Camera

and squirms in mortal agony. Three minutes later you behold the natives triumphantly throwing a beautiful tiger skin over the back of the pack elephant.

The tiger hunt, as has already been said, is only one of the many thrilling spectacles in the six reels of film, for among other scenes shown are the blowing up of the powder magazine in a huge fortress, the killing of an antelope and water buffalo close up to the camera, the sinking of a huge freighter at sea, the capture of a tiger alive, and the rescue of the hero's daughter from a tiny hut in a native Indian village in which she is confined with a tiger. All of the jungle scenes are taken in the real jungles of India, while the rest of the picture is staged in the Cines studio at Rome.

INSECTS THAT MIMIC

Few persons have the patience and scientific knowledge to view the common insects of the wood and fields with such an observant eye as that of the motion picture camera. The Pathe film entitled "Insects That Mimic," from which the accompanying illustration is taken, shows how a caterpillar mimics a leaf bud even to the extent of hiding its tell-tale legs to complete the illusion. Pale green in color, it defies the sharp eyed birds that are its enemies, safe in its inconspicuousness. A giant weevil is also shown which, like the opposum, mimics death when annoyed. Other insects pictured are the "leaf winged locusts," whose wings closely simulate the leaves of the plants upon which they feed; the strange "walking sticks," looking like twigs and therefore defying detection, and the "walking leaf" of Malaysia, the most astonishing of all, the joints of whose limbs, the veins of the wings, the body, everything combine to give a remarkable representation of a leaf.

The "Walking Leaf" of Malaysia

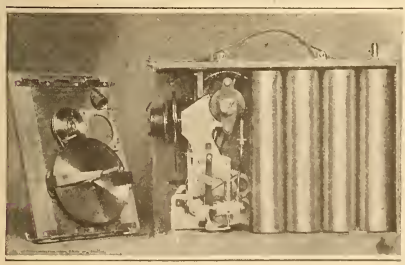
CELEBRATED AUTHORS WRITING FILM STORIES

The once despised motion pictures to-day are able to offer the works of some of the world's most celebrated writers in film form. The names of such writers as Rex Beach, Jack London and Roy Norton have long been seen on film posters as the authors of motion picture scenarios, but to-day one finds the Eclair Company announcing that it has secured the exclusive rights to film the works of Jules Verne and Arthur Stringer, the Vitagraph Company announcing the completion of Hall Caine's "The Christian," the Selig Polyscope Company filming Harold MacGrath's "Adventures of Kathlyn," and the Mutual Film Corporation heralding such a formidable array of authors as Thomas Nelson Page, ambassador to Italy; Paul Armstrong, playwright, whose drama, "The Escape," a romance of the underworld, is now being produced by Mr. Griffith personally; John Kendrick Bangs;

George A. Birmingham, who wrote that very successful Irish comedy, "General John Regan," now playing in a long run at the Hudson Theater, New York; Daniel Carson Goodman, author of "Hagar Revelly," the publication of which Anthony Comstock attempted to prevent; Zona Gale, Eleanor Ingram, author of "The Car Behind"; Robert H. Davis of the Munsey Magazines; Paul West of the *New York World;* H. R. Durant, playwright and associate editor of *"The Cavalier";* Gardner Hunting, editor of the *People's Magazine;* Homer Croy, the humorist of *Judge, Leslie's and Collier's;* George Pattullo and Roy Norton, both of whom are famous writers of Western stories; E. Phillips Oppenheim, the celebrated English novelist; Mary Roberts Rinehart, and Roy McCardell.

A MOTION PICTURE HAND CAMERA

The conventional type of motion picture camera has long been considered inadequate for the filming of topical, big game and hunting pictures, and the need for some compact light instrument which can be handled with the ease and simplicity of the ordinary snap shot or kodak apparatus. The first commercial success in this direction has recently been achieved by Mr. Proszynski, the Polish scientist, resident in England, who has perfected an instrument which he calls the Aeroscope.



The Aeroscope, an Instrument Perfected by a Polish Scientist, Who Resides in England

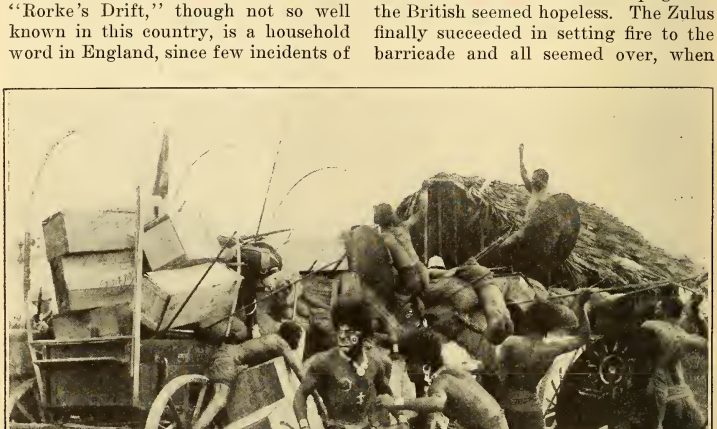
The Proszynski camera is driven by compressed air and is absolutely automatic in its operation, the exposures being made regularly at the desired number per second, all the while the control button is depressed and so long as there is sufficient air in the reservoirs to drive the mechanism. The instrument, measuring twelve inches in length by 8½ inches in width by 6½ inches deep and weighing fourteen pounds, is entirely self contained. It is fitted with separate film boxes inside the camera, any number of which may be carried and changed in full daylight, like the common kodak film roll. When loaded, the camera normally has 300 feet of film in the spool box, and the air reservoirs are of sufficient capacity to enable 600 feet of film, or two full boxes, to be exposed upon a single charge.

The compressed air is contained in four cylinders placed side by side and interconnected, so that as soon as one is exhausted the next comes into action. The air reservoirs are charged by means of an ordinary cycle pump in the same manner as if pneumatic tires were being inflated, the camera being placed upon the ground for this purpose. The charging valve is placed upon the top and is closed with a screw cap to prevent the entrance of dust. About 40 strokes with the average foot pump is sufficient to produce a pressure of 100 pounds.

Max Asher and a half-dozen others narrowly escaped being seriously injured during the production of the Joker comedy, "Love and Politics," when they slipped from a steep roof and fell into a nest of burning, oil-soaked rags. Their clothes took fire, and they were only saved by the speedy use of blankets.

A POWERFUL BATTLE PICTURE

One of the most powerful film stories of the last few weeks was Edison's two reel drama entitled "Rorke's Drift," which is an historically correct representation of the battle at that point between British troops and Zulu savages. "Rorke's Drift," though not so well known in this country, is a household word in England, since few incidents of



Dramatic Attack of Zulus Upon British Soldiers in New Photoplay Entitled, "Rorke's Drift"

British warfare surpass this engagement for a display of real valor and invincible courage.

History records that in the spring of 1879 a company of 80 British soldiers was marching through the hostile country of the Zulus when they were suddenly attacked by 4,000 savages. The little band seemed doomed to destruction—surely less determined men would have succumbed to the overwhelming odds. Time and again the Zulus succeeded in swarming upon the barricade, which the little band of cornered men had erected, but each time they were driven back by the desperate soldiers. Hundreds of savages lay dead about the barricade and still their forces seemed undiminished and the plight of the British seemed hopeless. The Zulus finally succeeded in setting fire to the barricade and all seemed over, when an officer, who, in the night, had managed to slip through the cordon of savages, arrived with reinforcements which he had led to the scene of the struggle at top speed. The Zulus were then swept back, repulsed and fled away to their native villages.

Edison has built a photoplay full of suspense, rapid action and battle scenes about this event and has staged it most carefully as the accompanying illustration will prove.

Curtiss Flying Boat to Cross the Atlantic

Glenn H. Curtiss, one of the foremost of our American airship pilots and builders, has been very quietly at work constructing an airship and perfecting the details for a 1,900 mile flight across the Atlantic ocean from Newfoundland to the Irish coast.

The existing record for duration of flight is held by M. Fourny, a Frenchman, who flew in a Farman biplane for thirteen hours and seventeen minutes, Sept. 11, 1912. The record for the greatest distance flown in one day is held by a German, Victor Stoeffler, who covered 1,340 miles. This distance record was not established before the wind, but in a circuitous flight.

The huge air craft which Mr. Curtiss has under way, and which it is believed will smash all duration records, is being rapidly assembled at his plant at Hammondsport, N. Y., and it is already so far under way that it will be finished, unless something unforeseen occurs, in time for an attempt to be made to cross the Atlantic during the coming summer.

It is being built, on plans drawn by Mr. Curtiss, in the form of a flying boat and will be named the Rodman Wanamaker Transatlantic Flyer, in honor of its backer, the son of the noted merchant prince, John Wanamaker.

This wonderful flying boat will be supplied with a light, but very powerful and new type of engine of 200 horsepower, and it is hoped that it will make the transatlantic trip, at an altitude of 10,000 feet, in not over 24 hours.

The attempt to cross the ocean will be under the auspices of the Aero Club of America, of which Alan R. Hawley is president.

Although the purpose of this flight has nothing to do with prize winning, the air voyagers will, if successful, win the Lord Northcliffe prize of $50,000. The cooperation of the governments of the United States and of Great Britain and of the Royal Aero Club of England will be sought.

The English government and our own will be asked to send vessels to different points on the course. The navigator of the air craft will be furnished with a chart showing the location of these vessels and the approximate location of every transatlantic liner. It is also proposed to make the flight a yachting event in which the owners of private yachts will view the flight from mid-ocean.

Lieutenant Porte, a skillful English flier, was one of the first to be taken into the secret and it is understood that he will be one of the fliers.

As has been stated, the flight, according to present plans, will be made at an altitude of 10,000 feet, where the wind velocity is between four and five times the ground speed. The start will be made during the season of prevailing westerly winds. The fuel supply to be carried will be based on the requirements for making the entire distance at the actual flying speed of the machine. That is, there will be enough gasoline aboard to fly the machine at 60 miles an hour for more than 30 hours.

Soon after leaving the coast of Newfoundland the fliers will be in the regular track of Atlantic liners, and it is thought that they will at no time be out of sight of vessels. If the motor should stop at the 10,000 foot level the machine will have a gliding radius of fifteen miles in any direction. A wireless telegraph will be carried which will put the fliers in touch with any liner within 100 miles.

One of the men will fly the boat while the other attends to the navigation. It will scarcely be necessary for the navigating officer to look over the side of the cockpit in the flight between the

two continents, so complete will be the equipment to tell the altitude, angle of flight, speed, direction and position.

While the details of the plans of the airship are still a secret it is known that the craft will be like an unusually large Curtiss flying boat. The hull is torpedo shaped and almost entirely inclosed, so that in case of a forced landing in mid-ocean it would float for days. The wings which will have a spread of 80 feet and a lifting surface of nearly 1,200 square feet will be detachable, so they could be dropped off to allow the boat to float alone.

The 200 horsepower motor will be installed in the bow where it will be accessible for adjustment in flight. The cockpit proper will be twelve feet behind the motor, and in it will be room for two men to sit at ease. The controls will be duplicated, so the machine may be handled by both men or either.

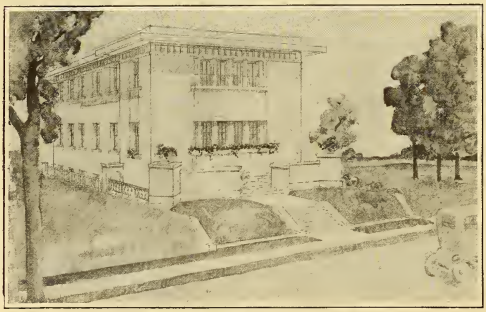
A tractor screw in front of the machine will be used instead of the ordinary propeller.

As to the chances of success, when Mr. Wanamaker decided to carry out the project, Mr. Curtiss said to him:

"We can calculate the probable speed of the machine; we know the distance to be flown, the quantity of gasoline and oil we must carry; we know from experience that flying is the least tiresome way of traveling—that a man can fly 500 miles under average conditions more easily than he can drive an automobile 100 miles. It would all be up to the motor. Our experience tells that we can run our modern aviation motors from 40 to 50 hours at full speed. So far as the machine itself is concerned, if it will fly a minute it will fly a week. I figure that the chances of success of the flight would be about nine out of ten."

TELEPHONE EXCHANGE IN MISSION STYLE

The Pacific Telephone and Telegraph Company is building a new type of exchange building at Seattle. Growing service has so pressed the three large exchange buildings that an exchange in the exclusive residence district on Capitol hill has become necessary. That this building may harmonize with the fine residences surrounding, the Company is resorting to mission style in its architecture and when completed the building will resemble a costly residence instead of a business house.

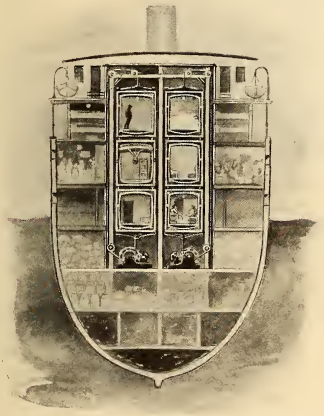


Telephone Building Which Resembles Costly Residence

The building will be two stories high with a basement. It is to be set well back from the street, so that attractive arrangements of the lawn and shrubbery may be made. The building material will be of a slow burning character, the exterior walls being of brick cemented smooth. A large veranda will be a feature of the front, with an entrance at the side. Palm gardens, trees, and shrubbery will be laid out at the front and rear and the windows and veranda posts will be ornamented with potted plants.

AVOIDING "DANCING" OF SHIPS' CABINS

In a voyage at sea, one learns that a vessel can make several kinds of unpleasant movements when the water is at all rough. When lying in a berth, one experiences first the rolling, which alternately raises the head higher than the feet and then the contrary, or brings first the right side and then the left above the other. The worst motion is the sudden rising and falling; but the unpleasant feeling is not caused by the motion itself, but by sudden change of velocity.



Novel Plan to Hang a Ship's Cabins in an Elevator and Control Their Action Electrically

Rolling is comparatively easy to prevent, but, to prevent rising and falling, up to date there seems to have been but one solution offered—that of Professor Korn of phototelegraphic fame, who proposes to place special cabins in an elevator which will rise and fall automatically with the same varying speed as the vessel itself, but in the opposite direction; so that they will, so to say, remain in the same plane in space. The tanks which have been tried for the purpose of preventing rolling have not been successful in preventing "stamping"; and it was not to be expected that they would be.

The traveling public is of the opinion that the vertical motion of the vessel is very considerable; it is, however, even in heavy storms, comparatively slight.

Professor Korn proposes to hang the cabin in an elevator with a motor which shall raise and drop it automatically; its action being electrically controlled. For the solution of this problem there should be two factors necessary; first to measure the speed of rise or fall with exactitude, and then to utilize these measurements for controlling the motor. Both problems are solvable by modern electro-technics.

It is not to be expected that on board a ship there could be many such cabins; but there are always travelers who are willing and able to pay any price to be free from the "stamping."

The fundamental idea is that velocities which are invariable do not annoy us. We note this, once an ordinary passenger elevator in which we stand has started and continues in its course with constant velocity. The sudden starting and stopping is annoying—the more sudden, the more annoying.

Now suppose that in the cabin there are two horizontal planes fixed with regard to the cabin itself; and that we let a little ball fall from the upper to the lower plane. If the cabin is immovable, the ball will require a definite time to fall from one plane to the other. This time would be the same if the cabin rose or fell with constant velocity; but if it did this with a varying velocity, this would not be the case. If while the ball was falling the cabin was rising with accelerating velocity, the fall would take place in less time; it would take more time if the cabin received an increased veloc-

ity in a downward direction. If then, the time of falling of the ball is registered electrically, we have a method of measuring the vertical velocity of the cabin. The same apparatus, by means of electrical control system which cannot be described in non-technical language, can vary the resistance of the motor proportionally, and thus keep the cabin practically suspended in space. As far as prevention of rolling is concerned, the ordinary universal joint suspension is recommended.

ILLUMINATED PLAQUE

A Holophane novelty is a translucent glass plaque made up so that it may be used as a wall or pillar decoration. The space behind the raised portion of the figure is sufficient to permit the installation of an incandescent lamp. The plaque is finding use upon the walls at the entrance to buildings, moving picture shows, art galleries, etc., where little illumination is required and a decorative effect is desired.

Illuminated Novelty to be Used as Wall or Pillar Decoration

ELECTRIC "SAFETY FIRST" SIGNS

"Safety First" Signs

Electric "Safety First" signs are now extensively employed by the Lehigh Valley Railroad to impress upon its employes the necessity for carefulness. The two here reproduced are located at the company's Sayre, Pa., shops and are placed conspicuously so that every man entering or leaving the shops must see them. The lettering is carried on frosted glass with strong illumination behind.

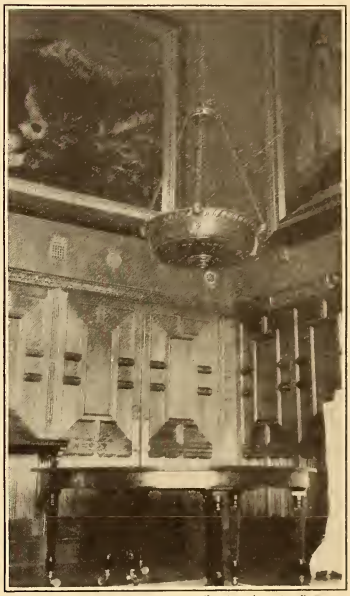
LIGHTING A DUCAL DINING ROOM

Previous to the development of the incandescent light, gas and kerosene were the only brilliant illuminants that could be utilized in small units. Both were difficult to arrange decoratively. Moreover the subject of light distribution was little studied and little understood. Fixtures were located according to the fancy of the workman and the worst lighted interiors were often those where the most money had been spent.

Electricity, on the other hand, is so flexible that it can be utilized in the ceiling or wall, or near the ceiling and the direction of the illumination can by reflectors be completely controlled. This makes it suitable for lighting, artistically and effectively, not only the modest room but also the most sump-

tuous interior. The picture shows a corner in the dining room of the Duke of Westminster's palace in London. There are four indirect lighting units and the fixtures are so arranged as to flood the interior with soft light. This is admirably accomplished by the inverted hanging bowl equipped with reflectors and tungsten lamps.

Handsome woodwork, paintings and tapestries are effectively illuminated and their beauties brought out as never before on account of the efficiency of modern illumination.



Courtesy Augustus D. Curtis

Corner of a Ducal Dining Room in London

STANDARD TIME

The standard clock of the United States is kept in a glass case in a dark underground vault in the Naval Observatory in Washington. It is so placed that no changes in temperature may affect it and it is wound half-hourly by means of electricity. It is the clock in this country that most nearly approaches perfection. Scientific officers of the government, regularly detailed for the duty, watch over it day and night, constantly correcting it by observations made from the sun and stars.

Thus this clock in the great glass case, though of itself it does not keep time with the sun and stars and the earth, is made so accurate that even the scientists, who say that there is no clock in the world that is perfect, call its time "correct." Strictly speaking, we are assured, the "only thing that does keep time" is the earth, changelessly rotating through space. But mathematicians and astronomers concede that the time of the big clock inside the glass case comes "near enough." That means within some thousandths of a second.

It is this "almost perfect" clock that sets the "standard time" of this country. The enclosure in which it stands in the Observatory at Washington is surrounded by three walls with spaces between. It rests on massive stone pillars that reach far into the earth. The temperature is so maintained that, should a human being step into the room, the increase in temperature occasioned by this intrusion would be registered on a thermostat of almost incredible delicacy.

The corrections continually being made in this clock's time by reason of the astronomical observations are seldom more than ten one-hundredths of a second. They are frequently less than five one-hundredths.

From the "almost perfect" clock, which is in duplicate, wires pass to two time sending clocks in another room of the observatory. It is through these that "time passes out to the country." Only one of the two last mentioned

clocks is needed at any one time, but there must be two to guard against accident. If science cannot quite succeed in getting any clock to keep absolutely accurate time, it can nevertheless get one to run precisely as another, to the veriest dot. So, with his hand on a telegraph switch, a man waits alongside the two auxiliary clocks a few minutes before noon each day. Five seconds before twelve he gives the first signal. Five minutes later, all the telegraph trunk lines of the country having halted and cleared away all other business meantime, time is officially announced.

England's standard time is derived from the famous Royal Observatory at Greenwich. It is an historic hill upon which stands this observatory. The granite line across the footpath on its summit is the meridian from which the longitude on every British map and chart is calculated. All England sets its time by the mean solar clock, and in addition to the daily and nightly observations of the heavens, elaborate records are kept of the diurnal changes in the temperature and humidity, the direction and force of the wind, the amount of sunshine and rainfall, the earth's magnetism, and a host of meteorological matters forming a science of daily increasing importance and interest.

Here is the large galvano-magnetic clock, fixed on the outside wall of the observatory and divided into 24 hours. The sidereal clock, kept within one of the buildings of the observatory, is corrected by observations of the stars every clear night, and every morning before ten o'clock the mean solar clock is checked from it. The latter is housed below the timeball on the white tower that dominates the hill and is in magnetic connection with the clock in the boundary wall, which has furnished the correct time to countless visitors to the hill since it was placed there in 1852.

To this galvano-magnetic clock in the wall comes, every Monday, a woman who makes $2,500 a year in the queerest way imaginable. She sells the time to London watchmakers. Her name is Miss Belleville, of Maidenhead. Eighty years ago the then Astronomer Royal suggested to her father that if he took the corrected time on a certified chronometer every week he could no doubt find numerous clients. So Mr. Belleville bought a famous watch made for the Duke of Sussex, one of the sons of George III, and soon worked up a business with it. When he died his widow sold the time until she was 81 years old, when she handed over the business to her daughter, referred to above.

