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STREET CARS MADE OVER INTO 'BUSES

No other place in the world has had such an interesting street car history as the bustling little city of Leeds, England. Three years after the overhead traction system was perfected in the United States, Leeds introduced it, the first town in England to do so. Then the municipal government

lutely. Nor are smooth streets an absolute essential, as a number are paved with rough blocks and still others with humble cobblestones.

The Leeds Railless Tramway System, as it is called, is essentially a co-operative enterprise, run solely for the benefit of the townspeople, and it



The Leeds Trackless Tramway System

purchased the entire system, built its own car factory and since that time has been running the cars at low fares and yet at a profit to the town treasury.

The latest improvement in the system, for Leeds has consistently led the march in railroad progress, has been the adoption of motor truck tired wheels for the cars and the elimination of tracks. Gradually this is being extended throughout the entire service, so that in a few years the tracks will have been banished abso-

has been an unqualified, unquestionable success. So much is it a common people's business that recently a plan has been introduced to allow workmen to ride to and from their places of work at what would be equivalent to two cents.

According to the wheel tax report of the city collector of Chicago, there were 3,859 fewer horses on the street in 1913 than in 1912, 4,239 more automobiles and 612 more motorcycles.

The Electric Eye of a Battleship

BY WALDON FAWCETT.

Recent advance in naval practice as regards searchlights has not been expressed by mere increase in the size and

later date certain portions of almost all searchlights were imported.

Our naval department came to a conclusion about two years ago as to just what is wanted in the way of a standard



power of lamps but rather by improvements in the arrangement and distribution of the lights on shipboard and particularly by the development of apparatus for the electrical and mechanical manipulation of the searchlights. The United States Navy is just now in the midst of very important experiments relative to "distant control" of searchlights and is trying out various devices in order to obtain dependable apparatus.

Incidentally it may be mentioned that the encouraging advances recently made by American firms in the art of searchlight manufacture has much to do with ushering in a new era of usefulness for these aids to warfare. Time was, when the major portion of the powerful searchlights in use in the United States were imported from Europe and until a much



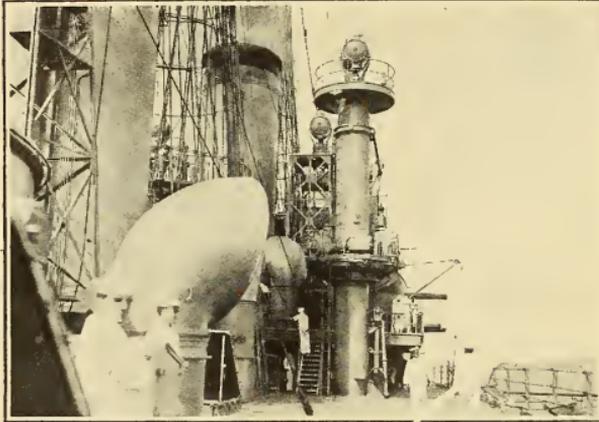
searchlight for use on warships and since that time has been wrestling with problems of disposition and manipulation as above mentioned. Only within the past few months have the experts of the navy rendered a verdict as to what is accounted the ideal complement and distribution of searchlights for a first class battleship or armored cruiser. Prior to the year 1907, six searchlights was deemed the proper complement for a battleship. Then the allowance was increased to eight searchlights and here it stood until the year 1910. Beginning in the last mentioned

(1) Wiring Electric Searchlights on the Fire Control Tower of a Dreadnaught. (2) Signaling Bridge of a Battleship; Searchlight in Position for Signaling. (3) Standard Navy Searchlight Mounted at the U. S. Naval Academy for the Instruction of Future Officers of the Navy



year the Department decreed that a trial should be made of a plan whereby sixteen searchlights were mounted on each of the big sea warriors. This scheme was thoroughly tried out for three years and now as a result of these comparative experiments the mandate has gone forth that eight searchlights is the proper and effective equipment for a battleship and all our floating fortresses are outfitted on that basis.

Under approved naval practice most of the searchlights are

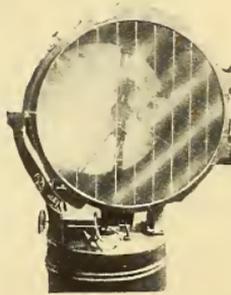


Special Searchlight Tower on One of the Newer U. S. Battleships

mounted upon platforms jutting out from the fire control towers which have supplanted the old time military masts on our warships. In some instances, however, searchlights are also mounted upon towers which serve the dual purpose of towers for such lights and pedestals for the powerful boat cranes with which every Dreadnaught or super-Dreadnaught is equipped. The allowance of eight searchlights made to each battleship or armored cruiser is scaled down to from two to four searchlights for each protected cruiser and one or two searchlights for each gunboat.

The type of searchlight favored by the United States Navy is the 36 inch pattern and the cost is about \$2,000 apiece. Naval searchlights are of two classes,

Portable Searchlight for Beach Illumination, in Use by the U. S. Life Saving Service. This is Now Operated by Acetylene, but Experiments are Being Made to Fit It with Storage Batteries



those having respectively electric control and distant mechanical control. Electrically controlled searchlights are designed to operate on a 125 volt circuit and must be capable of three methods of control; namely, distant electric, local mechanical and distant mechanical. In the case of electric control the controller must be capable of causing the searchlight to make a complete oscillation of two to 40 degrees in train and of two to 30

degrees in elevation every ten seconds. The control system is so arranged that it may be thrown into or out of engagement at the mechanical control.

Our naval searchlights, all of which are, of course, built to withstand exposure to spray from salt water, are fitted with lamps of the double feed, horizontal carbon type, designed for both hand and

automatic feed. The arc must burn quietly and steadily and be capable of burning for at least 5½ hours without the renewal of carbons. The glass front door composed of ground and polished strips of plain plate glass secured in a metal ring, must needs be mounted in a manner capable of quick adjustment without removal from the barrel in order to protect it from breakage due to shock from gun fire. The base of the searchlight is provided with an azimuth circle graduated from 0 to 360 degrees in five degree scale divisions and the controller is provided with a sight bar (fitted with open sights) which parallels the searchlight beam at all times when the light is in operation and which also enables the operator to sight accurately even though the searchlight shutter be closed.

One of the chief explanations of the present era of increased usefulness for the searchlight in warfare is found in the circumstance that under approved modern practice, searchlights are used not merely for purposes of illumination, offensive and defensive, but also for day and night signaling. Why, Uncle Sam's soldiers and sailors even resort to the searchlight to transmit the baseball scores in season! As indicative, too, of the development in this direction it may be noted that the searchlight may now be requisitioned for two separate and distinct classes of signaling. For the one, the searchlight requires to be fitted with a shutter, but for the other the ordinary searchlight without shutter suffices.

When no shutter is suitable or available, the beam of the searchlight is used for long distance signaling in a manner similar to that in which a flag or torch is employed for "wig-wag" communication. When the searchlight beam is thus employed the first position is a vertical one. A movement of the beam 90 degrees to the right of the sender indicates a dot and a similar movement to the left indicates a dash. The beam is lowered vertically fore and aft when the signaling is toward port or starboard. Ex-

perienced men have made some remarkable speed records in so signaling.

However, the preferred method of searchlight signaling involves the use of the light in a manner similar to the heliograph and for this the searchlight must, of course, be fitted with a shutter of the Venetian blind type. Under this plan, searchlight signaling is by no means confined to the hours of darkness since in daytime and in ordinary weather the shutter searchlight can be readily used for distances up to ten miles at sea. Indeed this method of day signaling is considered of exceptional value by the navy inasmuch as it is independent of background and may be used behind armor or other shelter. In this form of signaling the international code is used. The signals are made by short and long flashes, the short flash denoting a dot and the long flash a dash.

Great dependency is placed upon searchlights by the "police of the sea," and the derelict destroyer Seneca and the United States revenue cutters—which in the event of war are annexed to the navy—each carry one or two searchlights which are employed from time to time for night rescue work. In this connection it may be mentioned as one of the very latest developments in the searchlight field that the United States Life Saving Service is now conducting tests and experiments in order to perfect a storage battery searchlight that can be carried on each of the new power lifeboats of the service—the new type of craft that has so widened the scope of life saving work at sea. Already the federal life savers are making excellent use of searchlights—storm proof and fitted with 18 inch reflectors—for beach work when a marine disaster compels operations with boats, line gun and breeches buoy at night at a scene more or less remote from the life saving station. However, these portable searchlights which are carried on the truck with the beach apparatus are more often acetylene lamps than electric.

ALL NATIONS APPRECIATE THE TELEPHONE

The accompanying pictures obtained through the courtesy of the *Western Electric News* serve to emphasize the fact that the telephone is becoming almost universal. The two Siwash squaws seem to be as familiar with the instrument as their pale faced friends.

The old Maori chief of New Zealand seeks to add to the pleasure of his telephone conversation by holding in his right hand a *taiha* or talking stick which is decorated with white pigeon feathers. It is a custom long followed that the chief shall hold this stick in his hand while addressing an audience.

The Zulu chieftain is in full dress uniform

with a huge head dress of buffalo horns. While his feet look as if encased in white "kids," the fact of the matter is that he has whitened them, using pipe clay.

OUTWITTED BY THE TELE-DETECTIVE

The police were still in the dark—every clue to the murder of the prominent



Siwash Squaws at the Telephone



The Maori Chief Holds a Talking Stick While He Telephones



A Zulu Chieftain in Full Dress

banker Morris, which happened three weeks before, had been carefully followed but so far the developments were not encouraging. The two questionable characters arrested on suspicion had gone through the third degree successfully and apparently would soon be released, due to lack of evidence.

In the detective bureau the Chief had been doing some hard thinking for fully 20 minutes, when suddenly he struck the desk with his fist and muttered, "It's the last one, but we've got to try it." A certain button was pressed. The reporters were called. After the interview, each one left with the latest "dope" on the Morris case. It was a fake story but they didn't know it.

The next morning the public read about the latest developments in one of the most sensational murders on record — practically the same account in every paper. At the same time every prisoner in the lock-up was elated to find himself provided with a copy of the "Herald" — the police saying, "To conform with the new regulations."

Suddenly in No. 13 there was an exclamation. Johnson, one of the two suspected of the crime, nervously spoke in a low tone to his pal in the adjoining cell: "Bill, for God's sake — they've got us." How in blazes did they get wise that we hit the old man that night? Did they find the guns under the hedge?"

In the Chief's office upstairs the stenographer was industriously writing. Within ten minutes he had turned in a typewritten copy to the boss.

Several plain clothes men were called in and instructed to look for a couple of guns under a certain hedge somewhere near the Morris home — to handle them carefully as the finger print system would be employed.

"Now," said the Chief, "that clears up the hardest job we've had in a good while and shows, without a word of doubt, that the 'clo-detective' is just about indispensable for this and every other department.

The explanation is simple: an extremely sensitive transmitter was secreted behind the coping on top of the partition separating Cell No. 13 from 14 and the conversation between Johnson and Bill was reproduced at the receiving end of the circuit 400 feet away. The conversation coming to him in easily understandable tones, the stenographer was able to record it word for word.

AID TO HEARING CARRIED IN A HANDBAG

Besides the receiver, a transmitter and a small battery are parts of this odd device used by the partially deaf as an aid to hearing. To make the outfit as inconspicuous as possible, K. M. Turner, Jamaica, N. Y., has invented and patented a handbag within which are provided pockets for each piece of the outfit.



Handbag 'Phone

In the side of the bag against which the transmitter is carried are small perforations to admit the sound. In the jaws of the bag are two notches opposite each other for the cord of the receiver when in use. When not used the receiver may be placed in the bag which also serves for carrying miscellaneous articles.



A Trouble Shooter of the Sierras. In the Background is One of the Southern Pacific Snow Sheds Just Appearing above the Snow

The Trouble Shooters of the Sierras

When the wintry winds commence to pile and drift the snow faster and faster about the railroad snow sheds, the Sierra "trouble shooter" takes down his skis.

Thirty feet of snow is unusual, to say the least. It is odd to think of telegraph and telephone wires, apparently safely ensconced upon large glass insulators at the top of tall poles, being entirely submerged by snow. But however amusing this association of ideas may seem to the casual observer, to the man whose duty it is to maintain an uninterrupted flow of current through the wires the thought spells nothing pleasant at all.

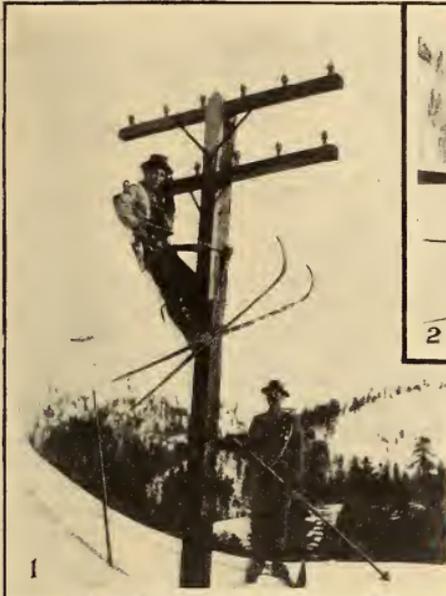
It would be difficult, indeed, to single out another man whose winter duties are as unusual and difficult, if not actually dangerous, as the trouble shooter of the Sierras. When the deadening circuits at San Francisco and Reno announce that the insidious white enemy is mantling and choking the wires, the trouble shooter obeys the call to duty.

Sometimes the drifts, by their nature and enormous size, prevent his progressing more than four or five miles a day.

Skis are the customary means of travel then. When he arrives upon the scene of trouble, he employs various means to attain his end. That itself, however, is well defined; it is just this: to clear the wires of the snow with utmost despatch.

Snow, at least ordinary damp snow, is not an insulator, as a great many people imagine. Especially is its conductive effect noticeable when conversation is attempted over long distance wires. Leakage then becomes very great, to such an extent often that voices cannot even be heard, no matter to what strength the current is adjusted.

Present day business methods have ordained the absolute necessity of clear long distance wires, or the next alternative of making them clear at greatest possible speed. Thus it is, when a trouble call comes in, we send a trouble shooter "skiing" to the scene of difficulty, oftentimes thereby necessitating his erecting rude shelter huts overnight. Whereas, had the same difficulty arisen not a great many years ago we would have simply waited for the snow to melt in the spring.



(1) When the Wires Begin to Deaden between San Francisco and Reno it is the Signal for the Sierra "Trouble Shooter" to Buckle on His Skis and Set out. (2) Deep Snow in Front of a Southern Pacific R. R. Snow Shed Station

(3) Staking Out Temporary Line. (4) Temporary Service over 36 Feet of Snow in which the Main Line is Partly Snow Covered

AEROPLANE TO PATROL TRANSMISSION LINES

A practical use for the aeroplane has been found by a western electric power company, which has engaged the famous aviator Robert Fowler to patrol its transmission line across the Sicras. The contract went into effect this fall and is the first of its kind in engaging the aircraft in patrol work of an industrial character. The transmission line extends over a very rugged and almost inaccessible region, which is readily surveyed by the air scout, however. Fowler will be remembered as the young flyer who began a transcontinental trip eastward, while Rodgers was flying west across the United States.

A MOTORCYCLE WIND SHIELD

One of the principal objections to motorcycling on cold and windy days has been overcome by the introduction of a motorcycle wind shield. As seen in the illustration it can be attached to the handle-bars of any motorcycle in two minutes' time by means of adjustable clamps and consists simply of a metal frame one foot wide and two feet high. The frame is glazed with a sheet of celluloid such as is used in automobile curtains and weighs five pounds complete.



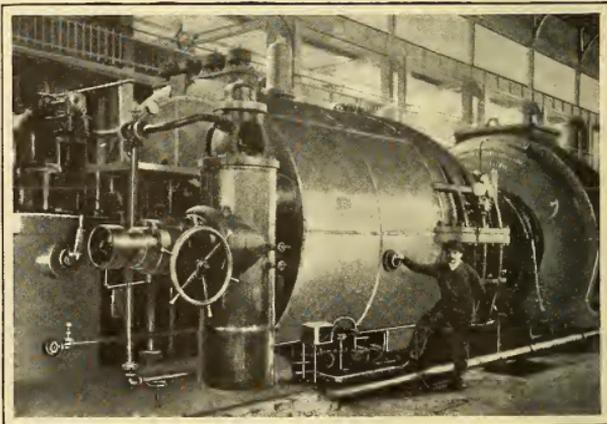
Horizontal steam turbo-generators are used in this great station and in the picture one of the units is seen. It is no larger than a modern locomotive but develops 20,000 horsepower.

NEW SCHEME FOR ILLUMINATING PAINTINGS

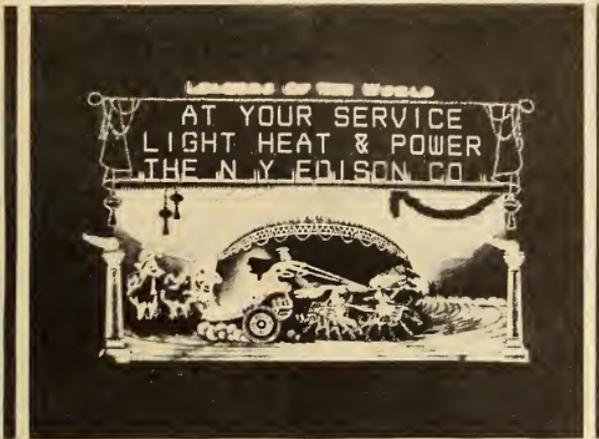
The color of the light falling upon a picture should be that demanded by the picture in order to obtain the same appearance as when lighted by daylight. This could be done by making artificial daylight by screening out the excess yellow and red rays from artificial light. However, this is expensive and unnecessary. Mr. M. Luckiesh, who has been investigating the lighting of works of art for some time, has recently developed a scheme which has already been applied to a large exhibit with great success. Each picture is treated separately and just those rays demanded by each individual picture are added to the artificial light. For instance, if the picture has a yellow tone ordinary artificial light is satisfactory. If there are some deep blue tints in it add some of the blue rays. If, however, it has a decided blue-green tone it is only necessary to add blue-green light. This is readily done by using a

GREAT STEAM TURBINES OF PARIS

The great electric station at St. Denis in the suburbs of Paris may be safely said to be the largest steam turbine electric plant in Europe, for since a recent increase it now produces as much as 120,000 horse power. The increase in the city's growth is making it necessary to afford quite a large amount of current, especially since the Metropolitan subway is taking such a great extension, for this will soon reach as high as 70 miles.



Monster Turbo-Generator of 20,000 Horsepower in Paris.



The Famous Chariot Race Sign, Known the World Over, Has Been Dismantled

trough reflector above and in front of the picture, in which are placed clear lamps and blue-green lamps. Judgment is necessary in treating paintings in this manner. The effect upon paintings is astonishing. Highly valuable paintings as well as cheap chromos have been very materially enhanced in beauty. The scheme bids fair to revolutionize the lighting of public and private galleries.

THE HAND AND THE BRAIN

An interesting illustration of the processes of reasoning by which scientific conclusions are sometimes attained is afforded by the case of the human skull discovered not so long ago at Chapelle-aux-Saints, in France, which was pronounced to be probably the oldest bodily relic of prehistoric man. This skull shows many of the characteristics of that of a monkey—but little indication of intelligence. Careful examination, however, revealed a slight excess of size of the left hemisphere, from which it was argued that the owner of the skull was right handed, and consequently a user of tools, a conclusion which is thought to be supported by the fact that ancient stone implements were found in the neighborhood.

A LAST VIEW OF THE CHARIOT RACE

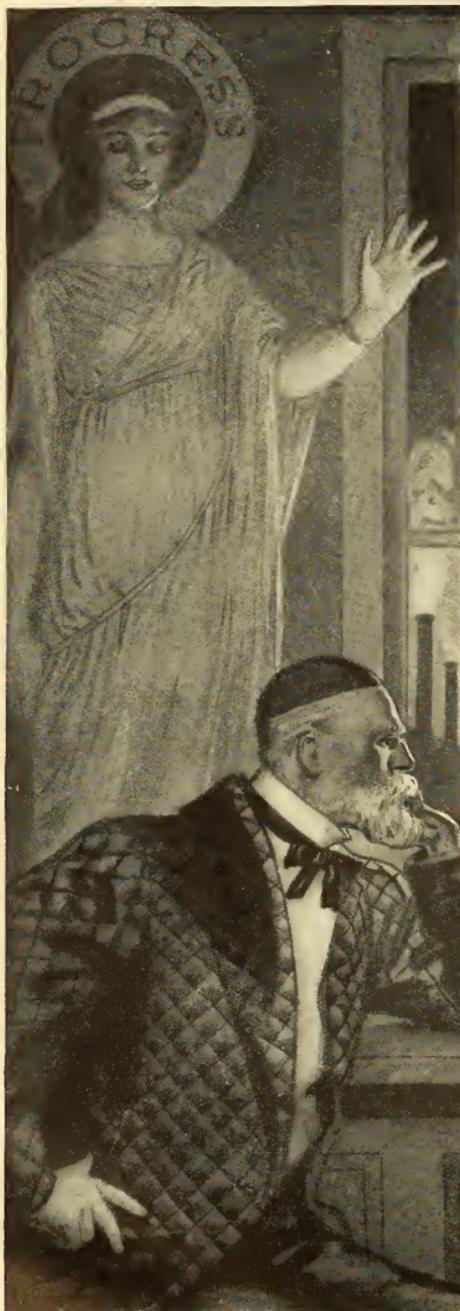
Temptation is too strong to resist to publish once more a picture of the famous Chariot Race sign—this in view of the fact that the great spectacle, which has for so many years adorned Broadway and burned its impression upon the minds of people from all over the world, was dismantled a few weeks ago and in all probability will not be re-erected. A twelve story building,

being erected at Broadway and 37th Streets, would have effectually obscured the view of the great sign.

As will be remembered by countless thousands, during the operation of the sign the horses all appeared to be running at breakneck speed, the rear chariot never overtaking the main chariot, which represent the "Leaders." The wheels of the great chariot revolved swiftly, while the road, which was of glass, appeared to recede from beneath the flying hoofs and revolving wheels. The crimson cape of the leading driver as well as the manes and tails of the horses all appeared to be waving in the wind, while the lights which decorated the arched wall appeared to move in the opposite direction.

The race lasted about half a minute—then followed a period of darkness lasting about the same length of time.

Directly over the race was suspended a great steel curtain 20 feet high by nearly 100 feet long—about 2,000 square feet of surface. Mounted on the top of this curtain (as a title of a painting) was the title of this great display—"Leaders of the World"—made entirely of electric bulbs, which remained illuminated continually. All during the evening there appeared continuously announcements of the world's greatest business concerns.



MORE BEYOND

*More beyond? The day is done!
Eye, myriad lights gleam as the sun,
And industries go on and on,
As massive wheels are turning.
A hand-touch sets broad belts astir,
Pulleys start and spindles whir,
Engines throb and motors purr
While countless lamps are burning.*

*More beyond? Can aught reveal
Each place where Toil has set his seal,
Where things of iron, brass and steel
Are man's great burden bearing?
More beyond! From rocky steeps—
From dizzy heights to nether deeps,
Comes stern demand, where purpose keeps
A challenge for the daring.*

*More beyond? The message flies
Twixt heaven and earth. Discoveries
Are held in trust 'tween sea and skies
For master minds to waken.
To wrest new force by tireless skill,
Responsive, subject to man's will,
For human good this meed fulfill.
Yet hold life's laws unshaken.*

— Renice Radcliffe.

HOW A CONDUCTOR WOULD ELIMINATE ACCIDENTS

Out in Portland, Ore., Mr. B. F. Boynton, claim agent for the Portland Railway, Light and Power Company, recently instituted a prize contest for the best papers written by platform men on the subject of how to prevent accidents to passengers boarding and alighting from moving cars. The first prize of \$15.00 was awarded to Conductor D. P. Simpson and his paper read as follows:

"I think this is a subject on which it is hard to tell where to begin, as a person might go on and cite all of the don'ts with which all of our street car men, who have been in the Company's employ for at least one year, are thoroughly familiar.

"I believe, in my own mind, that the way to eliminate this class of accidents, or any class of accidents, with exception of those which happen even with the utmost precautions, lies in the frame of mind in which a man goes to work.

"I think if a man begins his day's work full of confidence in himself, and with a firm determination that he will have his mind so concentrated on his work that it shall receive his undivided attention, during the period of time he is on duty, he will reduce accidents to a minimum.

"I believe when we are doing our utmost to eliminate this class of accidents, it is when we give our best thought, ability and power to the performance of our duty, and not looking on our work as a drudgery, as no work is a drudgery that is entered into in the right frame of mind. And a person whose heart and soul is in his work and who is thoroughly interested both in the work itself and in the final results, is doing his part in the elimination of such accidents.

"I think a great many of us carmen might be classed as what we might call the mechanical men, performing our duty (probably) O.K. with our mind and thought on some other subject. This might be permissible at times, but I think is a pretty poor policy to follow; as I believe our mind and thought should be

on our work while we are in the performance of same.

"We all know if we are in the habit of thinking of one thing while we are doing something else, we divide our attention, we cause the mind to ramble, producing absent-mindedness. To prevent this tendency, we should give our work our undivided attention, and make that a rule under every circumstance.

"The final results will be better pleased patrons, a better pleased company, and accidents eliminated beyond comprehension."

THE SUBMARINE COAL OF CAPE BRETON

On Cape Breton Island there are a number of collieries operated for the purpose of digging out coal from under the sea, the submarine area thus undermined now amounting to about sixteen ordinary farms of 100 acres each.