In these days, when Miss Belleville visits Greenwich at the beginning of each week her chronometer is corrected and she is given an official certificate. From this certified chronometer her customers correct their watches and clocks.

THE ELECTRIC HEATING PAD

For pain and inflammation where a water bottle was useful, the electric heating pad more fully meets every requirement. For muscular trouble it is particularly desirable be-

cause it can be applied in any position. In the nursery or the invalid's room it affords comfort in many ways. The maximum temperature is limited automatically to about 180 degrees. Those pads supplied with a regulating switch give three degrees of heat. The switch is on the cord within easy reach, so that the heat may be controlled without rising.

"A SEEKER OF LOST ISLANDS"

Several months ago, a British cruiser reported a sunken island in the Pacific Ocean off San Pedro, Calif. The naval department of the United States Government immediately despatched the U. S. S. Buffalo to look into the matter and verify or contradict the report as the case might be.

The accompanying photograph shows the instrument used in the work of determining the depth of the water at the particular point, and a comparison with the previous hydrographic record suffices to determine whether the depth has changed or not.

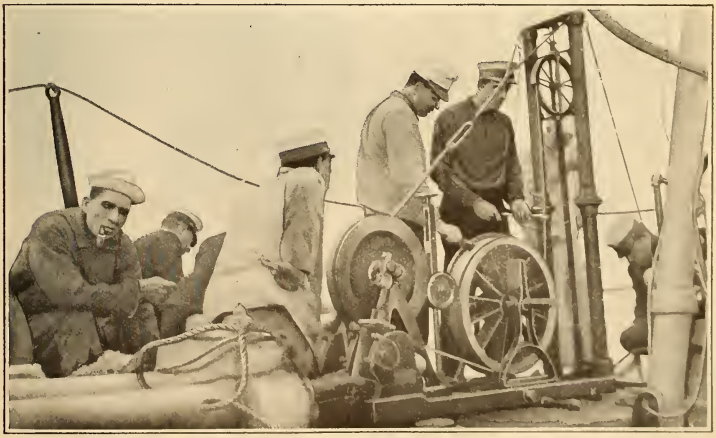
The customary procedure is as follows: A large brass weight, to which is attached a pressure gauge, is sunk until it touches bottom. When it is raised, the depth to which it has been lowered can be ascertained by noting the highest mark on the glass. The apparatus in the foreground is a high speed steam winch used for rapid hoisting of the weight, as soundings are often made in water several miles deep.

The U. S. S. Buffalo's tests disproved the "sunken island" report.

AUTOMATIC POPCORN MACHINE

The electric automatic popcorn machine is an ingenious device for making sanitary popcorn. The moment the handle is turned, the machine is placed in motion automatically, measuring out the exact quantity of corn required. The corn is popped by electric heat and deposited in a paper bag and the entire operation may be seen through the round plate glass window.

Imagine what this remarkable machine does. It makes the contact and



Instrument Used on United States Naval Steamship to Determine Depth of Water at a Particular Point

Clean, Wholesome Corn is Popped by this Remarkable Machine

throws the switch. It starts the motor and measures just enough corn for one bag and pops the corn. It shoves out the paper bag and deposits the corn in the bag. It measures out enough salt and butter for that one bag. This is done by pressing the buttons marked seasoning. Then it dumps the unpopped kernels. It keeps in sight every nickel until the next nickel is paid.

"NO ELECTRIC BULBS VISIBLE"

"No electric bulbs visible" is an advertising slogan of a fine resort hotel on the side of Sunset Mountain near Asheville. The Inn is built of great boulders of the mountain and it was built by hand in the old fashioned way but the interior shows the hand of the modern engineering expert who has achieved the full benefit of indirect illumination remarkable for its freedom from harsh shadows. In the field of interior illumination there have been three great steps: Light, more light and better light, but possibly Grove Park Inn is the first large establishment of its kind to advertise publicly the scientific control of the light flux by indirect methods.

CLEVER ART WORK WITH THE PROJECTOR

There are many "lightning artists" seen on the stage who have very little to do with electricity, though their title would suggest the connection; but there is one of these clever vaudeville performers who has an act in which electricity really plays an important part. He makes all his pictures on a circular plate of red glass about seven inches in

An Interior that Shows the Hand of the Modern Engineering Expert

diameter. This he covers with a coating of some black substance first, then etches in the picture, sometimes comic, often beautiful, by scraping away the black, leaving the red to show through. This is then slid into an electric projector or stereopticon and the cartoon or drawing revealed on the screen. He even works on the glass with it held in the rays of the machine, so that the

progress of the work may be watched by the audience, who are astonished to see him suddenly, with a few deft strokes, change the picture from that of an ugly old hag, to that of a bewitching girl.

SIBERIAN ICE BREAKER ASSEMBLED BY CONVICTS

On Lake Baikal, in Siberia, there is a large ice breaker used for transporting trains, goods and wagons across this great inland sea. This craft, one of the largest of its kind, can claim the distinction of having been assembled by convicts. The vessel was built on the Tyne in England and after being tested it was dismantled, the various parts numbered, and then sent by train and boat to the lake. The ship alone consisted of over 6,000 separate parts, and the machinery some 1,200 parts, their combined weight totalling over 3,000 tons. Arriving at their destination the various parts were reassembled by the convicts from the Russian prison nearby under the direction of two English engineers.

"We found these workmen," says one of the engineers, "a very hardy lot, rough and ready, but certainly obliging and willing. Indeed, they proved very good workmen. We felt a little nervous about them at first, as among them were many men who had been banished to Siberia for murder and other deplorable crimes. The majority consisted of political exiles and many of these were men of high intelligence. They took great interest in the 'big ship' and could hardly believe it was possible to construct a ship large enough to carry trains.

Big Ship Assembled by the Convicts of Russian Prison Under the Direction of Two English Engineers

THE AGE OF THE OCEAN

The ocean is not, of course, as old as the earth, since it could not be formed until the surface of the globe had cooled sufficiently to retain water on it. It may, therefore, seem chimerical to try to measure the age of the sea, but the task has been undertaken. The estimate has been based upon the ratio of sodium it contains to that annually contributed by the washings from the continents. The conclusion has thus been reached that the ocean has been in existence between eighty millions and one hundred and seventy millions of years. This does not seem to be a very definite determination, but, in geology, estimates of time in years are extremely difficult because of the uncertainty of the elements of calculation.

Printing a Chinese Daily

New York has another daily paper. If you should happen on upper Park Row (at the point of its junction with Third Avenue) most any afternoon after three o'clock you will hear a lot of ragged newsies shouting lustily "Mon Jee Yat Bo." That is the name of Manhattan's latest daily paper, for it's a Chinese daily.

Moreover this daily paper is brought out in the most up-to-date fashion; by the use of electricity. Electrical dictating and addressing machines are used by the editorial and circulation departments respectively while the presses are all motor driven. The print shop from which the daily appears every afternoon at three o'clock, is located in the fifth story of the more or less modern office building at No. 65 Park Street, just on the outskirts of Chinatown. Tom Tuy Gum is the managing editor and his assistants are Tong Shu San, Mon Lin Chang and Mon Soon Jung. Harry Lum, formerly connected with the *Chinese World,* San Francisco, is business manager.


MON JEE YAT BO

志民日報

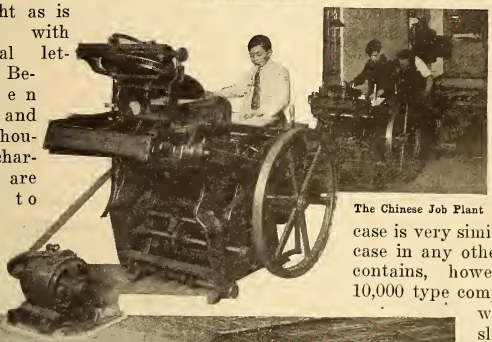
First Page of New York's First and Only Chinese Daily—Mon Jee Yat Bo

The paper is one of the results of the undercurrent of progress that has been in evidence in New York's Chinatown for some time. It is the only daily publication of its kind east of San Francisco and though only a month old it already has a circulation of between 8,000 and 10,000. This circulation is by no means limited to New York. A thousand or more copies are sold in Chicago, almost as many go to Buffalo. Canada comes in for its share, too, as well as do the southern states. In fact the paper has taken the same place in the East and Middle West as that occupied by the *Chinese World* in the Far West and Southwest. Indeed the Mon Jee Yat Bo now has a larger circulation than the much older dailies published out on the coast.

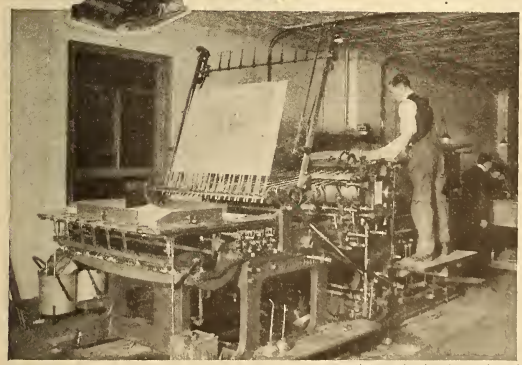
The first issue was printed on December 15, 1913, and according to the custom of the Celestials it was printed

in red ink. The initial issue of any Chinese publication is either printed in red ink or on red paper. Succeeding issues were printed in black ink, however. The only English characters used in the sheet are the letters in the date line on the first page. The Chinese characters, each a complete word, read from top to bottom and from left to right as is usual with Oriental lettering. Between three and four thousand characters are used to print each issue. It is an eight page publication.

This Type Case was Made in Shanghai. It Contains Spaces for 10,000 Characters, The Type was also Cast in a Shanghai Foundry



The Chinese Job Plant



The Mon Jee Yat Bo Going to Press

Photos by The New York Edison Co.

The Print shop is like any other modern print shop with one exception. Down the center of the room is a huge type case some 30 feet long. In appearance this case is very similar to the job type case in any other print shop. It contains, however, more than 10,000 type compartments each of which is filled with slugs of one particular character. Considering this, it is fortunate for the Chinese compositor that there are no lower case and caps in his language. Besides the type case, which by the way is built in Shanghai, where the type is also cast, the print shop has several fonts of English type for translation purposes. One large flat bed press, driven by an electric motor, is used to print the sheet while two job presses and a folding machine complete the printing equipment.

NEWEST FEATURE OF INDIRECT ILLUMINATION

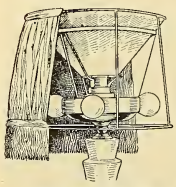


Table Lamp with Indirect Light Attachment

The newest idea in the development of indirect illumination is the elimination of the ceiling fixture and the use of a single parlor lamp. Apparently this lamp is the same outwardly as other silk shaded lamps but inside the shade is the mechanism that puts this new lamp in a class quite by itself.

The indirect light is produced by inverting an opaque reflector, placing in it a powerful tungsten lamp and concealing the whole within the lamp shade. Pulling the switch chain on the right hand side of the lamp, lights the three small lamps on the edge of the disk. These are ten watt Mazda lamps and they give the shade the decorative effect of the usual art lamp.

When a general illumination of the room is desired, pulling the opposite switch lights the larger Mazda lamp contained within the large opaque reflector. This powerful X-ray reflector is supported in the right position by the holder, the bottom of the reflector is open and a small percentage of the light from the large lamp strikes the white upper surface of the disk. These light rays are reflected against and illuminate the shade, making the use of the small lamps unnecessary when the indirect light is turned on.

In other words, the small lamps give the downward light and the desired decorative effect of an art lamp. Switching on the larger lamp floods the room with a soft, beautiful illumination which must be seen to be appreciated.

This New Lamp Eliminates the Ceiling Fixture and Provides General Illumination or the Subdued Effect of an Art Lamp

EXTRACTING SWEET SCENTS FROM FLOWERS

Large quantities of lavender oil are distilled in southern France from flowers which grow wild in that region It is limpid, colorless or yellowish, with a strong odor and a pungent, aromatic, somewhat bitter taste. The peculiar qualities of most plants are susceptible of improvement by cultivation, but none perhaps more than the lavender plants.

According to Messrs. Schimmel & Company of Leipzig, the very finest oils are produced from the higher valleys of the Savoy Alps and what is called Alpine lavender of France is remarkably good. This Company has devised an itinerant lavender distillery for use at Castellane, and at Barreme they distill between 25,000 and 28,000 kilos of lavender flowers daily.

Half a hundredweight of good lavender flowers will yield by distillation from fourteen to sixteen ounces of essential oil. For perfumery, lavender oil is of great importance, it being much employed by itself, as well as mixed with other oils. There are two methods of making essence of lavender, by distilling a mixture of essential oil of lavender and rectified spirit or by merely mixing the oil and the spirit together.

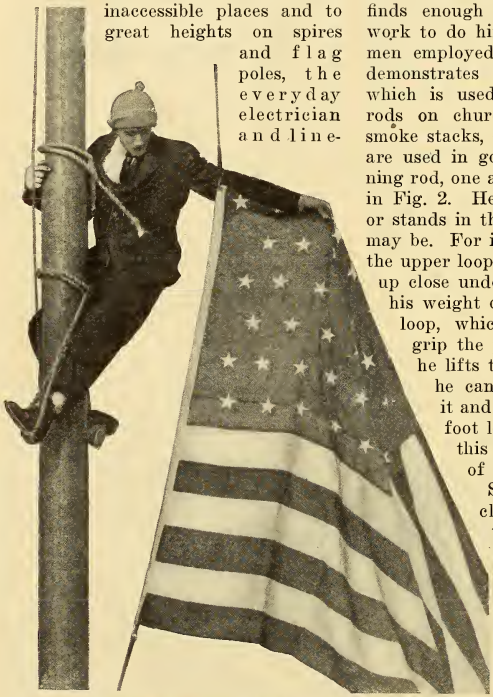
LIGHT GIVING MINERAL OF CORNWALL

The people of Cornwall, in England, aver that at night there may be seen there a faintly shining mineral among the rocks rejected from the mines. That this is not pure imagination on their part has been proved by scientific investigation. A specimen of the mineral autunite, which is also found in Wales, was sent to a scientific body at London for examination of its apparently luminous properties. It was found that it closely resembled artificially prepared salts of uranium, and that its luminosity was due to its spontaneous radioactivity. The light it sheds is stronger than that of nitrate of uranium.

Itinerant Lavender Distillery at Castellane

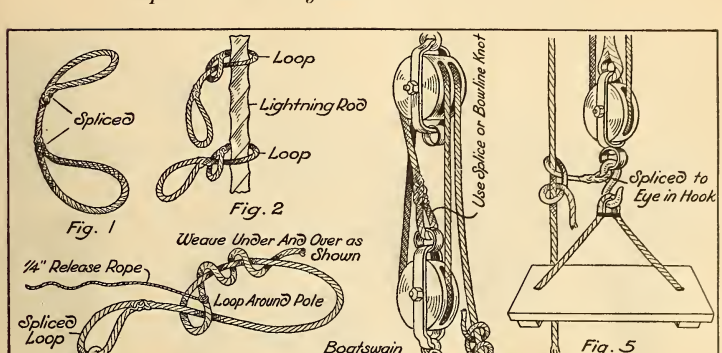
Steeple-Jack's Hints on Putting Up Wires

In these days of spectacular illuminations for conventions, street fairs, holiday events, advertising, etc., when wires and supporting cables must be run to all sorts of nearly inaccessible places and to great heights on spires and flag poles, the everyday electrician and lineman often finds himself in a quandary as to how to proceed with the work. If he is a "nervy" fellow and at the same time careful, he may follow the directions given below on some occasion and save a lot of time and money, through being able to do some difficult job of wiring without the necessity of erecting scaffolding.



Steeple-Jack Von Kaenel Mounting a Flagstaff by Aid of the Climbing Loops

The hints here presented are from Edmond von Kaenel of Chicago, an expert steeple-jack, who not only finds enough of this nerve racking work to do himself, but keeps several men employed besides. In Fig. 1 he demonstrates the von Kaenel loop which is used in climbing lightning rods on church steeples, flag poles, smoke stacks, etc. Two of these loops are used in going up a pole or lightning rod, one above the other as shown in Fig. 2. He sits in the upper loop or stands in the lower one as the case may be. For instance, while sitting in the upper loop he draws the lower one up close under him. Then he places his weight on the foot in the lower loop, which causes the latter to grip the pole. Straightening up, he lifts the upper loop as far as he can and then sits back in it and once more draws up the foot loop. The photograph on this page illustrates the use of the loops very clearly. So much for the actual climbing. Having reached the top of a pole or steeple, suppose he wishes to attach a rigging for a block and tackle, so that a string of wires may be hoisted up for a festoon effect or something of the sort. He wishes also to arrange this so that after the event, by simply pulling a line from below, the whole thing will fall clear of the pole. (Many electricians have spent as much time taking down their wires and tackle as in putting them up.) This is how he goes at it: When the tip is reached, a knot is used known as a



Various Knots and Tackle Used by the Steeple-Jack in his Work

timber hiteh, shown in Fig. 3. This timber hitch has a quarter inch release line fastened to it as shown, for the purpose of releasing the rigging when the work is completed. The splieed loop in the lower end of the timber hitch is made to hold the hook of the taekle bloek.

The block and taekle now in plaee, as shown in Fig. 4, may be used to draw up and hold temporary festoons of lamps, ete. But perhaps on the other hand, it is desired to do some wiring on the steeple, or around the pole, requiring a man to be hoisted. In that ease, a boatswain's ehair is employed as shown in Fig. 5. He raises himself by pulling down on the free running end of the line running through the pulleys.

But he might have heart failure or a dizzy spell and let go the rope, in which case the ehair and he would drop. Therefore a safety rope is splieed through the eye of the taekle hook and two half hitehes taken round the draw line as shown. The hitehes are slipped along over the draw line as he proeeeds upward, but if he should forget and let go of the draw line they would grip it and hold it from running through the bloeks, preventing a dangerous and perhaps fatal fall.

When the entire job is eompleted he takes the release rope and lowers it to the ground and ties it to a tree or post temporarily and pulls the rope through the bloeks so that just the double block is hanging on the timber hiteh. When all the bloek and taekle rope is to the ground, he pulls the release rope and the timber hiteh will open and fall to the ground, after whieh he coils up his rope and the job is done.

NICKEL A BY-PRODUCT

There are no producing nickel mines in the United States. The output of nickel from domestic ores is merely a by-product from electrolytes of the copper refineries. Salts and metal equivalent to 328 short tons of metallic nickel were saved in domestic refineries in 1912 from both foreign and domestic ores. Nickel ore "imported for consumption," is mostly from the Canadian deposits.

The Cycle Toboggan Offers Unique Diversion to Winter Tourists

SWISS CYCLE TOBOGGAN

In this winter scene taken in Switzerland, a new type of coasting device is shown called the cycle toboggan. The frame, somewhat similar to that of a bicycle, rests upon two runners the front one of which is used in steering, the course and balance being maintained by manipulating the handle bars.

A SPLENDID USE FOR A TELEPHONE.

High up on one of the stage walls of the auditorium of Cornell College at Mount Vernon, Ia., there has been for several years a telephone with its receiver always down. Of the thousands of people who have listened to splendid entertainments in that hall, hundreds have asked, why the telephone in that strange place?

The story is brief. The telephone is connected with a receiver at the bedside of a helpless invalid several blocks away. This sweetly patient person for many, many years has remained helpless in her bed. Deprived of all the usual pleasures of life, she would have to depend upon neighbors and friends for messages of cheer were it not for the telephone. As the hours drift into days, weeks and years, she is afforded moments of unbounded gratitude by listening at her receiver to the splendid vocal and instrumental music that is frequently provided in the college building on the hill. In that auditorium each spring a world-famous symphony orchestra participates in several programs. Famous singers add to the pleasure of the musical festival. During the year countless other entertainments bring some of the world's best talent. And the best of it all is that it is available to the eagerly listening invalid.

If you would write the value of modern science, surely you would include a tribute to the perfecters of the telephone, whose labors have brought the sunlight of opportunity to many a lonely bedside. Isn't there some place in your community where a cheap, easily installed telephone could bring hours of pleasure to some lonely shut-in?

RADIUM ONCE EXTRACTED CAN BE USED FOR GENERATIONS

The effort of the Federal Government should be, and Secretary Lane states that he believes it will be, directed to the promotion of all mining of radium ores in Colorado and Utah, in any and every way conducive to the protection of America's interest in the product. Early exhaustion of these deposits in the sense that we speak of exhaustion of other mineral resources is something which need not be feared. The radium once extracted from the ores becomes available for continued use without appreciable loss and becomes a permanent addition to the needed supply. The same radium that is placed at humanity's service to-day may be used by our children for many generations.

Whatever the percentage of American ores now exported from mines in private ownership and largely under corporate control, it is, in Secretary Lane's opinion, only equitable and humane to assure America preferential rights to the radium on land still in public ownership. It is for control to this end that the legislation is proposed, and such control is to be secured through the immediate opening of mines and the prompt extraction of the radium from the ores mined.

WASHINGTON'S DOUBLE DECK CAR

A double deck street car has recently been tried out in Washington, D. C., which is not only an innovation in traffic in that city, but is among the very few cars of this type in the United States. It is a middle entrance pay-as-you-enter type and will seat about 100 people. It was built under the direction of the master mechanic of the railway company over whose lines it will be run.