The outer end of the hole is something like a mile from the shore. Strange as it may seem, the workings have never been invaded by sea water streams, although fresh water streams have been encountered flowing out in the strata under the ocean bed. The thickness of this strata over the mines varies from 500 to 1,140 feet. About five million tons of coal have already been taken from these submarine workings and there is as yet no indication of the failure of the beds.

HOTEL ELECTRIFIED

It is stated that there are 41 miles of electric circuits in the new Hotel Wisconsin, in Milwaukee. There are 43 electric motors, which have an aggregate output of about 400 horsepower, of which 80 horsepower is used in operating the blowers in the ventilating system. This is the largest electrical installation in any hotel in the Northwest, it is said. The elevators are operated by electric motors, as are laundry machines, pumps, blowers, refrigerating machines, mixers, drippers and other kitchen machines, etc.

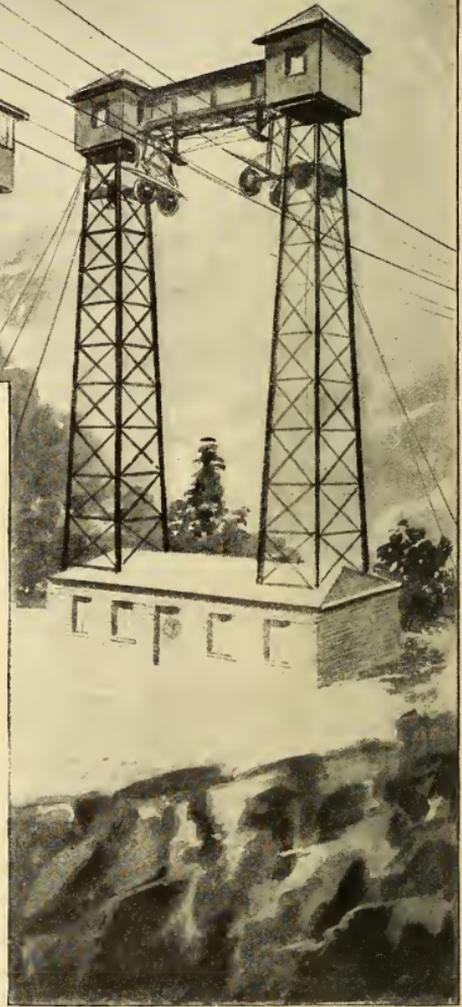


AERIAL CABLEWAY TO THE "VALE OF CASHMERE"

The spring of 1914 will witness the beginning of the construction of a great cableway, about 75 miles long, across the Himalaya Mountains which separate the beautiful, world famed "Vale of Cashmere" from the plains of the Punjab, in northern India. This will be the longest cableway in the world. It has been found impossible to construct a railroad from India into Cashmere and at present all freight going in and out is transported on bullock carts, requiring fifteen days, under the most favorable conditions, to cover the 200 miles between Rawalpinda, in the northern Punjab, and Sringar, the capital of Cashmere. The cost of transporting goods between the two cities is about \$25.00 per ton, which almost prohibitively raises the price at their destination.

The cableway will be constructed in great spans of about 800 yards each, with fixed cables upheld by iron towers. There will be separate cables, about nine feet apart, for outgoing and incoming freight. The endless moving cables for drawing the cars will be constructed in five mile sections. From the main cables,

steel cars will be suspended, 30 to every mile, holding about 450 pounds of freight. The cars will be carried over great gorges, with a drop beneath them in many instances, of more than 1000 feet. They will pass over the cable in about fifteen hours.





strated to the Cashmere government that the project is practicable and not unduly expensive. The firm has notified the government of its intention to begin the work this spring.

Water power will generate the necessary electricity to operate the line. The transfer of cars from section to section

Proposed Cableway through the Himalaya Mountains for Serving the Famous "Vale of Cashmere"

will be accomplished automatically by revolving drums, which will effect the release of the cars and their renewed gripping to the hauling cables of the next section. To overcome expansion and contraction from heat and cold, the cables will be equipped with a complicated system of springs, anchored with tremendous weights.

The cable will extend from the city of Baramula, at the entrance of the floor of the valley of Cashmere, to Abbottabad, 75 miles away, situated in the Orash Valley, India, which town is soon to be connected with the Northwestern Railway System, operating in the Punjab at Hasan Abdal 44 miles away. From Baramula the cableway will be connected with Sringar, the capital of Cashmere, by an electric railway, a distance of 38 miles. Baramula, the Cashmere terminus of the cableway is 5,150 feet above sea level, and Abbottabad, the terminus on the other side, is 4,200 feet above sealevel.

American Consul Henry D. Baker, in a consular report written from Simla, the Imperial Capital, has outlined the plan. The firm of Forbes, Forbes, Campbell & Co., together with the agents of the American Express Co. in India, have made the survey and have demon-

PHOTOGRAPHY IN NATURAL COLORS

It is truly said that the invention of color photography by the Lumieres still marks the most important event in the history of photography since the advent of the daguerreotype. A completely successful picture of this kind will always be a source of wonder and delight to the cultivated mind.

As a matter of fact, photography in colors for translucent plates is extremely simple when the autochrom, the most recent and successful process, is used. Any amateur with an ordinary camera and no extra equipment except a special yellow screen can obtain, by this method of development, almost as simple as for ordinary plates, within fifteen minutes, exposure and all manipulations included, a finished color plate, *absolutely true to nature*. In this process, of which a short description will be given, two solutions only are to be used.

These autochrom plates have been on the market but two or three years and it is within the last year that they have been perfected and within the last few months that a means of reprinting on paper has been discovered. This last mentioned marvel is the discovery of a German. The plates as now used render the most delicate tints and shades of nature with absolute fidelity. They produce a beautiful and permanent transparency in natural colors and of inestimable worth and beauty as window transparencies or when viewed in reflectors adding much to the decoration of a room. They are, too, in a prominent position as a means of advertisement for the sale of paintings, objects of art, rare furniture, stained glass windows, choice fabrics, tapestries and rare flowering plants. They have also a distinct place in many branches of science affording accurate records of skin eruptions, peculiar pathological cases and the like.

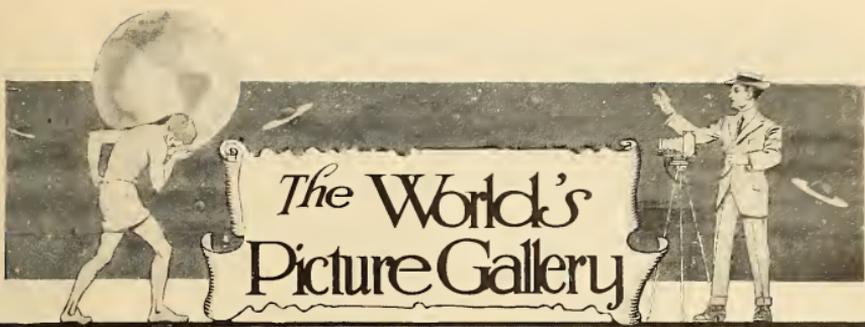
The plates differ from ordinary plates in this way: Interposed between the sensitive coating and the glass is a thin

layer of transparent microscopic starch grains, *died orange-red, green and violet*, spread without overlapping, and mixed in such proportions that the layer appears colorless when examined by transmitted light and absorbs but a small percentage of the light received. The sensitive coating is extremely thin and is made of a special fine grained panchromatic emulsion.

When such a plate is exposed in the camera with the glass side towards the lens, the light, before reaching the sensitive coating, passes through the colored starch grains which act individually as minute screens, each one absorbing all colors but its own. A microscopical selection thus takes place, and after development there is found under each grain a corresponding black spot (reduced silver) of a density proportionate to the amount of color received and transmitted by this particular grain. Were the plate fixed at this stage, the picture when examined by transmitted light would show only the colors complementary of those of the original, since the true colors are masked by the black spots beneath the grains. But when the reduced silver is dissolved (in the permanganate solution) the image is reversed; the opaque spot under each grain becomes transparent and transmits colored light precisely of the same hue as the light transmitted by the grain when the plate was exposed in the camera; in other words, the color is reconstructed just as it was decomposed during exposure.

A *special yellow screen* must be fitted to the lens in order to equalize the action of the light and compensate for the predominant action of the violet and blue rays, to which the panchromatic emulsion is most sensitive.

The use of such plates also necessitates some simple adjustments in the darkroom, lighting, camera and in the plate holders, but there is not space at this time to go into these details, which, however, are very simple and represent very slight changes.



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The Great Statue of Rameses II, Now Lying on a Palm Grove Near Bedrashin, a Few Miles South of Cairo, is to be Removed and Set Up in the Center of the New Square Outside the Cairo Railroad Station. The Statue Weighs Over 100 Tons and Owing to its Great Weight Cannot be Transported Over any Bridge in or Near Cairo. The Place Where it Lays is About Two Miles from Bedrashin Station and Special Rails Will be Laid to Bring it to that point.



Experiments are being made by the Chicago Post Office in facilitating the work of mail carriers by having them go about on roller skates. Some of the inside men have also been provided with skates to hasten their progress through the great package store-rooms.



PHOTOS BY THE INTERNATIONAL NEWS SERVICE, N. Y.

Lung Yep, the first and only full blood Chinese policeman in America, being presented with his badge by Chief of Police Sebastian of Los Angeles. Lung Yep requested that at the ceremony he be permitted to wear his Oriental robes of honor which had been handed down for generations by his revered ancestors.



The lady in the picture is a bride of the Sara tribe, in the Congo region of Central Africa. This deformation of the lips among the women is a sign of beauty. The effect is produced by piercing the lips when young. Into the holes are placed small wooden disks, which are increased in size as the lips gradually become more and more distended.

A bright and progressive Chicago newsboy owns a pair of educated dogs. They were recently permitted to sell newspapers and magazines while their master went to lunch. "Rex" sits on the stand and grips between his teeth a big calabash pipe and a copy of a newspaper, while "Brownie," a water spaniel, perches himself upon a soap box beside the stand and holds in his teeth a little "plug" hat for the safe keeping of the coin.

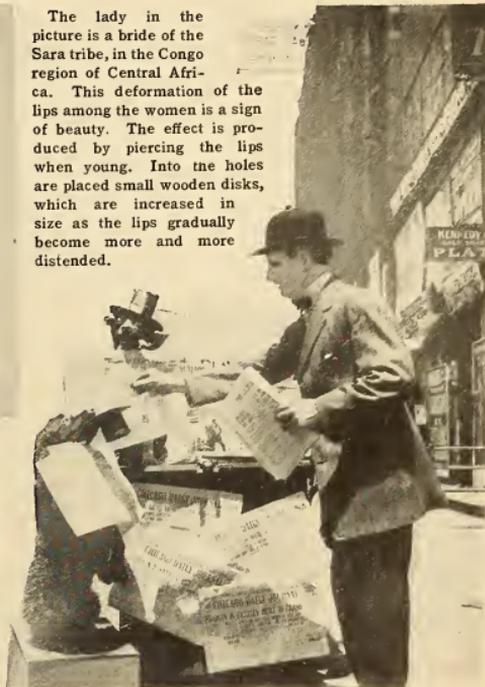
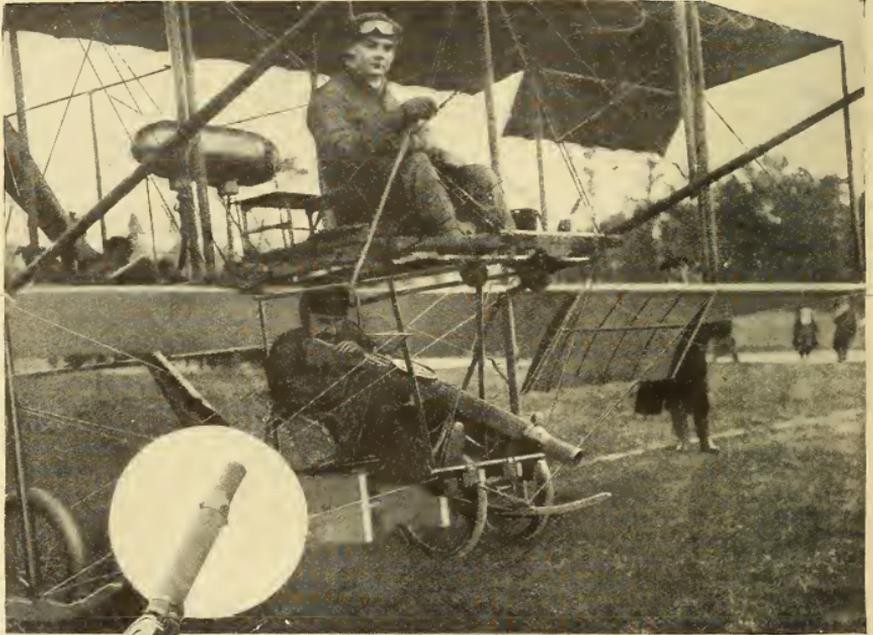


PHOTO BY PAUL THOMPSON, N. Y.

The German Kaiser and his guest Franz Ferdinand, inspecting the results of a hunt — seven stags and a wild goat.



The Belgian army has been experimenting with a new type of aerial gun. This gun can be used on the aeroplane or turned against the latter by a sharpshooter on the ground.

Dr. Rudolph Goldschmidt is the inventor of a high frequency machine and also the famous tone regulator, both used in wireless telegraphy. The English Marconi Syndicate has bought the Goldschmidt patents for \$240,000.





The great Shoshone dam in Wyoming, the highest in the world, is a wedge of concrete 328 feet from base to top. Were the U. S. capitol set down in this gap the tip of the dome would fall short of the dam parapet some 21 feet.



PHOTO BY ALEXANDER HUME FORD, HAWAII

Hot Springs at Puna on the island of Hawaii — the remains of an old crater. The water has mineral properties, fine for bathing.

The cannibal temple at Bau, the ancient capital of Fiji. Here the great king Cakbau made his human sacrifices and had his harem. Strangely enough, the rock on which the heads of victims were smashed is now used as a Methodist baptismal font.



PHOTO BY ALEXANDER HUME FORD, HAWAII



PHOTO BY W. M. KIRKPATRICK, NORTH WALES, PA.
 This concrete bridge structure at Allentown, Pa., is the largest of its kind in the world; neither the longest nor yet the highest, but containing the greatest bulk of material. It is 2600 ft. long, 46 ft. wide and 150 ft. high.



PHOTO FROM F. P. MANN, PARIS, FRANCE
 This curious combination chair and table was used by Napoleon in his campaigns. It is constructed so that all the parts fold up into a compact form for transportation.

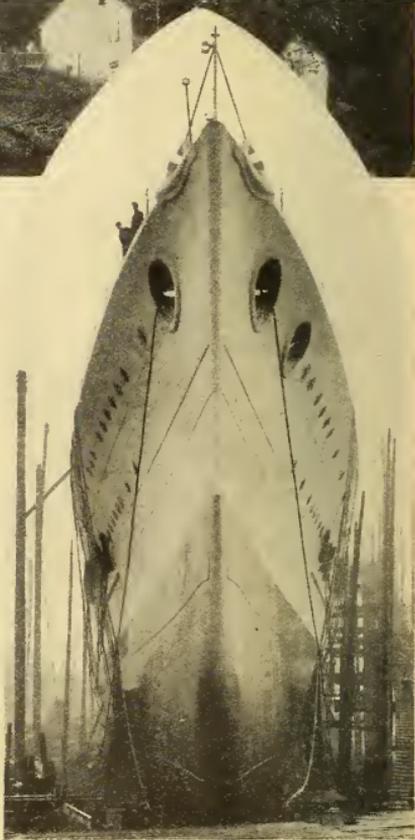


PHOTO FROM FRANK C. PERKINS, BUFFALO, N. Y.
 This is rather an odd view of Brazil's greatest battleship, the Rio de Janeiro, built in England. It draws 27 feet of water and has armor nine inches thick.



PHOTO BY D. A. WILLEY, BALTIMORE, MO.

Here is a picture of what is called "salt farming" on the great American desert, called the Salton Sink, in southern California. This was once the bottom of the sea. The salt is so pure that it needs no treatment.



PHOTO FROM BURKE & ATWELL, CHICAGO

On Martinmas Eve, the customary audit for receiving the wroth silver due and payable to the Earl of Dalkeith was held at Knightlow Cross, Ryton on Dunsmore. This was originally a tax on all persons who used Dunsmore Heath for their cattle to pass over, but it is now not compulsory. Each parish [subscribes, and the money raised is put into a stone in a field at Knightlow Cross, and collected by the agent of the Earl of Dalkeith. The proceeds are devoted to an old-fashioned breakfast held at the Dun Cow, and the guests are charged 1/6 if it is their first visit, or 1/ if they have had the breakfast before. After the breakfast is paid for, the balance is spent in rum and hot milk, and the health of the King and Earl of Dalkeith is drunk.



PHOTO FROM BURKE & ATWELL, CHICAGO

This picture shows an inmate of the Home of Comfort, Southsea, England, and her nurse listening to services being conducted at St. Bartholomew's Church through the aid of the electrophone.



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The open air model school recently opened at Bryn Mawr College is termed "the first temple of the superwoman." It is expected that after the fifteen pupils who constitute the first class have finished their seven year terms in the open air, they will be far healthier and will have accomplished much more than their sisters whose education has been gained indoors.



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The method by which canal locks operate is not clear to all, and in view of the opening of the Panama Canal it will be interesting to all just how a steamboat "climbs a hill." The four small locks shown here illustrate the point admirably. The boat is just passing from the lower lock into the second from the bottom. When through, the gate behind it will be closed and the one in front opened, letting the water from the third lock into the second, which will raise the boat. In this manner the boat is raised from lock to lock. In coming down the process is reversed.



PHOTO BY UNDERWOOD & UNDERWOOD, N. Y.

In Sidney, Ohio, "Susan," a collie, is mothering her seven puppies and four pigs. The mother of the baby pigs died and Susan became their foster mother and saved their lives.



Showing the entrance to Tunnel No. 1 during the "smoking out" of Ralph Lopez, the murderer who had sought refuge in the mine. This attempt was unsuccessful, but later he appeared of his own accord and was shot.



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This shows a wood model of a case for shipping eggs by parcel post, designed by a committee of Chicago women, headed by Mrs. E. E. Smith, in the great national fight to break up the "egg combine." The government will make these cases, of papier-mache, to carry 30 dozen eggs, under the new P. O. ruling allowing a 50 pound gross limit on packages within certain zones.

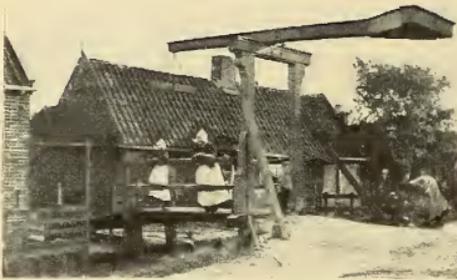
The aeroplane skirt—latest freak idea of the fashion artist. Although a freak, it may be extensively worn—you never can tell these days.

Senator Helen Robinson, of Utah, the first woman senator. She was among the Suffrage host which "invaded" Washington a short time ago.

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Lord Gladstone, Governor of South Africa, is an enthusiastic sportsman. The lower picture shows him and his friends about the camp fire listening to the song of the negroes. His Excellency can be seen in the center smoking a pipe.

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COPYRIGHT BY WALDON FAWCETT, WASHINGTON, D. C.

Queer old type of lift bridge in use to this day in an out-of-the-way corner of Holland.

Curious Japanese picture book, 47 yards long, which has just been sold in London to a well-known collector.



PHOTO BY WALDON FAWCETT WASHINGTON D. C.



Little Margaretha Ritschen, four years old, who traveled all the way from Austria to San Francisco unaccompanied. The direction card stitched to her dress was written in several languages.



PHOTO BY PAUL THOMPSON,
N. Y.

A fisherman of India casting his net.



Largest and most expensive cigar holder in the world. It is made of pure meershaum and is worth \$250. The owner lives in Germany.



PHOTO FROM THE BOSTON PHOTO NEWS CO.

Russian wood carvers are wonderfully expert at their craft. This photograph shows a group of these people in their picturesque costumes and some of their handiwork, which is all done by penknife. It was taken at a recent "Ideal Home" exhibition given by the Princess of Teck.



PHOTO BY BURKE & ATWELL, CHICAGO

A number of Blackfeet Indians formed an important feature at the recent Land Show held in Chicago. While in the city, they camped in a tepee village on the roof of the Hotel Sherman, nearly 400 feet in the air. They often whooped with delight on the way up the elevator shaft, to the amusement of the hotel guests.



Women workers in the beet fields of England wear a picturesque and at the same time very practical garb.

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PHOTO BY INTERNATIONAL NEWS SERVICE, N. Y.

John D. Rockefeller at 74 is not only an enthusiastic golf player but takes a great deal of pleasure in bicycle riding.

At the Hotel La Salle in Chicago are to be found girl "Bell Hops," or, more appropriately, "Belle Hops."



Six lions belonging to a circus recently escaped in Leipsig, Germany, when the cage collided with a street car. Great excitement prevailed, and 80 policemen took part in the chase, finally shooting the lions, after \$7,500 damage had been done. Neither lions nor police killed any one.

PHOTO BY GEO. GRANTHAM BAIN, N. Y.

Britain's largest liner, the Cunarder Aquitania, is approaching completion. The photograph shows the top casing of a turbine being lifted into the ship. Each turbine weighs about 425 tons.



An arrangement, recently patented by a German scientist, to compel a child to maintain the correct posture in writing.





Wagon train bringing out 45,000 pounds of bullion, property of Alvarado Mining Company, Parral, Mexico—value \$1,121,000 Mexican currency.

Federal Armored Car



Sergeant Marie Terragos, Mexican Joan of Arc, who during battle of Mesa shot 20 Federals. At target practice Sergeant Marie beat out 50 men.



Miss Condelario, who, armed with rifle and six-shooter, went into the thick of the fight to bring out wounded. She is resting a moment and lighting a cigarette.

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BUREAU OF STANDARDS TESTS TRACK SCALES

The Bureau of Standards of the Department of Commerce has equipped and is sending out over the country a test weighing car to test the scales used in the

Bureau of Standards Scale
Testing Car



COPYRIGHT BY EROWN & DANSON, STAMFORD, CONN.

different cities of the union. The car, as is shown in the illustration, is equipped with a number of standard weights, and apparatus for putting them on the track scales to be tested. A crane bridge equipped with a trolley and a hoist can be projected out of one end of the car and any given number of standard weights can be placed on the small truck and run out on the scale platform.

Most track scales have four pairs of first levers and the scales are tested by observing the scale reading for a known amount of standard weights on the scale. Weights may be gradually added to the truck, giving readings at a number of points on the scale.

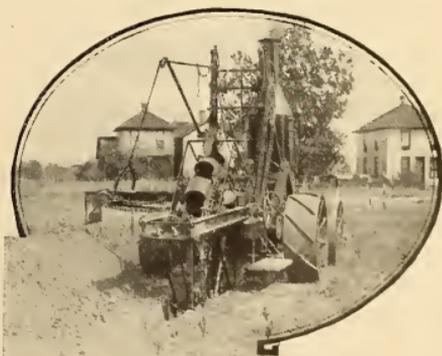
The car carries eight weights of 10,000 pounds each and four of 2500 pounds each. They are of cast iron, machined.

Charles P. Steinmetz, electrician of the General Electric Co., has been invited to act as honorary president of the International Electrical Congress, to be held at San Francisco in 1915. E. B. Rosa, of the Bureau of Standards, Washington, D. C., will be honorary secretary.

DITCH DIGGING BY MACHINERY

In sections of country where tile is laid to drain the land before it can be cultivated, a mechanical ditch digger is almost a necessity. A modern type of machine is shown in the picture. Bucket

shaped blades upon a strong, circular, steel wheel dig their way down to the depth set as they revolve, each bucket automatically dumping its load upon a lateral carrier as it reaches its highest point. This carrier drops the dirt in a neat pile along the edge of the ditch. An



A Modern Ditch Digging Machine

operator and helper are all the crew required and in an average day this engine driven ditcher can easily excavate in fairly mellow soil 100 rods of ditch three feet deep.

Also, it shows that electrification is no longer confined to the level alluvial country of the Atlantic seaboard. It is pushing into the mountains, the open spaces, the zones where collections of houses are few and far between.

From a transportation standpoint this is of tremendous importance. On the flat, densely populated, Atlantic Coast country, electrification was a natural evolution. It lengthened the commuting areas of important cities and so increased the traffic. In other words, when the suburban service used to be composed of slow steam cars few persons cared to make a daily trip to business of more than 30 miles. Now with swift, clean electric trains the zone has been lengthened to 40 and in some cases even 50 miles. It has developed new suburbs, provided new passengers and poured more money into the treasuries of the railroads.

This has all come about in the last eight years. To the Long Island Railroad goes the credit for the first venture. Before 1900 electric locomotives had been used in the tunnels of the B. & O., but it remained for the Long Island in 1905 to



Electric Locomotive of the St. Clair Tunnel at Port Huron, Mich. It is capable of Hauling the Heaviest Freight and Passenger Trains through the Great Bore

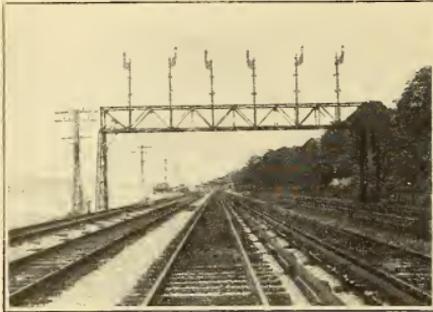
electrify the first suburban lines. So satisfactory were the results that the Pennsylvania and the New York, New Haven and Hartford fell quickly into line. The Long Island found that although the bills for electrification were big they were more than balanced by increased returns, coming from new suburban developments. So satisfied was the Pennsylvania system with the experiment that they are now constructing a similar electric service around Philadelphia's suburban district. Their line between Philadelphia and New York will also be electrified. Such long line projects as this are expected to produce a loss. That is, a loss for the first few years. Railroad engineering experts believe, however,

that this will be more than balanced by increased efficiency.

George Gibbs, electrical engineer of the Pennsylvania Railroad and an

First Electric Motor Passenger Train on the Butte, Anaconda & Pacific Railroad—the Only Railroad, by the Way, which is Operated Entirely by Electricity





A Beautiful Stretch of Six Track Line on the New York Central at Spuyten Duyvil

international authority, has given as his opinion that the day when all lines will electrify their lines for long distances is at hand. He points out that the new system reduces track congestion, the number of train hours per mile of track. He declares that although it has only been applied to passenger service it is now entering the freight field. In three years he says that freight will be brought from New England in electric trains across the gigantic Hell Gate Bridge, and across New York Bay, feeding into tracks that lead west and south. It will be the first practical application of electrified lines in the handling of freight.

Railroads have electrified their systems for different reasons. In New York City, for instance, it was to supply adequate terminal facilities. On the New Haven line the goal was economies with extremely dense and mixed traffic. On the Norfolk and Western it was to facilitate the handling of enormous coal trains. In the Rocky Mountain country cheap electrical power was available. In one of the Great Northern's electrifications a long tunnel was the cause. The proposed line for Dakota and Montana was decided upon by the almost prohibitive difficulties of poor coal.

At the Engineers' Club one night recently, during a discussion bearing on this subject, it was stated by one of the most prominent men in the work that the steam locomotive itself is the cause of its passing. He went on to say that the

waste of fuel is too big a factor to be ignored longer. He showed that 90 per cent of the heating value of coal is lost in a locomotive. He said it was the most wasteful method of using fuel, contrasting it with the combustion obtained in large plants where coal is spread over large grate areas by automatic stokers. He estimated that five per cent of the steam producing value of coal ordinarily obtained in big plants is lost utterly by railroads. When it is considered that many millions of tons are burned annually the sum mounts up. He pointed out that it costs less to convert coal into power and distribute it from a central station than it does to have a hundred little units like locomotives produce that same power.

Because the science of water power development and transmission is being perfected so rapidly, railroads are considering that as an item. In 1898 one of the greatest authorities on power transmission declared that electricity traveling on a line 100 miles in length lost in energy about 60 per cent. To-day on a line 250 miles long the loss is about 25 per cent. That is one reason why railroads are now beginning to make use of electric power.

The Butte, Anaconda & Pacific Railway has begun operation by electric power and



In Localities Where Water Power is Not Available Steam Power Plants of Large Capacity Will be the Rule, Burning Cheap Coal Spread Over Large Grate Areas by Automatic Stokers. Typical of Such Plants is this, the Main Power Station of the New York Central at Yonkers, N. Y.

claims the distinction of being the first railroad system in the world to be operated entirely by electricity. It is owned by the Anaconda Copper Mining Company and has a main line trackage of about 28 miles between Butte, Mont., and the town of Anaconda, and ten miles more of sidetracks and spurs. Seventeen electric locomotives are hauling ore, freight and passenger trains between the two cities. It cost the Anaconda Company more than \$1,000,000 to make the change from steam to electric power, but the officers of both the railroad and mining company say the investment was a good one and a stroke of economy. Water power and electricity in Montana are cheap, and it has been figured out from tests carried on for many months that the electric motors give 150 per cent more work in the same length of time and with the same crew than the steam locomotives at a saving of 30 per cent in the cost of power.

The following table presents present electrifications in operation:

	Miles
Baltimore & Ohio.....	7.4
New York, New Haven & Hartford.....	594.8
New York Central.....	371.6
Pennsylvania.....	435.5

A Ten-foot
Wood Stave Pipe
Line of the Madison
River Power Plant,
Showing How Water is
Brought Long
Distances to be
Dropped with
Enormous Force
upon the Blades
of Water Wheels,
Generating Power
to Replace the
Locomotive



Butte, Anaconda & Pacific.....	38.0
Southern Pacific.....	95.0
Grand Trunk.....	4.0
Erie.....	49.0
Great Northern.....	6.0

1593.3

Also this additional table shows electrifications under way:



Big Hole Dam,
One of the Chicago,
Milwaukee & Puget
Sound Power
Developments

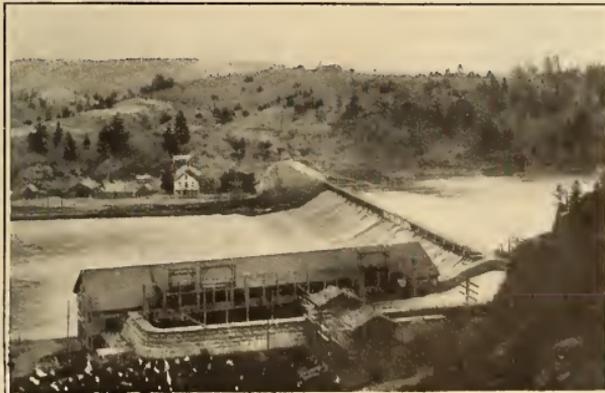
	Miles
New York, New Haven & Hartford.....	216
Pennsylvania.....	70
Norfolk & Western.....	73
Denver, Rio Grande & Western.....	114
Chicago, Milwaukee & Puget Sound.....	440
Great Northern.....	530

1443

The Sante Fe has under consideration a project to electrify its system from Dodge City west. The object is to provide cheap power for the establishment of pumping irrigation plants on every farm in the Kansas-Colorado-Arkansas valley. This introduces a new angle into the electrification situation. A railroad can electrify its lines, help pay for it by selling power for the irrigation of arid farm land, and at the same time develop a fertile country that will increase its own receipts.

In Europe electricity

Canyon Ferry Dam and Power House, near Helena, Mont., Another of the Plants which will Furnish Current for the Chicago, Milwaukee & Puget Sound Electrification

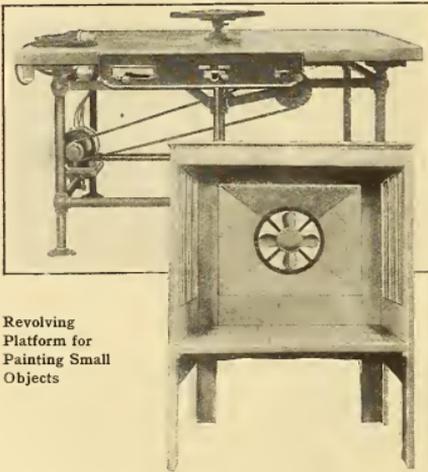


is also supplanting steam. Italy, Germany, Finland, Switzerland, France, England, Norway, Sweden and Prussia are already at work on the electrification of their lines. In many of these countries an abundance of water power cheapens the cost considerably. England has been especially active in electric operation, also being very successful from a financial standpoint. In Germany great progress has been made with economy and power transmission. That is what they are working for in this country. Central stations will be the order and coal burning locomotives will be pushed aside by electricity's powerful hand.

DEVICE FOR PAINTING SMALL OBJECTS

For covering comparatively small objects and parts with paint, japan, enamel, lacquer, etc., the machine shown in the illustration is very effective.

The article to be painted is placed on



Revolving
Platform for
Painting Small
Objects

the elevated platform which is rotated by means of a small motor mounted under the table. The paint, or other material, is sprayed on by means of compressed air, thus covering the article more rapidly than can be done by brush work, reaching all parts of carvings, irregularities, etc.

When it is necessary to remove the fumes, the revolving stand is mounted inside the hood illustrated, which is provided with a ventilating fan.

THE ORIGINAL "TANGO"

There is nothing new under the sun. This shows how the tango was danced by

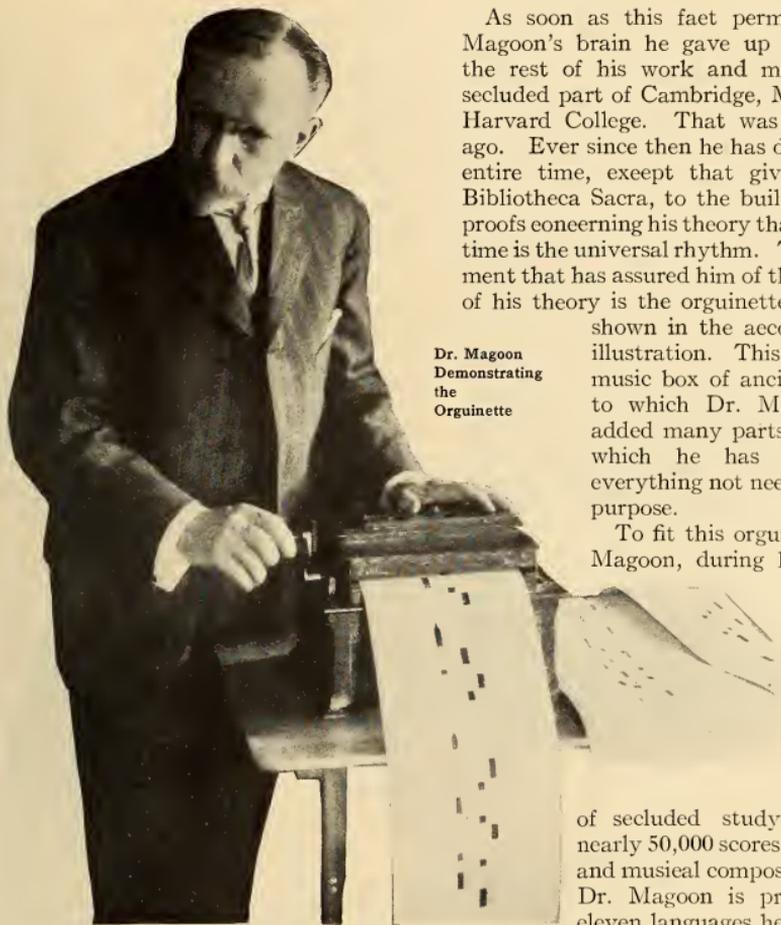


As Assyrians Tangoed 3400 Years Ago

the Assyrians in 1500 B. C. It is taken from a fresco now in the British Museum, London. Whether this was called the "hesitation waltz," the "grapevine" or the "Lotus Glide" is beside the point. It certainly remains that they were "doing it" thirty-four hundred years ago.

THE TELECHRONOMETER

This is the name of that ingenious device for measuring the time a telephone has been in use. The machine bears some resemblance to a gas meter. The removal of the receiver from the hook puts the meter in connection with the motor at the central office, and the hands of the dial begin to move as soon as the operator answers the call, and continue to register the time until the receiver is again hung up.



Dr. Magoon
Demonstrating
the
OrguINETTE

COMMON TIME THE UNIVERSAL RHYTHM

After ten years of research into the rhythm of all languages and all forms of musical composition, Herbert William Magoon, Ph.D., fellow in Sanskrit from Johns Hopkins and former professor of Greek and Latin at Oberlin and associate editor of the *Bibliotheca Saera*, is asserting broadcast in pedagogical, musical and scientific circles that there isn't any rhythm and never has been any rhythm in the world either in literature or music that does not rightfully belong in common or $4/4$ time.

As soon as this fact permeated Dr. Magoon's brain he gave up almost all the rest of his work and moved to a secluded part of Cambridge, Mass., near Harvard College. That was ten years ago. Ever since then he has devoted his entire time, except that given to the *Bibliotheca Saera*, to the building up of proofs concerning his theory that common time is the universal rhythm. The instrument that has assured him of the veracity of his theory is the orguINETTE, which is shown in the accompanying illustration. This is really a music box of ancient design to which Dr. Magoon has added many parts and from which he has eliminated everything not needed for his purpose.

To fit this orguINETTE, Dr. Magoon, during his decade

of secluded study, has cut nearly 50,000 scores of poetical and musical compositions. As Dr. Magoon is proficient in eleven languages he has been

able to draw from the classics of every nation. He is now certain that there is not a poetical or musical composition of acknowledged worth which has not been made to pass through his orguINETTE to the rhythm of common or $4/4$ time. As an example of the method that Dr. Magoon has employed, his notching of "The Charge of the Light Brigade" is given below:

Half a league—half a league—half a league—onward
All in the —valley of death—rode the six—hundred.

It will be noticed that Dr. Magoon has inserted a notch after every third beat, which is equivalent to a pause. This

notch or pause, according to Dr. Magoon, is in the time of an eighth note. Adding this $1/8$ to the accepted $3/8$, the result is $4/8$ or $2/4$ or common time. This same general treatment has been given to the 50,000 scores that Dr. Magoon has cut to prove his theory.

If the universality of common time as a basis for all enduring verse or musical composition is accepted it will prove that the reason why so many compositions of the present day are trash and ephemeral is due to the fact that they are written in $3/8$, $3/4$ or $6/8$ time. It will also solve the trouble with many modern church hymns that jingle like a jig. It will in addition of necessity do away with the scansion method of teaching the classics, so that the student need no longer infer that ancient actors mostly addressed each other in a rhythm that was a cross between a waltz movement and a march.

Dr. Magoon realizes that he has much to overcome in the attitude of scholars toward his theory of common time; but he feels hopeful in that he has recently been allowed to present his assertion before the American Philological Society.

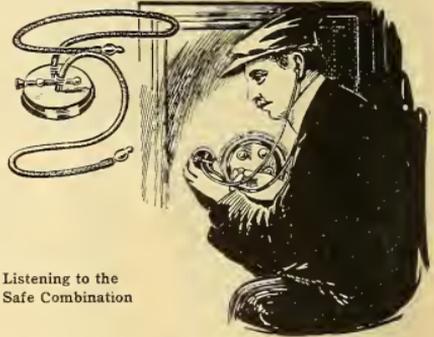
ELECTRIC HEATER FOR A PRINTING PRESS

More or less trouble is experienced in job printing work from the fact that in cold weather the ink becomes stiff and

gummy if the inking plate on the press is not kept at the right temperature. This causes poor impressions and no end of trouble to the pressman. A practical printer, who is also something of an electrician, Mr. Julian Bucher, has ascertained, by careful experiment, that a small electric heater can be placed under the inking plate in such a position and so regulated that the temperature of the plate may be kept uniformly at the proper degree, even in very cold weather or where the press stands in a position to be subjected to draughts of cold air. He has patented the idea and the accompanying diagram illustrates roughly the arrangement of the heater relative to the plate.

HOW BURGLARS DECIPHER SAFE COMBINATIONS

Some people are skeptical as to the ability of a burglar to open a safe with a

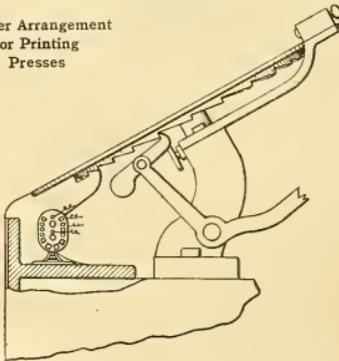


Listening to the Safe Combination

combination lock by listening to clicks as the dial is revolved. But in the case of some types of combination lock, this would appear to be possible, and our Paris correspondent sends the following description of a microphone transmitter which was actually used to enable the burglar to turn the trick.

The illustrations show the apparatus and method used with a type of combination lock having four different buttons, each button carrying letters around its rim so that the right letter needs to be set opposite a mark, upon all the four but-

Heater Arrangement for Printing Presses

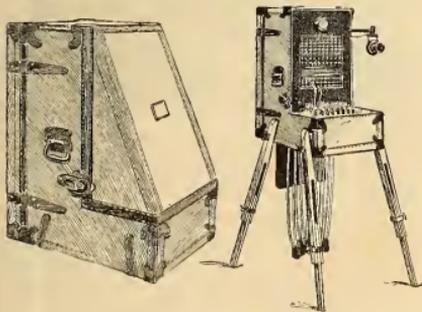


tons. In turning a button, there is a slight click produced, just when the chosen letter passes in front of the stop piece which it operates, but it is almost impossible to hear this from the outside, although a person who has an exceptionally fine sense of hearing may be able to work the lock by the ear alone. But it is quite an easy matter to hear the sound by using a microphone transmitter, which enables one to hear even the slightest sounds, so that all that is needed is a small transmitter designed for applying on the front of the safe and a pair of ear tubes. In this way the burglar hears all the different sounds made by turning the lock, and when he becomes skilled he is able to pick out the proper sounds for making the combination.

The use of the microphone is said to be one of the most successful methods for opening this kind of lock, but as often happens, this may put manufacturers on the defensive and lead to designing other forms of lock which cannot be opened by sound.

TELEPHONE SWITCHBOARD IN A TRUNK

The telephone has proven itself to be a valuable instrument in the directing of bodies of troops, this fact being partic-



U. S. Army's Latest Type of Portable Telephone Switchboard

ularly demonstrated in the Russian-Japanese war.

A new telephone switchboard used in the United States Army and so installed as to be readily moved about is presented

in the illustration. This is a board set in a strong iron framework and placed in a trunk. When set up, the trunk with the cover removed is supported upon substantial, adjustable legs. The board will handle 40 magneto lines and when packed for moving weighs 200 pounds.

FLASHLIGHT IN A WATCHCASE

A flashlight in which the lamp and battery are enclosed in a watchcase is the subject of a patent by Emil Neu-



Watchcase Flashlight

dörffer, Stuttgart, Germany. The lamp and reflector occupy the center of the case and specially shaped battery cells occupy a triangular position around them. The lamp is flashed by pressing a projecting button or may be lighted up steadily by revolving one part of the case upon the other.

UNCLE SAM'S MAIL BAGS

There are 28 different kinds of mail bags in the service of the Post Office Department, and they cost from 22 cents up. There are mail bags for almost every conceivable use, especially since Uncle Sam is now engaged in the transportation of parcels. One may ship almost anything, coming within the postal regulations, with little danger of loss or breakage.

One of the most peculiar mail bags is that contrived for the transportation of bees. Sending bees by mail was a difficult operation in the days before the adoption of the "bee bag." Then the little creatures generally arrived at their destination dead or so exhausted that they were of little value. Nowadays, however, they may be shipped by mail

for thousands of miles by means of the special bag mentioned, obtaining food and air *en route*.

Uncle Sam's mail bags are made of various materials. Those of inferior grade are of cotton; those of the highest grade are of leather. Those employed on express trains are reinforced with metal, so that they may be flung from fast moving trains without damage. Even these bags, strong as they are, do not endure for much longer than a year and a half; while some of the cotton bags will remain in service for nearly ten years.

In some of our Western states, where the mails must be carried for many miles on horseback, special pouches are made for slinging over the animals' flanks. In the Far North special bags are made for sled transportation, and in the cities a bag in use for pneumatic tube service is made of "leatheroid." The ordinary cotton mail bags are woven so closely that they are practically waterproof, and in the weave there are thirteen stripes of blue. Each country marks its mail pouches in a characteristic way, so that, if one gets lost in a foreign country, identification is an easy matter.

About 65,000,000 mail bags are used each year by the whole country, and it is necessary constantly to replace worn-out bags and to repair damaged ones; the Government maintains mail bag "hospitals," where tens of thousands proceed every week. One such establishment repairs upward of 5,000 bags a day. A railway wreck may injure several hundreds or thousands, and these must all go to the hospital before entering active service again. Christmas is responsible for much damage to mail bags, by reason of the extremely hard service at that time of year, and immediately after the holiday season several hundred thousand bags are retired for repairs.

In Pomeroy, Wash., 25 per cent of the people who use electric light, use electric washing machines.

EGYPTIAN SUN POWER PLANT

The question of sun power was first seriously approached by the great Swedish engineer, John Ericsson, some 50 years ago. Had he been a younger man he might have lived to see the realization of his dreams, but technical resources,



Sun Power Plant in Egypt
Operates an Irrigation
System



especially the development in low pressure steam engines and the cheap production of glass and mirrors, had not then reached

a point which made his ideas commercially possible.

This problem was attacked some seven years ago by Mr. Frank Shuman of Philadelphia, who has now in operation at Cairo, Egypt, a very practical and profitable irrigation plant, deriving its power entirely from steam generated by the sun's rays. This plant has now been running steadily for some time, pumping water at a rate sufficient to irrigate over a thousand acres of land.

In detail, mirrors of ordinary window glass, silvered, are placed in a curved metal framework, as shown. Down through the center are suspended "boilers," as they are called, containing water. Every five square feet of mirror surface concentrates a ray of reflected sunlight upon a boiler and the temperature of the water is soon sufficient to form low pressure steam, which is carried from each boiler by a pipe to a low pressure engine.

This engine operates a pump for irrigating. Every acre of ground covered with the mirror apparatus, it is claimed, will produce 250 horsepower.

ARTIFICIAL JOINTS IN LIVING LIMBS

One of the most remarkable feats in modern surgery is the replacing of diseased joints by artificial ones of silver and steel. This experiment has been successfully performed by Dr. Milton F. Clark of San Francisco, who used for subjects a pet dog and a monkey. Of course, the intention is to perfect the



From an X-ray Picture of a Metal Joint in a Living Dog

method so that it can be used with success upon human beings, and this will be done, no doubt, in the near future. The experiments upon the dog and the monkey resulted in giving both of these animals perfect freedom of movement and no loss of activity, although the dog carries in his hind leg a joint of steel and silver, and the monkey has a similar one in the elbow.

In this operation, the natural joint is removed, the ends of the bones capped with silver and the joint itself made to

conform as nearly as possible to the natural shape. The tendons are extended according to a method developed previous to Dr. Clark's experiments.

The value of this discovery that diseased joints can be replaced is greater than may be generally known. A partial or complete stiffening of the joints (known as ankylosis) has made a hopeless cripple of many a man otherwise strong and healthy. It is a hardening of the tissues, which may be caused by rheumatism, gout, and other diseases, or by injury, and in extreme cases can wholly incapacitate the victim, making him a burden upon his family. It was observation of such cases in railroad hospital practice that suggested to this surgeon the idea of artificial joints.

REMARKABLE HACK SAW TEST

The accompanying illustration shows a most interesting test of a hack saw at Springfield, Mass., in which a flexible back blade supported two men, one weighing 147 pounds and the other 135



Saw Blade Supporting Two Men

pounds, or a total of 282 pounds without breaking. It is maintained that the best hack saw should have a strong yet a soft flexible back with hard or tempered teeth, such that when the blade runs at proper speed through metal, the hold it takes can be felt.

MING DORFAN—A question of assimilation.

PHOTOGRAPHS REPRODUCED
BY SPECIAL PERMISSION
OF THE HON. LOO KUM SHU
MANAGER CHINATOWN DIVISION



(PACIFIC TELEPHONE
AND TELEGRAPH CO.)



BY GEORGE F. WORTS

The Chinese have been accused, among other things, of lacking the power to assimilate. We are annoyed because they, in so large a measure, cling to their quaint, picturesque dress. We become resentful when they steadfastly refuse to accept our religious beliefs. But we neglect to realize that it is inherent racially for the Chinese to follow custom—that the Oriental is a stickler for prerogative. We cannot somehow digest the fact that the Chinaman's mental processes are entirely different from ours. I am not evading the question of whether or not the Chinese can assimilate. In fact, by an interesting example that was shown me I will endeavor to cast a little light, hitherto unshed, upon the situation, so that you can draw your own conclusions.

If you will walk three squares down the main thoroughfare, into the very heart of San Francisco's Chinatown, turn to the right and enter the second building from the corner, a gaily colored pagoda, you will meet with a pleasant surprise—a Chinese telephone exchange. Behind the official desk in the outer office Hon. Loo Kum Shu will arise and cordially greet you—in perfect English. If you are especially favored, he will open the inner door a trifle and permit you to peep at the charming Chinese maidens, quaintly attired in loose fitting jackets and trousers, and seated in a row at the telephone switchboard.

Assimilation? Why the first thing you know you're wondering if we Americans aren't a little slow after all.

"How do they say 'Number please?' in Chinese?" I asked Mr. Kum Shu.

"They very rarely use that expression," he replied gravely. "Ming dor-fan?" or 'name please?' would be the closest approach. "Our operators know the subscribers all by name, so that you merely call for the subscriber, not his number. We have, by the way, nearly a thousand and a half subscribers in Chinatown."

Think of knowing 1,500 Chinese names by heart, and their respective locations on the intricate switchboard! One of the operators, a pretty Chinese girl of about eighteen, attired in the inevitable loose jacket and silken trousers, entered, spoke a few low words in that impossible language to Mr. Kum Shu, and pattered softly (she wore tiny sandals) to her place at the board.

"When the exchange was first opened," the manager was saying, "curious Chinamen often entered and insulted the girls. It became so bad that we just recently built this partition under the torii so that they may work unmolested."

Chinese women, until very recently—and the custom has by no means been entirely



abolished — were relegated to an incredibly insignificant part in the social scheme. That, however, is but one of the many difficulties with which the newer and greater spirit must contend.

Until very recently the act of having one's picture made violated a tenet of the Chinese religious belief. The young operator objected very vigorously to being photographed, but finally, perhaps realizing the necessity of sometime or other taking the broader minded attitude, she graciously yielded to the insult.

Before leaving the interesting building Mr. Kum Shu translated the ideograph which appears at the portal. It simply means Pacific Telegraph and Telephone Company.