New Street Car That Promises an Innovation in Traffic in Large Cities

A few cars of this type have been tried out in Pittsburgh and in New York, but they have not proven entirely successful. Both of these types were studied before building the Washington car, the latter being built with the best points of both the other cars. The Washington car will be run for a short time for experimental purposes, at the end of which time if successful more of the same type will be built to be run on suburban routes.

Fighting the Mountains

An Interview with Henry K. Wicksteed, B. A. Sc., Chief Engineer of Surveys for the Canadian Northern Railway

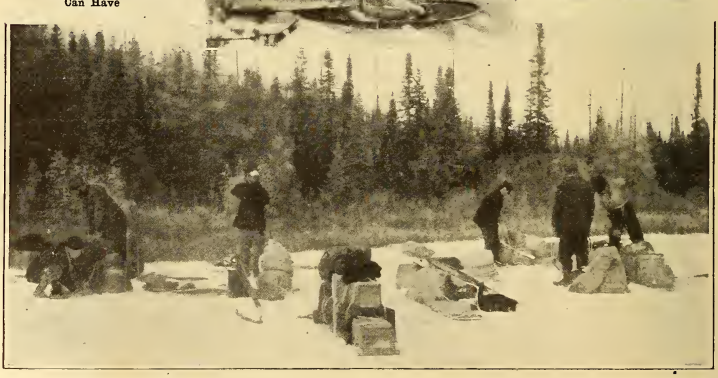
By ROBSON BLACK

"Mr. Wicksteed, the building of a transcontinental railway has never suggested more to the average magazine reader than stock exchanges, dynamite, construction gangs, and a few such phrases. What I want is to dig underneath and get a chief engineer's 'confession' of his problems, his opinions, and maybe some of the everyday axioms that no one but himself regards as commonplace."

Mr. Wicksteed's eyes—the beaming goodtempered eyes that seldom you see on the indoor man—focused on the bowl of his pipe. It was the same pipe that had puffed him comfort beside a thousand camp fires from side to side of Canada. And when he spoke and tried to help me out it was with no more starchy diction than one might expect from a bronzed pathfinder discussing the points of his pet canoe. Mr. Wicksteed's last great undertaking was the surveying of the important link in the Canadian Northern Railway's ocean-to-ocean system, a 500 mile stretch between Port Arthur and Sudbury. Back of that undertaking stands a professional lifetime of arguing scientifically with mountain ranges in British Columbia, of stretching steel over the prairies, and spanning rivers with a single arm. Mr. Wicksteed needs no other title to distinction than the fact that he first conceived the idea of breaking through the 'impenetrable' lines of rival railways into the heart of

An Ojibway Indian is One of the Best Axmen a Surveyor Can Have

Supplies are Distributed by Dog Teams to Various Camps



Montreal by digging a tunnel through the huge Mount Royal and paying for the whole scheme by creating high land values at the mouth of the tube. Many names have been credited with doing that trick, but Mr. Wicksteed is the man who *did* it.

"It is a rather common impression," he observed, taking up my question leisurely, "that the job of driving a railway line through a range of mountains is the one thing that tests the patience and ingenuity of the engineer. In the country to the north of Lake Superior, difficulties are to be met, quite as perplexing—indeed, I think, more so—than anything the mountains can offer. When a survey party enters the Rockies, the river courses must be accepted as their guide from point to point. Drainage really establishes railway routes, for water takes the lowest level, and tracks must run where grade is slightest. Elevations are so tremendous that no option is allowed as a general rule in working a way through. In the rocky, swampy, undulating territories over the back of Lake Superior and for 500 miles to the east and south, four parties of from fifteen to seventeen men apiece spent five years determining the best line. Our trouble was that we faced a dozen or more possible 'best lines' and were never certain that there were not three or four more that we might have missed. The country is so vast, so irregular, that we would have welcomed a mountain range as a long lost brother."

"Is the preliminary survey a costly item in railway building?"

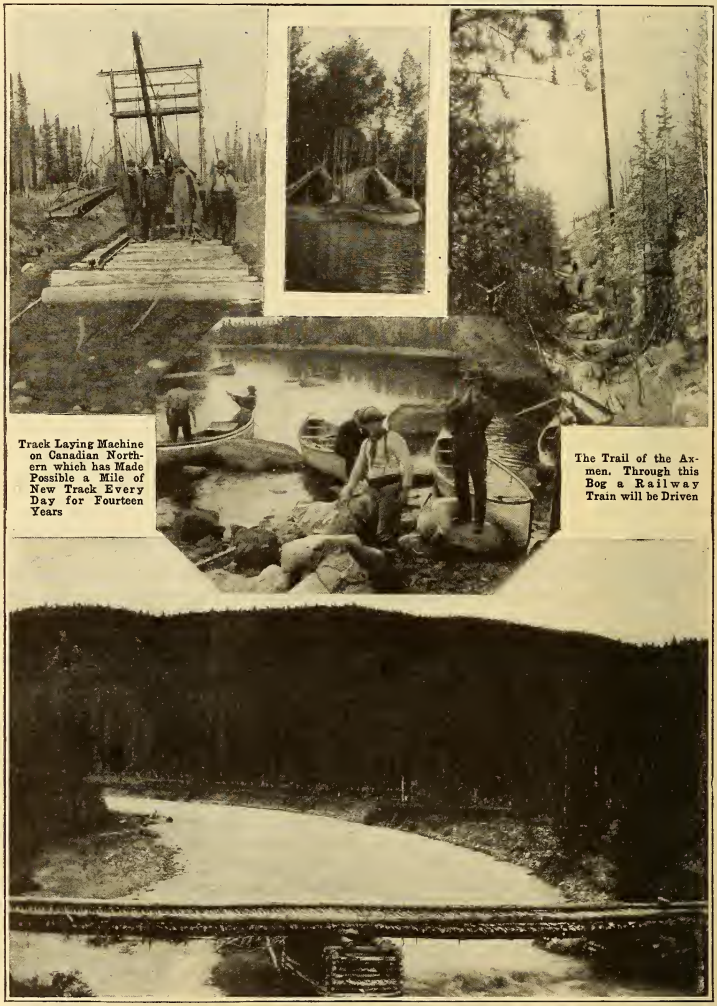
"Rather negligible. We completed the 500 miles at a final outlay of perhaps $500 a mile"—about $250,000 in all, a fraction of the ultimate expenditure for construction and rolling stock.

"In attacking a thousand mile stretch of practically unknown country, we gather together all possible information such as comes from the geological surveys of the Federal Government, and supplement with exploratory work by our own engineers. The latter establish supply routes, elevations of lakes and rivers, direction of drainage and the character of the surface geology. From this information a general route is laid down through governing points; this done the regular survey is started and continued from end to end. On the 500 mile stretch above Lake Superior, which I have mentioned, the parties worked summer and winter, enough supplies being brought in during the late summer by the water routes to convenient points at which caches were made, and from these they were distributed as required by dog teams to the various camps. These caches were placed as far as possible ahead of the work, rather than behind, and the moral effect upon the men, due to the sense of security, was most noticeable.

"The successful engineer must be a strategist and a good deal of a financier, too. Indeed, the latter is perhaps his first duty. I mean that his success as a survey expert is dependent upon his ability to run a line across a given territory so that construction can be carried on at a minimum of cost, and the lowest possible grades must ensure the economical handling of freight."

"Then railroad building begins and ends with the question of fixed charges?"

"Begins, maybe, but it does not end there. The science of the engineer and the astuteness of the financier travel hand in hand. Thus I know of tunnels constructed by other railroads, which, while splendid engineering projects, were never justified economically. The long detour which the engineers sought to avoid was really the most advisable course to take from the point of view of the company's future profits. Not infrequently the engineer's bias towards scientific railroad building causes a legacy of wakeful nights for the directors who must keep up the dividends on capital.



Track Laying Machine on Canadian Northern which has Made Possible a Mile of New Track Every Day for Fourteen Years

The Trail of the Axmen. Through this Bog a Railway Train will be Driven

Preparing to Break Camp—A Typical Scene in the Survey of a Railroad

In the Hills, Where River Courses are Uncertain, the Survey Engineer and the Construction Engineer are Face to Face with Knotty Problems

"Modern machinery and long experience have dampened down many of the old bogies of railroading. We take a tunnel as just part of the day's work. Usually a railway hesitates to dig a channel through a mountain of rock when a nearby river bed offers a convenient alternative. There must be a strong reason, such as occurred in the case of the Rogers' Pass tunnel on the C. P. R. for which a contract has been let for eight millions. Our Montreal tunnel cost us a million a mile, the work being carried through Mount Royal from opposite ends, the drills meeting in the center early in December.

"Carrying a line across the prairies is simplicity itself to men who understand their work. In the hills, particularly through unbroken swampy country with irregular ravines and uncertain river courses,—more so than amongst mountains of great elevation—the survey engineer and the construction engineer who follows him are face to face with many knotty problems which sometimes demand great ingenuity in solving. Where construction across prairies averaged for the Canadian Northern between $30,000 and $40,000 a mile, mountain work jumps to an average of $60,000 a mile, including tunnels, bridges, and other special structures. On hillsides the track must be continually curved and usually all supplies must be brought up behind the working gang; on the prairies where the country at each side of the right-of-way is level and clear it is a simple matter, teaming supplies well in advance of construction. Wherever possible, of course, when working in the Rockies near the C. P. R. lines, we utilize them to haul our goods to the point of construction.

"Railway labor has been a changing quantity since the first roads were built in America. Then the Irish immigrants and the Scandinavians, and some Scotch, the best types of labor we have had, kept the market pretty much to themselves. These men have largely assimilated into other callings and have risen in the scale of earning power. In their place have come the Southern European, the Italian, the Bulgarian—good workmen if they would only eat our northern foods and sacrifice their eternal macaroni for beef. But they have not the muscle or the endurance of their predecessors in railway labor. In survey work I find the Indian an inimitable axman and canoeman. For instance, when a white axman and an Indian go into the bush to clear a line, and there are three trees at a certain spot, one of which must be removed, the Indian will glance backward at the last stumps and instantly attack the one tree that requires felling. The white man likely will cut down all three trees in his uncertainty. The Indian appears to have a perfect sense of direction, a thing that only a French-Canadian voyageur and an occasional lumberman acquires with experience. That is why I have been forced to the conclusion that a white man does more work, but an Indian accomplishes more."

TELEPHONING IN ABYSSINIA

Abyssinia is being provided with the telephone—another advance, surely, of civilization. Nearly 800 miles of wire have been put up, and 1,000 more are in process of construction. It would seem, however, that the contractor who is doing the work for the Abyssian government has had to encounter unusual difficulties. Tropical rains wash out the poles, white ants eat away the parts in the ground, and when iron poles are substituted for the wood, natives steal them to make tools of. Monkeys find the wires delightful swings, while elephants use the poles as scratching posts, and often knock them down. Lastly, the jungle grows so fast that a party of men is kept constantly employed in cutting away the young growth.

HONOR STUDENTS IN EDISON SCHOOL

In the commercial school of the New York Edison Company, 26 students have completed the prescribed courses with the rating that entitles them to the

Entitled to Receive Edison "A" Gold Button in Commercial School of the New York Edison Company

Edison "A" gold button recently presented to them by Arthur Williams, the company's general inspector. The badge represents a rating of 90 per cent or over in the two years' work prescribed in the company school. This, however, is open to all member companies of the New York Section of the National Electric Light Association and two of the recipients are members of the New York and Queen's Electric Light and Power Company.

The first year's work covers courses in "History and Development of Electricity; Elements of Central Station Business Getting; Basic Principles of Individual Efficiency; Effective Speaking and Business Letter Writing." In the second year the subjects are: "Hygiene, Health, Recreation and Elements of Psychology; Basic Principles of Salesmanship; Policies and Organization of the New York Edison Company.

Of the 24 Edison students who were thus graduated with highest honors, 22 are still with the company, most of them holding better positions than when they commenced school work.

This demand for trained men in the sales and contract departments in large light and power companies is on the increase and something over a year ago led to the organization similar to the above; namely, the Chicago Central Station Institute, and the companies interested in this institute are the Commonwealth Edison Company, Illinois Northern Utilities Company, Federal Sign System (Electric) Middle West Utilities Company and Public Service Company of Northern Illinois.

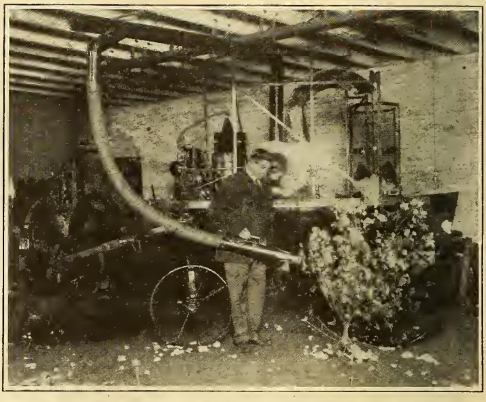
HAWAIIAN PLANTATION RAILROADS

Extending from the city of Honolulu for 70 miles away to the west and north there is an almost continuous line of cane field, broken here and there where the lava came down to the sea, forming darkly precipitous walls between it and the white surf. Constantly changing the base of operations in the cane fields necessitates a form of railroad easily convertible to meet conditions. The solution of the problem

is a knock-down track of short lengths which can easily be put down or taken up. It is a narrow gauge track and upon it operate diminutive engines and cars. The views herewith are of the Oaku railroad, which penetrates the dense tropical growths and finally branches out, tapping the sugar plantations.

VACUUM COTTON PICKER

A cotton picker, working on the principle of the vacuum cleaner, is the apparently successful invention of a Binger, Okla., man, William Cook. This latest mechanical cotton picker consists of a special truck, a small stationary motor, a vacuum fan and connecting hose, which permits the picker to be operated on two rows at each side of the machine in the field.



Vacuum Cotton Picker Which Does the Work of Several Men

As no hands or mechanical parts actually touch the cotton plant, the immature cotton bolls are not injured as by many previous mechanical pickers. It is claimed that the vacuum picker gathers less trash and leaves from the cotton plant than would be thrown into cotton gathered by hand. The truck on which the machine operates, straddles two rows of cotton without injury to the plants.

This machine, which does the work of several men, sells for about $600, or less than the cost of a slave, originally used for cotton picking in the south.

COW WITH A WOODEN LEG

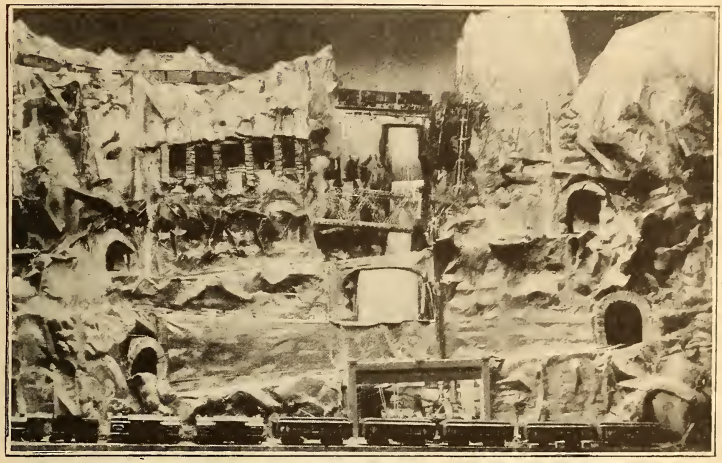
The London *Daily Mirror* recently pictured this oddity, which is one of the sights at Wishaw, N. B. It is perhaps the first instance on record of a cow which has been provided with a wooden leg.

MINIATURE OF AN ELECTRIFIED RAILROAD

Herewith is shown a miniature railway, electrically operated, negotiating a steep grade on a papier maché mountain, which represents the Cascade range, lying between the cities of Puget Sound and the Inland Empire to the East, on the line of the Chicago Milwaukee & St. Paul. This miniature was designed and constructed for the railway company and is being used by it for exhibition purposes, foretelling, as it were, what may be expected from this corporation in the line of electrification of its holdings in the mountain districts.

From the miniature power house, shown at the foot of the mountain, to the tail lights of the little train, this contrivance is an absolutely perfect reproduction of the present line, minus the electrical features.

In the construction and operation of this replica railway, there are used 265 feet of 2⅛ inch gauge, rock ballasted track, nine electrically operated semaphores and six automatic switches. The elevation is nine feet and the line has



Miniature Electric Railway Used by a Railway Company to Illustrate Possible Electrification of Its Holdings in Mountain Districts

a grade of one inch to the foot on straight track and ¾ inch on the curves.

Sixty gallons of water tumbling over the three waterfalls provides the power for operating the two trains, including the electrically operated semaphores and switches, this power actually being generated in a miniature electric plant with water-wheels and generator operated by the falls.

ELECTRIC IRON WITH HEAT BALANCE

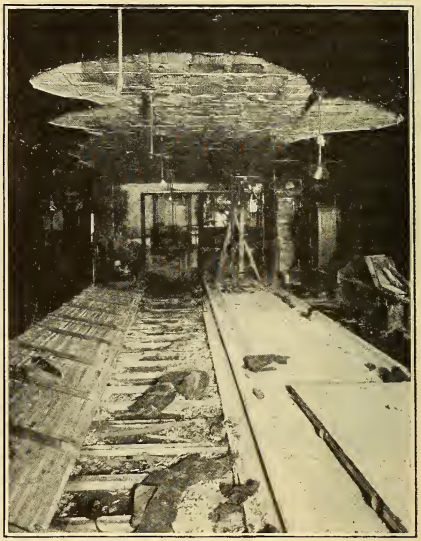
In this electric iron the heater covers the entire area of the bottom and is sealed to it so that the bottom and the heater are one. This iron heats quickly and over the entire bottom, while the top heats more slowly than any other, so that it does the same work with, the maker claims, from fifteen to thirty per cent less current. Most important, there is just the proper amount of heat generated properly to do the work required of it without waste of current, loss of speed or danger to the fabric. This quality may be called "heat balance," so this iron is distinctive and economical.

An Electric Iron that is Distinctive and Economical

MAZDA LAMPS RESIST FIRE

On December 28th of last year, a fire on an upper floor of the Cleveland Athletic Club made a raging furnace of the club's bowling alley. While the firemen waged a desperate battle on this floor, about 50 club members slept peacefully on the ninth, tenth and eleventh floors of the club house. It was the first real test of a completely fireproof building in Cleveland and while the fire raged for several hours before it was discovered by a watchman, the damage was entirely confined to the one room.

An interesting feature of this fire was the remarkable discovery that the Mazda Buckeye lamps were uninjured and some of them were still burning in this bowling alley after it had been gutted and destroyed by the fire. This is a proof that the electric light is the safest artificial illuminant in existence and is preferable to any other; and it also demonstrates the reliability and sturdiness of an electrical installation that will withstand such a fiery test.



Some of the Mazda Lamps were Still Burning After This Bowling Alley Had been Destroyed by Fire

THE GREATEST DEGREE OF COLD

Science assures us that there is a definite limit to the lowest conceivable temperature, and that this may be placed with considerable accuracy at 459 degrees below zero on the Fahrenheit scale. It is held that at all temperatures above this "absolute zero" particles of matter, either solid or gaseous, are in a state of vibration, the more rapid vibrations corresponding to the greater degree of heat. All such vibrations would cease entirely at absolute zero and all gases would liquefy and even solidify before reaching this absolute zero point.

Many experiments, extending over a long period of years, were necessary to attain this knowledge. Liquid air, with its 312 degrees below zero, was a great advance on previous records, although still over 100 degrees above this absolute zero. Liquid hydrogen at minus 422 degrees, or 37 absolute, was a still greater advance, and when this was frozen into solid hydrogen "ice" at 432 below zero or 27 degrees absolute, it seemed as if science had gone as far as it could in this direction. But, not so long ago, the rare gas helium was liquefied at minus 451 degrees. When this was boiled under reduced pressure a temperature of minus 454 was reached, or only five degrees above absolute zero. Slightly lower temperatures can undoubtedly be reached; but, it is said that, even with the most refined methods, there is little likelihood of our ever attaining absolute zero.

Wandering Organs

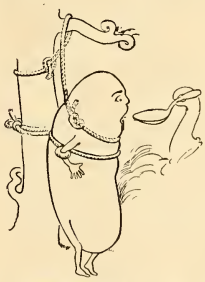
By WILLIAM BRADY, M. D.

The urchin who informed his physiology teacher that "me stummick is in me chist" was no less accurate in his anatomy than the average dyspeptic whose stomach lies anywhere between his collar and his belt. It is a common observation that under great stress of fear the heart will leave its customary moorings under the necktie and sink into one's shoes, though the heart is by no means the only vital organ possessed of the wanderlust. At this very moment there are hosts of people wearing porous plasters over their hip bones to alleviate pain imaginatively situated in the kidneys which lie some twelve or fourteen inches above!

It has long been known that the kidneys are fond of travel. In some individuals the kidneys roam about in the most aimless fashion, calling on the appendix, the liver, the colon or any organ that offers a temporary haven of refuge. There is probably method in this madness; the kidneys are no doubt endeavoring to escape the barrels of worthless dope thrust upon them by the ten million patrons of Dr. Kilmer, whose wonderful free trial offer has unjustly stigmatized them as irresponsible organs.

The life insurance examiner in the course of the day's work quite frequently finds kidneys which have no visible means of support. In such a quandary there are two possible courses to pursue: (1) the physician may ignore the circumstance and send the unwitting subject on his way rejoicing; or (2) he may persuade the owner of the movable kidney to permit him to support the unfortunate organ in the way he thinks a floating kidney ought to be supported. Some physicians are exceedingly charitable about supporting homeless kidneys, while other patients are more circumspect in their choice of a family doctor.