Chinatown has lost, practically, whatever romance it ever possessed since the fire in 1906. The modernizing influence has altered it just as it has altered all of our American cities and made them conform to a single standard. There are, as before, underground secret passageways. But "underground tunnel" stories nowadays are mainly the fabric of eager newspaper writers' imaginations. Perhaps you will see opium being smoked. But then again, opium smoking is not romantic—



Little Ching Wears American Union Made Overalls

She Must Know Not Only the Numbers but the Names of Nearly 1500 Chinese Subscribers

unless you classeverything surreptitiously romantic. Opium is to China just what whiskey is to England and America and what absinthe is to France. In each case steps are constantly being taken to eradicate the national curse.

Throughout Chinatown you will glimpse the rapidly disappearing signs of old tradition as newer and better things are taking their places. Not only has the telephone entered into the daily life of the present day Chinaman, but likewise the electric light and the motor in its myriad applications—lighting his way and lightening his tasks—if you will.

The virile, progressive, modernizing spirit of the Americans is dangling temptingly before the suspicious nose of the Chinese; and they are, at first reluctantly, then gradually, eagerly accepting and

entering in to it.

Give the Chinaman time; he will assimilate. China is the greatest nation in size and population in the world to-day. Perhaps, in the years to come, we will look

back and regret a little our present consuming anxiety for him to assimilate.



Laborious Task of "Seeing the Point" to Mutt and Jeff in the Sunday Newspaper



Chinatown at Night

LEAD EATING BEETLES CAUSE LINE TROUBLE

A thickly populated section of a western state lately experienced in its extensive telephone system a variety of line trouble exceedingly annoying by virtue of its uncertainty of occurrence, its somewhat mysterious nature, and the difficulties encountered in locating it.

It seems that subscribers using the cables throughout the district at the time of rainfall very frequently complained of sudden loss of service. The trouble has been found by the company supplying the service to be due to the rampages of a kind of beetle which bores its way through the outer lead casing of the trunk lines, thus permitting rainwater to enter and cause short circuits.

It has been almost impossible to locate coming

trouble from colonies of these insects, which seem to bore into the cables during summer months, and usually the general whereabouts of them is not known until the moment one of the numerous interior wires was put out of service.

That some of the creatures of the insect world have lead eating or lead gnawing proclivities is not a hitherto unknown fact, but the ravages of this telephone bug opened up a new angle to the question for scientific research. Perhaps the discovery that a specimen of this variety of bug was found to be the "female of the species" may lead to the conclusion that burrow holes to the sheltered interior of the cables have been found by the insect to provide excellent incubators for the hatching of eggs—and more line trouble.

MOVING A HOUSE BY LOCOMOTIVE

This unique method of moving a house was employed in one of the western states. A locomotive was hitched to the front end to pull, and another in the rear

pushed. The house was placed on wheeled trucks running on the track rails.

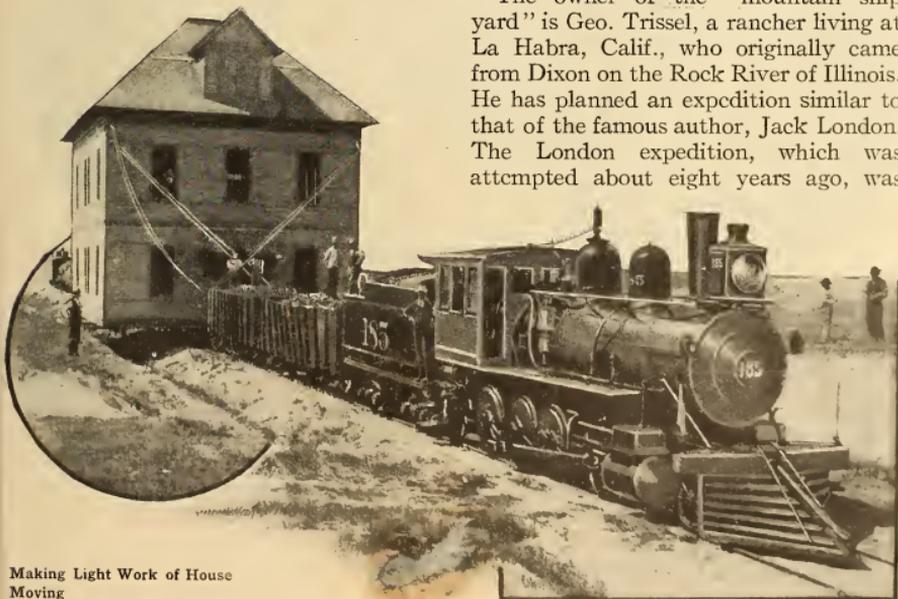
SEA GOING BOAT BUILT IN THE MOUNTAINS

At an altitude of 1,000 feet above sea level and 40 miles from the coast, a man in California is constructing a high powered motor boat with which to make a trip around the world.

The ship is of no mean proportions, being 62 feet long and containing six large rooms. It will have storage tanks for 2,500 gallons of gasoline and 1,000 gallons of fresh water. It will also have a sea water distilling apparatus, a high power electric generator for a lighting system, one mounted machine gun and large boxes of earth for growing green vegetables while on a voyage.

The ship will cost in the neighborhood of \$7,000 to construct. When completed it will be transported, as a whole, to the sea coast on two caterpillar engines and its gas engine power plant will be installed after launching.

The owner of the "mountain ship yard" is Geo. Trissel, a rancher living at La Habra, Calif., who originally came from Dixon on the Rock River of Illinois. He has planned an expedition similar to that of the famous author, Jack London. The London expedition, which was attempted about eight years ago, was



Making Light Work of House Moving

overwhelmed with an epidemic of scurvy and abandoned. Trissel has made provisions against scurvy by providing conveniences to grow green vegetables at sea.

Trissel will make the voyage in the interest of a prominent magazine to which he will contribute feature articles. He will also

The "Mountain Shipyards" and the Round-the-World Motor Boat



take motion pictures for another concern. He will have six companions.

TURKEYS ROOST IN THE WRONG PLACE

The Ozark Power and Water Company, whose new hydro-electric plant is located on the White River near Branson Mo., recently experienced a most peculiar interference with its service. The 66,000 volt transmission lines between the power plant and Springfield traverse many miles of unsettled mountainous country, which is abundantly supplied with wild game. A flock of wild turkeys in selecting the high voltage wires, near Ozark, for a roosting place caused a "short circuit" on the line, which temporarily put the entire system out of commission.

Owing to the danger of the high voltage, and not knowing the cause or conditions of the trouble on the line, the current could not be turned on until the line was patrolled, the cause of the trouble

discovered and necessary repairs made. The linemen, while hurriedly patrolling the line, suddenly came upon two dead turkeys—one lying on the ground below the wires, and the charred body of the other still clinging to the wire.

STRANGE OBSTRUCTIONS TO TRAINS AND TRAMS

During the still spring evenings in Durban, South Africa, the termites, so called white ants, in a certain stage of their life become winged and come out in great numbers swarming round the street lamps. They soon lose their wings, and their thick, gelatinous bodies lubricate the street car rails so that the cars can hardly climb the grades and the down coming cars can hardly stop without the extensive use of sand.

A similar curious case of insects obstructing the service used to occur on the South Africa Railway in Natal, when the locusts came in millions on a hot summer day and so lubricated the rails that the locomotives had often great difficulty in hauling the trains up the steep grades despite the use of sand. After giving a great deal of trouble for several years the locust pest retreated to its proper home, the interior deserts.



Mada the Bohemian

Adapted from the Kleine-Cines film of the same title

BY LAWRENCE EDWARDS

When Lea, the adopted daughter of Count and Countess Marcelli, became a young lady and the time finally arrived when she was to make her appearance

Count mentioned the matter to her, "for then, indeed, we should feel as though Lea were a part of our family, in fact, as well as by adoption."



The Visits of Marius Were Received with Anything but Joy by Castellani

in society, the Count discussed with his wife the advisability of urging a match between her and their son Marius, and was much delighted to discover that she favored such an alliance.

"My dear Carlos, nothing would give me greater pleasure than to have our Marius woo and win the pretty child," the Countess had remarked when the

"I have noticed that Lea and Marius seem much attached, but then they have grown up together and our son may regard her only in a brotherly fashion, after all, though it would give me keen delight should he ask for her hand in marriage."

"It has not escaped my notice either," responded the Countess, "and I well



Spent Long Hours in Company with Mada, the Dancing Girl

know that pretty Lea regards him highly, though, like yourself, I cannot state that it is love, other than that a sister displays for her brother."

A day or two later the parents of Marius were much delighted, therefore, when the handsome young man came into the drawing room with Lea's arm linked through his and bashfully announced: "Lea and I love one another and have decided to ask your approval of our marriage."

The Count and his wife readily gave their consent, and, when the young people had happily wandered into the garden, congratulated each other on the near accomplishment of the very thing they had had in mind.

A day or two later a wandering band of gypsies camped near the vast estate of Count Marcelli and, out of curiosity,

Marius and Lea paid the encampment a visit. The swarthy gypsies welcomed the strangers and took much delight in performing for them many feats of strength and a few feats of magic, which not only delighted but puzzled them. The exhibition concluded with a graceful and weird dance, performed by a comely girl of the tribe.

Marius became loud in his praises of her dancing and tossed her coins from his purse which she gathered up and smilingly thanked him for. Her beauty and grace was so pronounced that even Lea admitted she had seldom seen a more handsome girl, even of her own race. Leaving Lea's side Marius sought speech with the gypsy dancer and when the time finally came for them to leave Lea had difficulty in inducing her lover to accompany her, so bewitched was he by the charm and grace of the gypsy maid whose name he learned was Mada.

Though Lea could not be again induced to visit the gypsy encampment, Marius went again and again to call on the strange folk who had established themselves so near his home, and each time he spent long hours in the company of Mada, the dancing girl. The gypsy seemed to enjoy the hours spent in his company, though Marius soon came to understand that his visits were received with anything but joy by Castellani, the chief of the band, and Peatro, a strapping youth who had performed many feats of strength and skill during his first visit to the camp. In fact, Mada told him that Peatro and she were affianced, after the custom of the gypsies, though this seemed to make little difference to Marius, who was now clearly infatuated by the girl's beauty.

Lea said nothing at home concerning the new attachment of Marius', though she keenly felt his neglect and would willingly have done anything to win back his love. Less than a week later the band struck their tents and stole quietly away in the night, and with them went Marius, or at least so Lea suspected,

for he was missing on the following morning. Both the Count and his wife were amazed at the conduct of their son, though they suffered in silence and not even Lea suspected how much they were hurt.

Shortly after his disappearance the Count received a note which read:—

MY DEAR PARENTS:

I have erred and more than erred. I love one I can never marry and who is wandering about the country earning her living. I leave you to follow her travels. Forgive your

MARIUS.

—and with tears in his gray old eyes the Count handed the note to his wife and begged her not to tell Lea of their son's graceless conduct.

On the evening when the gypsies were about to break camp, Marius had obtained an inkling of their intentions from Mada and had straightway appealed to Castellani, the chief of the tribe, for permission to join the troupe, offering not only to work as did the others, but even to pay him something besides for the privilege of accompanying them. Upon this condition Castellani had given his

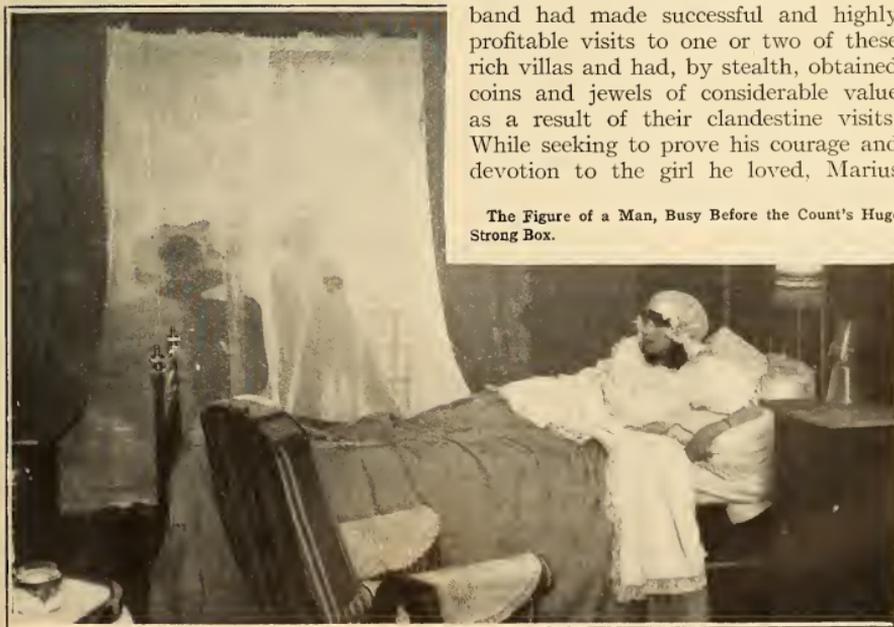
consent and Marius had donned the habiliments of a gypsy.

Peatro took immediate offense and Mada warned her lover that he was tempting fate in following her, for Peatro had sworn to revenge himself upon the man who was seeking to supplant him in the affections of the dancing girl. As the weeks passed Marius grew to disregard the animosity of Peatro, for he was facing a new problem.

Mada was gradually growing tired of his constant adulation and one evening frankly told him that it was his money that had attracted her, not himself. Though this admission was a bitter blow to Marius, for he had believed the girl was genuinely fond of him, he sought to make the best of it and offered to do anything that would restore him to her favor.

At this time the band was passing through a wild and lonely country which was thinly settled, though there were scattered here and there through the countryside the luxurious villas of the rich nobles. Several members of the band had made successful and highly profitable visits to one or two of these rich villas and had, by stealth, obtained coins and jewels of considerable value as a result of their clandestine visits. While seeking to prove his courage and devotion to the girl he loved, Marius

The Figure of a Man, Busy Before the Count's Huge Strong Box.



rashly offered one day to participate in the next raid upon a rich man's summer home, and Mada had smiled and taunted him with being too cowardly to carry out his threat.

In the meanwhile Count Marcelli with his family sought to forget themselves and their son's disgrace by seeking a summer home in the country and by chance selected a villa in the very neighborhood through which the gypsy band was then passing.

The Countess and her husband being suddenly called back to the city on business, Lea was left alone one night in the great villa, though she had assured her guardians that she had no fear, since their absence was only to be a short one. Perhaps in order the better to forget her growing terror at the loneliness of the big rooms, Lea sought her boudoir earlier than usual, and had barely sunk to sleep when she was aroused by the sound of some one in the Count's room, which opened off from hers. Rising on her elbow, she was able to see a light moving about in the other room and, finally, to discern a man's figure busy before the Count's huge strong box in the corner.

Summoning all her courage, Lea slipped on a negligée and went to investigate. Revolver in hand she strode to the door and then halted—speechless with horror—for in the man bending over the contents of the strongbox she beheld none other than Marius, whom she instantly recognized, despite his strange costume. Uttering a shrill scream, Lea fell in a faint to the floor. Marius swept up the jewels, coins and papers he had taken from the safe, stowed them safely away about his person and hastened away. In climbing over the high wall which bordered the Count's new estate he was seen by an old caretaker of the place, just returning from a visit to a neighbor's, but he felt certain she had not recognized him.

When Count Marcelli returned the following morning he was dumfounded at the discovery that his safe had been

robbed, and that his adopted daughter had been found by the old caretaker senseless on the floor of her boudoir. To repeated questions both by the Count and the village magistrate, who was hastily summoned, she replied that she had seen nothing, had recognized nobody, and hysterically had declared she must have been walking in her sleep, though her strange actions and incoherent story led all who knew her to believe that she was concealing something.

This fact even leaked into the newspapers, for a publication in a near-by city blazoned forth on its front page a story which began as follows:

MYSTERIOUS AFFAIR AT COUNT MARCELLI'S VILLA

The Count and Countess Marcelli have been victims of their own generosity. A young girl they had adopted and brought up as their own daughter has helped some robbers to carry off a large sum from a safe in the villa . . .

Some days later a copy of this paper fell into the hands of Marius, who for days had been conscience-stricken for his part in the robbery and terrified for the health and safety of Lea following the fright she had experienced. Horrified at the account of the affair as printed in the newspaper, and amazed at Lea's shielding of himself, he immediately sat down and wrote his father:

MY DEAR FATHER:

I see by the papers that Lea has been arrested. For the sake of truth and justice I declare to you she is innocent . . . The real culprit is myself, who, blinded by an unhappy love, left my dear home and have dragged my good name in the mire.

MARIUS.

Poor fellow, he had suffered the very pangs of hell on earth, for Mada had accepted the spoils of his robbery, only to laugh at him for his desperate attempt to win her favor, and had then turned the jewels and coins over to Peatro and gone with him to a nearby fête to spend the booty for wine and cakes.

Some days later, broken in health and spirit, Marius returned to his home. His mother received him with open arms and his father was less stern than he had expected. As for Lea, she was so de-

lighted over the fact that he was disillusioned regarding the dancing girl, by whom he had been bewitched, that she forgave him for his neglect and finally even consented to a renewal of the engagement between them.

PICTURES IN THE AIR

Three hundred men and 250 horses were used in making the new Kalem two part feature "The Big Horn Massacre," one of the most realistic and spectacular of frontier stories ever produced.

Romain Fielding, of the Lubin (Las

Vegas, New Mexico) studio, is making a five reel dramatic picture which deals with imaginary conditions in 1950. A thrilling fight in the air is an important scene of the spectacle. Three aviators with their dirigibles, biplanes and mono-planes were engaged and Fielding himself participated in the mid-air fight. Over 2,000 supers were employed for some of the scenes among whom might have been found every member of the Elks Lodge of Las Vegas, who turned all their earnings into a fund for the erection of a new B. P. O. E. club.



MOTION PICTURES IN ADVERTISING

Mr. Dana H. Howard, advertising manager of the Commonwealth Edison Company of Chicago, recently gave a most interesting talk on the subject of advertising to the students

various manufacturing processes. Marshall Field & Company show by this method the processes of manufacture of their various goods, such as laces, cotton goods and prints. The making of cotton goods is shown from the picking of cotton by darkies in the cotton fields of Georgia to the goods piled on the shelves for sale. The Elgin National Watch Company, shows by motion pictures the various processes of manufacture of Elgin watches. These films are shown in moving picture theaters in the various towns where Elgin watches are sold.

of the Central Station Institute of that city. In discussing his subject, which related principally to effective methods of advertising at the command of any electric light and power company, he gave definite emphasis to the value of motion pictures as one of the resultful methods to be employed in securing publicity, not at the expense of the people, but in reality to their advantage in an educational way. A paragraph or two from his paper will illustrate the point:

"The Commonwealth Edison Company was probably the first in the electrical line to adopt motion pictures in its advertising. This is one of the latest forms of publicity and is now being adopted by many firms to show their

"The Commonwealth Edison Company has had several of these films made for use at electrical shows, and the latest one of these is entitled 'Gloom and Joy,' a comedy, the plot of which was suggested by myself, and worked out with the help of the motion picture company and their staff of actors. This film was shown in our White City exhibit during the past summer to upwards of 85,000 people. It all looks very simple on the screen, but if you could have been present in the studio when the picture was being made, you would realize the enormous detail necessary to be gone through with to produce the finished picture, and all for advertising, to let the public know of the comfort to be derived from the use of things electrical in the home."



The illustrations on this page give, after a fashion, a meager idea of the stupendous character of the latest Kleine-Cines production, "Antony and Cleopatra," which has recently been imported from Italy by George Kleine, who gave us "Quo Vadis?" and "The Last Days of Pompeii," and which is soon to be shown in the larger theaters of the country. Eight full reels tell the fascinating story of the queen of Egypt who



won the heart of a Roman general, and one powerful scene succeeds another so rapidly as to well nigh dazzle the spectator. The wonderful lighting of the scenes and the exceptionally beautiful coloring of the films make the picture one quite out of the ordinary and insure its being remembered long after the common "feature pictures" are forgotten.

ANNA HELD "PERFORMS"

When the Kinemacolor Company of America in continuing its series of natural colored pictures of famous legitimate stars asked Miss Anna Held to pose for them, the popular light opera star, as usual, insisted upon being original and chose the Central Park Zoo in New York City as the background for the series of pictures in which she appeared. After fondling baby lions, caressing a tiger and riding a camel, Miss Held ordered Bill Snyder, head keeper of the zoo, to bring out his elephants, that she might assist them in becoming famous. Snyder obliged and in the accompanying picture we behold the magnetic Anna "elevating an elephant" as the Kinemacolor people subtitled the subject. Those who have admired the lady with the famous eyes on the stage will probably take equal pleasure in watching her unique acting for motion pictures.

"THE CHRISTIAN" IN FILMS

The fact that motion picture production has become so perfected that any drama, which the so-called legitimate stage has heretofore appropriated to itself, can now be presented in pictures with all the dramatic interest sustained, supplemented by a greater realism by actually showing upon the screen what the stage must be satisfied in portraying

in words, will shortly result in the release by the newly formed Vitagraph-Liebler Feature Film Company of a number of stage length dramas in picture form.

The Vitagraph Company of America, acting in conjunction with the Liebler Company, has already completed a multiple reel production of "The Christian" by Hall Caine, a literary masterpiece of established popularity, and the booking of the films as a regular attraction at the Liebler theaters will shortly begin.

J. Stuart Blackton, vice-president of the Vitagraph Company, personally supervised the staging of the big play, and was ably assisted by Frederick A. Thomson, formerly stage director for David Belasco, and Frederick Stanhope, stage director for the Liebler Company. An all star cast has perpetuated the gripping intensity of the noted author's masterpiece. John Storm, one of the

greatest characters of the speaking stage, has been portrayed by Earle Williams, while

Edith Storey enacts the rôle of Glory Quayle, the glorious creature of sunshine and shadow, joy and sadness. Such players as Charles Kent, James Lackaye, Harry Northrup, Alberta Gallatin, Donald Hall, James Morrison, Carlotta De Felice, and Jane Fearnley enact other prominent rôles. They are ably assisted

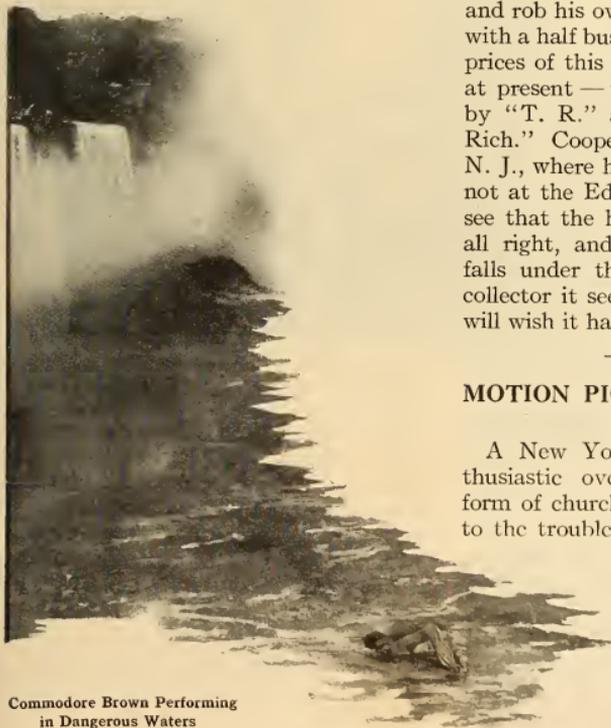


The Magnetic Anna "Elevating an Elephant"

by well known players of the legitimate stage who were featured in the casts of "Joseph and His Brethren" and "Disraeli."

AQUATIC STAR FILMED IN COLORS

A decidedly unique subject was recently obtained by the Kinemacolor Company of America when Commodore Alfred Brown of College Point, N. Y., the celebrated life saver and long distance swimmer, was induced to pose for them while performing one of his surprising aquatic feats. The Commodore had long had his heart set on swimming from ocean to ocean, through the Panama Canal, and recently he has succeeded in accomplishing the feat. Only a short time ago he swam from the Battery, New York City, to Sandy Hook, a distance of 30 miles.



Commodore Brown Performing
in Dangerous Waters

THIS WILL BOOST HIS INCOME TAX

Bigelow Cooper of the Edison Company must have broken into the ranks of the millionaire class, judging from this



Getting Away with a Bushel of Eggs

picture of him. Any man who can go out and rob his own henhouse and get away with a half bushel of real eggs — with the prices of this luxury soaring as they are at present — would certainly be classed by "T. R." as among the "Predatory Rich." Cooper has a nice farm in Bethel, N. J., where he spends all his time when not at the Edison studio. It is easy to see that the hens are "laying for him" all right, and if the above illustration falls under the eye of the income tax collector it seems almost certain Cooper will wish it hadn't.

MOTION PICTURES ILLUSTRATE SERMON

A New York pastor became so enthusiastic over motion pictures as a form of church advertising that he went to the trouble and expense of arranging his own motion picture crew. Several parishioners armed with an up-to-date motion picture camera made a tour of Fifth avenue, paying particular attention

to windy corners. They travelled through the Tenderloin too, and when they had finally exposed several thousand feet of film they advertised the fact that the pastor would deliver a scathing sermon on the immodesty of present-day fashions which would be illustrated with motion pictures. Needless to say the church was well crowded on the evening set for the sermon.