So long as a patient doesn't know his or her (usually her) kidneys are away on a journey there is apt to be no complaint; but once the patient is informed of the unstable condition of internal affairs nothing short of a $30 corset or a $200 operation will assuage her grief. There seems to be a pretty firm popular conviction that while the heart and lungs must keep moving every instant, the kidneys were intended by Providence to stand still and take their swamp root. Yet X-ray photography has taught us that a surprisingly large proportion of healthy adults have kidneys or other organs which are practically never at home.



"To Stand Still and Take Their Swamproot"

If there is one vital, intimately personal possession every orderly man thinks he can put his hand on at a moment's notice or without any notice at all, it is, not his insurance policy, but his stomach. Until late years even the doctor imagined he knew right where to find a patient's stomach; he fancied all he had to do was travel due northeast 10½ inches from the base of the appendix—of course every tyro knows where that is—and dig right in, and there he'd find it lying snug and warm and still palpitating in his cool, collected grasp. But alas!—things are not always where they seem. X-ray observation of the inside works has

shattered many a venerable diagnostic delusion and imperilled many a professional reputation. To tell the truth —which is always a pleasure out of business hours—it appears that about half the time what we have really been grasping was, not the stomach, but, well, perhaps a handful of good crisp bacon. You may have noticed how the doctor hesitates for just a fraction of a second after he gets a strangle hold on your spinal column, and says: "Hum,

"The Life Insurance Examiner in the Course of the Day's Work"

what did you eat for dinner anyway?"

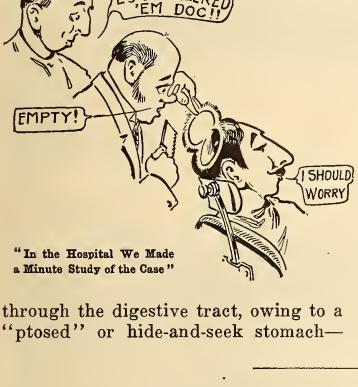
Last summer we had a patient—and we might have had him yet if we had only kept on pumping—whose stomach troubled us considerably. He was a popular young engineer, so we took him to the hospital where his friends and relatives and neighbors might be spared the sight of our mental distress. In the hospital we made a minute study of the case. We kept him in bed, though he clamored to be up and about, and forbade him to exert himself even to the extent of eating his own meals; instead he was nourished through a tube. The trouble was—frankly we didn't know what. At first it appeared to be gastric ulcer; then cancer; then a mere neurosis, and finally dilated stomach, for we discovered the man had a tremendous capacity—at times.

A council of doctors solemnly sat on the young man's stomach, the prevailing opinion being that it was a case of gastrectasia, which is the official password for dilated stomach. This conclusion was reached only after we had pored over the records and poured over three gallons of water into the stomach and got back through the tube only a trifle over two gallons. Thereafter, day by day, as the patient ceased losing weight and strength and courage, we mapped out the steadily diminishing outline of that stomach with an indelible pencil on his white, shrinking skin. All this under an inspired regimen of dietetic and electrical treatment. As time passed we began to feel much less troubled.

Then one sad day we gave the patient a test meal of buttermilk and bismuth and stood him up before an X-ray plate and photographed his digestive machinery. What was our chagrin to find that he had no official password at all, but just a hide-and-seek stomach. In other words, while he was lying down with his hips elevated a trifle, his stomach was just about where we had outlined it with the pencil; but when he stood erect it slipped way, way down—so far down that had it not been restrained by the natural limits of the peritoneal cavity the patient would certainly have kicked it when he tried to walk.

The X-ray disclosure saved our patient much bootless treatment. He was now fitted with a modish straight front corset, reassured that there was absolutely nothing the matter with his stomach, instructed in certain physical culture exercises to overcome the need of a corset and in the value of self massage and the knee-chest posture in holding up his dinner, and sent back to his engine in comfort and peace. The way the young man gained blood and flesh and confidence from just one brief X-ray exposure (of his doctor's diagnostic frailty) was indeed marvelous. We feel proud of the results of the treatment, but that is not the reason for mentioning the case here. The point to be emphasized is that hundreds of victims

of "stomach complaint" of lesser or greater severity are suffering simply from a "kink" or accidental obstruction to the normal movement of food



"In the Hospital We Made a Minute Study of the Case"

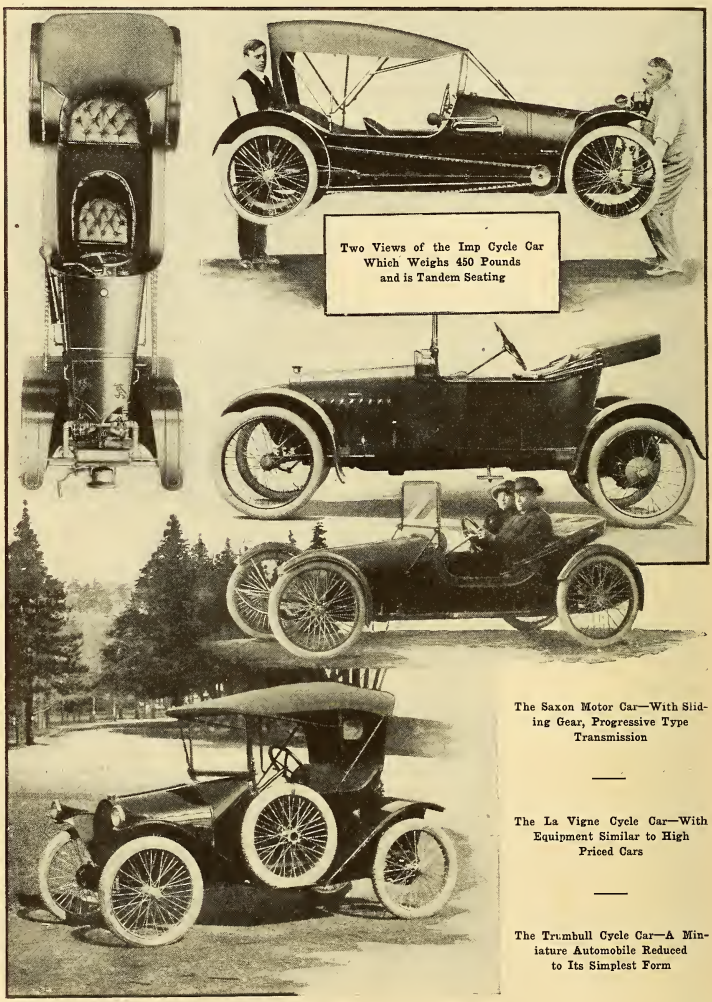
through the digestive tract, owing to a "ptosed" or hide-and-seek stomach—the penalty of man's upright position.

Just why certain individuals suffer from "ptosis," or displacement of organs, while others do not, is difficult to explain. The underlying factor seems to be the lack of tone in muscles and ligaments in certain constitutions. Ptosed organs are often present in men of apparently athletic build, however; the case cited was of this type. Among women, who most commonly have ptosis, the dragging of skirts on the waist band has been considered a factor, and no doubt increases any tendency to ptosis in the individual case. Men, however, have no drag on their waists. It is nevertheless evident that few men know how to throw out their chests, pull in their chins and hold up their stomachs. It is a curious fact that the first thing we learn to do with our muscles—stand erect—is the one thing which many of us so soon forget.

A Recording Target

Mr. Sydney Rose, an Australian, has invented a recording target which, it is claimed, shows accurately to a small fraction of an inch the exact course of the bullet in relation to both stationary and moving targets.

The indicator at the firing point consists of a small white disk, representing the bullet hole, which is mounted at the end of a light pointer working behind a transparent screen. The object target is a wide strip of paper wound off one roll and rewound on another, and on its edge is a row of contact fingers placed in a vertical comb and protected behind an armor plate. Normally these fingers are held out of electrical contact by the paper, but when a shot has been fired the pressing of a button causes the paper to be wound up on the receiving roller until the hole reaches the row of fingers, one or more of which press through the hole and complete the circuit. This stops the movement of the paper, and as the indicating pointer moves synchronously with the paper, it also is stopped, its position thus representing the position of the bullet mark on the paper from right to left. The vertical position of the mark is recorded by means of the comb of contact fingers, each of these having a resistance between them, so that the higher the finger is from the base the greater is the resistance in circuit when it makes contact and the higher the position taken by the indicating needle included in the circuit. The target is not a sectional target requiring a wire for each section, but on the contrary needs only two live wires and an earth connection, with which over 200 indications per square inch are obtained.



Two Views of the Imp Cycle Car Which Weighs 450 Pounds and is Tandem Seating

The Saxon Motor Car—With Sliding Gear, Progressive Type Transmission

The La Vigne Cycle Car—With Equipment Similar to High Priced Cars

The Trumbull Cycle Car—A Miniature Automobile Reduced to Its Simplest Form

LITTLE BROTHERS OF THE AUTOMOBILE

The motor car of size, weight and expensive upkeep has long monopolized the automobile field, but now there is a demand for a small, light car, a little vehicle between the automobile and motorcycle; and the cyclecar is here to fill this demand. Cyclecars will not be overlooked by the business man who would move about his work quickly and he will appreciate the ease of operation.

The Trumbull cyclecar is a miniature automobile reduced to its simplest form, not weighing more than 750 pounds, fitted with a light, compact motor which is dependable and economical in fuel and oil consumption. All modern elements of automobile construction are considered.

The Saxon motor car is a well designed, small automobile with four cylinder motor, standard tread and features. This car has the modern left hand drive with gear shift and emergency brake levers in the center, permitting entrance from either side. The sliding gear, progressive type transmission gives two forward speeds and reverse. A new feature for American cars is the cantilever spring suspension, giving this car with 96 inch wheelbase and 28 inch wheels, the riding comfort of larger cars.

The La Vigne cyclecar is not a toy. It is a small, light car low in tire upkeep. It has a four cylinder air cooled motor and some features found only in high priced cars, such as worm drive rear axle, unit power plant sliding gear transmission and multiple disk clutch. The tread is 50 inches and the wheelbase is 96 inches. There are three electric lights and the head lights are built into front fenders which turn with the wheels.

The Imp cyclecar is a ten to fifteen horsepower, tandem seating, friction belt drive car with a wheelbase of 100 inches and a tread of 36 inches. It is claimed this car will make 45 miles an hour and run 50 miles on a gallon of gasoline. It has a two cylinder vertical motor, mechanically operated inlet valves, air cooled, piston pump circulation for oil and a high tension magneto. The weight is 450 pounds. The rules governing the construction of a safe, reliable cyclecar are narrow tread for road ability and to reduce wind resistance, tandem seating for easy springing, and lowest possible weight center for safety.

ELECTRIC AUTO FIRST MADE WITH WHIP SOCKET

In 1895, when electric pleasure cars were new, a certain manufacturer noted with alarm that these strange vehicles running around through the streets frightened horses, then unused to such a spectacle. Whereupon this enterprising man, with a touch of imagination, constructed a model on the dashboard of which were attached the head and shoulders of a horse. This he believed would reassure its equine brothers.

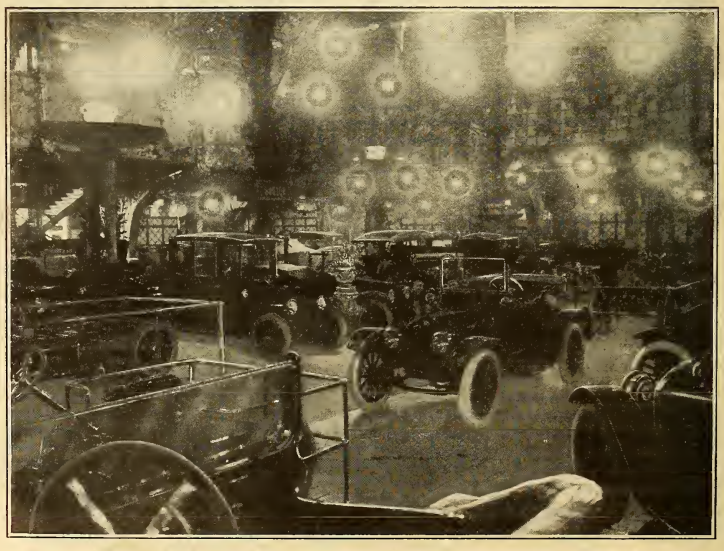
The episode gives a fairly good picture of the beginnings of the electric pleasure vehicle, when the car was actually made with a whip socket on the dashboard, since its nearest progenitor, the country "buggy," had always been provided with this necessary apparatus. Electric vehicles of this period looked like horseless carriages, indeed—blunt, sawed off, as if something were missing, as, in fact, there was. The wheel base was short, and the wheels much higher than is now standard in any automobile.

The next thing that happened to the electric vehicle was the arrival of the gasoline car. When it once more plucked up its courage and emerged from the gasoline fumes, its models were made to look as much as possible like the touring car and racer.

It has taken electric pleasure vehicles several years to find their own characteristic style, now shown in the type with a longer wheel base, low wheels, batteries placed where logic suggests, together with lines graceful if not typical of high speed. While electric pleasure cars have thus been slow in developing their outer parts, their mechanism has been practically perfected since 1903, when an automobile trade paper said: "For elegance of translation and freedom from contingencies of delay, the electric vehicle is beyond criticism."

Chicago Automobile Show

The Fourteenth Annual Automobile Show at the Coliseum January 24 to 31 was particularly significant as illustrating the rapid and gigantic strides of this industry. The number of exhibitors of automobiles reached 500, with 215 firms displaying auto accessories, the value in machines alone being conservatively set at $3,000,000. No one year has brought out so many new conveniences for the use of the autoist, from the electric self starter to specially designed clocks, nor has elegance ever before entered so much into the construction and finish of cars. Besides the trend toward the six cylinder engine, the cyclecar, the increased use of the wire wheel and the devices for gasoline economy are in the foreground. Although 1,127,940 cars were licensed in 1913, the fact is that in this country alone 605,000 of these were purchased during 1911, and the year 1914, it is believed among manufacturers, will surpass all previous records.



A Certain Somberness About the Great Black Cars Themselves Typified the Conservativeness of Wealth and Luxury

AUTOMOBILE 'BUS LINE WITH CONDUCTRESSES

Provided the Board of Estimates in New York City gives its consent, the People's Bus Lines will be regularly organized, to operate storage battery driven 'buses over some 21 different routes about the city. One of the backers of the scheme is Thomas A. Edison, and his new battery will be used to propel the car like vehicles. If the 'bus lines are permitted to start operations, the five cent fares will be collected by nattily dressed, uniformed, female conductors.

Female Conductors will Collect Fares on This 'Bus Line

THE DYE HOUSE

A delivery car body shaped like a house was designed by a California dyer, who constructed a neat little model which calls attention to his business and is a decidedly practical vehicle as well.

In making a "front porch" to keep the rain and sun from the driver, he developed the plan very cleverly. The interior of the house is supplied with wardrobe fixtures to receive the garments.

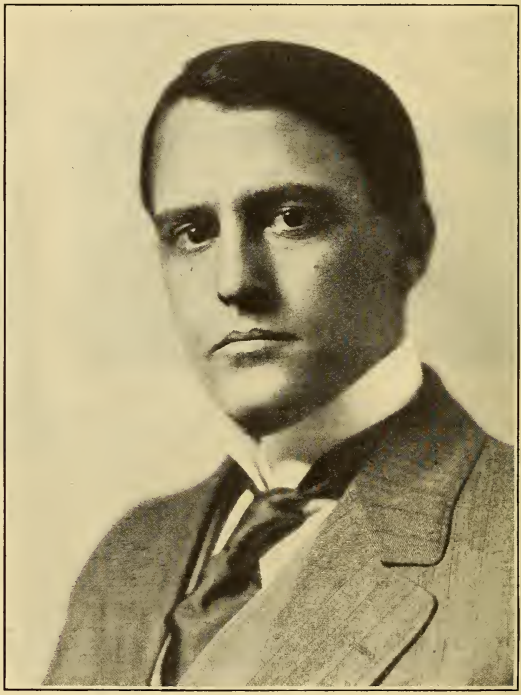
A Neat Little Model that is a Practical Advertisement

COMFORT IN MOTOR CARS

At least one expert has pointed out that the prevalent opinion, that the comfort of automobilists is best promoted by having the weight carried within the wheel base, is incorrect. The passenger should, he contends, be seated within a base, but, he adds, weight placed behind and in front tends to steady the chassis and to free the passengers from the effects of shock. If weight be placed outside the wheel base both front and back, he argues, an improvement in smoothness of running is obtained without any increase of the total weight of the automobile.

Electrical Men of the Times

MILLER REESE HUTCHISON



When Asked for a Recipe for Success He Replied, "Work Like the Deuce"

You may not know Mr. Miller Reese Hutchison, but you know one of his inventions, the Klaxon Warning Signal, we'll wager,—the auto horn that sounds like a husky man being strangled or as if pandemonium had let loose in all its fury, and terrifies you into instantaneous action.

The principle of it is that you'd better be scared almost to death than to be killed outright. At any rate, the manufacturers proved their belief in its effectiveness by paying Mr. Hutchison over a half million dollars for his invention.

When a man can make that much money by bringing out just a noisy little horn, one naturally wonders that some noise has not emanated from the man himself. But that is not Mr.

Hutchison's way. Perhaps being chief engineer to Thomas A. Edison has increased his natural tendency to do things so constantly that a minimum of time—or inclination—is left for talking about them.

Miller Reese Hutchison was born at Montrose, Baldwin County, Ala., August 6, 1876.

From 1883 to 1895 he attended several private schools in and around Mobile, completing his education in the Alabama Polytechnic Institute.

In 1895, while a student of the A. P. I., in sympathy with a schoolboy friend who was afflicted with deafness, his mind was set to wondering if it were not possible to devise some sort of an instrument for the alleviation of deafness. So the more he thought of it, the stronger his conviction became, resulting in the well known Acousticon for the deaf.

While engaged in the further improvement of the Acousticon, the war with Spain broke out. Mr. Hutchison was appointed chief electrical engineer of the 7th and 8th districts of the United States Light House Establishment, and engaged in laying submarine cables and submarine mines along the southern coast of the United States. This temporarily retarded further development of his Acousticon, but at the close of the Spanish-American war he again took up its perfection.

In the summer of 1902 his duties called him to Europe, and while in England he attended Queen Alexandra for deafness, succeeding admirably. As a result, he was summoned to H. M. Yacht "Victoria and Albert," at Cowes, and while on board was presented with a beautiful gold medal fittingly inscribed.

From the summer of 1904 until 1910 he was associated, as consulting engineer, with several large financial institutions of New York City. He also established his laboratory and, as a result, the horn was evolved.

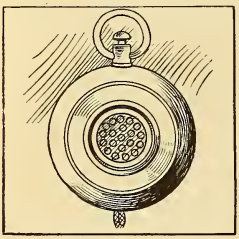
But these are not the only inventions of the young man. In all, he has about 500 patents to his credit in different lines of endeavor and is rapidly increasing this number yearly.

In June, 1910, he became associated with Mr. Thomas A. Edison, as personal representative of naval affairs, and therefore immediately moved his offices to Orange, N. J., to take up the adaptation of the Edison storage battery to submarine boats and other special army and navy uses.

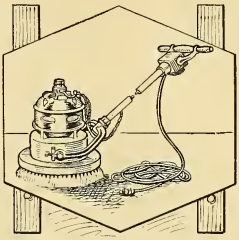
In 1911 Mr. Hutchison was appointed advertising manager of the Edison Storage Battery Company. Simultaneously he was also given the exclusive sales right of the Edison storage battery for all government purposes of all nations. While acting in the capacity of advertising manager it was an everyday occurrence to see him come walking into the office in the morning with about two dozen Edison dictating machine records, dictated full of advertising "dope" on the storage battery. Altogether, he dictated about 10,000 words daily for 100 days. As Mr. Hutchison expressed it at the time, in a letter addressed to a friend, "I am writing with both hands, both feet, and dictating into the Edison dictating machine simultaneously." The now well known, nation wide, advertising campaign of personal letters to the readers was the result.

In the spring of 1910 he was appointed, by Mr. Edison, chief engineer of the Edison Laboratory, chief engineer of Thomas A. Edison (Incorporated) and affiliated companies. With this addition to his already very strenuous existence, you can readily surmise that he is "reasonably" busy. It is a frequent occurrence to see him working in the laboratory in the small hours of the morning, on some very important experiment.

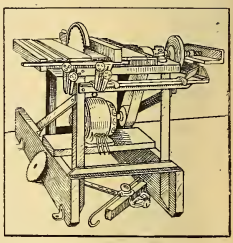
When asked by a group of college students for a recipe for success, he replied, "Work like the deuce!"



Watch Case Cigar Lighter



Floor Machine that Does the Work of a Score of Scrubwomen



Circular Saw With a Boring Attachment

NEW WAYS OF USING ELECTRICITY

CIGAR LIGHTER FOR AUTOMOBILES

Although electric cigar lighters are not new, their use on automobiles is novel. Their convenience seems to have appealed to automobile dealers as on many cars of both foreign and American makes these devices are found as part of the equipment.

One of the most recent types of lighter is one made in the form of a watch case. The ring serves as a support by which the lighter may be hung on a hook. The device operates on six volts and is provided with a contact button on the stem and a flexible silk cord for connecting to the battery.

FLOOR MACHINE OF MANY USES

Scrubbing, cleaning, grinding and polishing the floors of a large office or bank building is ordinarily the work of a score of scrub women and laborers. According to the claims of the manufacturers of the Kelley floor machine, all of this work can be handled at far less expense and with equal thoroughness wherever electric current is to be had.