MARY GARDEN IN MOTION PICTURES

Mary Garden, the grand opera star, was snapped by Pathé's cameraman as she stepped from the Broadway Limited, which bore the grand opera troupe to Chicago, in the Union Station on Sunday morning, November 22, thereby scoring a distinct "scoop," for Miss Garden has always objected heretofore to being snapped for "the movies."

The popular grand opera star was met at the depot by a band of Blackfoot Indians from Glacier National Park, who were a part of the Great Northern Railroad's display at the Land Show, then in progress at the Chicago Coliseum and was presented with a pair of beautifully decorated and handsomely beaded moccasins, as a token of their appreciation of her creation of "Natoma" the first Indian rôle ever sung in grand opera.

Through his interpreter, Eagle Calf, Chief Medicine Owl explained to Miss Garden how much the Indians appreciated her accurate impersonation of the character Natoma, and then Lazy Boy, another of the band, handed her the moccasins. In the picture reproduced

on this page Miss Garden is seen shaking hands with Fish Wolf Robe, one of the band, while just behind her stands Mrs. Medicine Owl, the squaw of the chief.

BURNING A HOUSE TO SECURE FILMS

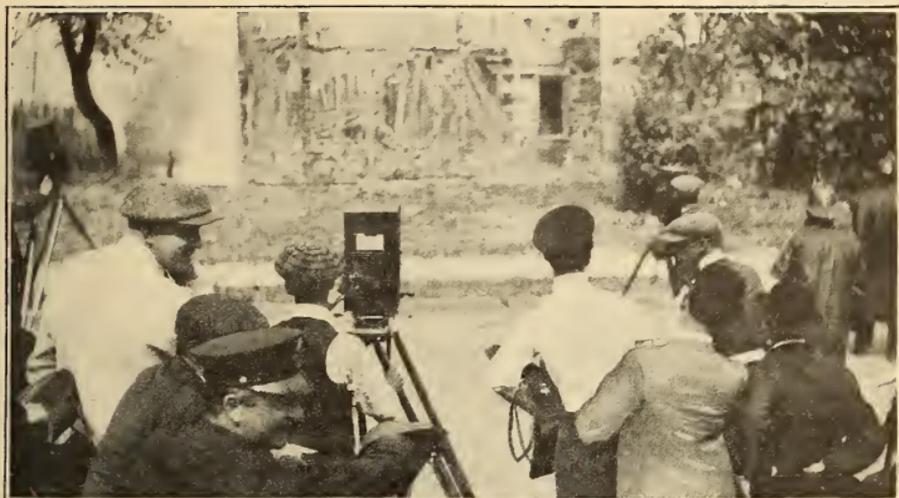
Motion picture manufacturers as a rule spare no expense whatever once they decide upon a certain effect that must be produced. For instance, in filming a subject later entitled "The Junior Partner" the Thanhouser Film Corporation of New Rochelle, N. Y., had to have a realistic and impressive fire scene to carry out the story properly. The ordinary



Mary Garden Meeting Chief Medicine Owl

smoke pots, frequently used in motion picture studios to produce fire scenes, would fall a long way short of answering the purpose in this case so the director looked about the city of New Rochelle and finally picked out a frame dwelling which he believed would answer his purpose. Purchasing this house at no small expense he proceeded to set it afire, after he had lined up his battery of cameras and set them to working.

Practically every detail of this fire, which lasted more than an hour, was



Burning Down a House — Three Film Cameras "On the Job"

taken on the flying films, and, by using several cameras, Thanhouser obtained enough fire scenes to last them for several months to come. Only a small part of the entire negative was used in "The Junior Partner" but those who have seen this picture on the screen will recall how effectively it is used and how much realism it adds to the finished picture.

Dorothy, and was taken at the Kinemacolor studios.

KINEMACOLOR AIDS BEAUTY LECTURES

When Lillian Russell was preparing her feature act for vaudeville and wanted to show her methods of beauty treatment and the exercises, kinds of massage, etc., which she most strongly recommended, she was at a loss, at first, as to how to proceed. Kinemacolor motion pictures at last solved her difficulty, however, and to-day at each performance the fair Lillian shows the natural colored pictures of herself going through the exercises and using other aids to beauty which she approves of and which could be shown in detail and in colors in no other possible way. The accompanying illustration shows the noted beauty, with her daughter



Lillian Russell and her Daughter Dorothy

What Happens to the Scenario

In the first instalment of this series, which appeared in last month's issue, suggestions are given the scenario writer bearing upon the preparation of the manuscript in the correct form to submit to the scenario editor, and the general method of handling after it has reached the office of the latter was pointed out. Assuming that the scenario has been accepted and is to be filmed, we will now follow it to the producer, or stage manager, who is to direct the actual making of the film.

The producer takes the author's manuscript and carefully marks each scene with some peculiar designation or hieroglyphic of his own, by which he may quickly turn to any portion of the manuscript he wishes to find. For instance, a capital "O" may designate an office scene, "H" the set representing May's home, "G" the garden scene, a cross may denote an indoor or interior scene, a circle may indicate a hallway, a dot, enclosed by a square, an exterior or outdoor scene, etc.

The task of compiling a list of the "props" to be used in the various scenes is alone a task of magnitude. Usually, each room is listed separately and the props for that room compiled under one heading. For instance, in the opening scene of "Vengeance," which shows the interior of Cozetti's office, the director may compile the following prop list:

"C.'s office:—Four stenographers' desks and chairs, three filing cabinets, long bookkeeper's desk, high stool, four typewriters, six large pictures (framed), two calendars, one roll top desk, two large rugs, cuspidor."

In some studios a diagram of each room, with the setting required, is drawn by the producer on a specially arranged large sheet of paper, marked off in a scale of feet from the camera's focus. Such a diagram of a "parlor set" is reproduced herewith, from the sketch prepared for use in the Chicago studio of a big producing company. The figures at the right indicate the distance in feet from the camera and those at the left indicate the width of the field or range of the camera lens at different distances. The exact portion of the scene which will show in the finished picture is indicated

by the slanting lines, running out from the point where the camera is stationed, shown near the base of the figure.

The producer has, by this time, decided exactly what members of the stock company he will use in the picture and dictates to his stenographer a list of their names, which she types off on a sheet of

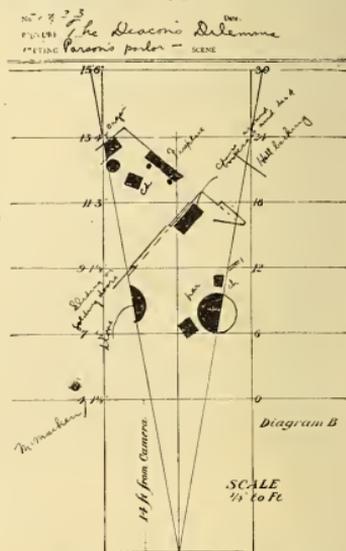
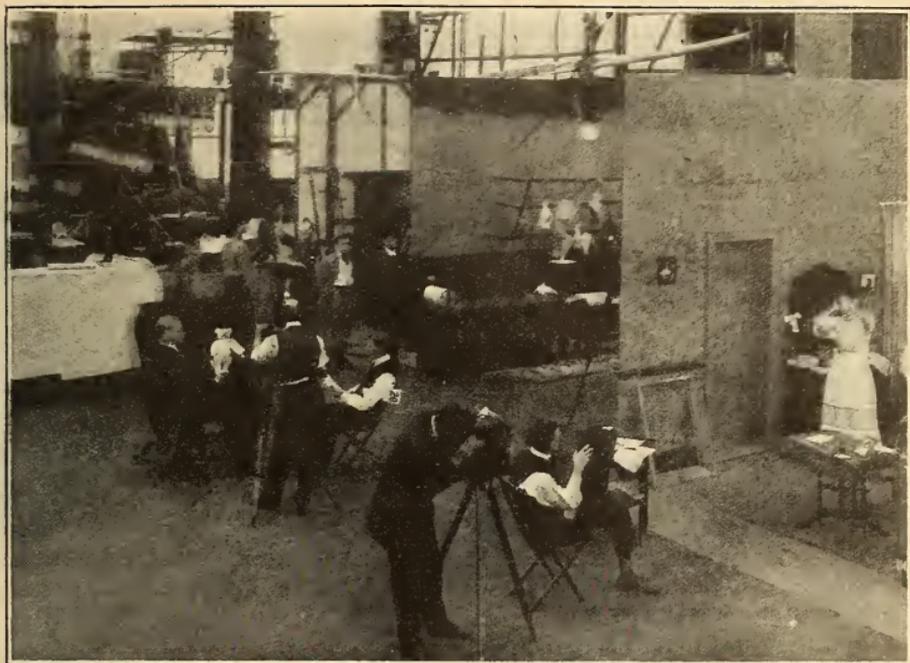


Diagram of a Studio Stage Setting

paper to be hung on the "call board," which each player consults when he arrives at the studio, to learn just where he is to appear that day, under which director, and whether in the studio or at some outdoor location, miles away.

With all the machinery set in motion to bring all the players, all the stage sets, all the props, etc., to the floor of the studio at the right time, the producer



Cameraman and Producer Directing a Scene in the Right Foreground While Stage in Rear is Being Set for Another Scene. Note Smallness of Stage and Edge of Rug which Forms the "Marker" for this Scene.

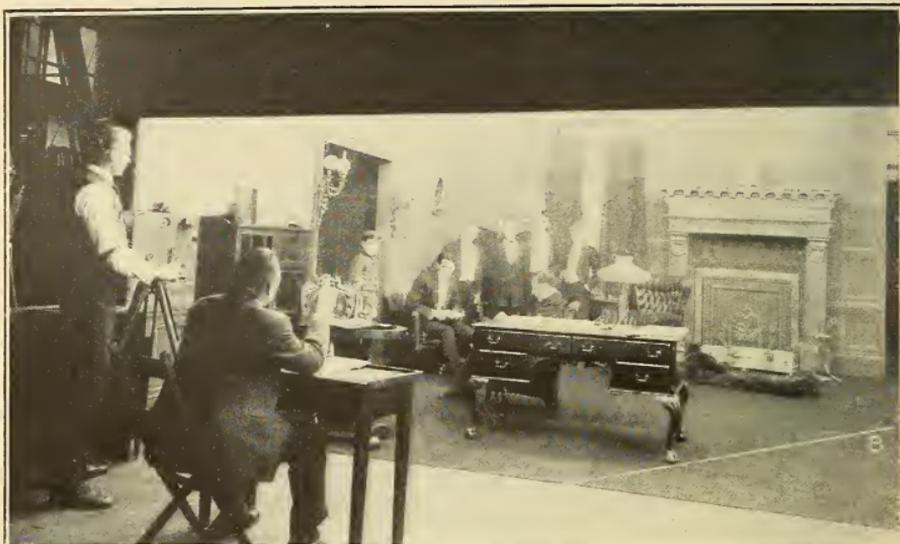
turns his attention to another manuscript and "Vengeance" is forgotten until the next day when the actual work of production will begin.

When the day finally arrives on which the work of production of this photoplay we are following through the studio is to actually begin, the director finds his stage all set for Scene 1 of the drama—the main office of the small private bank in which the opening scene of the story is laid.

Instead of being a deep stage, with ample room for the players to move about, as would be the case were the play to be staged as a regular drama of the legitimate stage instead of a motion picture, we find only a two walled room constructed of scenery, the back wall being probably only twelve or fourteen feet from the camera while the players have only eight or ten feet in which to move about. All the props have been arranged

in their proper positions as shown on the diagram which has previously been prepared by the stage director, and everything is ready for the entrance of the characters.

In this particular studio in which the play we are following was produced, the players are now told the story of the little drama they are to enact, and the "business" of each individual is explained to the player who is to enact that particular rôle, but in many studios the players are never informed what the play is about, but are merely instructed that they are to enter through a certain door, take a seat in a certain chair after they have crossed the stage in a certain manner, and are then to make their exit through another door which is pointed out. That is all they know about the part they are to enact and they have not the remotest idea whether the scene is the first or the twenty-first in the production.



As the Scene Looks from the Front. Note Line (AB) at Right which Forms the Marker or Boundary of the Scene. When a Player Steps Beyond this Line, He is "Off" or "Out" of the Picture.

In "Vengeance" the players in the first scene were told just what they were to do and why they were to do it. The actress playing the part of "May," for instance, was told that she was to be a stenographer who was loved by the Italian banker, her employer, and that when he began paying her unusual attentions she was to treat him coldly because she was deeply in love with "Jack," another character in the scene.

"May" and "Jack" and "Cozetti," the banker, were next shown just where they were to enter the scene, just where they were to be seated, and just what "props" they were to use in carrying out the "business" called for in the author's manuscript.

After everything that is to be done in the first scene has been carefully explained and the director feels reasonably sure that his players understand what they are to do, he begins a rehearsal of that scene. The various characters enter, do what they are to do, and make their exits, but it is all done without a single picture being taken.

The director, watch in hand, times the action to a second, and if he discovers that the enactment of the scene takes even ten seconds more than the time he had decided necessary for "getting over" all that is essential for that scene he shortens this action and trims that one until the players are able to do all that need be done within the required time limit.

Perhaps he has discovered that "May," the stenographer, is wearing a pair of shoes or a hat that fails to correspond with his idea of the character she is playing. The actress is then hustled off to her dressing room to make a change. Perhaps "Cozetti" is wearing a waistcoat that would be more suitable to a German or a Yiddish character than to an Italian, and the director, noting this, will order him to don a vest more suitable for the part he is to play.

The players finally letter perfect in their parts, their costumes all having passed the critical eye of the director, and the stage set and lighting effects having also been approved, the cameraman takes

his position and the actual taking of the picture is ready to begin.

"Ready, go!" calls the director and at his command the cameraman begins to turn the crank of his little machine while the players move about the tiny stage and in pantomime go through the actions they have rehearsed. The director, watch in hand, has been following the action and the moment the time limit for scene one is reached he commands "stop" and all action ceases.

Scene seven will be the next one filmed, for it is laid in the same place as scene one. Therefore scenes two, three, four, five and six are skipped and the players are told what is to occur in scene seven. Referring back to the author's manuscript we discover that a letter is to be read by "Cozetti," the banker, in the middle of this scene, but when the time comes for the taking of this part of the scene the banker looks at the blank sheet of paper handed him only long enough to "get over" the idea that he is reading it and then the action specified by the author is carried along to the end of the scene.

After the whole play has been filmed, the letter which "Cozetti" was supposed to read in scene seven, and which has been carefully written on stationary of the appropriate sort, will be photographed by another motion picture camera, and the strip of negative on which it is imprinted will be attached to the rest of the play in the proper place.

Scene seven, having been rehearsed, trimmed down to the proper time limit, and photographed, is now a thing of the past and the director next will proceed to some other interior scene of the same play, for as a rule a director devotes one



Director Rehearsing His Players. Note that Even with Studio Roof and Walls Practically All of Glass a Very Elaborate System of Artificial Lighting Is Necessary in Making the Pictures.

day to interiors or studio scenes and the next or the first clear sunny one thereafter goes outdoors to take his exteriors.

The exteriors are most frequently taken in the large "yard" outside the studio proper, for nowadays nearly every motion picture concern has a large fenced-in space adjoining its plant in which may be found reproductions of foreign and historic buildings, streets of western types, mimic lakes, and miniature mountains.

In cases where a scene is difficult to obtain or for some reason impossible to duplicate, as would be the case were the players to appear as a part of some civic parade or pageant, or where they are to appear in a scene that is to be blown up or destroyed by fire, two or even three cameras "take" the scene in order to ensure at least one perfect negative. Thus if anything happens to one film, such as it being light struck or injured in some way in development, the manufacturer will still find himself in possession of a perfect negative. Then, too, when two films are taken by independent cameras, a choice may be had between the two films.

Next month a description of trick pictures and players' make-up will be given.



IRENE WARFIELD

Miss Irene Warfield, a beautiful leading lady of the Essanay Eastern Stock Company, was born in New Orleans in 1890. She entered upon her theatrical career when she was but seventeen years of age and played with a dramatic stock company at Memphis, St. Louis and Louisville, Ky. The last three years have been spent in playing parts with Dustin Farnum and in several Cohan and Harris productions, such as "The Aviator," "Within The Law," and "The Common Law." Miss Warfield is especially fond of horse-back riding, tennis and football. She has portrayed leading rôles in such well known photoplays as "The Boomerang," and "Grist to the Mill."

IRVING CUMMINGS

Irving Cummings possesses that rare gift of the Gods known as magnetism, which makes him as pleasant to meet in real life as he is on the screen. Twelve years of stage work, during which he played leading rôles in "Texas," "Way Down East," "The Man of the Hour," a season with Lillian Russell and a summer season with the Davidson Stock Company in Milwaukee, prepared him for his picture work. The past few years have been spent in the studios of the Powers, the Reliance and the Pathe Freres Companies and now he is with the Universal. He is unmarried.



UNCLE SAM AS A RAILROAD OPERATOR

An interesting feature in connection with the work of the Boise irrigation project is a railroad 21 miles long, extending from Boise to the Arrowrock dam. This is the only government owned and operated railroad in the United States.

irrigating 243,000 acres of land in the government project near Boise, Idaho.

THE STRENGTH OF INSECTS

That the strength of insects is prodigious is demonstrated by the experiments of French naturalists, especially M. Fabr . It appears that the smallest insects are, for the most part, the strong-



Views on the Only Railroad Owned and Operated by the United States Government

Uncle Sam has assumed new dignity in the r le of a railroad president and trains run regularly over the new government railroad from Boise to Arrowrock. Supplies, equipment and building material are being carried by this railroad to the town of Arrowrock, where the army of more than 1000 men are at work erecting the highest dam in the world. It will hold back flood and excess waters of the Boise River for the purpose of

est, proportionally to their size, and that all are incredibly strong when compared bulk for bulk with vertebrates. A horse can scarcely bear two thirds of its own weight, while one small species of June beetle is able to lift 99 times its own weight. Were the strength of man in proportion to that of the beetle, it is pointed out, he could play with weights equal to ten times the weight of a horse.

CHEAP POWER FOR THE SOUTH

Great plant at Hale's Bar
on the Tennessee River,
Classed with
Niagara and Keokuk



With the completion and dedication of the nine million dollar lock, dam and power plant at Hale's Bar on the Tennessee River near Chattanooga, November 13, 1913, a large locality of the South will be brought by a supply of cheap power into a well merited place as one of the leading manufacturing sections of the United States.

This great hydro-electric development, begun in 1905 by the late Anthony N. Brady of New York and since his death fostered by his interests embodied in Nicholas Brady, is in the front rank of such projects in the United States, being classed with Niagara and Keokuk.

Electrification of southern industries has a peculiar significance because of the unlimited supply of coal which is being mined throughout that section, thousands of acres of deposits as yet being untouched. Much of the coal mined now is used in making steam to drive factory wheels, whereas, with water doing that work, this section of the South will eventually become much more of a factor in supplying coal markets in regions where Nature has not been so kind.

The South is the world's greatest cotton producing country and who can say that the 65,000 electrical horsepower made available by the Hale's Bar plant may not mean a shifting of the great textile industry from New England, which has long held supremacy, to the South where the raw material is produced.

The project further has tremendous

value as an adjunct to navigation on the Tennessee River, connecting the cities on that stream with Ohio and Mississippi river points without interruption on account of water supply fluctuation during the seasons. The government and the company have worked jointly in the operations. The national feature is the lock for raising and lowering boats; the private end of the work is the construction of the dam and power house.

Col. John Bogart, civil engineer, of New York, began the surveys for the work. Jacob & Davies, who built the first tunnels under the Hudson River, finished the task. The scene of the project started as a camp and grew to a village of several thousand workers—with office buildings, commissary, hospital, hotel, stores, athletic club, theater, etc.,—named Guild after J. C. Guild, one of the promoters. Much of the village remains, but the ground where a portion of it stood is now inundated since impounding of the water began.

"Gravity dam" is the term engineers apply to this mass of concrete—1,200 feet long, 52 feet high, a little over eleven feet thick at the top and from 57 to 64 feet thick at the bottom—because its immense weight must prevent it from being overturned by the water behind it.

At the west end of the dam is the lock 60 feet wide and remarkable as being the highest lift in the world, the massive down stream gates being 59 feet high and weighing 129 tons. At the other end of



the dam is the power house, in reality part of the dam. A passage way $2\frac{1}{2}$ by $6\frac{1}{2}$ feet extends through the dam from end to end so one may pass from the power house to the lock. This tunnel serves also for wires to conduct current to the motors operating the lock gates.

In cutting away the rock for the wheel pits great difficulty and delay was experienced in stopping the numerous springs of water which gushed up with considerable force. Not a cubic yard of rock was left in an uncertain condition, however, hundreds of deep holes being bored and all crevices cemented solidly with pure Portland cement, which was forced into the holes by compressed air.

While the corralled energy of the Tennessee spends itself upon the fourteen big power units in the station, two three wire circuits, of hard drawn copper one-half inch in diameter, supported on steel towers, carry the current at 44,000 volts to a substation at Chattanooga eighteen miles away where it is stepped down for power users.

And Hale's Bar will henceforth have a deeper meaning to every dweller on the banks of the river made navigable by its great concrete wall; it will stand for scores of factories and wage earners within reach of the magic that follows a copper wire to its end, there to aid in the task



The Great \$9,000,000 Hydro-Electric Plant at Hale's Bar on the Tennessee River. A Vast Lake Was Formed by the Impounded Waters. The Locks, Permitting Navigation, have a Lift of 59 Feet, the Highest in the Western Hemisphere.

set for it; it will exemplify the thought expressed by the great mathematician Chas. P. Steinmetz, that material and energy must be brought together that the human race may live; and, finally, the roar of Hale's Bar's big wheels will bring an industrial growth to the South not possible without this and similar projects affording cheap power.

VACUUM CLOTHES CLEANER

A miniature vacuum cleaner which does remarkably effective work in cleaning one's clothes is shown in the cut herewith — a particularly valuable addition to the equipment of barber shops and shoe shining establishments as well as for the home. It embodies a circular



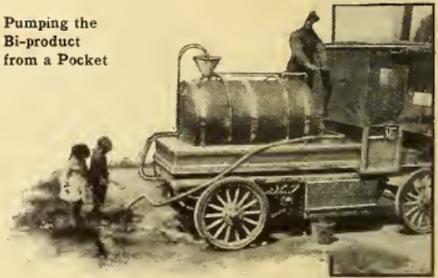
Vacuum Clothes Cleaner

brush the center of which is cut out. This brush fits over the mouth or suction end of the cleaner. Inside the casing of the latter is a little suction fan driven at high speed by an electric motor. As the brush passes over the fabric, loosening the dirt and particles of lint, air is drawn in by the fan and the dirt is deposited in the bag beneath. A screen in front of the opening prevents folds of cloth, buttons, etc., from getting into the way of the fan.

GETTING BENZOL FROM GAS MAIN LEAKS

This vehicle, with its conspicuous, brass-bound, funnel-topped tank, piping, hose, pump, etc., is an outfit rigged up by a gas and electric corporation for collecting benzol, a bi-product very much akin to gasoline, draining from high pressure gas mains along with gas-water. The liquid, being highly volatile, is pumped by

Pumping the Bi-product from a Pocket



hand from seepage pockets, emptying into the funnel and then into the tank, which is bound with polished brass and kept more or less attractive as a sort of advertisement, in its continual passage over the city streets. Some 150 gallons of this valuable bi-product, formerly thrown away, is now gathered daily, distilled once and used in place of gasoline by the numerous automobiles and auto-trucks of the corporation, a very large one, it being, by the way, under contract to supply all the heat, light and energy of the Panama-Pacific Exposition. The manner of formation of the benzol is unique in

that it enters the mains with the illuminating gas in a similar gaseous form but later becomes condensed into a liquid.

Persons who have experimented declare the gas-water, which also collects in the drain pockets, beneficial for skin diseases when tried out on "the dog."

Some very unenlightened individuals have actually supposed the man at the pump to be filling the mains with illuminating gas.

A GREAT LIFE SAVING INVENTION

Within a stone's throw of the shore of Puget Sound, over 100 lives were lost when the "Valencia" went to pieces. It was on the rocks for more than 36 hours, simply because a lifeline could not be thrown from the deck to the land. After this disaster the revenue cutter officials decided that a breech loading gun, easily mountable on the rail of any ship, and fired accurately and without recoil in any seaway, no matter how

rough, would be an invaluable addition to the gear of any ship doing patrol duty in the employ of the United States government. Consequently an appropriation was made and the revenue cutters Acushnet and Snohomish were equipped with guns of this type, the invention of F. Granger Hall, of Dansville, N. Y. Since that time the Acushnet stationed at Woods Hole, Mass., and the Snohomish stationed at Port Angeles, Wash., have taken in tow many wrecks and thus saved countless lives. In tests these two cutters have thrown ten consecutive shots with accuracy into the face of a roaring gale for distances of more than 2000 feet.

Hall's apparatus consists of a bronze gun which can be attached to the rail of a ship at any point, fore or aft. It is so easily loaded and fired that it can be operated by comparatively inexperienced men. An ordinary brass cartridge, weighing 20 pounds, to which the line is attached, is slipped into the breech. This line, by the way, is contained in specially



Hall's Line Gun for Use on Ship-board

devised cylinders of different sizes for different uses. The gun can be shifted to any direction or angle of elevation necessary, and two minutes after the gun is set on

the rail, the shot is carrying the line out and over the distressed vessel.

When communication has thus once been established, the breeches buoy or life car is whipped back and forth until every soul on the unfortunate vessel is saved. To have accomplished this, it is not necessary for anyone to leave the deck of the rescuing vessel.

An ordinary beach gun could not be used because of its recoil. In the guns used by the Snohomish and Acushnet, the recoil has been overcome by a special device so the gun may be mounted on the rail, trained, aimed and fired like a modern naval gun without moving.

Hall's gun shoots a line over the wreck and the men aboard the wreck haul in the "leader," make it fast, and then pass the wire cable which carries the breeches buoy from the mast-head to the rescuing vessel. This keeps the cable well clear of the sea.

PORTABLE CLASS ROOMS IN LOS ANGELES

In a rapidly growing city like Los Angeles, Calif., it has been rather hard to keep up with school accommodations. In some parts of the city where it has built up rather unexpectedly the Board has been at a loss to know just how to



Temporary Class Rooms Erected for Los Angeles Schools, Made Necessary by Rapid Growth of Certain Districts. As Soon as Permanent Buildings Can be Erected, the Temporary Ones Are Knocked Down, and Transported by Motor to Other Localities.



proceed. In one such section eight portable class rooms were erected on a vacant lot near the school.

When the addition to the school was completed these portable structures were folded up and conveyed by truck to other crowded sections and will serve until such time as new buildings are erected.

A SENTIMENTAL CEMETERY

A number of mounds which are rather facetiously intended to represent graves are to be seen between the tracks of the



A Sentimental Cemetery

Pennsylvania Lines and the Chicago & Alton Railway near the Harrison Street bridge in Chicago.

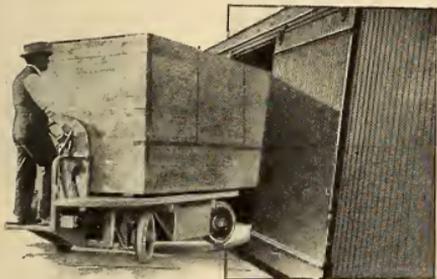
One of the "graves" has planted upon it an ancient round pin, a flat pin and a discarded coupling pin, the sort of paraphernalia used in railroading many years ago. In pebbles is arranged the inscription:

"OLD TIMERS
DAYS GONE BY
PARTED FOREVER"

On other mounds are to be seen somewhat similar sentiments. An imaginative and sentimental flagman who has seen over 35 years of service as a railroad man conceived the unique idea of building these memorials as a fitting tribute to a past era in American railroading.

TRUCK ENTERS A CAR DOOR

Economical handling of merchandise at railway freight sheds may be very well accomplished by means of an electric



Electric Platform Truck

truck which can negotiate the car doors as seen in this picture. The truck, though small, has a capacity of 4000 pounds. The operator stands on a little platform behind and has perfect control of the motor and steering gear. Electric energy is supplied by a storage battery.

REPAIRING SHIPS IN DEEP WATER

On November 6, 1912, the English liner, "The Royal George," a vessel of 14,000 tons, ran onto the rocks in the St. Lawrence River, at a distance of about nine miles from Quebec, during a dense fog. After spending fifteen days in attempting by the old methods to refloat the ship, without success, an American engineer, Mr. W. W. Wotherspoon, was called upon. By means of powerful air compressors the water in the damaged compartments was driven out. The installation of the machinery required three days, and fifteen minutes after it was set in motion the ship was refloated.

The holes in the shell, which extended along nearly half its length, were temporarily closed with planks packed with oakum, and the ship taken into deep water, the packing being kept in place by the pressure of the air inside the shell. Then a diver on a scaffolding hung on the outside of the ship took exact measurements of the holes and a drilled plate was made to suit each one. Corresponding holes were now drilled in the shell, and the outside plate bolted on, the nuts being tightened up on the inside. The air pressure inside the shell was kept equal to the pressure of the water outside, making handling of the plates easy.

JAPANESE ENGINEER STUDYING WISCONSIN METHODS

Interested in the Wisconsin method of regulation of telephone companies, Genichro Ohata, electrical engineer of the Imperial Department of Communication at Tokio, visited Madison, Wis., investigating state regulation. In Japan the telephone lines are owned by the government.

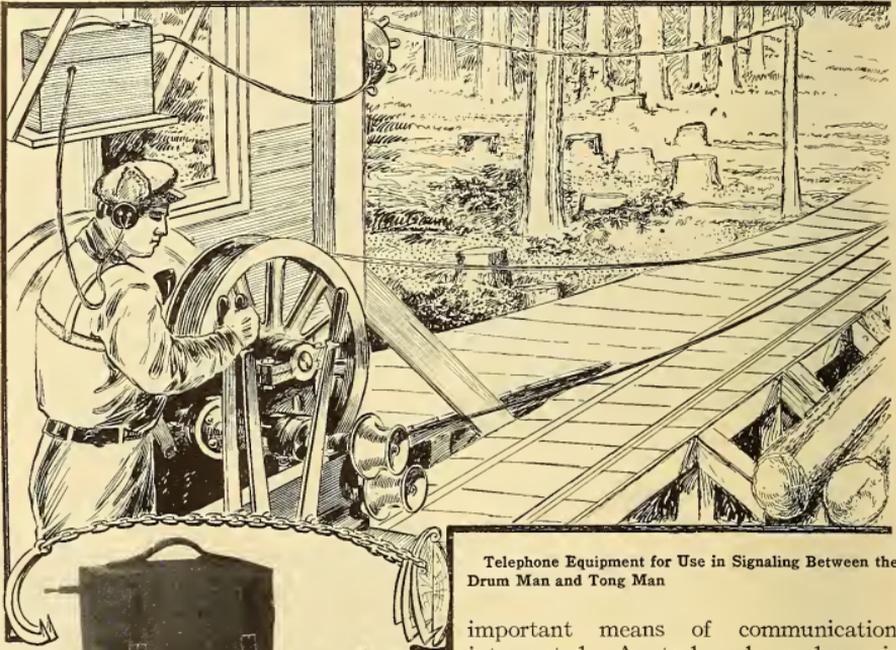


BY COURTESY OF LA NATURE
Compressed Air in The Hold of the Ship Prevents the Water from Entering

A Lumberman's Telephone

Lumber producers often employ the long haul or pull boat method of skidding. To be able to signal quickly and accurate-

not, and it works successfully whether the tong man be 100 feet or 4000 feet from the skidder. At no time is this

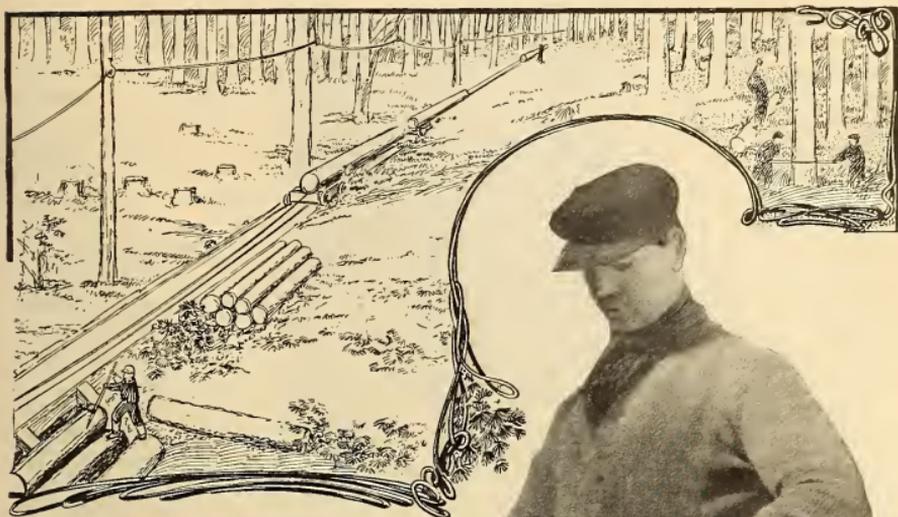


Telephone Equipment for Use in Signaling Between the Drum Man and Tong Man

ly between the drum man who controls the big cable winding drum and the tong man in the woods who attends to the log tongs on the skidway is imperative. Here the telephone, of an unusual type, steps in as a refinement over the old method of signaling by lung power or gesticulations, by whistles, strings and cords; in fact, every method that had before been conceived.

By means of this telephone system the tong man and drum man can talk to each other at all times, regardless of whether the skidder engine is running or

important means of communication interrupted. A steel reel or drum is mounted on the skidder, together with a telephone instrument. Continuous connection is made at all times through this wire by means of a brass commutator. The skidder telephone is placed in a heavy wood box directly over the head of the drum man. To this is connected the field wires from the telephone cable drum, by means of a plug on the end of the field wires. This plug is inserted into a jack or hole for that purpose in the set, which is in the box. This jack is covered by a leather flap which can be securely fastened when the plug is taken out. The head telephone set of the drum man is also connected to this same box by means of a similar plug and jack.



The telephone set used by the tong man is built very small, is light and compact and is made entirely of steel, enclosed in a black sole leather case. This is to be fastened to a belt worn around the waist. The belt is also provided with a pocket for the receiver when not in use. If the drum man desires to signal the tong man he can do so by simply turning the crank in the box over his head and this will ring a bell inside the field set on the tong man's belt.

Differences in the length of cable necessary between are adjusted by means of the telephone cable drum

Electricity is no longer a luxury. This is settled. It is rapidly becoming a necessity to rich and poor alike. In a western mining camp, out of 23 shacks or cabins, nineteen were found to be wired and using current. In Altoona, Pa., hundreds of the cheapest houses, occupied largely by foreigners, laborers, railroad employecs, and artisans, are wired for electric light.



WORLD'S LARGEST ICE CAVE

A natural ice cave of enormous dimensions in the Dachstein Mountains (Austrian Alps) has been made accessible to tourists, after being three years ago discovered and explored by Mr. Hermann Bock of Graz, his wife and George Lahner, Secretary of the Dachstein Cave Committee.

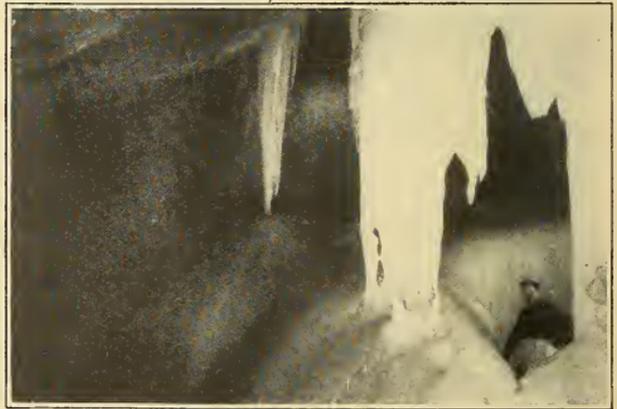
This huge cavern is made up of several domes filled with eternal ice and communicating with one another through galleries, likewise frozen. At about 165 feet from the entrance, it is crossed by an ice crevasse 89 feet in depth and 116 feet in width, lined by giant ice pillars, the passage of which was the most dangerous part of the explorers' task. Beyond this chasm the cavern widens out into a mighty dome, known as "Tristan's Dome," where ice stalagmites of the most weird configurations are seen rising from a level ice sheet reaching from end to end of the hall.

The horizontal gallery continuing this dome is traversed by an ice river which flows out in several directions into some sort of cross gallery.

A hall of truly imposing dimensions (Parsival's Dome) is then reached abruptly, which contains ice figures of most variegated forms. The descent to the bottom of the cavern is made over an underground ice river, called Montsalvash Glacier, at the foot of which there



The Explorers' Descent into the Ice Chamber



Portal to the Kondwiramurs Ice Palace

extends an ice mirror lake with ice stalagmites of striking animal forms.

No greater contrast can be imagined than that between this frozen cavern and the warm summer sun shining outside on the mountain slope only 150 feet distant. In the interior of the Ice Cave there seems to be no alternation of seasons, and the same formidable ice giant now rising from the smooth ice sheet at the bottom is likely to have stood there practically unvaried for thousands upon thousands of years.

NEW YORK'S ELECTRIC TRUCKS

During the first seven months of 1913, 271 new electric trucks began operation in New York, bringing the total number of cars in operation to 2,151, or about 40 per cent of all the commercial vehicles in the city. The prediction was made at the time that this number, 271, would be more than doubled before the end of the year 1913.

BEATING BACK THE FUR TRADE

Without notifying the world through newspaper headlines, the Hudson Bay Company, monarch of the northern fur trade through two centuries and a half, has embarked on a project that means the founding of a new commercial empire next door to the North Pole. Holding



"Tracking" a York Boat up the Athabasca River—a Method Employed for 200 Years and Only Recently Replaced by Modern Steamers

to its policy of solemn reticence, the company dispatched a double masted steamship from Liverpool last fall; another and another will follow the unheralded procession next spring; yet nobody, in the ordinary course of events, would know why such heavily bulwarked, low lying craft slipped down the river and turned their heads toward the Atlantic never to touch British waters again. If you were to see them two weeks later they would be plowing through the Panama Canal, another three weeks or so, curving around the top of Alaska and heading back East, yet a few more weeks, and anchors would drop in Hudson Bay.

These three ships are to be the vanguard of the new fur trading invasion. They mean that this hoary dictator of the whole northern area of Canada, the Hudson Bay Company, has been ousted from the hunting grounds of two and a half centuries by the trespass of immigration and railroads, and intends that here, inside the Arctic Circle, he shall make a final stand against civilization.

How strangely remote this new king-

dom of the fur trade is from the world as most of us know it, is indicated by saying that one must travel as far north of Winnipeg as Mexico is south. Hitherto the great returns from the fur trade have been gathered south of the sixtieth parallel of latitude; now it will be pressed far beyond that division even to the barren lands and the home of the polar bear, the musk ox, the white wolf, the polar hare, the Arctic fox, the blue fox, the seal, the walrus and other fur bearing animals. Trading will be done almost exclusively

with Esquimaux, another of many indications that the days of the Indian's usefulness in the lands he once dominated are pretty well over.

The whole project, on which millions of pounds sterling will be expended, is simple an intention to re-establish in the remote North the ideal fur trading conditions which Canada supplied previous to the arrival of the settler and the construction gang. New forts are to be built along the edge of the Arctic Ocean, manned by the best captains in the company's service, and the custom of whole Esquimaux tribes for hundreds of miles in every direction is to be secured by the shrewd methods known to the Company.

Every motion of your body is accompanied by electric variations. A whirling wheel, a growing plant, a forming cloud, a fly buzzing through the air, a bullet speeding on its way, a wind blowing over the earth, a nebula condensing in space and a thought arising in your brain—all these give rise to electric manifestations, proportioned to the physical forces called into play.

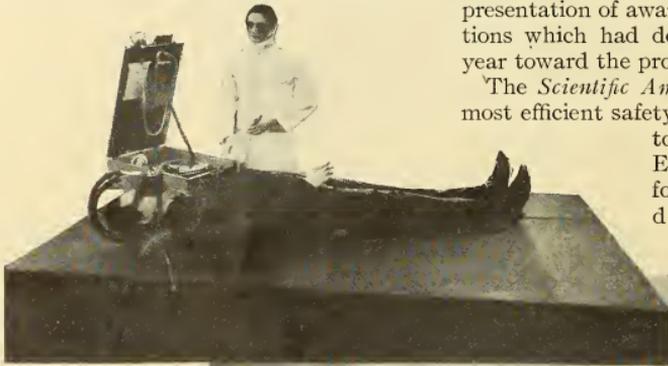
INTERNATIONAL EXPOSITION OF SANITATION AND SAFETY

"Now let us conserve human life." The old régime of "trust to luck, and pay the damage" that marked the attitude of industry toward labor is being swept away in a more adequate and more humane policy of protection. Industry has

various lines, foreign governments and food dealers were among the exhibitors.

In connection with the exposition there was held a three-day conference on safety and sanitation which closed with a banquet at the Waldorf-Astoria and the presentation of awards to those organizations which had done most during the year toward the promotion of safety.

The *Scientific American* medal for the most efficient safety device was awarded to the Welin Marine Equipment Company for its lifeboat and davit improvements.



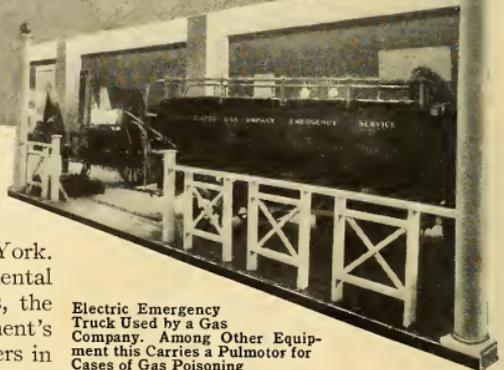
Pulmotor Exhibit

been brought to a realization that there is no compensation for lost limbs and lost lives; hence the country-wide movement that is putting safety first.

Some idea of the extent to which industry is going in the conservation of human life was seen last December when the first International Exposition of Sanitation and Safety was held at the Grand Central Palace in New York. Street railroads and transcontinental carriers, electric and gas companies, the Army, the Navy and the government's Public Health Service, manufacturers in



A Model Field Hospital of the U. S. Army



Electric Emergency Truck Used by a Gas Company. Among Other Equipment this Carries a Pulmotor for Cases of Gas Poisoning

The Travelers Insurance Medal was awarded to the New York Telephone Company, signifying that, as an employer, the telephone company had done more than any other to protect the lives of its workmen. In this connection a special award was made to the General Electric Company of Berlin. The Louis Livingston Seaman Medal for progress in the promulgation of hygiene was awarded to the United States Steel Corporation. The General Electric Company received the Ratheneau medal for the best device for safeguarding life and health, and the Southern Pacific Railroad received the E. H. Harriman Memorial Medal as indicating its success in the protection of the lives of employees and the public.

The various sessions of the conference were devoted to discussions of "Industrial Accidents," "Accident Prevention and the Public," "Industrial Hygiene," "Employer and Employee" and "The Coming Generation."

Naturally the scope of the papers presented was wide. Dr. William H. Tolman, director of the American Museum of Safety, under whose auspices the exposition was held, delivered an illustrated lecture on "Safer Shops," declaring among other things that only where electric motors drove the machinery was it possible to secure a maximum of safety. The problem of factory lighting was covered by G. H. Stickney of the Illuminating Engineering Society.

The Brooklyn Rapid Transit Company, besides specimens of its road equipment and models of its new trolley cars and subway cars, presented a graphic description of its safety crusade among the schools. This company, co-operating with the Museum of Safety, brought about the organization of the Brooklyn Committee of Public Safety, probably the biggest civic organization in this country devoted entirely to the promotion of the safety propaganda. It was through this committee that the work in

the schools was possible. The New York Edison Company exhibited the safety devices that have been installed in its half-million horsepower plant and for which it received the Travelers Insurance Medal a year ago. The exhibit of the Consolidated Gas Company was of especial interest, for it showed a number of electric appliances used for work where there is danger from escaping gas. Of course there were storage battery electric lamps and motor driven tools and the big electric emergency wagon which is always held in readiness to respond to calls where gas is escaping, or where some one has been overcome. This truck carries a pulmotor.

The New York Telephone Company established two central offices in the building, showing the operators at the switchboard and including a rest room such as is provided for the recreation of employees.

The Army pitched camp in the building, showing a mess tent, sleeping quarters and a field hospital, while the Navy fitted up a replica of a ship's operating room, complete from the smallest bandage to the most delicate instrument. And in addition there was a small hospital equipment such as is carried ashore by landing parties. Prominent in both these exhibits were the precautions taken against the spread of infectious or contagious diseases. The United States Public Health Service showed a section of a rat infested house, of a quarantine station, a tuberculosis camp, and exhibits illustrating the preparation of vaccines and sera.

Of course electricity played a large part in all these exhibits, particularly those of the railroads and of the manufacturers. However, it was not the purpose of the exposition to exploit the advantages of electricity — its sole desire being to show that it is better and far more humane to protect the workman than to find satisfaction in a willingness to compensate him for injuries received.

CHRISTMAS TREES GALORE

In Chicago, when they want Christmas trees, they just send to the northern woods of Michigan and Wisconsin and load a vessel or two with them, bringing them down for wholesale and retail distribution. A year ago the pioneer vessel

hands on board were never heard from again and Santa Claus had an awful time providing trees to go round for all his little friends in the breezy city by the lake, in that year of memorable gales. But the woman of it came to the rescue in the person of Mrs. Schuenemann and



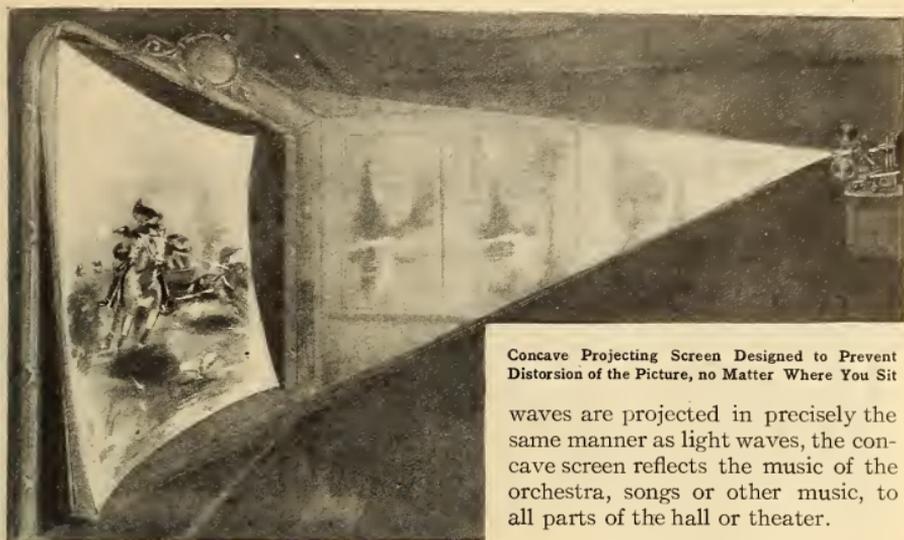
Mrs. Capt. Schuenemann and Her Daughter Who This Winter Successfully Conducted the Christmas Tree Business

Schooner
J. V. Taylor,
the Christmas
Tree Ship,
at Dock

in this special business, which has to be left to as late date as possible, so that the trees may be brought down in good condition, was lost with all hands. The skipper Captain H. Schuenemann, and a "worthy man was he," had sailed the great lakes for 30 years, and although winter had set in early and the ice was packing with stormy seas and winds, he postponed his last and downward trip until two weeks before Christmas. This was in 1912. He and his crew of sixteen

her daughter Elsie, widow and daughter of the dead master, who for a week "stood bravely by" on the Clark Street wharf, selling trees obtained from other sources and thus bringing some financial relief to themselves and the families of the crew.

Our illustration shows the schooner J. V. Taylor of Michigan City, which this winter took the place of the ill-fated craft lost in last winter's gales. It was moored to the wharf just west of the



Concave Projecting Screen Designed to Prevent Distortion of the Picture, no Matter Where You Sit

waves are projected in precisely the same manner as light waves, the concave screen reflects the music of the orchestra, songs or other music, to all parts of the hall or theater.

North Clark Street bridge in the Chicago River. From its deck the widow and her daughter once more directed the sale of Christmas trees.

A CONCAVE PROJECTING SCREEN

Since the inception of the moving picture industry practically all the inventive genius and talent has been concentrated upon films and projecting apparatus; the equally important feature, the screen, has been neglected.

Realizing the inherent defects of the flat screen "Ghosts," "Glimmers" and "Scratches," caused by unequal rays of light being projected on flat surfaces, a Chicago inventor has perfected and placed on the market a concave projecting screen.

The screen is a segment of a sphere, the lens of the projecting apparatus being at its focal point; as a result the rays of light are reflected from the screen at the same angle, thus obviating the distortion seen at the edges of the flat screen.

Another advantage claimed for the concave screen is that it improves the acoustic properties of the hall or theater in which it is used. As sound

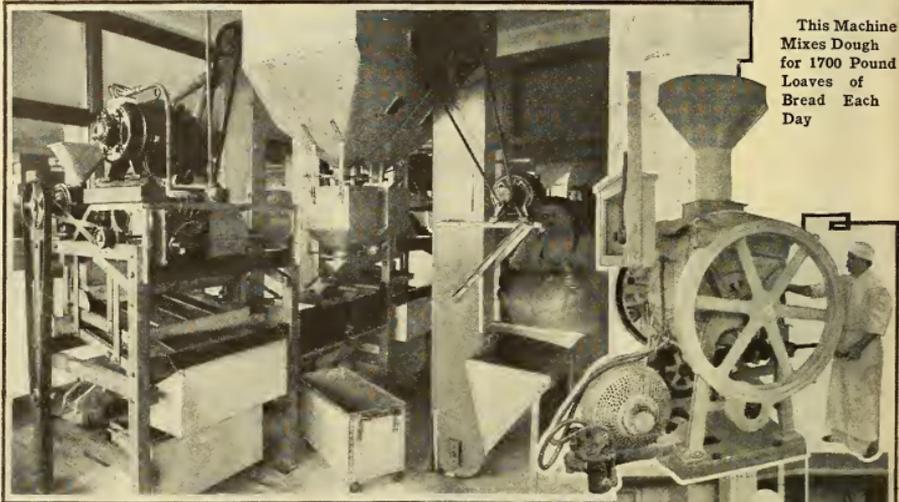
A "COTTON MAN"

Boys in the south cannot enjoy making snow men as do their northern cousins. But one southern boy, who had seen a snow man in New England, got around



Southern Boy's Substitute for a Snow Man

the difficulty by making a "cotton man," made from raw cotton fresh from the field.