The motor is located on the top of the machine, the polishing, scrubbing or sanding heads on the bottom with a dust proof casing between within which the gears and bearing are protected.

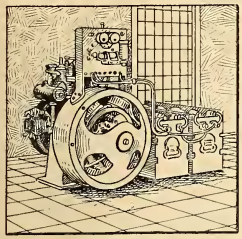
A switch located in the handle bars controls the current. After the machine is connected to a lighting circuit and is in operation, the direction of movement of the machine is controlled by putting more pressure on one side of the brush than on the other. For example, if the machine is to travel to the right, bear down slightly on the handle which will place more weight on the back of the brush releasing the front and causing the machine to travel to the right.

The most interesting application of the machine is in scrubbing rugs, the cleaning fluid being worked over the surface of the rug by the rotary brush cleaning all sides of the nap.

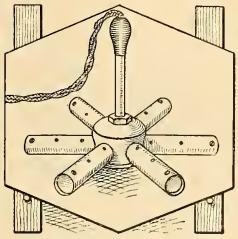
CIRCULAR SAW AND BORING OUTFIT

A motor driven circular saw outfit with a boring attachment is shown in the accompanying illustration. The frame is made of heavy angle steel, strongly braced, while the base is of wood and can be securely fastened to the floor by angle steel clips.

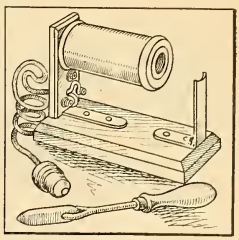
The saw table is made of angle and channel steel and is hinged at the back



Compact Lighting Plant for Use in Summer Homes



Electric Bath Water Heater is an Ideal Device



Soldering Iron Furnace in Either Round or Oval Form

so as to allow it to be raised or lowered. The depth of cut can be adjusted and a boring attachment for routing, mortising, etc., is provided.

The three horsepower motor is placed on a platform almost directly under the saw and out of the way.

SMALL LIGHTING PLANT

In the accompanying cut of a small lighting plant is illustrated a unit put upon the market recently for use particularly in large yachts, summer homes, or buildings away from the power station. The superiority of electric lighting is so generally conceded and its efficiency and conveniences recognized that its installation in well-equipped dwellings is more a matter of economy than luxury. The Regal plant is of the direct connected type—that is, the generator is connected directly to the engine. The armature is keyed upon the engine shaft and the field is bolted to the engine base itself. Upon the field housing is an unusual location of the switchboard to save space and to the left a storage battery forms part of the equipment. The capacity of the generator alone is 60 16 candlepower lamps. With the assistance of the storage battery more than twice this number of lamps may be carried from four to six hours, depending upon the size of the battery. The unique feature about this plant is its resemblance to the modern automobile engine with electric starting and lighting dynamo.

QUICK BATH WATER HEATER

That it will heat a gallon of water a minute to a temperature for bathing is the claim of the manufacturer of the Insto electric bath heater.

The heater is small in size with the units arranged somewhat like the spokes of a wheel without a rim, the handle being fastened at the hub. The heat, released in the water, cannot get away and from the viewpoint of heating water where a hot water system is not available the device is ideal.

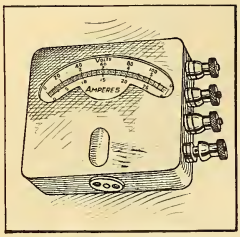
The heater comes furnished with eight feet of cord ready to attach to any wall plate and will operate on either alternating or direct current of 110 volts.

FURNACE TO HEAT SOLDERING IRON

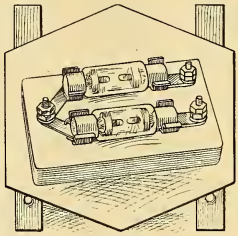
A small electric furnace built especially to heat soldering irons is shown in the accompanying illustration.

The furnace is made in either round or oval form and into the interior is placed the iron to be heated, the handle resting on a support upon one end of the furnace base.

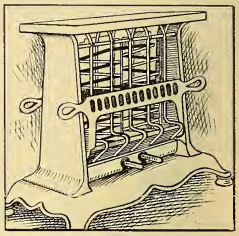
The furnaces are built in three sizes and are furnished with a cord and plug. The heating elements are wound to operate on 110 volt circuits.



Pocket Meter Convenient for Electricians or Signal Maintainers



Arrester Mounted in Cartridge Fuse Manner



New Toaster Said to be Most Economical in Operation

MICA SHIELD VACUUM ARRESTER

Telephone, fire department and signal wires all require arresters to protect switchboards and instruments from lightning and from high voltage currents that accidental contact with trolley or high tension lines may place upon them.

The Brach vacuum arrester looks at first glance not unlike a cartridge fuse with a body of glass. The glass tube is hermetically sealed and within it is a tube of mica mounted on porcelain spool heads. The spaced electrodes in the inner shell will carry heavy current. Before the glass tube is sealed the air is exhausted, forming a vacuum which with the gap is gauged to the degree effecting the best possible conductivity to static and high tension currents and at the same time maintaining perfect insulation between the line and ground of the circuits. The common terminal is connected to ground and the two terminals each to a line. The inner mica tube seems to increase the capacity of the arrester while the cartridge fuse manner of mounting is a convenience when a tube needs replacing.

SMALL, LONG SCALE POCKET METER

A new meter which is small enough to be carried in the pocket and designed for use to measure either the voltage or the current on a direct current circuit has just been placed on the market. The meter measures 3¼ by 4½ by 1¼ inches. The case is of heavily nickeled brass and carries four insulated binding posts on the edge.

The range of the instrument when used as a voltmeter is from 0-1 to 0-120 volts; employed as an ammeter the capacity is from 0-1 to 0-50 amperes.

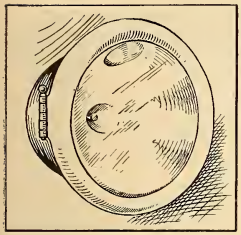
NEW RADIANT TOASTER

A new toaster, the design of which it is claimed makes it a most economical device in point of operation is shown in the accompanying illustration. At a rate of twelve cents per kilowatt hour the cost of toasting ten slices of bread is about three-fifths of one cent. The small doors on the sides are one of the features of the toaster and they hold the bread close to the heating elements thereby causing the use of practically all of the heat.

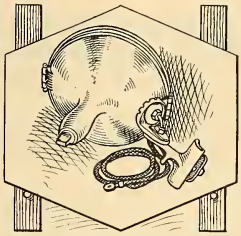
The toaster is of substantial construction and is heavily nickel plated and on the top is fitted with a metal shelf which is very convenient for keeping warm, bread already toasted, or as a place for setting the coffee pot.

ONE KILOWATT TURBO-GENERATOR LIGHTING PLANT

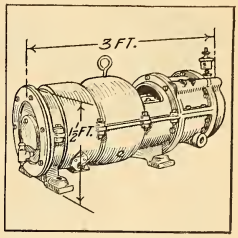
Light is frequently wanted for limited areas where steam is available but



De Luxe Auto Headlight that Regulates Blinding Glare



Searchlight for Autos that will Turn in Any Direction



Turbo-Generator that Develops One Kilowatt on 90 Pounds Steam Pressure

suitable electric power is not, as on contracting operations, small industrial plants, steam launches, etc. To provide a means for supplying electric light under such circumstances, a small turbo-generator which will operate an arc lamp and a few incandescents at the same time, or about 40 25-watt Mazda lamps, or their equivalent, alone, has been designed and is here shown.

This unit is very compact—only three feet long and 1½ feet high—and can be installed anywhere provided the unit is kept horizontal. It requires practically no attention when operating; there are no delicate adjustments to make, and all parts are easily accessible.

The turbine and generator are mounted in the same frame. The turbine is of the impulse type and has a governor which keeps the speed uniform for all variations of load and steam pressure. The full rating of one kilowatt is developed on 90 pounds steam pressure and satisfactory operation can be obtained with pressures up to 250 pounds. The weight is 283 pounds.

DOUBLE BULB AUTO LIGHT

The passage of laws in some cities and strong agitation in others has created a sudden and unprecedented demand for automobile headlights that give no blinding glare. The feature of the headlight here illustrated is in the use of a second bulb located in the upper part of the parabolic reflector in a second small reflector all by itself. This design gives it the name of Double Bulb De Luxe headlight.

With the large reflector mounted horizontally, the rays from the small bulb are projected downward and forward. Direct rays from this bulb are thus not projected at a height greater than that of the lamp and are so kept below the eyes of pedestrians and drivers of other vehicles. In the city the upper bulb is employed; on country roads the lamp at the focus of the big reflector is used.

SEARCHLIGHT FOR AUTO DRIVERS

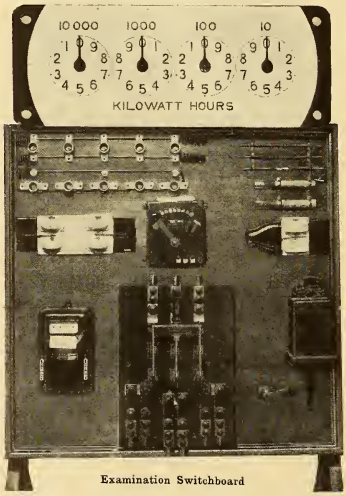
This light fastened on the windshield can be turned in any direction and will stay locked in the position placed. The driver may direct the light to the rear in backing up, use it in driving ahead, read signs at the side of the road, locate numbers on houses, etc. The delivery truck driver finds it serviceable, too, in looking at the names on packages he is delivering.

The lamp is provided with a special bracket, an exterior switch in the handle and the cord for connecting the lamp to the current source is attached to the lamp when made.

For Practical Electrical Workers

DUMMY SWITCHBOARD USED AT EXAMINATION

To test the electrical knowledge of applicants for the position of superintendent of school buildings, the New York Board of Civil Service has erected a board in the old power station of the Brooklyn Bridge now used as a training school for city engineers.



Examination Switchboard

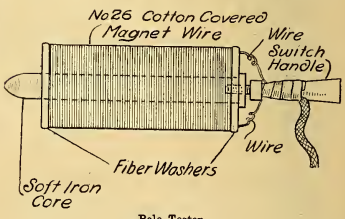
The board contains a well assorted electrical equipment including a five horsepower rheostat, a 600 ampere, loop service switch, a double branch cut-out, a magneto, a 100 ampere cut-out, a one foot section of 500,000 circular mill cable, a section of 350,000 circular mill cable, a section of fourteen wire cable, a piece of eight wire cable, a section of six wire cable with splice, a five ampere, 120 volt, two wire, recording watt meter, five lamps in series, five lamps in multiple and a large dummy meter dial.

A set of sixteen questions has been compiled by the examiners. Each applicant is brought before the board and the sixteen questions are asked him by way of examination. On the number of correct answers given depends the mark he receives from the civil service board. The test, it is said, is exceptionally stiff and the ordeal of facing the dummy board is not anticipated with pleasure by the average candidate.

TO MAKE A POLE TESTER

Take a rod of soft iron about ½ inch in diameter and about five inches in length. Force onto this two fiber washers about two inches in diameter and $\frac{3}{16}$ inch thick. One of them should be placed to allow the core to protrude about 1¼ inches. The core should then be wound with No. 26 cotton covered magnet wire to a depth of about ⅝ inch. One end of the core should be tapped out for a ¼ inch bolt or switch handle stud. The two wires should be brought out through the fiber washer. Attach the coil by reinforced cord and plug to a 110 volt direct current circuit. When brought near a pole of a generator or motor, if the pole or field piece is positive, should the core of the magnet be positive then the instrument will be repelled. If the coil core is negative, the coil will be pulled toward the pole.

The core of the tester should be tested each



Pole Tester

time by a small compass after the current is on the coil unless a polarity plug is employed in con-

necting to the circuit. If the north-seeking end of the compass needle is attracted to the end of the core this core end is a south pole, and vice versa. In an attempt to use a compass to find the polarity of a large pole, the compass needle is not at all stable in stray magnetic fields, while this tester determines by the pull or repulsion the polarity of the core tested.—F. F. SENGSTOCK.

PURE PLATINUM LAW

The National Jewelers' Board of Trade of New York will shortly introduce in the legislature of that state a bill to provide a fine of $500 or one year's imprisonment for labeling as platinum a product which is not 950-1000th pure. Spark plug manufacturers will strongly feel the effect of such a law.

LIGHT FOR HORSESHOER

The accompanying picture presents to the owner of both the large and the small blacksmith shop a good plan for obtaining light upon his work when shoeing a horse. At a suitable distance overhead is secured either an iron rod or a wooden one having projecting pins at intervals along its length. The lamp socket and handle is the heavy wire lamp guard having a hook at the end opposite the handle which serves to hang the light at any point along the rod.

Portable Hanging Lamp for Horseshoer

permit the use of reinforced cord which stands rough usage, while the feature of the equipment

REVERSING D. C. SHUNT MOTOR

To reverse the direction of rotation of a direct current shunt motor, one may either reverse the

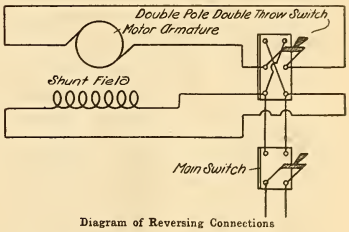


Diagram of Reversing Connections

field wires or those leading to the armature. In no case should both be changed simultaneously, else the direction of rotation will remain unaltered. The first method is seldom used, because considerable sparking will occur at the brushes if the field is opened while the motor is running. On very small motors it will work, especially if the motor is brought to a full stop before the switch is thrown in for the reversal. On larger motors, however, say anything above 1–20 horsepower, only the second method ought to be employed. The great advantage of this method is that the motor may be reversed in very little time, since one may throw the switch from one side to the other without even waiting for the motor to slow down.

Connections for reversing a motor by this latter method are shown. The only auxiliary piece of apparatus which is necessary is a two pole, double throw switch. It should be noticed that the field is in as soon as the main switch is thrown in, even though the motor may be standing still. When the two pole, double throw switch is thrown, the motor will go one way or the other, depending on the polarity. The wires forming the cross connections on the latter switch should be insulated throughout their length. This may be accomplished by placing upon one of the cross connecting wires a piece of circular loom.

ARTIFICIAL POLE FOUNDATIONS

Artificial pole foundations, as shown in Figs. 1 and 2, are seldom used in telephone construction but are occasionally necessary, as in the case of building a heavy line through soft or swampy land. The platform at the foot of the pole

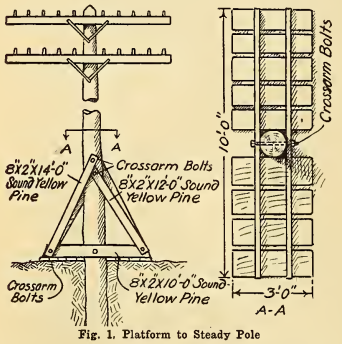


Fig. 1. Platform to Steady Pole

has a much greater tendency to steady the pole than would a number of guys. Another thing in connection with the use of this style of construction is that it is sometimes possible to find a dry spot here and there through a bit of

Lighted Basement of Church

swampy land that would do first rate and be plenty large enough to allow the use of the artificial pole foundation, but where, on account of the nature of the soil or something equally as bad, guys could not be placed or would involve a very heavy expense. The foundation in Fig. 2 is very similar to that used for constructing a dam, pier or abutment on soft ground. The

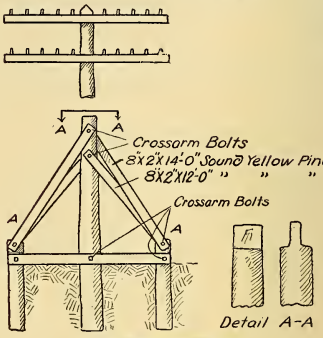


Fig. 2. Stubs to Support Pole

pole is first set, then the stubs are set or driven and the platform built upon them so as to hold them fast to the pole and thus make the pole firm and solid.— GEORGE MADISON.

UNUSUAL CHURCH LIGHTING

In the town of Dunnville, Ontario, Canada, it became desirable to illuminate the basement of the Baptist church by electricity. The main floor of the church had already been lighted for a long time by means of an enclosed arc lamp. The arrangement shown in the picture was suggested to one of the church officers and was adopted.

A circular hole having a diameter somewhat greater than that of the electric arc lamp was cut in the main floor. When meetings were held downstairs the electric arc lamp was let down through the hole in the main floor. A lid closed the hole in the main floor when the lamp was used upstairs. JAMES ASHER.

TO HOLD LAMP IN SOCKET

To hold lamps in their sockets where vibrations are likely to shake them out, merely put a rubber band over the threads on the base. The friction is sufficient to keep the lamps in place.

In tearing up an old concrete floor in a large industrial plant, an electric crane was used to break the concrete by raising and dropping a heavy piece of iron upon the floor.

A Lighthouse Without a Keeper

By EDWIN O. CATFORD

A little over three years ago the writer was placed in charge of the Platte Fougère lighthouse, which, being the first and only one of its kind, presented plenty of scope for study. Various problems presented themselves, which, owing to the unique character of this lighthouse, could not be solved by reference to past experience elsewhere. During the greater part of the time there is not a living soul at the great concrete tower on the lonely rock, and, although in the strict sense of the word the light has a keeper, he lives more than a mile away across a stretch of water.

The lighthouse is a concrete tower built on Platte Fougère rock, nearly a mile and a quarter to the N. E. of Guernsey, a coast strewn with rocks and very dangerous to navigation. During fog, power is transmitted from the engine room ashore to an electric motor on the lighthouse. Air is then compressed into three tanks on the summit of the tower and a clock, wound by compressed air, allows a blast to pass every 90 seconds through a siren and horn. This fog signal has been heard at a distance of more than 30 miles.

The Platte Fougere Lighthouse Where No Attendant Resides

Two lightkeepers reside ashore, where the generating plant is established, and on the approach of fog have to start the 25 horsepower oil engine directly coupled to an 11½ kw. three phase generating set which transmits about fifteen amperes at 600 volts through the submarine cable. The cable is probably the heaviest armored rock type yet made with G. P. insulation. It contains three power cores of 19–17 copper and two wires of 7–23 copper. The latter were provided in order to work a drop switch on the lighthouse, by which in the event of the breakdown of one motor, a spare motor coupled to a second air compressor could be at once started in its place.

The man in charge of the engines ashore is responsible for the correct working of machinery more than a mile distant, and it is of the first importance that he should know that the fog signal is performing its duty. The horn being directed away from shore towards the N. E., the men in charge are behind, in the very worst position for hearing it. Moreover, the atmosphere conveys sound in a most capricious way, so that the fog signal, which on occasion is heard along the coast of France 30 miles distant and is quite ordinarily heard in Alderney 20 miles away, is on many days barely audible ashore just over a mile distant. Some means had to be found by which each blast could be signaled to the engine room. Obviously, this device must be operated by the vibration of the blast itself and the first experiment was to construct

with the aid of arc lamp carbons what is probably the largest microphone ever put to use. This was placed inside the lighthouse, so that by listening ashore each blast could be heard by telephone. Listening at the telephone entailed waste of time and took a man from other duties, so that an electric lamp was substituted, which ceased to glow at every blast. Watching this lamp, however, had almost the same objections as the first method, so a bell was finally adopted, which rings in the engine room at every blast.

The tell-tale is arranged to respond only to the full blast, and on one occasion the siren stuck with the ports open, so that the air escaped each time in a huge gasp instead of a blast. These gasps could be heard ashore, the day being good for hearing, but this was not enough to operate the tell-tale, which thus indicated in the engine room that something was wrong at the lighthouse.

The light shown in the lantern is from an acetylene burner flashing every ten seconds, and is turned on at sunset and extinguished at dawn by means of a clock which requires winding every three months, a small by-pass flame remaining always alight. The acetylene gas required is supplied from two steel cylinders, each containing enough gas to last about one month and before the cylinders in use are exhausted they have to be changed for full ones in order that no interruption of light may occur. Formerly no means existed for ascertaining how the acetylene was lasting, except by paying an inspection visit. This led to many boat trips, which, in winter particularly, had often to be undertaken in unpleasant and dangerous weather in order to prevent any risk of failure of light through shortage of gas. Many of these boat trips carried with them all the spice and excitement of adventure.

These considerations led the writer to fit an arrangement by which an alarm is given ashore as soon as the gas pressure at the lighthouse falls below a certain amount which represents a fortnight's supply. To speak more correctly, a bell rings every hour so long as the gas supply is ample, so that any failure of battery or bell is equally indicated. When the bell ceases to ring at the hour, a button is pressed, and if the bell then rings it shows that bell, battery and all shore end connections are in good order and the boatmen are notified that a visit must be paid to the lighthouse on the first fine day.

The light may fail from other causes than shortage of gas. More than once the by-pass flame has been extinguished from some unknown cause, and when this has happened during rough weather, several days have elapsed before it was possible to reach the lighthouse to relight the gas. For this reason electric lamps have now been fitted in the lantern at Platte Fougère, so that in the event of failure of the acetylene light it is possible to work an electric light in its place. The flasher in use is of the thermic type commonly used in connection with shop signs, in which the passage of current causes a contact arm to alternately expand and contract, thus closing and opening the circuit for the light. It being essential that the man in charge shall know what is happening at the lighthouse, it is arranged that every time the electric light flashes in the lantern of the lighthouse an electric bell rings in the engine room.