This Machine
Mixes Dough
for 1700 Pound
Loaves of
Bread Each
Day

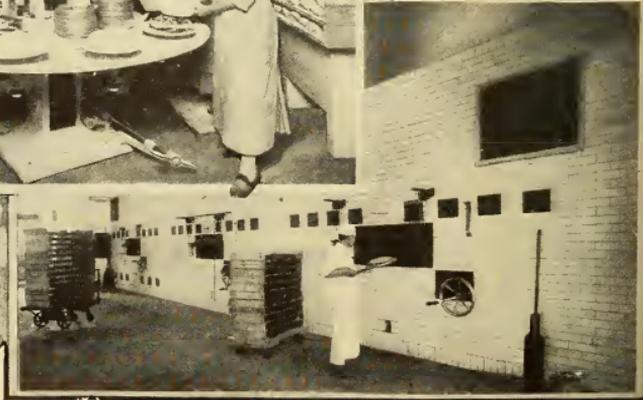
A View in the Coffee Grinding
Room. Electric Power Here—
Silent, Clean, Effective



Machine Which Slices
Apples for Pies

A Motor Driven
Machine Which Makes
Pies at the Rate of 500
an Hour

Three of the Six Pie Ovens—
Capacity 2000 a Day



A Million Dollar Bake Shop

Twenty-two years ago a Danville, Ill., boy tired of the country. He believed he knew what people like to eat, how they want it prepared and the sort of place they like to eat in. Upon a background of white, the symbol of cleanliness and purity, he wrought his plans. The interior of the first John R. Thompson restaurant was white—white lead and oil. The interior of the sixty-seventh and last restaurant is of white tile—floors, walls, ceilings. Even the pictures on the walls are shining glazed tile, set piece by piece each of the proper color to contribute to the whole. But the symbol of cleanliness is not merely an impression, and it is the purpose of this article to step behind the white tile walls and marble counters and see first hand how tons and tons of the best food products are obtained, prepared, distributed and served to 75,000 people each day who patronize 42 of these places in Chicago and 25 in other cities.

Just north of the river on Clark Street, Chicago, is an eight story building so white that people exclaim in passing, "What a clean looking building." It is Thompson's "Million dollar" bake shop.

The Biblical injunction, "Touch not, taste not, handle not," with the middle phrase omitted and the last kept to emphasize the first, is religiously preached and practiced within its walls, and in the making and handling of all foods the most important assistant is electricity.

Huge bins upon the eighth floor receive the tons of flour necessary for making bread, rolls and cakes. These bins in the form of big cylindrical funnels project through to the next floor, and under the end of each funnel is a motor driven dough mixer. A lever releases the required amount of flour from the bin into the funnel. Here it is automatically weighed and dropped into the dough mixer where metal arms knead it as water is poured in by an electric pump. This

water is also weighed. When the pasty mass is sufficiently mixed, the pull of a lever causes the motor to dump it out into large metal lined boxes on trucks to be rolled into an adjoining room where the temperature is kept automatically correct and the humidity is controlled until the bread "raises." Then one after another the boxes of dough are wheeled from the "raising room" to a hole in the floor, through which the dough is dropped into another funnel connected with a dough divider. At the throw of a switch a wide wheel resembling a large pulley sucks into each recess upon its rim just enough dough to make a loaf and drops these upon a table as the wheel turns over. Each ball of dough now goes in at the bottom of a spiral trough facing a revolving cylinder and as it travels along the spiral to the top is kneaded. A third machine receives it and shapes the loaf which goes to the pan, and thence to the ovens, of which there are three ready to bake 800 loaves each at a time.

And the making of bread and rolls is but one example of the application of electricity. An electrically operated pie machine that will turn out 500 pies an hour is part of the equipment. This machine rolls out and drops the flat disk of dough for the crust into the empty tin, wets the rim, drops the top crust on after the pie is filled and presses down and trims the edges.

Pies to the number of 2,000 are baked in six ovens daily. These pie ovens represent an ingenious combination of heat, electric power and mechanical refinement. In looking into the oven one sees a flat soapstone disk fifteen feet in diameter, slowly turned by a motor. Three pies ready to bake are thrust upon it with a long wooden paddle and close to these three more until the disk is full—177 pies. It takes this disk seven minutes to revolve and by the time the first three pies have made the circular journey once

they are done and the disk is cleared with the wooden paddle and the pies placed in racks on trucks to cool. The heat reaches the pies not only through the soapstone disk, but by flues which lead it to the top of the oven and shoot it down.

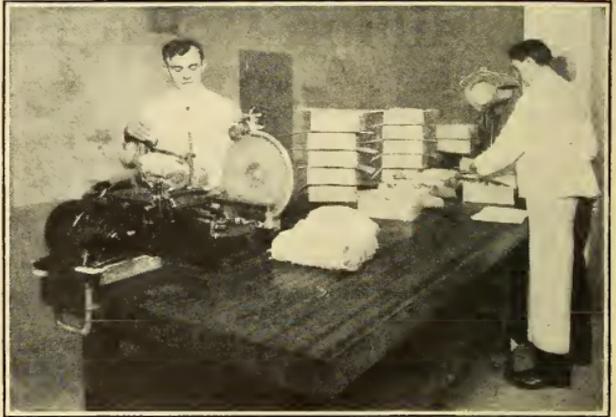
But bakery goods are not all that are handled; carloads of apples, peaches and vegetables in season find their way to cold storage rooms until used.

The commissary might be called an "electric bake shop," so thoroughly is it equipped with individual motor driven machines. There are egg beaters, cake dough mixers, apple slicers, chocolate grinders, ham slicers, and even an electric machine for shaping the lower crust in the tins for soft pies, such as pumpkin and lemon cream.

Four motors are in operation in the coffee room, where the coffee is received in the berry and ground and packed at the rate of 1400 pounds a day and sent out ready for the pot.

A fully equipped electric laundry on the sixth floor washes, dries and irons all the linen for the 67 restaurants.

To cleanliness and pure food should be added system and dispatch as ends sought by Mr. Thompson, and all of these factors are furthered by the use of electric trucks



All Day Long One Man Slices Ham for Sandwiches, with an Electric Slicing Machine

in the delivery department. Referring to these cars, Mr. Nehls, who purchased the first electric for Mr. Thompson five years ago, says, "That car is as good to-day as the day it was purchased. We must keep our supplies clean and away from any odor they might absorb. At the same time we have to consider these same features in connection with our building, for our garage is in the basement. We find, too, that electrics can be operated by less experienced help than the gasoline car. It has cost us only one-half as much to operate them as to operate a gasoline car, and a driver can be taught in a very short time to handle the car perfectly. Further than this, he does not tinker with the car as he might were it a gasoline car. It may be said, also, that our batteries are Edison cells, and in all of the five



Part of the Fleet of Electrics which Ply Between the Commissary and the 42 Restaurants

years we have not had a cent of expense for battery repairs, and have only needed to clean these batteries once a year. We are now using eleven electrics in our delivery service."

WONDERFUL WORK WITH SCISSORS

With a piece of white paper and two or three pairs of scissors of different sizes Mr. A. Girling, an Englishman, cuts out of the paper beautiful silhouettes, one example of which is shown. Although he is a green grocer by trade his work attests his ability as an artist and his 63 years do not interfere with his pastime.



Example of
Silhouettes
Cut from Paper
without
Pencil Line
Guides

He uses no pencil lines as a guide, the sense of proportion being exercised as he cuts.

OLD TIME TELEGRAPHERS

The two men, Albert G. and G. Alfred Hall, whose pictures are here shown, were telegraph operators in 1849 when the art was very young. They are twins and celebrated their eighty-second birthday September last. A letter to this magazine from Goff-Alfred Hall telling of the national convention that nominated Lincoln and of the sending of the news will interest our readers, and we quote from it as follows:

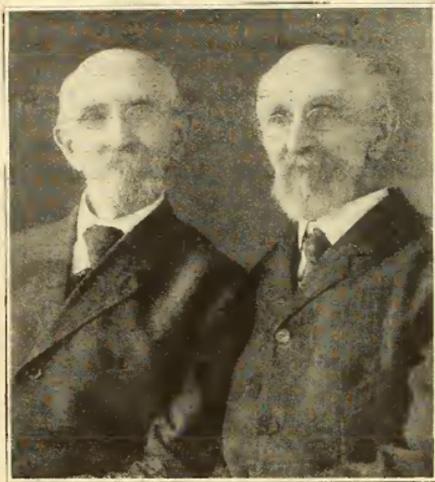
"I was one of the four delegates elected to the Republican convention in 1860. It was the first time the District of Columbia was represented in a National Convention.

"Having been a telegraph operator, I made myself known to the operator in



attendance, and gave him a dispatch all written out, leaving name of successful candidate blank to be put in when I gave him the signal. The result was, my message, "Lincoln nominated on third ballot," was started long before announcement was made, and about 40 minutes ahead of any other. My brother, to whom it was sent in Washington, took it to one of the papers, but the editor didn't want to use it because he was afraid it was incorrect. You see, they were not used to getting things over the wires in those days.

"The same course was pursued regarding the nomination of the vice-president,



The Hall Brothers, Twins Who Have Just Celebrated Their 82nd Birthday. They were Telegraph Operators in 1849

Hamlin. It was my lot to be on the committee on permanent organization, and when asked to vote, declined, remarking that I was a young man and preferred that the older members make the choice. Two names were presented, Ashman of Massachusetts, and Cleveland of Connecticut, the result being fifteen each, when Mr. Horace Greely of New York informed me that I must vote, which I did for Ashman, who was made the unanimous nominee and of course elected.

"In connection with this matter, I have every reason to believe I am the only delegate living to-day who was a delegate in that great convention that gave to the country the illustrious Lincoln for president. We celebrated our eighty-second birthday last September, the 19th. I am glad to say we are both in fairly good health. I enclose a photo of recent date."

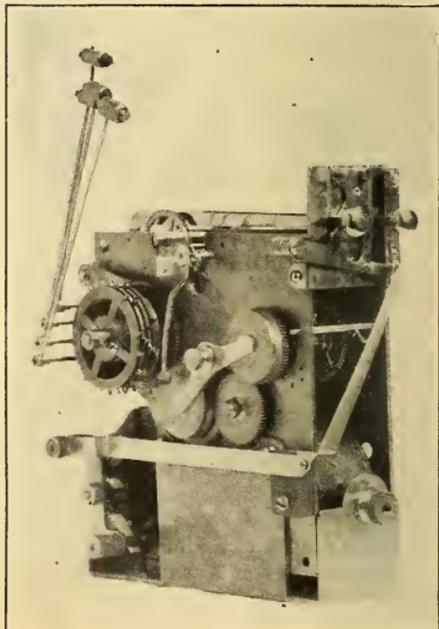
A STRIKING, SELF WINDING CLOCK

A self winding clock that strikes the hours and chimes the quarters has finally been perfected and placed on the market. Heretofore, self winding clocks

have lacked this desirable striking feature owing to the weakness of the electric magnets employed to wind the clock spring periodically, and the impracticability of using larger units, due to the fact that the enormous drain on the batteries would shorten their life to such an extent that the self winding feature would be nullified.

In this clock, as shown in the illustration, the problem is solved by utilizing an electric motor to serve the triple purpose of striking, chiming and winding the clock spring. The striking and chiming is done directly by the motor without the intermediate aid of a spring, through a series of contact points on a spur wheel, the points corresponding in number to the hour and also the quarters.

The consumption of current is claimed to be but four and one half ampere hours per year, two small dry cells being of sufficient capacity to operate the clock without attention for 300 days.



Works of the Striking, Self Winding Clock



CARTOONS THAT SPEAK FOR THEMSELVES

These cartoon maps of political situations in Europe in years gone by, and the relations of the United States to the Philippine Islands, are reproduced from photographs of the originals now in the National Museum at Washington, and which form the only collection of its kind in existence.

Some Examples of the Interesting Cartoon Collection at Washington

caused by minute particles held in suspension, but the experiments of scientists abroad suggest a different explanation.

THE COLOR OF WATER

Pure water appears blue when light is transmitted through a sufficient thickness of it, and when opaque particles are suspended in it the hue of the water is greenish. But while pure water looks blue when light passes freely through it, yet when it is contained in a deep, opaque receptacle, like the basin of a lake or the ocean, it ought to absorb all light and look black. Experience shows, however, that the deepest parts of the Mediterranean, for example, appear not black but intensely blue. For a long time it was supposed that this was

They have found that warmer currents passing through pure water interrupt its transparency, even when the difference of temperature is very slight. Such currents may cause deep water to appear blue by reflecting light back from its depths through the transparent layers above. This, it is contended, explains the fact that fresh-water lakes are more transparent in winter than in summer, since in winter, currents of heated water are not traversing them. Even the shadow of a mountain falling on a lake may, it is said, increase the transparency of the water, simply by cooling the surface.

The Test Car

BY GEORGE AUSTIN BARNES

When Monahan crossed the yard beneath the network of overhead wires, the electric lights were beginning to sputter through the gathering dusk; although it was not yet six o'clock, the days were beginning to shorten. He passed on to the locker room to leave his dinner pail and remove his overcoat.



"Slipped Back and Applied His Eye to the Crack in the Door"

The day men were just leaving, and as they washed some of the grime from their hands and faces, they discussed the occurrences of their runs. Murphy's heavy voice rose above the others.

"I was called by Jacques for being

late to-day. Dropped a bearing at City Line on my last trip. He acted as if I done it a-purpose. It's that blamed oil and the dinky cups they've put on. If they'd go back to the old dope we wouldn't have any trouble. I told him so, too. He's out there now, with the Perfection oil man, giving him a ballin'-out."

Monahan looked up from his locker. "The oil is all right," he said. "If it wasn't, why didn't you drop more bearings, or why didn't all the cars go bad?" Monahan liked the Perfection oil salesman.

"What do you know about it?" Murphy demanded. "French has filled you with that con talk of his, just like he did the old man. What do you know about a street car, anyway?"

Monahan did not reply. He was naturally a quiet man, and was rather surprised at himself for championing French. Then, too, he still felt the isolation of his old tramp life from which he had been rescued by Mr. Willett, the president of the traction company. He closed his locker and went out into the shops.

His occupation as night watchman at the Park Avenue car barns, to which he had graduated from sweeper and car washer, gave him many opportunities for fascinating examination and study of the equipment. He had not hesitated to ask questions from the time of his first employment and while he met with considerable raillery and some rebuffs in his pursuit of information, it had resulted in a store of knowledge concerning the construction and operation of the rolling stock that would have surprised some of his fellows.

From the locker room he passed through the paint shop and entered the winding room where the damaged arma-

tures and fields received repairs and overhauling. Jacques, the master mechanic, and French, the oil salesman, were bending over an armature on the floor.

As he stepped into the room, Jacques said angrily, "Aw, that's all con! Your oil's no good and your cups are worse. That's the third machine that's gone down inside of two days, and we can't stand it."

"But look at this," French expostulated. "There's oil in the cups and this bearing had oil on it when it went down; you can see it over against the collar. I know the cups are all right and the oil can't be beaten. Why should we fall down on your road when we are lubricating hundreds of machines of this same type on other roads?"

"I don't know; and I don't care anything about what you are doing on other roads," Jacques replied. "You have fallen down here. I want to be fair in this, French, but I can't have my cars in the shops all the time; and these dropped armatures mean a lot of expense to us."

"I'll tell you what I'll do," French said, after a moment's study of the machine. "I'll fit up one of your cars myself to-night, and if it runs hot I'll give up and leave you alone. But I want this business and I know I can make good."

"All right; go ahead," Jacques said quickly. "I'll take you up on your own proposition. You can have one more chance."

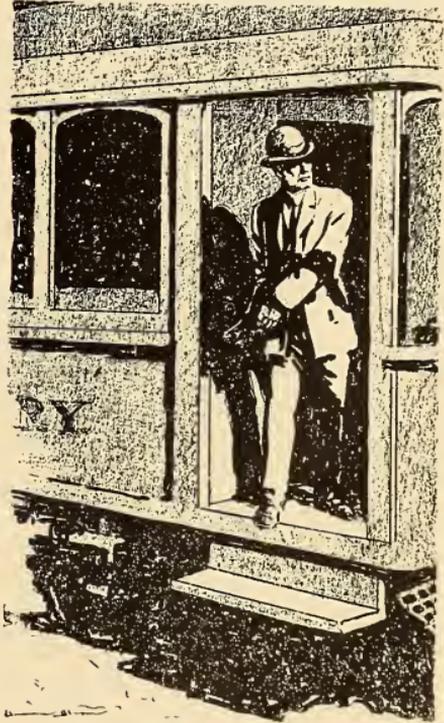
Monahan had come over and stood looking down at the machine in question. "What motor is that?" he asked.

It needed just this harmless question to bring down upon him Jacques' pent-up wrath. "Get out of here!" he shouted. "You're not paid to hang around asking questions. Go on about your business."

Monahan straightened up, a startled look in his eyes. Then he moved on silently. Later, he saw French busily engaged in fitting up the test car which was to decide his fortunes on the road and

stopped to watch the business like way in which he went about his work. When it was concluded French straightened up with a sigh of relief.

"I'll guarantee that to run cool," he said, wiping his hands on a piece of waste. "It's funny, though, that this other bearing heated last night," he added thoughtfully. "I had it packed



" Jacques Appeared on the Car Platform "

right and there was oil in the cup. Whose car is this?"

"Lander's," Monahan replied. Then, glancing shrewdly at French, he added, "He's all right."

"Well, it's queer about that other bearing," French insisted, apparently not noticing the implication.

The big barn was deserted except by the oilers working on the cars at the other end of the building. French tossed the piece of waste into a can.

"What was it you asked about that motor a while ago?" he inquired.

Monahan flushed at the recollection of Jacques' rebuff. "I only wanted to know what make it was."

"Maybe I can help you," French suggested. "I can't tell you just how to identify all the different motors; you'll have to study that out for yourself. But don't get discouraged. Any good railway man can tell these different types the minute he looks at them. When you see one and hear what make and number it is, look it over carefully, so you will know it when you see it again. And there's another thing, Monahan, if you'll let me advise you a little. Study these things and learn everything you can, because every man has his opportunity if he watches for it and is prepared. I know some books that will help you, but I can't send them to you; it wouldn't do just now; Mr. Russell might misunderstand my motive. But I'll tell you where you can get them and I will have the motor builders send you their bulletins on different kinds of equipment, and you can study them."

"That will be fine, Mr. French. I want to learn everything about these cars," Monahan said earnestly. "You see, I never had a chance before to help myself or work at anything steady and it seems as if I could go without eating and sleeping if I could just be around here and know how everything was done and why. But it's hard to learn these things alone—just like walking in the dark."

"I understand," French replied. "I've been through all that and the only thing to do is to keep plugging. You know a good plugger is sure to be a winner some time, if he plugs intelligently. The other fellow may run ahead for a time but he will fall behind eventually because the plugger never knows when he is beaten. So you keep on plugging and if you want any information ask me when I come around and I'll tell you all I know."

French replaced the trap in the floor of the test car and straightened up. "I call that a perfect job," he said, "and if those cups and that oil won't run the bearings cool, I'll give it up and decide the devil is in league with somebody against me."

"Why did you put that little bunch of waste under the oil cup? What's it for?" asked Monahan.

"Well, you see when the oil feeds out of the cup, if it were not for the waste it would drop on the bearing and not spread quickly enough; or when the car comes into the barn, the motors warm, the oil would keep on feeding for a time and would drop on the bearing, and when the car started up in the morning it would flirt that oil off in a clot because there is too much of it. But the waste absorbs the oil and spreads it over the bearings and when the car is standing and the cup is feeding, the waste takes it up and feeds it slowly to the bearings, instead of all at once."

"And she'll run now without any trouble?" Monahan questioned. "It nearly broke my heart when she came in this morning with those new bearings down and the machine stripped."

"Yes, it will run all right. That oil is the real thing, Monahan. There isn't any better made. And I know how to fix those cups so they can't fail. She'll run all right."

He slipped into his coat and stood looking at Monahan a moment, as if doubtful of something.

"Tell me; who is in the barns at night? Anybody but you?"

"Why, yes," Monahan replied, with an air of surprise. "There's the two oilers and sometimes Jacques comes in for a while, to see that everything is all right and the men doing their work."

"Well, don't let anybody touch that car. Tell the oilers Mr. Russell said to leave it alone. I don't want some hunkey spoiling my job. I'll drop in tomorrow and see how it comes out."

Monahan walked with him to the

door and then resumed his round of the barns.

"He's all right," he said to himself. "If he was around here for a while I'd learn all about these things and not get jumped on every time I asked a civil question. But why did those bearings let go on Number 30 last night? I watched him, and he fixed them just as he did to-night."

Cogitating over this matter he passed through the long, silent barns, crossed the alley, flashing his searchlight into every dark corner and entered the paint shop where he stopped to sniff suspiciously for any odor of smoke, then passed through the winding room and the store room, punching the time clock in each department, and finally entered the office. For a few minutes he stayed there, reading the evening paper and some of the technical journals, and then resumed his round.

And so the night wore on, divided between faithful surveillance of the property entrusted to his care, peering into crannies that an ordinary man would have ignored, and taking eager snatches at the pile of electrical journals in the office.

The oilers had long since finished their work and gone home and he was alone in the long, ghostly buildings. It was after one o'clock when, as he crossed the alley from the blacksmith shop, he saw a light move in the car barn. Slipping quietly to the little door he opened it gently and peered through the crack.

A man was moving about in Car 30, and he thought for a moment that French had returned to apply an overlooked touch to his work; but he in-

stantly bethought himself that the salesman could not gain access to the building except through him.

He drew back into the shadow, his eyes fixed on the test car. He waited for probably five minutes before the intruder appeared and then he saw, to his surprise, that it was Jacques.

Monahan slipped back across the alley, opened the door of the blacksmith shop, closed it with a bang and recrossed the alley to the car barn, whistling softly to himself. When he pushed the door open Jacques was not in sight. Monahan passed down between the cars to the oil room, looked into the foreman's office and then returned to Number 30 and stood for a moment regarding it thoughtfully.

"And so you'll run all right to-morrow, will you, my lady," he said aloud. "Well, I don't know about it. French says you will, but Jacques says it takes good oil to run a car and that French can't deliver the goods; and maybe Jacques knows more about what you'll do than French does."

He stood for a moment longer, silently contemplating the car and listening sharply, but no sound came from its interior, and he moved away negligently, as if only following his usual routine. He crossed to the paint shop, opened and closed the door noisily and then slipped back to the car barn where he applied his eye once more to the crack in the door.

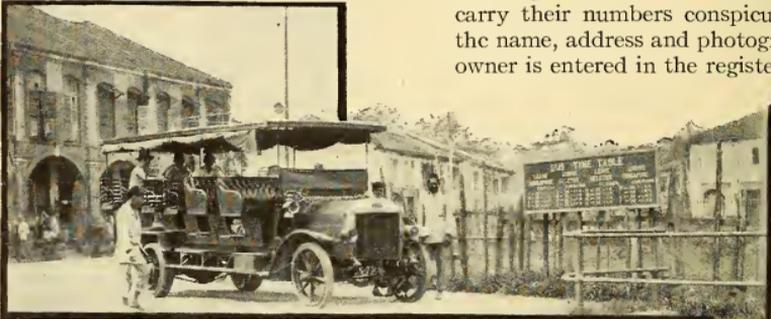
In a moment Jacques appeared on the car platform, and after looking around suspiciously, hurried to the little door opening on the back street and slipped out like a shadow.

To be Concluded

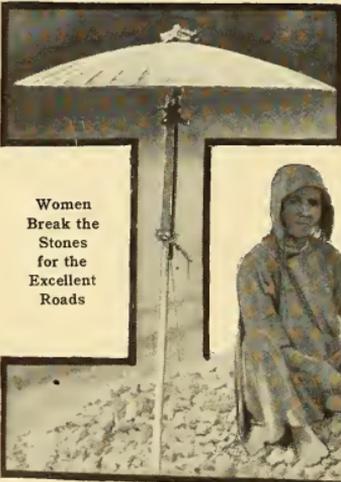
SINGAPORE AND ITS AUTOMOBILING ADVANTAGES

The island of Singapore may justly be termed the Emerald of the British Empire in the East. The island cannot boast of many hills and is, therefore, topographically adapted to automobiling. Although we do not readily associate this far-off island, kicked off, as it were, from

ous combination of Orientalism and Occidentalism is to be observed on every side. From the midst of tawdry looking native shops rise modern European establishments of commanding appearance; lumbering ox wagons and hand drawn jinrickshas move side by side with electric street cars, swift automobiles and smart equipages of all sorts. Even the hackney coaches and jinrickshas are licensed there and, together with the automobiles, must carry their numbers conspicuously, and the name, address and photograph of the owner is entered in the register.



One of the Auto-buses of Singapore



Women Break the Stones for the Excellent Roads



Package Delivery

the toe of the Malay Peninsula, with such modern conveniences as electric and gasoline automobiles, it is none the less true that they are to be found there and in abundance.

The city of Singapore has, for the most part, wide and well kept streets. A curi-

The roads are above the average, with broken stone foundations and there you will find the women are employed in road building work, as one of the pictures shows. As you look at the picture you can almost imagine that you can feel the fierce, reflected heat from that stone pile.

ELECTRIC TIRES SUFFER BY UNDERINFLATION

There are very few people who differentiate between tires for gasoline cars and the specially built tires for electrics. The electric tire is highly resilient, and consequently supersensitive to the evils of underinflation and overloading.