It was very soon found that during visits to the lighthouse a telephone for the use of the keepers was indispensable. This instrument is in one of the chambers of the lighthouse and can only be reached by the keepers themselves. Lately it occurred to the writer that a telephone outside the lighthouse accessible to all who care to climb the ladder might prove of value, and thanks to the kind permission of the supervisor, Mr. Julius Bishop, this has now been provided. The primary object of the new telephone is to obtain news of the approach of mail boats during fog, when, guided by the sound of the fog signal, they frequently creep up to within two ships' lengths of the lighthouse before dropping anchor. In future, any pilot knowing of the presence of a mail boat may at once telephone this news to the Central Telephone Exchange of Guernsey, where it will be placed at the service of any subscribers making inquiry.

The above mentioned automatic devices are by no means all that are to be found about the unique lighthouse station. For the protection of the engine room the writer depends more upon entirely concealed door contacts than upon bolts and bars. Visitors sometimes think they will have a look around the engine room without troubling anyone and are surprised to find that directly they have opened the door an attendant appears on the scene.

When Baby Catford was four months old he used to be put to sleep out on the common, with a telephone instead of a nursemaid to let his mother know when she was wanted. So long as the boy's mother could hear the ticking of a clock that lay beside the boy but could not hear him crying she knew all was well, and no failure of the telephone could occur without being known.

Another matter of domestic interest might be

referred to. The writer has two cats, and because they catch fish as other cats catch mice, visitors come the five miles from town to see them. They have their own electric bell which they ring to gain admittance to the house, a little shelf on which they stand making the necessary contact.

FOR BENDING CONDUIT

A permanent and useful conduit bender for shop use can be made up at little expense in the following manner: Take a plank about four feet long and one inch in thickness and saw one end of it to form a half circle, then groove out one

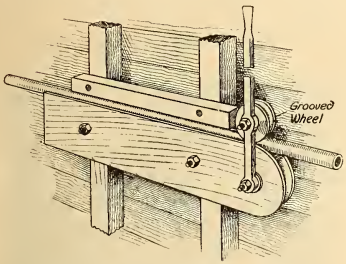


Fig. 1. Plank and Lever Conduit Bender

edge as well as the half round portion, Fig. 1. Securely fasten this plank to a wall or partition where there is ample room to work. Above the plank may be fastened a block of wood about 2 by 4 by 24 inches, or several bolts may be used instead, to hold the pipe to be bent in the groove. On the half round end a lever is fastened by means of a bolt which acts as a bearing. On this lever a grooved wheel is so attached that it moves concentric to the circle of the groove which is slightly larger than the pipe to be handled.

In new buildings where conduit is being installed, the following arrangement, Fig. 2, will be found handy: Take two blocks of wood about 4 by 2 by 24 inches and saw one end of each to form a quarter-circle. Nail or bolt these blocks to a work bench, or a plank may be set on two strips of wood nailed across upright joists. The blocks should be separated just a little more than the thickness of the pipe. It is very seldom that this device will be used for conduit over one inch in diameter, in which case the blocks and supports would have to be heavier and stronger.

ELECTRIC WELDING

The application of electric welding has been greatly increased through the supplying of the proper equipment by manufacturers.

The welding of metals by the electric arc may be briefly defined as the fusing together of two metals, without pressure, allowing them to melt, mix, unite and then cool. For heavy cutting and for the repair of castings which show defects or blow-holes and imperfect formation and for general work, the metal to be welded is made one terminal of the direct current circuit, and a carbon electrode is made the other. Upon placing the carbon electrode in contact with the metal and then simply withdrawing the same, an arc is established between the two. By this means, which produces the hottest flame known — the temperature being between 3500° and 4000° C. — the metal may be either directly welded, melted away, moulded into a different shape or fused to another piece of metal as desired. With this process the current ranges from 180 to 1000 amperes, depending upon the class of work being done, 250 to 350 amperes being the average value for ordinary work. For lighter and smaller repair work, the metal to be welded forms one terminal of a direct current machine while the other terminal is formed by a metal pencil instead of the carbon electrode. This pencil which is usually $\frac{5}{16}$ to $\frac{3}{8}$ inch in diameter is coated with a suitable flux and the

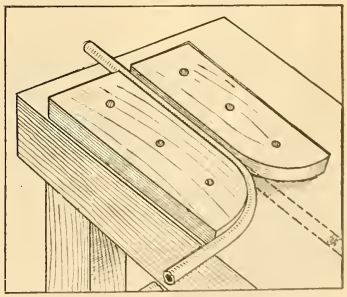


Fig. 2. Work Bench Conduit Bender

operator holds it by means of a pair of pliers or tongs. The arc is drawn as described above, and with a $\frac{1}{4}$ inch carbon, is approximately $\frac{1}{8}$ inch long, taking from 150 to 180 amperes. This latter process is used extensively in railway shops for flue welding, boiler and firebox repair, also in machine shops for repairing steel castings, etc.

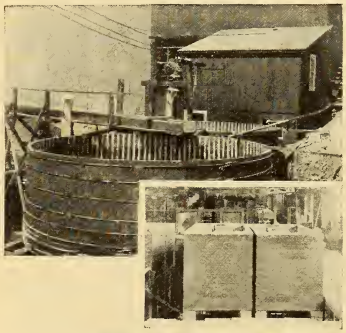
GAINING COPPER BY ELECTRICITY

The process of electrical separation of copper from the crude rock is interesting and comparatively in its infancy.

The ground-up particles of rock are first dumped into a large tank of sulphuric acid solution, known as the leaching tanks. The

Electrolytic Copper Plant

acid dissolves the small particles of copper. The waste parts — rock and dirt — settle to the bottom of the tank. The solution is now ready for the cell room for the collection of the copper. Each cell is 8 by 2¼ feet and about 3 feet deep. Through the length of the tank are placed first an anode, the plate from which current enters the electrolyte, then a cathode, the plate by which the current leaves the electrolyte.



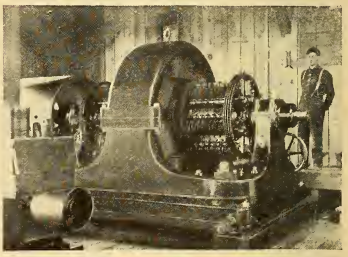
Large Electrolyte Storage Tank and Small Electrolyzing Tanks

The anodes in this process are sheets of lead hanging into the tank from a copper bar. The cathodes are sheets of copper hanging in the electrolyte from copper rods, upon which the copper is collected.

When in operation the current passes from the bus bar to the anodes of cell No. 1, then through about two inches of sulphuric acid solution to the cathodes. This occurs throughout all cells. When a cathode weighs about 40 pounds, it is removed for shipment. It weighs about five pounds when put into the electrolyte. On its journey from an anode to a cathode the current carries dissolved particles of copper, depositing them on the cathode.

The bus bars rest on square pieces of glass on the edge of the tank and are as long as the cell. The fumes corrode the surface of the bus bars and make it necessary to clean them with emery cloth every few days.

All cells are lined with sheet lead, as the solu-



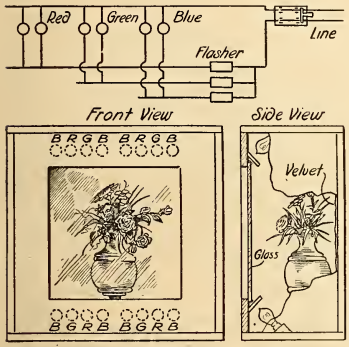
Generating Station

tion will not affect it. Woolen clothing is the longest wearing material for the employees. All sulphuric acid is diluted with water to obtain the best results. The solution makes a trip through four cells and in each cell some copper is picked up. After going through all four cells, it flows into a tank below, from where it is pumped up to a storage tank for future use. The current used is direct and the current density employed is twelve to thirteen amperes per square foot. The tanks are covered with black oil to prevent the fumes from escaping into the room. At times dirt gets into the cells. This settles to the bottom and makes it necessary to clean them about every week. When there is too much dirt in a cell, the copper forms on the edge of the cathode in shapes resembling miniature pine trees.

The outside round tanks are for storing solution only.

COLORED LAMPS IN WINDOW DISPLAY

One of the most attractive displays can be made by using colored lamps connected to flashers, giving an illumination variable in color. As a consequence colored goods are made to assume a variety of tints from apparent white through various colors to black. The principle is merely that of the science of color; namely, that the color of an object depends upon the color of the light which falls upon it. The advantage of this display is that it has almost a



Circuit and Arrangement of Lamps

universal application. Any kind of goods can be shown to advantage.

A box with an opening in front as shown is painted a dead black inside and the back is lined with black velvet. Red, green and blue lamps are used as shown, the wiring being very simple. The lamps being shielded from the observer and the inside of the box being of black velvet, the goods on display appear to undergo mysterious changes in color.

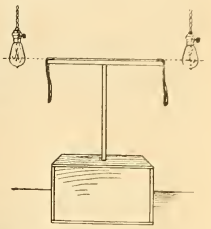
The number of lamps to be used depends upon the size of the box, of course, and likewise upon the surroundings. It is well to plan on shutting out of the box all outside light. Twice as many blue lamps as of other shades should be used, for their intensity is lower than the green or red lamps. If the lamps are 60 watt Mazda, the number of lamps shown in the illustration will be sufficient to light a display in a box with an opening 20 inches square. The more lamps used, however, the more striking is the effect.

A large box of this kind containing 40, 60 watt, Mazda lamps has been used in a florist's window with amazing success. It is necessary to take care that the circuit is not overloaded. The flashers can be of the thermostat type which operate automatically.

SHOWING RUGGEDNESS OF FILAMENT

In a Seattle show window I saw the outfit illustrated used for demonstrating the rugged qualities of the tungsten lamp.

Within the box was a small electric motor which revolved the vertical shaft at the top of which was a cross piece having at each end thongs of soft leather. Two lamps were placed in such a position that as the cross piece was made to revolve, the leather thongs, thrown out by centrifugal force, would strike the lamp globes.



Filament Tester

GERMAN NIGHT LAMP

A very useful night lamp has been recently placed on the market in Germany. It is used upon alternating current. Within the base a small transformer is arranged, reducing the voltage to four different available values so that the lamp may be burned at one, two, three and four candlepower at a consumption of two, three, four and five watts respectively. If the price of current is ten cents per kilowatt hour, the cost would be from .2 to .5 of a cent for a night of ten hours according to the voltage applied from the transformer.—J. P. Schroeter.

Lamp with Transformer in Base

Dry cells are intended solely for light, intermittent work; they never were intended to be used for continuous service and when they are so used they very quickly become exhausted and worthless.

BALL AND LOOP IN FISH WIRING

The arrangement shown in Fig. 1 is extremely useful to the old-building wireman. By properly using the device it has been possible to wire houses by removing but very few floor boards. The method is ordinarily of value only in wiring

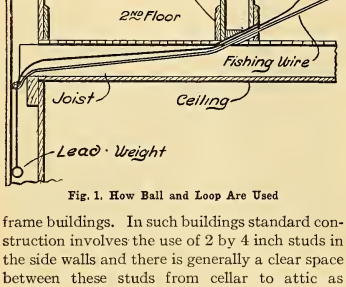


Fig. 1. How Ball and Loop Are Used

frame buildings. In such buildings standard construction involves the use of 2 by 4 inch studs in the side walls and there is generally a clear space between these studs from cellar to attic as shown.

The arrangement as detailed in Fig. 2 consists of an ordinary fishing ribbon having a loop bent in its end. The loop is so bound with fine wire that it cannot straighten out. A ball of metal is fastened to the end of a carpenter's chalk line which should be at least 20 or 30 feet in length. In using the arrangement, the chalk line is passed through the loop as shown in Fig. 2, and the fishing wire is pushed through the pocket in the space between the ceiling and the floor and toward the opening in the outer wall of the house down which it is proposed to drop the circuit. The chalk line is held taut as the wire is pushed along in the space, the ball being snugly up against the loop. When the looped end of the fishing wire reaches a point over the open space in the wall, the chalk line is released and the heavy ball dropped to some point near the cellar ceiling. It may, in houses of certain construction, drop clear down into the cellar, in which case loom covered or steel armored conductors can readily be drawn up to the outlet through which the fishing wire was originally pushed. In case there is no free opening into the cellar, one man must pull the chalk line backwards and forwards in the upper room, allowing the ball to bounce up and down against the obstruction that prevents it from falling into the cellar. A second man in the cellar can locate the position of the ball by its sound and can bore up through, so the chalk line can be drawn out.

In pushing the looped end of the fishing wire with the ball drawn up against it in the ceiling, the wire should be continually twisted and shaken around while it is being crowded forward, so the ball will pass over obstructions. The wireman should be careful to select a space between two studs through which to drop to the cellar; that is, space not obstructed by an outside window or door. This method is not alone useful in dropping wires from the second floor to the basement but can be utilized where it is desired to install a bracket or switch on the outer wall of a room.—Geo. V. Jerome.

CUTTING IRON UNDER WATER

The cutting of submerged metals is done by means of chisels and saws; this method, however, is extremely costly, as it requires the employment of divers, who can work for only short periods at a time. Now it is quite possible, by means of certain precautions, to keep an oxyhydrogen torch burning under water, provided that the gases are supplied under high pressure; the workman can therefore heat the metal with the oxyhydrogen torch and complete the cutting with a jet of pure oxygen. A German firm has just patented an oxyhydrogen torch cutter, which consists of an air tube surrounded by a

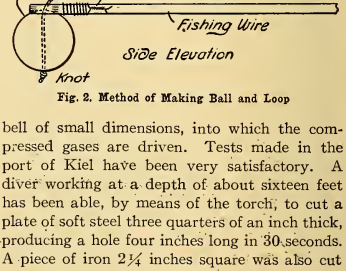


Fig. 2. Method of Making Ball and Loop

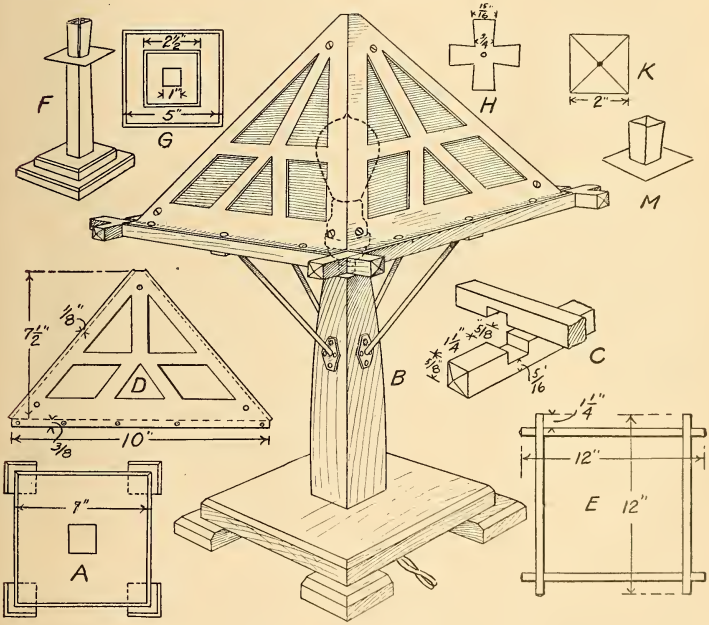
bell of small dimensions, into which the compressed gases are driven. Tests made in the port of Kiel have been very satisfactory. A diver working at a depth of about sixteen feet has been able, by means of the torch, to cut a plate of soft steel three quarters of an inch thick, producing a hole four inches long in 30 seconds. A piece of iron 2¼ inches square was also cut through in 30 seconds.

A kind-hearted old lady in Alexandria, Va., called up the chief operator and asked if it "disturbs the operators when she plays a graphophone in the same room with the telephone."

Mission Table Lamp and Candlesticks

A table lamp which can be constructed with a very limited kit of tools is here described.

Oak, preferably, or pine can be used for the base, center pillar and the frame of the shade. The shade is made of sheet brass of about No. 24 gauge, but black iron or galvanized iron could be used and painted with a dead black enamel or with a round file down the center of one side of each piece, so that on putting the two pieces together, a hole $\frac{5}{16}$ inch in diameter is formed. The two pieces should be of such shape that when glued together they will form a square pillar $1\frac{1}{2}$ inches at the bottom and tapering to one inch at the top. Square the bottom end of the



Assembled Lamp and Parts

lacquer. The base of ¾ inch material is seven inches square and at each corner is screwed on the underside and glued, pieces two inches square of the same thickness as the base.

The pillar is made of two pieces to avoid the difficulty of drilling so long and small a hole as is needed to take the flexible lamp cord. The height of the pillar is ten inches measuring from the base. A groove is sawed and then filed pillar so that it will stand upright when screwed to the base and bevel the edges of the base and feet as shown, (A) and (B).

The square frame for the shade is made by taking four pieces of wood (E) twelve inches long and $\frac{5}{8}$ inch square, and cutting out a piece at each end of the four pieces, half the thickness of the piece. Then fit and glue these together as at (C). The four sides of the shade can be

marked out on the sheet of brass (D) and cut to size. The bottom edge of each side is screwed to the wooden frame, at the $\frac{3}{8}$ inch flange. This flange is drilled to take four or five $\frac{1}{2}$ inch No. 4 round head wood screws. The brass edges adjacent to the four sides have a $\frac{1}{8}$ inch flange which is turned in, and the sides are soldered together along this flange from the inside. Openings should be cut in the shade and can be made as shown or to suit the maker's fancy. The outline should be marked on the brass when laying out the four sides of the shade. A series of holes are drilled just inside the line. When each opening is drilled all around, cut through the holes with a sharp cold chisel and file to the line.

Before the shade is finally screwed to the wood frame, it can be bronzed with the following mixture: hydrochloric acid, twelve ounces; ferrous chloride, one ounce; white arsenic, one ounce. The grease should first be cleaned from the shade with alcohol or a hot lye solution, using a rag tied to a stick for the purpose. The bronzing solution should be used near an open window on account of the fumes and can be applied with a clean rag tied to a stick. The solution should be mixed in a glazed earthenware or enameled iron dish, large enough to take one side of the shade. The pieces should next be lacquered with a colorless lacquer, or failing that, apply a thin coat of white, or orange, shellac varnish.

The supports for the shade are made of $\frac{3}{16}$ inch square rod. Cut and file the rods to the angle at which they meet the sides of the center pillar and the under side of the shade frame and then make two small plates for each support rod. Lay the plates flat on the bench and solder a plate on the end of each rod. To further strengthen the joint, drill a hole through the end of the rod and through the plate and rivet in a piece of brass wire.

Two or three holes should be drilled in each plate to take small round headed wood screws to hold the supports to the pillar and shade frame. The supports are bronzed to match the shade.

The windows in the shade can be left open and a frosted globe lamp used, or white or colored parchment paper may be glued to the inside of the shade. In the lamp constructed, white opal glass was used. Triangular shaped pieces were cut slightly smaller than the inside of the shade sides and holes were drilled through the corners of the glass and corresponding holes through the brass shade, (D) and (B). Small brass machine screws were passed through the holes and a nut on the inside held them in place. The drill for the glass was a flat drill, about $\frac{1}{8}$ inch in diameter, hardened by heating to red heat and quenching in a salt and water solution. Left in this hard condition, it will drill glass satisfactorily with turpentine as a lubricant while drilling. The drill should be frequently sharpened. An ordinary lamp socket fitted with a short piece of threaded tube and with either a pull chain or a switch, is clamped in the center pillar when the halves are put together and six or eight feet of flexible lamp cord, with a screw plug to screw into a chandelier or wall socket, is used to make connection to the lamp. The wood can be stained with any of the regular oak stains and waxed or varnished.

Two candlesticks to complete the set can be made as shown at (F). The bases are formed of two wooden pieces $\frac{3}{4}$ inch thick, and of dimensions shown by (G), and are screwed or glued one above the other. The center pillar is made of one inch square material, tapering from a point two inches from the top to $\frac{3}{4}$ inch square, and is six inches long.

The brass plate and tapering socket to hold the candle are made of two pieces of No. 14 or 16 gauge sheet brass. The holder is cut in the shape of a cross as shown by (H), and after cutting and filing to shape, the four projecting pieces are bent up at right angles to the square in the center, when it should look like (M). The square flange (K), below the holder, is bent up slightly along the diagonal lines, and can be made somewhat saucer shaped to catch any melted wax. A hole is drilled through the center of the plate and holder and a wood screw holds these to the top of the pillar. The brass should be bronzed, the same as the reading lamp, and the woodwork stained and waxed also.

REDUCING MINERS' PHTHISIS

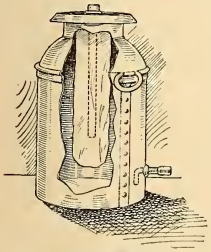
The management of one of the South African Rand gold mining companies has decided to use electricity throughout its mine and to so install the system that it may be employed in firing blasts. This will allow the miners to get away from the fine dust and bad air resulting from blasting, and, it is hoped, reduce the cases of miners' phthisis which it is asserted is caused by these health destroyers.

American electric incandescent lamps are being installed for street lighting in Hyderabad, India.

VACUUM CLEANER TANK FROM MILK CAN

A rotary vacuum pump which can be purchased from dealers may be employed as a vacuum cleaning outfit with a little trouble in arranging a tank as illustrated.

The tank is made of an ordinary 40 quart milk can which may be readily procured at the expense of about two dollars. The cover of this can forms an air-tight tank. A round hole is cut in the cover and a pipe connection made as shown.



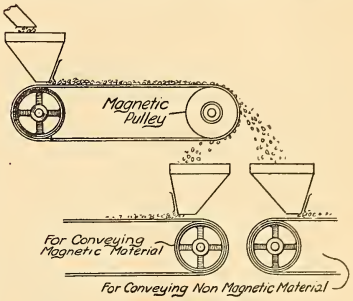
Made Over Milk Can

The pipe or hose connecting the tank with the cleaning tool is attached at this connection. The connection from the can to the pump is made at the bottom in the manner shown. This can is to act as a screen and to prevent the dust and dirt from entering the pump, and it therefore becomes necessary to have a screen in the can to catch the dust and dirt. This is provided for by means of a bag made in suitable shape to set in to the can about three-fourths of the way down and to rest over the neck of the can in such a manner that the cover will be drawn down over the top, holding it secure. This bag may be made of some material such as canvas, canton flannel or silk bolting cloth, depending on the amount of dust and dirt the cleaner is expected to handle. The connection to the pump is made by means of a pipe nipple and a union. The machine is now ready for operation after attaching a belt to the pump from a motor or a line of shafting.

DOES WORK OF HUMAN FINGERS

Hand picking of foreign material out of raw material being prepared for manufacture is expensive and not always an effective method. The illustration shows the use of a magnetic pulley which automatically holds the iron, steel or other substances subject to magnetic attraction against the action of centrifugal force, thus allowing the non-magnetic material to be thrown forward onto one hopper and the magnetic substance to fall off into the rear hopper as the belt passes away from the magnetic attraction of the pulley.

Among some of the interesting adaptations of such a device are the following: In paper pulp mills it is employed to take out nails or



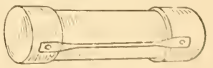
Magnetic Picker

other pieces of metal from wood chips; in gold mines, to remove stray iron or steel and so protect the crushers; in city refuse disposal plants, for taking out corset stays, tin cans, buttons, etc., from the refuse; in paper plants to remove metal buttons, hooks, etc., from rags used for making paper; in sugar refineries for removing iron oxide specks from sugar; in coal mines for removing hammer and pick heads from coal passing to the crushers; in linoleum factories for removing stray iron or steel pieces from the ground cork before it passes through the high pressure rolls.

EMERGENCY FUSE

The fuses used in the lighting system of one of the large office buildings in Milwaukee are of the enclosed type.

Recently several of these fuses blew out and it was found impossible to secure a fuse of the proper size except by ordering direct from the factory, which occasioned delay. In the meantime the blown fuses were reconstructed for this emergency as follows:



Emergency Fuse

The small nails which hold the brass caps on the fuse were pulled out, and a piece of lead wire with the ends flattened was placed from cap to cap. The nails were again driven in through flattened ends and into the fuse, holding the wire securely to the caps.—W. H. Heise.

Design for a Small Induction Motor

BY CHAS. F. FRAASA, JR.

PART I

The accompanying drawings illustrate the construction of a self starting, single phase, induction motor designed for operation on 110 volts 60 cycles. The synchronous speed is 1800 r. p. m., but under full load the speed will drop to from 1730 to 1750 r. p. m. On full load, the machine will consume about 110 watts and develops 1/15 horsepower.

The motor operates purely on the induction principle. The supply current is led into a

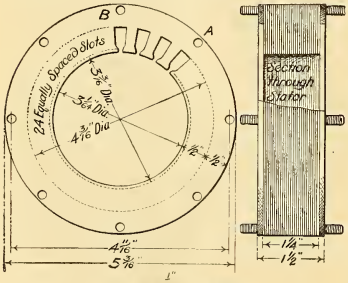


Fig. 1. Stator of Motor

stationary winding on the stator which produces a rotating field about a short circuited rotor, inducing in it a current which reacts upon the stator, producing rotation. In a motor of this type, having a short circuited rotor winding, the absence of commutator, brushes, and insulated windings on the rotating element leaves little to get out of order.

The induction motor consists essentially of a rotating element and a stationary element with their windings. The primary winding is placed on the stator and the secondary on the rotor.

A single phase motor with a bar wound rotor will not start without assistance, while two and three phase motors are self starting. There are several ways to make the motor described in this article self starting. In the method used, the arrangement imitates that of a two phase motor. Two separate sets of coils are wound on the stator, overlapping each other as would a two phase winding. The winding is practically a two phase winding. The one phase is wound with heavy wire and is used as a running winding. The other phase consists of many turns of smaller wire and is in use only a few moments at starting and must be cut out when the motor is up to speed, or it will burn out. The difference of resistance and inductance in the two windings causes the current in the one phase to lag sufficiently behind that in the other phase to produce practically the same effect as would two phase currents in the windings. This type of winding is known as the split phase winding.

The stator, Fig. 1, is constructed of a number of laminae securely clamped together and having slots for the winding around the inner periphery. The material for the stator laminae is No. 29 sheet steel. Cut enough 5¾ inch disks of sheet steel to make a stack 1¼ inches thick when tightly compressed. Then get two disks of ⅛ inch iron, having the same diameter and clamp the disks for the laminae between them. Inscribe a $4\frac{11}{16}$ inch circle on the top disk and divide its circumference into eight equal parts. This is to locate the eight holes (A) and (B), etc., which are drilled with a $\frac{5}{16}$ inch drill. The holes (B) should be counter bored on both the top and bottom plates. Procure eight $\frac{5}{16}$ inch rods each four inches long and thread each end. Put these rods through the holes in the disks and turn a nut on each end allowing the rod to project equal distances on each side of the core.

Using the same centre that was used in locating the holes (A) and (B), Fig. 1, inscribe two circles on the top disk, one $3\frac{29}{32}$ inches in diameter, and the other 3 6/16 inches in diameter. Divide the larger circle into 24 equally spaced parts and at these points draw radii to the centre. Around the outer circle drill 24 $\frac{9}{32}$ inch holes and at the points located on the inner circle drill 24 $\frac{5}{16}$ inch holes. There will then be 24 pairs of holes

around the disks. Each pair of holes locates a slot.

The material between each pair of holes, Fig. 2, is then cut out with a chisel made for this purpose and the slot shaped out. The chisel for cutting the slots is dimensioned in Fig. 2, (A). Any blacksmith will make this at small cost. It may be made of an old chisel, or from tool steel forged to shape. When grinding the cutting edge, be careful not to allow the tool to get too hot, as this will soften the steel.

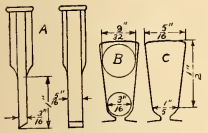


Fig. 2. Chisel and slot it is Used to Make

If the metal is too hard, the edge will chip off. If told what it is to be used for, the blacksmith will draw it to the proper temper.

At (B), Fig. 2, is shown the two holes in the iron which form the slot. The slot outline shows the material that is to be cut away. The finished slot is dimensioned in illustration (C). After the iron between the holes has been cut away, the slots should be shaped out with a file.

The stator iron is clamped to the lathe faceplate by means of the rods through the holes (A), (B), etc., Fig. 1. The rods are inserted through the slots in the faceplate and a washer and a nut are turned on each rod. The outside is turned down to a diameter of $5\frac{3}{16}$ inches and the center bored out to 3 1/64 inches in diameter. The slots should be filled with pieces of wood before the centre is bored out, to prevent the tool from tearing up the teeth. The iron over the teeth is cut away by boring the heavy end plates to a diameter of $4\frac{3}{16}$ inches. Next remove the stator from the lathe and cut off the rods (B) on both sides of the core and rivet them down closely. They should come flush with the surface, since the holes were counter bored. The slots are opened by a $\frac{3}{32}$ inch saw cut made with two or three hack saw blades mounted side by side in the frame. The stator will then appear as in Fig. 1.

Fig. 3 dimensions the finished bearing housing, of which two are required. Both housings are alike, so only one pattern need be made. The material for the patterns is ¼ inch white pine. Mount a wooden block on the faceplate of the lathe and on this glue six pieces of white pine, first gluing a piece of heavy paper on the faceplate before gluing the pattern material to it. This will facilitate the removal of the finished pattern. The pattern is then turned inside and outside. The four windows in the pattern are cut with a coping saw. The recess (A) will not be turned in the pattern, but in the finished casting. The four bosses (B) are ½ inch dowels, ⅞ inch long, and are glued in holes drilled through the housing at the places indicated. The hole in the bearing hub for the bushing is to be cored out. The core print

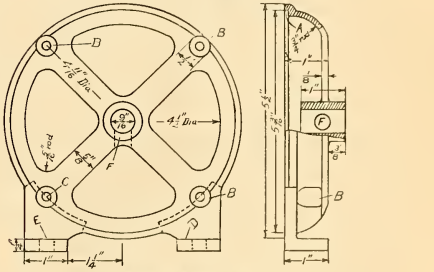


Fig. 3. Finished Bearing Housing

is dimensioned in Fig. 4 at (E). This core print is glued in a ¼ inch hole drilled in the bearing hubs. One print is required on each side. The base lugs (D), Fig. 3, are cut from some white pine, and glued into a slot cut in the pattern as shown by the dotted line, Fig. 3. All corners should be rounded out with fillet or beeswax. The pattern should then be sandpapered well using No. 0 sandpaper and receive a coat of shellac. This will raise the grain of the wood. Sandpaper again, and give two coats of shellac. This completes the pattern for the housing. Two castings will be required.

When the castings come from the foundry, clean them well with a grinding wheel, emery cloth, and a file. Chuck the housing casting in the lathe and bore the hub out to $\frac{5}{8}$ inch for the bushing. Next mount the housing on a mandrel, bracing it well and face both sides of the hub and the bosses. The recess (A) on the inside is turned $5\frac{3}{16}$ inches in diameter and $\frac{1}{8}$ inch deep. The recess should be a tight fit over the outside of the stator core. Remove the housing from the lathe and drill the holes (E) in the feet and (B), Fig. 3, in the bosses. The holes in the bosses are drilled ¼ inch to give ample allow-

ance for inaccuracies in drilling the holes for the clamping rods in the stator iron. This will not affect the centering of the rotor core,

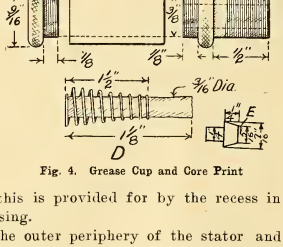


Fig. 4. Grease Cup and Core Print

as this is provided for by the recess in the housing.

The outer periphery of the stator and the surfaces of the two housings may be improved by a coat of black machine enamel.

The bearings are phosphor bronze bushings. These are one inch long, bored out to $\frac{7}{16}$ inch in diameter, and then mounted on a mandrel and turned down to $\frac{3}{16}$ inch in diameter. Drive the bushings in place, and drill and tap the $\frac{3}{8}$ inch hole (F), Fig. 3, for the grease cup. This hole is drilled and tapped to the bushing. Through the bushing it continues as a $\frac{3}{16}$ inch hole for the wick which supplies the lubricant to the bearings.

The lubrication is provided by means of a wick hanging in a grease cup. The grease cup is illustrated and dimensioned in Fig. 4. The body (A) of the grease cup is made of a brass tube threaded $\frac{3}{8}$ inch, for a short distance on each end, internally. The two caps (B) and (C) are also made of brass, and are threaded to screw into the part (A). The cap (C) has a $\frac{3}{16}$ inch hole drilled through it for the wick. The wick has a short piece of brass spring wire coiled around and bound to it, as at (D), to force the wick up against the rotor shaft. Soft grease should be used in this cup.

(To be continued)

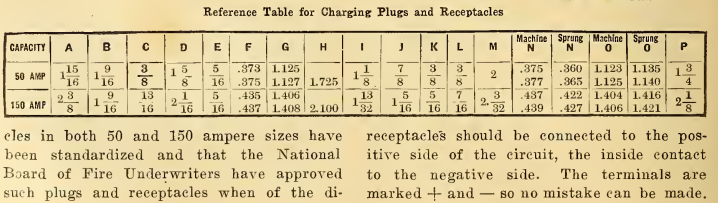
HOT FIELD MAGNETS

When the field magnets of a dynamo are found to be excessively heated, they should be tested for faults in the order given: (1) excessive exciting current; (2) moisture in field coils; (3) short circuits in field coils; (4) eddy currents in pole pieces.

Charging Plugs and Receptacles Standardized

A most welcome announcement to the electric vehicle industry and to owners of machines is, that charging plugs and receptacles in both 50 and 150 ampere sizes have been standardized and that the National Board of Fire Underwriters have approved such plugs and receptacles when of the dimensions shown in the accompanying table, allowing an overload of 50 per cent as well.

The outside contacts of the plugs and receptacles should be connected to the positive side of the circuit, the inside contact to the negative side. The terminals are marked + and — so no mistake can be made.



Reference Table for Charging Plugs and Receptacles

CAPACITY	A	B	C	D	E	F	G	H	I	J	K	L	M	Machine N	Sprung N	Machine O	Sprung O	P
50 AMP	1 15/16	1 9/16	3/8	1 5/8	5/16	.373	1.125	1.725	1 1/8	7/8	3/8	3/8	2	.375	.360	1.123	1.135	1 3/4
						.375	1.127							.377	.365	1.125	1.140	
150 AMP	2 3/8	1 9/16	13/16	2 1/16	5/16	.435	1.406	2.100	1 13/32	1 5/16	5/16	7/16	2 3/32	.437	.422	1.404	1.416	2 1/8
						.437	1.408							.439	.427	1.406	1.421	

MODERN WATER COOLING TOWER

This is not a Japanese pagoda but a modern cooling tower and is the outgrowth of the demand for a cheap water supply for cooling purposes. Ten or fifteen years ago a cooling tower was a sort of "rule-of-thumb" affair and was used only in large power plants, where a natural water supply was not available.

In former times it was thought necessary to install all large power plants on the bank of a river or lake where a plentiful supply of cooling water could be obtained. These locations were expensive and were not as a rule advantageously placed for trolley car or lighting service.

Cooling Tower

With the advent of the modern cooling tower, however, the location of a power plant may be viewed from the standpoint of cost of ground and center of distribution, the question of water supply becoming unimportant.

In the cooling tower, heated water from the condensers is cooled so that it may be used over and over again, the only loss being that due to evaporation, which does not exceed from five to eight per cent of the total quantity of water circulated depending upon the location and time of the year.

In the Hart cooling tower the hot water is discharged to distributing troughs placed at intervals on a steel structure. This structure is equipped with a series of decks. Each deck is equipped with cooling trays placed so that there is a free circulation of the air between the trays, which are shallow. The water spills over the sides through notches.

The question of spray has been entirely cared for by the use of the wings shown in the illustration which are known as "spray preventers." They stand out at an angle to the vertical and also guide the incoming air so that it strikes the cooling surface at the most efficient points.

HEATS FROZEN SOIL FOR POLE DIGGER

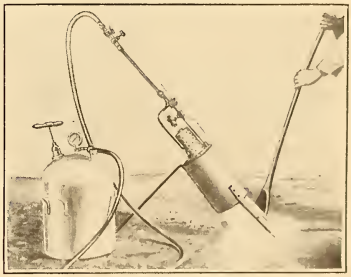
To dig holes for telephone poles in frozen ground is a tedious and expensive operation. To do the work quite as quickly and cheaply as in warm weather, there has been patented a portable kerosene heater shown in the photograph.

This device consists of a complete kerosene oil burner outfit with tank, hand air pump, pressure gauge, length of hose and the burner proper and also a specially constructed hood.

The burner gives a large intense flame and by using the hood, confining the flame to the ground on the spot where the hole is to be dug, the frost can be taken out in a very short time at nominal cost.

By using this kerosene heater the poles can be set in just about the same time in cold as in warm weather. The earth can be put back and there is no necessity for retamping the earth around the poles.

The New York Telephone Company has adopted this system and made this equipment standard for their use. Any laborer can easily operate this device and it can be carried by one man.



Portable Kerosene Heater

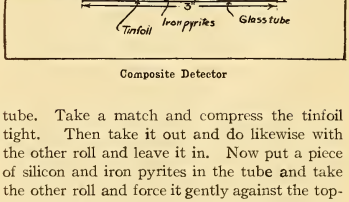
It can also be used for other heating operations such as dressing tools, straightening and bending pipe and bars, brazing, soldering, etc.

The installation of ten 1500 kw. and two 1000 kw. 60 cycle rotary converters by the Cleveland Railway Company is the largest 60 cycle rotary converter installation in the world and, according to recent reports, is giving remarkably satisfactory results.

COMPOSITE DETECTOR

This detector is easy to make and is ideal for portable sets because of its compactness.

Procure a piece of hollow glass tubing three inches long and 3/8 of an inch in diameter. Then cut two strips of tinfoil an inch wide and about three inches long. Put a piece of bare copper wire in the middle of each and roll up tight. Take one of the rolls and force it into the glass



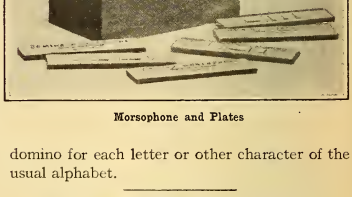
Composite Detector

tube. Take a match and compress the tinfoil tight. Then take it out and do likewise with the other roll and leave it in. Now put a piece of silicon and iron pyrites in the tube and take the other roll and force it gently against the top-most mineral. Connect up the detector and tap the glass tube until you hear the signals the loudest. Carefully disconnect and pour melted sealing wax into each end.

Perikon crystals of course could be used in place of those mentioned and will work well.—T. C. KEARFOTT.

MORSOPHONE

The Morsophone is a little French device of very small cost which enables one to learn telegraph receiving very quickly. A set of flat pieces resembling dominoes are used and these are made of some insulating material and carry metal plates on the under side representing dots and dashes. The upper side carries only an arrow to show the direction for moving the dominoes, and it only remains to move them along the box over a double contact piece to produce the Morse signals by closing an electric circuit and sounder. The set includes one



Morsophone and Plates

domino for each letter or other character of the usual alphabet.

WIRELESS TELEPHONE FOR THE EXPERIMENTER

A simple system which all amateurs owning a wireless station can install with no additional expense other than a common telephone transmitter, is shown in Figs. 1 and 2.

A current of four amperes at 110 volts, 60 cycles, is connected by wires (A) and (B) to primary (C) of a ¼ kilowatt transformer. From the secondary (D), wires connect to the terminals (E) and (F) of a micrometer gap shown in detail in Fig. 2. This gap is made by taking two

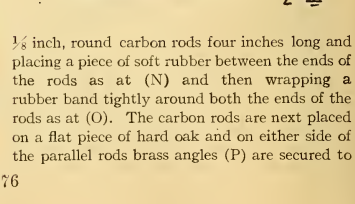


Fig. 1. Transformer and Micrometer Gap

⅛ inch, round carbon rods four inches long and placing a piece of soft rubber between the ends of the rods as at (N) and then wrapping a rubber band tightly around both the ends of the rods as at (O). The carbon rods are next placed on a flat piece of hard oak and on either side of the parallel rods brass angles (P) are secured to

the oak base by screws (Q). The carbon rods (R) are normally ⅛ inch apart, but by means of screws threaded through the brass, adjust-

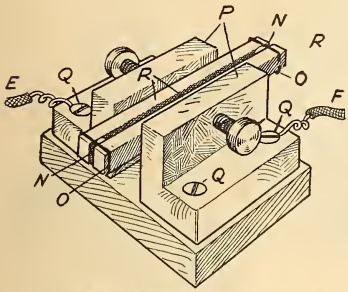


Fig. 2. Micrometer in Detail

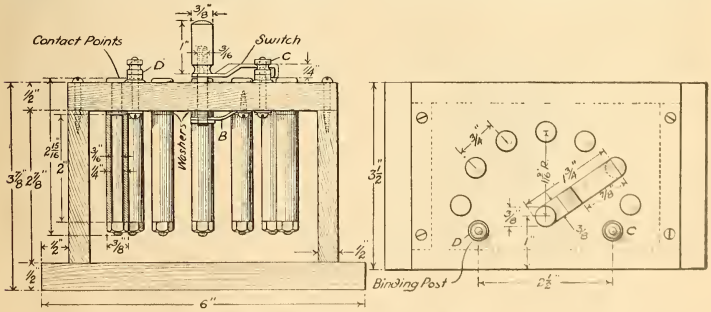
ment of the carbons can be made so that they are 1/16 inch apart. Since the carbons are bowed at the middle, the gap does not need adjustment, for as soon as a part of the carbon is burnt in one spot, the spark takes another spot along the bowed carbons, always finding a new and cool spot for the spark to take place. From the terminals (E) and (F), Fig. 1., condensers (G) each made of four glass plates 10 by 10 inches, are connected to the primary (H) of an oscillation inductance. The acrial (J) connects on one terminal of the secondary (I) while from the other a wire passes through a transmitter of any make and then to ground (L). In place of one transmitter, a number may be connected either in series or parallel.

The voice is clear and distinct if the gap between the carbons is about 1/16 inch and the tuning on the primary and secondary of the oscillation inductance is sharp. Because of the short gap employed, very little insulation is needed and the thinnest glass may be used for the condensers. Talk in a firm voice not closer than two inches from the mouthpiece of the transmitter. When trying this system out, put the transmitter up to the horn of a phonograph and take a receiving set about 100 feet away and listen in until you get the distinct speech or music.—E. M. NELSEN.

Constructing a Rotary Non-Inductive Potentiometer

Construct a box in accordance with dimensions, using ½ inch oak. Ten holes should be drilled in the cover with spacing and dimensions as given.

The contact points are turned from a piece of round brass ⅜ inch in diameter. The dimensions of the shank should be 5/16 inch by 2⅝ inches long. The contact points should be 1/16 inch thick.



Interior and Top View of Rotary Potentiometer

Turn an 8/32 thread on the lower end of the shank.

The resistance units of the potentiometer consist of seven carbon rods 2⅜ inches long each.

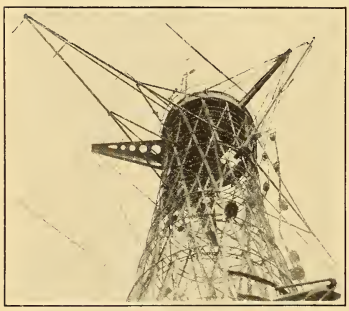
These rods are ordinary arc lamp carbons. A ¼ inch hole should be drilled through the center of the carbon. Dimensions of the carbon rods are shown.

The switch has a rubber handle and a $\frac{12}{32}$ thread is tapped on the bottom of the handle. The switch blade is made of a piece of brass 1¼ by ⅜ inch. It should be about No. 14 gauge. The blade should be bent as shown and soldered to the shank. The switch is held in place on the cover of the box by a spring (B). The spring (B) should be fastened with a brass wood screw.

The carbon rods should be connected in series with each other, stranded wire being used. One of the carbons should be connected to binding post (C) and the switch should be connected to binding post (D).—SAMUEL COHEN.

SAYVILLE TO NAPLES LATEST NAVY WIRELESS FEAT

A practical wireless test was conducted by the Atlantic battleship fleet while on its recent cruise to various Mediterranean ports. The test first took the form of a competition between the wireless officers on nine U. S. battleships when each ship's apparatus was used both for sending and receiving messages to and from the great naval station at Arlington, Va.



Cage Mast Carrying Aerials on Dreadnaught

Battleship's Wireless Room

During the first 2,000 miles of the trip all the ships were able to reach Arlington, but from then on until the fleet passed Gibraltar the laurels went to the radio force of the dreadnaught Florida. After leaving Gibraltar nothing more was heard of Arlington, and later it was learned that Arlington had not again picked up the fleet. It was clearly demonstrated, however, that Arlington could flash messages for 3,000 miles, which could be caught by the Florida.

While at anchor in Naples, Italy, nearly 4,500 miles from New York, the wireless operator tuned his instrument to catch Arlington. Much to his surprise he caught, instead, press news being sent out by the Telefunken system station at Sayville, Long Island. Until the ship left Naples for New York nine days later the operator received press news every night from Sayville. The flashes were very naturally weak, but out of a 500 word despatch not more than 25 words were lost.

The radio experts are unable to account for the fact that the Sayville station sends to a greater distance than the Arlington plant. It may be because the Sayville station's tower is a shaft of steel resting upon a ball instead of the usual three towers with flaring bases, and because of the greater length of the antennæ, which stretch around the top of Sayville's sending tower like the ribs of a gigantic umbrella.

The aerials of the battleships of the Atlantic fleet have been raised about 40 feet, so that now they are nearly 190 feet above the water's edge. So high are they, in fact, that the aerials and the

supporting top-masts must be taken down when the ships pass under the Brooklyn Bridge en route to the navy yard at Brooklyn.

On the trip a typhoon encountered in mid-Atlantic rendered the use of the wireless practically impossible for several hours. There was a great deal of static; that is, electrical disturbances which could be heard in the receivers, and many of the ships' apparatuses were rendered temporarily useless because of the high wind, which blew the aerials against steel parts of the vessel and chafed the insulation from the main wires; but on the whole the radio office of the Navy Department is pleased with the results of the tests.

HINTS ON BUILDING RADIO-INSTRUMENTS

Much of the interest in experimenting in radio-telegraphy lies in the making of the instruments. The most important item in this work is patience. Any electrician's scrap heap contains material that may be had for little or nothing, which can be carefully worked over and made of use.

Hard rubber may be softened and made pliable by soaking it in very hot water. When heated through it may be bent into the shape required. Flat sheets that have warped out of shape may be straightened by soaking in hot water until softened through, then clamped between two smooth boards until cold. Rubber is easily cut with any saw that will cut hard wood and the edges may be finished with a file or sandpaper. Holes can be drilled with twist or fluted drills.

Old photographic films make good dielectrics for small condensers, Brownie and pocket kodak films being of convenient size. To clean off the photo emulsion, boil in a pail of clean water to which a handful of washing soda has been added. Rinse in clear water and dry thoroughly.

Marble for bases may be cut with an old saw and plenty of water and the edges smoothed up with a rasp or file. Holes can be drilled with a flat or twist drill kept wet.

Zincs from old dry batteries may be melted up and cast into new zincs for which molds can be made for any style needed. The zinc should be melted under a layer of charcoal. Carbon elements from dry batteries can be cleaned by boiling in clear water and may be used singly or in groups to make bichromate or other batteries. The screws from these carbons are very useful in instrument building.

Dipping condenser sheets into shellac after they are cut to shape and smoothed up, brushing off the surplus and hanging by one corner to dry, makes them less liable to brush discharge, or short circuiting. The shellac should be rather thin and put on smoothly. The operation may be repeated several times and sheets treated in this way may be made up into condensers with a very thin waxed paper, giving high capacity in small space.

If variable condenser sections, after the fixed and movable parts are finally assembled, be each dipped into rather thin shellac and then dried and the operation repeated two or three times, better efficiency and less liability to short circuiting will result. The shellac coating will stand considerable wear and a light contact, which would render a bare plate condenser useless, will not affect for some time one treated in this manner.

To provide better insulation on wood instrument bases, use mica washers or pieces of mica under all binding posts, detector parts, switch points and their clamping screws, so that no metal rests directly on the wood. Under screw heads use a mica washer next to the wood and a small metal washer on top of it, so that the screw head will not cut through the mica. Thin hard rubber may be used in this way also, but is liable to crack when pressure is applied to it in tightening screws.

Dectectors using a fine wire contact, such as the "cat-whisker," are improved by using a pure silver wire for such contact. No. 30 or 32 B & S gauge can be had at a jeweler's supply house at about ten cents a yard.

Excellent detector cups can be made of discharged revolver and rifle cartridge shells. Be sure that the primer of the cartridge has been exploded, and that there is no powder left in the shell. Drive out the primer with a small punch or a nail and clean the bottom of the shell with a file or sandpaper.

All small metal parts, such as screws, washers, detector parts, switches, etc., on a radio set should be silver plated. The small expense and labor of the operation will be well repaid in the increased efficiency and appearance of the instrument.—Chas. E. Pearce.

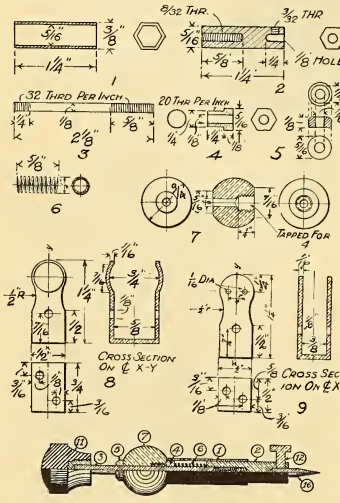
Sometimes, but not often, head phone receivers need the distance of the diaphragm from the holes adjusted. This can be done by using a soft rubber cushion between the cap and the receiver case, turning the cap on with more or less pressure.

A UNIVERSAL DETECTOR

The amateur who makes his own instruments —and incidentally derives the most knowledge of wireless telegraphy from it—desires a high degree of efficiency and he also wants his instruments to have a business-like appearance.

With this end in view the writer has designed a universal detector. Following is a general description with drawings.

Parts 1, 2, 3 and 4 are made of ordinary brass



Detector Detail

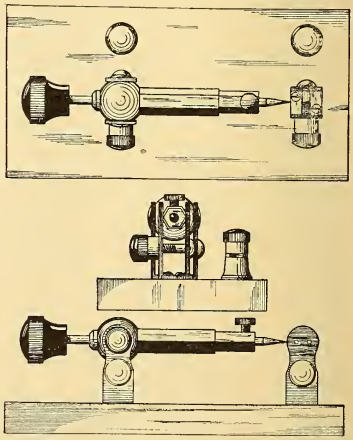
tubing and rod such as may be purchased at any experimenters supply house. The work to be done on these parts is shown in the detail drawings. It is necessary to use care to get them dressed down so that they will fit and work together smoothly.

Part 7 is a ¾ inch brass ball with opposite sides dressed off so that the flat faces so formed will have the diameter shown in the drawing. Use care in getting these faces absolutely parallel, with the hole through the center of the ball at right angles to them, for on this depends the smooth action of the detector.

Parts 8 and 9 are made of $\frac{1}{16}$ inch sheet brass cut and bent as shown. The cup shaped depression in the top of Part 8 can be made by clamping it over the ball, Part 7, in a vise with an iron washer or nut between the jaws of the vise and the sheet brass to form the brass around the ball.

1	Mineral Paint(porcelain)	10	Brass		
4	Flat-screwsor Head, 6-32 x 1/4	15	Brass		
2	Binding Posts	14	Brass & Hd Rubber		
1	Base	13	Hd Rubber or Marble		
1	Setscrew 8-32 ⅜" long	12	Brass		
1	Knob for parts	11	Hard Rubber		
2	Adjusting Screws 8-32 - 1½" long	10	Brass-Hard Rubber		
1	Clamp for minerals	9	Cast or Spr. Brass	Pattern	C
1	Clamp for 7	8	Cast or Spr. Brass	Pattern	B
1	Ball	7	Brass	Pattern	A
1	Spring-No 20 B & S wire	6	Spring Brass		
1	Collar for 3	5	Brass		
1	Plug for 1	4	Brass		
1	Rod	3	Brass		
1	Hexagonal Rod	2	Brass		
1	Hexagonal Tube	1	Brass		

The other parts, such as the hard rubber, knurled head for the adjusting screw and the hard rubber binding posts used as clamping screws, can be purchased from any good supply house. The base is of hard rubber, which can also be purchased. Then, by lacquering the metal parts and using hard rubber binding posts, the detector presents a beautiful, business-like appearance and is efficient.



Three Views of Assembled Detector

In case readers have any trouble in constructing the detector or do not clearly understand the drawings, the writer would be pleased to hear from them through this Magazine, and will give any aid desired.—G. E. RUDOLPH.

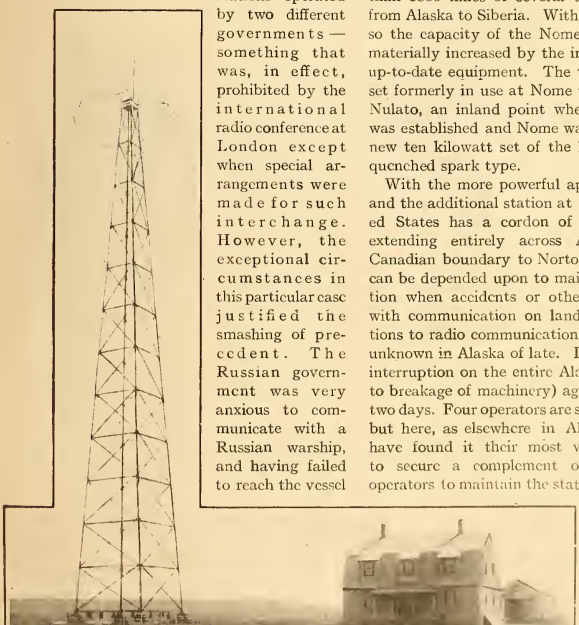
THE WIRELESS LINKS ALASKA AND SIBERIA

One of the final reaches of the habitable globe was brought within the sphere of instantaneous electrical communication when there was recently transmitted the first wireless commercial message between Alaska and Siberia. The distance between the American radio station at Nome and the Russian radio station at Anadyx in Siberia is only a few hundred miles, so that the significance of the event lies not in the distance traversed by the aerogram but in the international phase of the exchange and in the circumstance that this is literally a case of "farthest north" for such uses of the wireless.

Not the least interesting feature of this wireless spanning of Behring Strait is found in the fact that the communication passed between land stations operated by two different governments — something that was, in effect, prohibited by the international radio conference at London except when special arrangements were made for such interchange. However, the exceptional circumstances in this particular case justified the smashing of precedent. The Russian government was very anxious to communicate with a Russian warship, and having failed to reach the vessel through its own channels of communication appealed to the United States government. The message was transmitted from St. Petersburg across the Atlantic, thence across this continent and finally to Alaska, whence it passed from Nome to the Russian government station at Anadyx and was then sent to the cruiser. Incidentally it may afford a valuable alternative route to Europe should an emergency ever arise to interrupt trans-Atlantic communication.

The wireless outpost at Nome is the most westerly of the ten radio stations in Alaska established and operated by the Signal Corps of the United States Army. The Nome station is accounted the most powerful of the chain which serve to keep communication open along the Alaskan coast and up the Yukon. On occasion it has transmitted messages a distance of more than 1800 miles or several times the distance from Alaska to Siberia. Within the past year or so the capacity of the Nome station has been materially increased by the installation of new, up-to-date equipment. The ten kilowatt radio set formerly in use at Nome was transferred to Nulato, an inland point where a new station was established and Nome was provided with a new ten kilowatt set of the latest Telefunken, quenched spark type.

With the more powerful apparatus at Nome and the additional station at Nulato, the United States has a cordon of wireless stations extending entirely across Alaska from the Canadian boundary to Norton Sound, and this can be depended upon to maintain communication when accidents or other causes interfere with communication on land lines. Interruptions to radio communication have been almost unknown in Alaska of late. Last year the total interruption on the entire Alaskan system (due to breakage of machinery) aggregated less than two days. Four operators are stationed at Nome, but here, as elsewhere in Alaska, the officials have found it their most vexatious problem to secure a complement of qualified radio operators to maintain the station in a high state of efficiency. Indeed, the Alaskan system offers opportunities which should not be overlooked by wireless operators in search of employment.



Nome Wireless Station

On Polyphase Subjects

Dr. Langmuir and the New Lamp

Disturbing, indeed, are the losses which take place between the coal pile and the glow finally produced in the filament of a lamp. Under average conditions scarcely one per cent of the energy of the fuel actually appears as light. Anxious then are scientists, engineers, business men to accomplish anything which will in a measure close up the existing gap. Every little step toward that end, in the design of lamps and machinery, or in operating methods, is greeted with enthusiasm.

Two or three years ago, when the tungsten lamp became a commercially established fact people said, "How wonderful! How much better is interior illumination, how different and how much more brilliant are electric signs now from what they used to be!" Engineers and electrical men exclaimed: "At last —what we had hoped for—one watt per candlepower!"

And now science has once more come forward and at one stroke cut that one watt per candle down to one-half watt per candle. In other words, for a given amount of electricity twice as much light has been produced as ever before. This has been accomplished in what is known as the nitrogen-filled lamp, as announced in the December issue of this magazine and more fully described in this issue by Mr. C. V. Ferguson. True it is that the lamp has been made only in large sizes, as yet—2,000 candlepower, suitable for street lighting and very large interiors. But nevertheless it is a notable advance and it is not to be doubted that eventually smaller units of equal or greater efficiency will be produced.

Intimately connected with this latest achievement is the name of Dr. Irving Langmuir, a young man only 32 years of age, to whose research work it may be chiefly attributed.

And the development of this new lamp is but another proof that inventive genius is not dead in this country and that not all resultful research is carried on across the water, although some pessimists would have it so. Dr. Langmuir is an American, born in Brooklyn. His early education was obtained here, although as a youth he studied three years in Paris, where he had gone with his parents to live. He came back to the United States, however, for his college course, at Columbia University—taking his doctor's degree later at the University of Göttingen, Germany.

But his real work in developing the new lamp was done after 1909, when he entered the research laboratory of the General Electric Company, and in him, as an American product and an American producer, his countrymen may well take pride.

Short Circuits

"I hev come to tell ye, Mrs. Malone, that your husband met with an accident."

"An' what is it now?" wailed Mrs. Malone.

"He was overcome by the heat, mum."

"Overcome by the heat, was he? An' how did it happen?"

"He fell into the furnace over at the foundry, mum."

* * *

The seedy individual (who has come up just after the rescue)—"Are you the cove wot 'as just pulled my boy aht o' the sea?"

The other (modestly, after effecting a very gallant rescue)—"Yes, my friend, but that's quite all right—don't say any more about it."

"Orl right? It ain't orl right! Wot abaht 'is bloomin' 'at?"

* * *

A German farmer near Fort Wayne lost his horse and went to the newspaper office to advertise for it. The editor asked him what he wanted to say.

"Yust put vat I told you," replied the man. "One nite, the udder day about a month ago I heard me a noise by the frunt middle of de pac yard which did not use to be. So I jumps the ped oud, run mit der door and ven I see I finds my pig gray iron mare he was tied loose and runnin mit der stable off. Whoever prings him back shall pay $55 reward."

* * *

"Hey, there, boy!" said the traffic cop to a gamin who was puffing on a cigar stump, "what brand is that you're smoking?"

"Robinson Crusoe," replied the youngster.

"That's a new one on me," admitted the policeman; "where do you get 'em?"

"In the gutter; where'd you suppose?" returned the boy. "Wasn't Robinson Crusoe a castaway?"

Patron (who has waited fifteen minutes for his soup)—"Waiter, have you ever been to the Zoo?"

Waiter—"No, sir."

Patron—"Well, you ought to go. You'd enjoy watching the tortoises whiz past."

* * *

She—"I saw you in a swell touring car this afternoon."

He—"Yes, that was some automobile, 50 horsepower."

She—"But you seemed to have a hard time getting up the hill."

He—"Well, 49 of the horses died when they saw the hill."

* * *

A gentleman playing golf with a clergyman who constantly missed his stroke was astonished to hear him ejaculate "Assuan!" every time he made an especially bad mistake. At the end of the game the layman asked the clergyman what he meant by saying "Assuan."

"Well, my friend," said he, "Assuan is on the Nile, and the biggest dam in the world."

* * *

One of Bert Taylor's meal tickets "made the line" with the following:

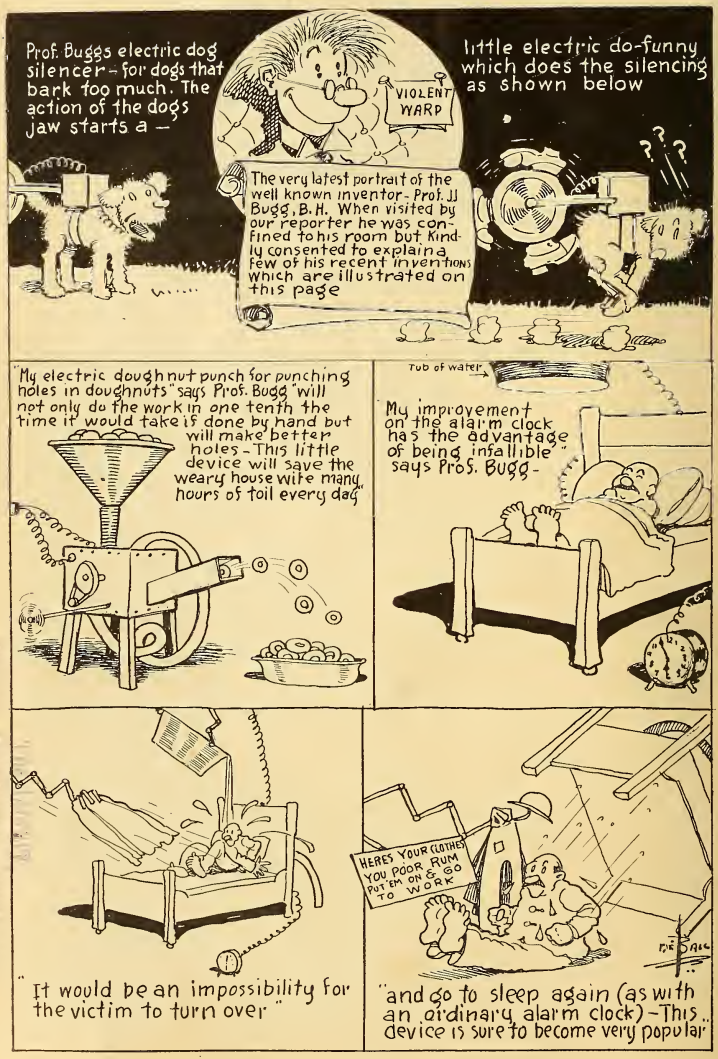
"Sir: While I was trying to get Mr. M., a German, on the phone today, carpenters were erecting a wooden partition in the office. Mr. M. could not understand a word I was saying, and in disgust he said, 'I can't hear nottings but hittings.'"

* * *

Mrs. Clarke came running hurriedly into her husband's office one morning.

"Oh, Dick," she cried, as she gasped for breath. "I dropped my diamond ring off my finger, and I can't find it anywhere."

"It's all right, Boss," replied Mr. Clarke. "I came across it in my trousers pocket."


Prof. Buggs electric dog silencer - for dogs that bark too much. The action of the dogs jaw starts a —
VIOLENT WARP
The very latest portrait of the well known inventor - Prof. JJ Bugg, B.H. When visited by our reporter he was confined to his room but kindly consented to explain a few of his recent inventions which are illustrated on this page
little electric do-funny which does the silencing as shown below
"My electric doughnut punch for punching holes in doughnuts" says Prof. Bugg "will not only do the work in one tenth the time it would take is done by hand but will make better holes - This little device will save the weary house wife many hours of toil every day"
Tub of water
My improvement on the alarm clock has the advantage of being infallible says Prof. Bugg -
"It would be an impossibility for the victim to turn over"
HERES YOUR CLOTHES YOU POOR RUM PUT 'EM ON & GO TO WORK
"and go to sleep again (as with an ordinary alarm clock) - This device is sure to become very popular