However, any automobile engineer knows that a gas car tire absorbs more energy than an electric tire. The gas tire's ordinary plain weave fabric, in which the warp and filling have the same strength, laid on the bias, gives the maximum strength and durability. Four, five, or six plies of this fabric impregnated with gum and vulcanized together as a unit form a body of considerable rigidity. This rigidity when performing its duties as a tire, utilizes considerable energy to produce the flexing of the walls of the tire. In the case of the gas tire the recoil is taken care of almost entirely by the air pressure, because the fabric walls are quite sluggish in this respect.

Now, in order to produce a more efficient tire, that is, a tire which will consume less power, a change in the structure of the fabric was tested, and engineers began their experimental work to perfect an electric tire. One of the most efficient tires on the market is made of fabric which consists simply of warp threads or small cords, all parallel to each other, and surrounded and separated by a thin envelop of rubber. The several plies of this fabric are placed at 45° with each other. Thus by having each individual end of each ply of fabric entirely surrounded by rubber of high elasticity and resiliency, the casing walls will flex with the minimum of resistance. The difference in the rigidity in the walls of a gas and electric tire may be readily noticed by depressing the deflated tires with the thumb.

At one step in the evolution of the electric tire, a fabric compound of warp threads, with the exception of a very light filling thread spaced every 3/8 inch, was

tried. This filling thread was used simply to facilitate handling the fabric, and at the time of its conception nobody thought any serious low efficiency would result. The effect, however, was to reduce the efficiency.

Among other things tried was that of laying the warp fabric at an angle greater than 45° with the center line of the tread. A point was found between 55° and 60° where the efficiency was a maximum, but the latter arrangement proved to give decidedly inferior wearing qualities.

This last mentioned point is a good illustration of the fact that high excellence in one quality might be offset economically by a sacrifice among the others.

In discussing the question of efficiency, apparently a great deal of importance is attached to the internal friction phase of the situation. But this is very important to the electric vehicle engineer, since he is anxious to see less and less of this precious battery energy consumed in the tires. However, in spite of their desire for resilient, power saving tires, some owners of electrics see gas tires give certain service, and then, if an equivalent electric tire does not equal that performance, they say hard things about the electric tire, and perhaps try some other make.

Now it is very true that for some time past rather serious complaints have filtered in along with the boasts about the limited life of electric tires. As explained, it has been necessary to build a tire which structurally was less firm and substantial in order to make it consume the minimum amount of power. Bearing in mind one particularly well known make, a little better gum was put into this tire, and absolutely the best cotton that could be bought, and it was found that just as long life could be obtained from these tires as from equivalent gas tires during tests. When the public could not get the mileage, it was a puzzling situation, and it took some time to find that overloading or underinflation was the crux of the whole situation. The explanation is that

the walls of the fabric flex so readily that with underinflation or overloading (which amounts to the same thing) the fabric is stressed excessively, resulting in premature failure. Undoubtedly some very good types of tires have been forced off the market because of the practice of undertiring the cars. True, an electric is slower and easier than a gas car on tires, but,—an electric tire is more sensitive to neglect than a gas tire.

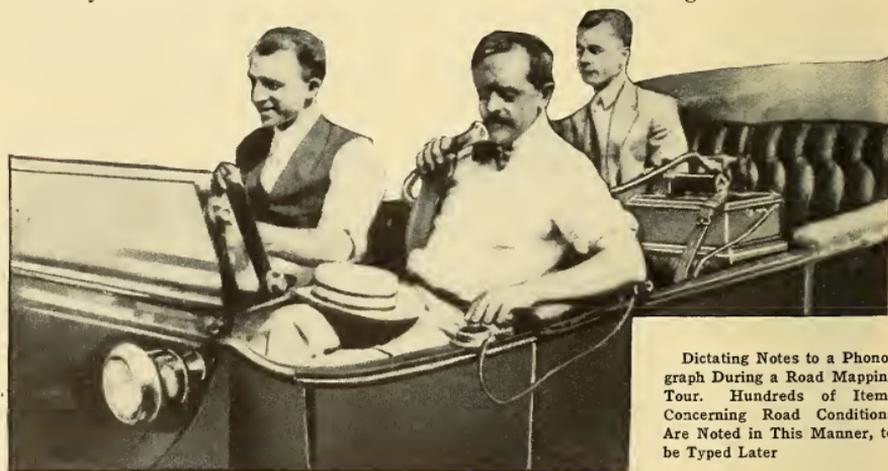
TALKING MACHINE HELPS PATH-FINDERS

While logging the route for a motor car tour of more than 120 miles, the secretary of the Automobile Club of St.

while traveling is a great help. All such features as bad spots in the road, landmarks, grades, railroad crossings and dangerous curves can be noted in this manner as soon as observed. After making the trip with the machine, the notes were transcribed by a typist and the directions were printed for the benefit of motorists making the tour.

LEARN TO APPRECIATE THE SPEEDOMETER

There is no part of motor car equipment more constantly damned, and with less consistency on the part of motorists, than the speedometer, due largely to a lack of understanding. There is a wider



Dictating Notes to a Phonograph During a Road Mapping Tour. Hundreds of Items Concerning Road Conditions Are Noted in This Manner, to be Typed Later

Louis made use of an electrically operated talking machine to note road directions. The photograph shows him pressing the switch button while dictating to the automatic stenographer in the rear seat.

There is a great advantage in this system over the method of dictating to a shorthand writer, as it would be practically impossible to make notes while the car is in motion. To stop the car for every road direction noted, hundreds in all, would be a great waste of time and an inconvenience; therefore the talking machine that can receive the dictation

range of difficulties to be met in the fittings of a speedometer than in any other single accessory on the car. The speedometer itself is a watchmaker's job, adjusted and balanced to register mileage and speed as accurately as a watch registers time. It is true that this part of the speedometer is placed inside the car, and more or less protected from the weather, though few of the automobile manufacturers make any special provision for it, and it usually has the appearance of an afterthought—something stuck on the dash after the car is built.

First. First half revolution of the crank shaft; piston travels toward the crank shaft; gas is drawn into the cylinder. This is the suction stroke.

Second. Second half revolution of the crank shaft; piston travels back; gas is compressed in the cylinder. This is the compression stroke.

Third. Third half revolution of the crank shaft; piston travels toward the crank shaft; combustion and expansion of gas in the cylinder; this is the power stroke.

Fourth. Fourth half revolution of the crank shaft; piston travels back; burned gas is expelled from the cylinder. This is the exhaust stroke.

These four strokes are continuously repeated in rotation as long as the motor runs. However, there is one important point to be remembered; namely, power is *not* produced in any cylinder throughout all of the power stroke, but, approximately, through only four-fifths of it. It is evident then, even to the casual observer, that it is utterly impossible for the single or two cylinder engine to deliver continuous power, as each cylinder delivers power through less than one-fourth of the cycle. Many think, however, that the four cylinder will give continuous power, and it would, if it were not for this fact, that in not quite all this so-called power stroke is power available. As a consequence, to obtain continuous power the six cylinder engine has been developed.

All this is much more easily grasped by inspection of the two diagrams. It will be seen by them, why that small fraction of the power stroke which is not available for power shuts out the four cycle engine from being an absolutely continuous power producer.

BROUGHAM INTERIOR LIKE A PARLOR CAR

A four-chair electric brougham, one of the popular 1914 models, is unique in its seating arrangement from the fact

that every passenger is provided with a separate Pullman chair. By an ingenious placing of three of the chairs, the one in the center slightly back of the other two,

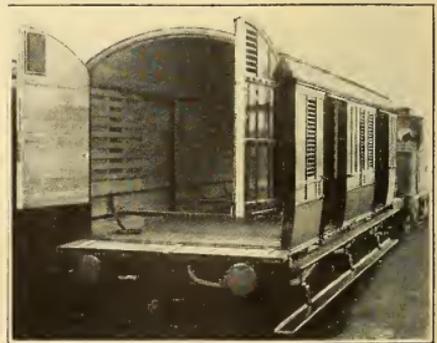


Chairs in a Brougham

a gain of nine inches seat space is obtained over the old style of rear seat, while the driver retains his place with his guests instead of in front of them. The fourth passenger is accommodated in a cozy corner seat at the right.

BRITISH RAILWAY AUTOMOBILE CAR

The railroads of Great Britain provide special cars for the use of manufacturers of automobiles in the shipment of their produce. A picture of one of these cars

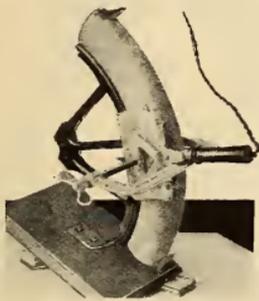


Railroad Car for Transporting Automobiles

is here shown. The doors are arranged at the end of the car so that the entire space may be used in loading and unloading the machines. The interior is provided with special supports for the body of the car to rest upon en route.

"WELDING" INJURED AUTO TIRES

Vulcanizing, in spite of its formidable name, is a very simple, easy proposition. It consists merely of heating raw rubber, mixed with certain chemicals, to a temperature of 265° F. for about fifteen minutes. At the end of that time the consistency of the rubber will have changed from that of chewing gum to the state in



Electric Vulcanizer

which we see it in a tire. Also if the raw rubber is forced into close contact with rubber that has been "cured" in this manner, it will unite with it in a perfect weld.

In mending a tire, therefore, it is only necessary to clean the injury thoroughly, fill it with raw rubber and apply the hot vulcanizer.

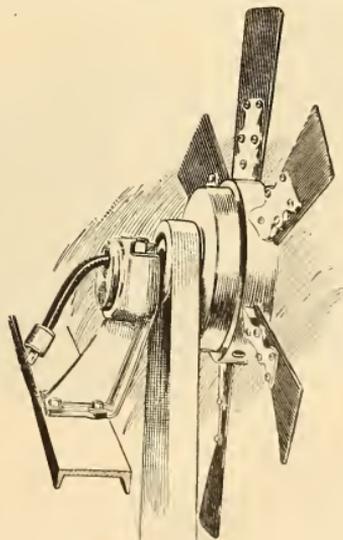
Maintenance of the correct temperature of 265° is essential to perfect results. An ingenious mechanism in the electric vulcanizer makes it impossible for the temperature to vary a degree even if the lighting current fluctuates. A thermostat, affected by the slightest change of temperature, is placed inside of the vulcanizing heater and connected in series with the heating unit. When the heater

is cold, the thermostat keeps the circuit closed but as the current heats the iron, the tension of the thermostat gradually decreases until it finally separates a pair of contact points and breaks the circuit at the required temperature. When the vulcanizer starts to cool (a variation of a degree operates the thermostat) the circuit is closed and more heat is supplied. This operation continues as long as the vulcanizer is in use, maintaining the temperature of the vulcanizer exactly at the correct degree, eliminating all watching and regulating by the operator.

AUTOMOBILE FAN TYPE GENERATOR

While the engine is turning the radiator fan it can, with a Kcmco equipment, run an electric generator and provide current for lights, battery charging, operating an electric starter, gear shift, horn and ignition.

The generator is what the manufacturer calls "fan type"; that is, it is built



Radiator Fan Combined with Dynamo to Furnish Current for Lights

for the shaft of the regular cooling fan of the car. On many cars the generator

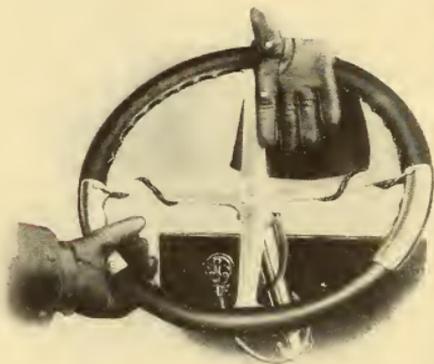
can be installed upon the original fan supports, simply substituting it for the old fan. With the generator is provided an automatic cut-out which makes and breaks the connections between the battery and generator in charging and also an ampere meter to tell how much current is flowing to or from the battery.

ELECTRICALLY HEATED GLOVE

Winter motorists will be interested in this electrically heated glove which will keep the hands warm in the coldest weather.

Incorporated in the lining of the ordinary automobile gauntlet is a very tough and flexible fabric containing fine electrical resistance wires which terminate on the inner surface of the forefinger in a small disk and at the other end in a like disk on the inner side of the thumb.

It may be stated that the contact of these disks with metal contact plates on the upper and under surface of the steering wheel, when the hand grasps the wheel in steering, closes the circuit and



Electrically Heated Auto Glove

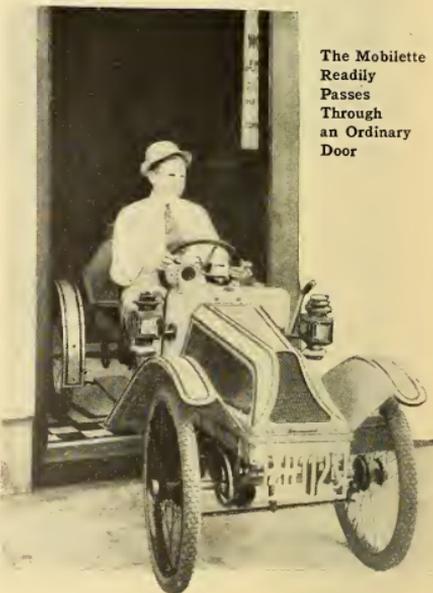
allows the current to flow through the glove lining, where, by reason of the resistance set up, warmth is generated against the back of the hand and all of the fingers.

The metal plates on the surface of the steering wheel constitute the terminals

of another circuit leading from the storage battery system which lights the car. A six volt battery is sufficient to furnish the warmth desired and a current regulator admits of three varying degrees of warmth.

THE MOBILETTE

Cycle cars, as they are technically termed, are very commonly used in Europe and are beginning to come into



The Mobilette
Readily
Passes
Through
an Ordinary
Door

vogue in this country. Being "in between" the automobile and the motorcycle, they have sometimes been called the "missing link," and no doubt they have a specific field of usefulness. One type, the Mobilette here shown, has a tread of only 30 inches (35 inches over all) and consequently will pass through an ordinary door. Therefore the owner does not need to have a garage or barn but can take the machine into the house at night.

Notwithstanding its small size, the Mobilette is in no sense a toy. Its engine develops ten horsepower and is four cylinder, air cooled. Transmission is by

shaft to rear axle with especially designed friction drive. It will make speeds of from two to 50 miles per hour. The body is designed for carrying one passenger aside from the driver, but the rear seat may be readily removed and a parcel delivery body mounted in place of it, capable of carrying a load up to 550 pounds. It is, therefore, entirely practicable for many small business concerns as a delivery vehicle.

HOSPITAL IN A MOTOR CAR

Included in the equipment of the hospital corps of the French army are a number of motor cars completely fitted out for X-ray work and surgical operations in the field. A motor bus chassis equipped with an engine of 35 to 45 horsepower carries a houselike body arranged with all necessary hospital equipment, as shown in the plan drawing.

The operating table is equipped with the latest type of X-ray apparatus for locating bullets and noting fractures of the bones. A most complete sterilizing equipment is provided, with ozone generating

Hospital Motor Car Ready for Service.



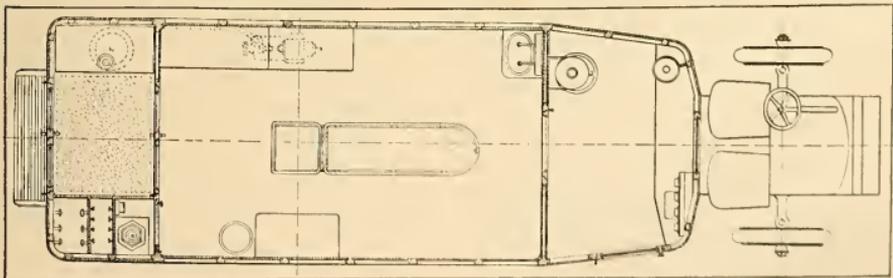
apparatus and ultra-violet ray devices.

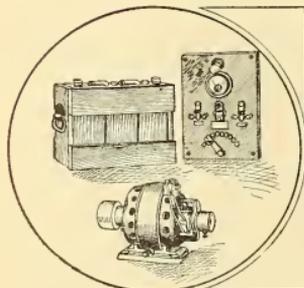
An electric motor driven pump conveys hot or cold water to the operating room from the reservoirs of the car.

UNIVERSAL LUBRICANT

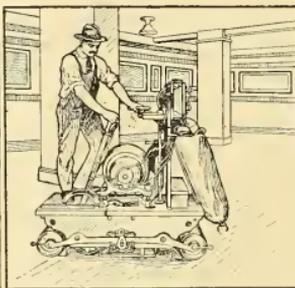
A petroleum oil in solid form has finally been produced which eliminates the waste which is attendant upon the use of fluid oil and does not have the objectionable features of grease. Being a happy compromise between these two forms of lubricants, it can be used on any of the parts of an automobile and so does away with the nuisance of having to carry several kinds of oils and greases.

This oil is called Tule and it will not freeze in a temperature as low as 40 degrees below zero, neither will it melt at a temperature of 340 degrees above. It feeds by capillary attraction in just the right quantity properly and economically to lubricate the bearing.

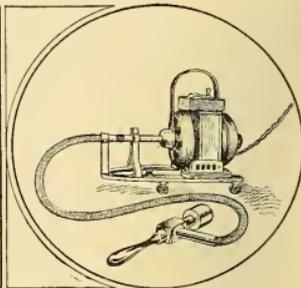




Boat Lighting Outfit



Floor Surfacer



Mosaic Polisher

NEW WAYS OF USING ELECTRICITY

MOSAIC WORK POLISHER

The most satisfactory and economical way to keep stair work, wainscoting, mosaic and terrazzo work polished is to "Do It Electrically."

A machine, for this purpose, is shown, which consists of a one-half horsepower electric motor mounted on a small, portable truck. Six feet of flexible shaft extends from the motor to a carborundum wheel which is driven at from 1200 to 1800 revolutions per minute and which is applied directly to the work. One man with the machine can do as much as five men the old way, it is claimed.

BOAT LIGHTING OUTFITS

Any boat large enough to have a cabin can be lighted by electricity and on cabin cruisers and yachts this form of illumination is not a new proposition. Searchlights are also common even on small open boats to assure safe navigation at night.

A Champion lighting equipment suitable for service on cabin boats 35 or 40 feet in length is here illustrated and consists of a dynamo, switchboard and storage battery. The battery is rated at six volts and 150 ampere hours and will supply five, six volt, sixteen candlepower lamps for eight hours. Ordinarily, however, six candlepower lamps are sufficient and the battery will then require less frequent charging.

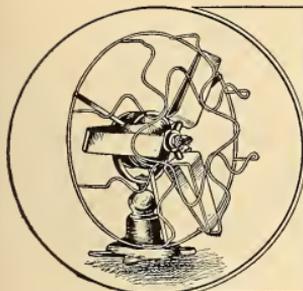
The dynamo is run by a one-inch belt from the engine and a pulley is provided of the proper size to secure 1800 revolutions per minute. The dynamo requires one-fourth horsepower to run it, and takes up a space 14 by 12 by 9 inches.

The switchboard, 11 by 14 inches, is of Venetian slate and is equipped with a double reading ammeter and a circuit breaker which opens the battery leads when the dynamo stops. The battery may be charged while the lamps are burning. The necessary knife and push-button switches are installed on the board to control the ignition and the lighting circuits, the latter including running lights and a 25 candlepower searchlight. The outfit is made in other capacities as well.

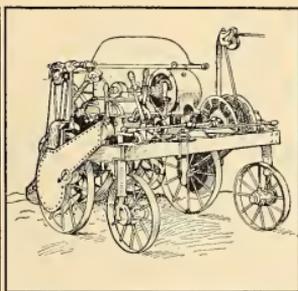
FLOOR SURFACING MACHINE

Instead of a small army of floor scrapers tearing up the grain of the wood, leaving gouge marks and a slipshod appearance, one man with the American floor surfacing machine can do as much work as a dozen men can do by hand, and at far less cost.

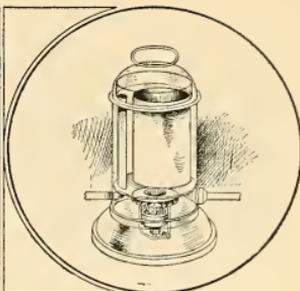
The machine has two rolls $9\frac{1}{2}$ by 18 inches, covered with sandpaper, driven 600 revolutions per minute by an electric motor which also propels the machine. A suction fan picks up the fine dust and deposits it in a bag, leaving the floor clean.



New Type of Fan



Sand Cutter



Rotor Vacuum Cleaner

NEW TYPE OF ELECTRIC FAN

Taking the idea offered by the punkah, so widely used in India, an English firm is placing on the market an electric fan which, like the punkah, gives an intermittent breeze.

The varying movement of the air is due to the peculiar shape of the fan blades which are shown in the illustration, and to the turning of each blade on its own axis, as they all revolve in the plane of the blades. The movement of air thus made gradually rises and falls in a fair imitation of Nature's breezes and is far more pleasing and comfortable than a steady draught. The frequency of the changes in the breeze, as well as its briskness, may be regulated to suit. The motor is designed for either alternating or direct current.

ROTOR VACUUM CLEANER

The Rotor electric vacuum cleaner possesses, as one of its features, ball bearings for all shafts. This construction makes the use of oil unnecessary.

The floor type machine, illustrated by a phantom view, is light and compact, the enclosing case being entirely without sharp edges or corners.

The lightness of the motor and rotating parts has made possible the manufacture of what is called the "hand-type," so built that it can be held in the hand and the projecting tool be moved over curtains, walls, etc., without wearying the operator.

Another claim made for the equipment

is that the miniature proportions of the fan which is of special design produces a suction far beyond what would be expected from it.

SAND CUTTER

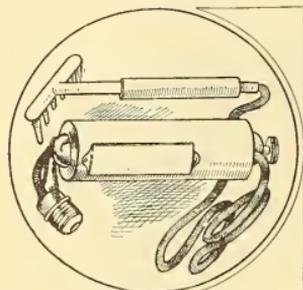
The electric driven auto sand cutter here illustrated saves the time of the molders every morning in preparing sand. The mechanism is mounted upon a metal frame, on wheels, adapted to the dirt floor of the foundry. Between the rear wheels are specially shaped blades, upon a shaft which obtains its power by a covered chain drive from the motor mounted above and at the front of the machine. The blades are set to cut the sand every half-inch throughout the heap from top to bottom.

One responsible man, unassisted, can operate the cutter, usually cutting the sand over at night, so the molders fresh from a night's rest, may begin their work at once. An operator can cut the sand for 100 or more molders, preparing anywhere from twelve to 20 heaps per hour, depending on conditions.

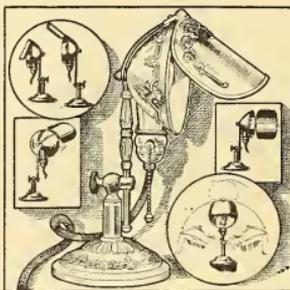
The cutting cylinder is raised and lowered by power from the motor and the machine is driven about by similar power. A take-up reel carries cable for reaching the nearest electrical supply.

PORTABLE HIGH FREQUENCY COIL

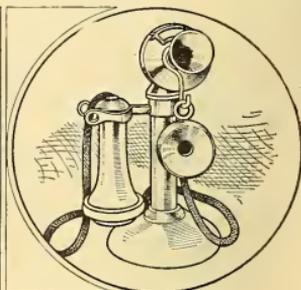
High frequency current is widely employed as a therapeutic agent. A com-



High Frequency Coil



Adjustable Lamp



Telephone Intensifier

compact, portable set for obtaining this kind of current consists of a coil so small and light that it is supported by the cord from the plug used in connecting to an ordinary lighting socket, and from this coil a cord connects to a handle in which is held the electrode being used.

The outfit will operate on either alternating or direct current, adjustment being obtained by turning a thumbscrew on the coil case.

Electrodes for many different uses are made for the coil in order to obtain certain effects, such as stimulating, irritating, cautery, etc. A handbook accompanies the coil and contains instructions as to the strength of current to use in different cases. The electrode shown in the handle is called a "comb electrode" and is for the treatment of scalp diseases and the stimulation and care of the hair.

LAMP OF MANY ADJUSTMENTS

The Lyhne lamp, which is made for portable use, in the office or at home, has as one of its features, a parabolic reflector; that is, a reflector which throws the rays of light out in parallel lines if the source of light is at a certain point in front of the reflector, as it is in this lamp. Besides the reflector, an adjustable shade is secured to the portable, in such a manner that it may be revolved to any point about the circumference of the reflector, and set at any angle for the desired distribution of the light.

A set screw on the base of the lamp

affords also a means of turning the standard from an almost horizontal to a vertical position and vice versa.

The metal of the base, reflector and shade are decorated with neat raised designs and the socket is of the pull chain type.

INTENSIFIES TELEPHONE CONVERSATION

A receiver made to connect in the circuit and to hold to the "other ear" while using the telephone is here illustrated.

With the equipment any telephone becomes practically a telephone booth as regards noise. The appliance is particularly serviceable in noisy shops and factories where satisfactory communication by telephone is impossible without the use of a sound proof booth.

A hook supports this special receiver which can be readily picked up at the same time as the regular larger one.

HOLDER FOR ELECTRIC IRON CORD

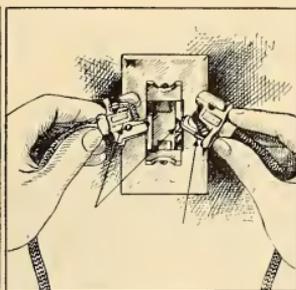
The user of an electric pressing iron is sometimes annoyed by the cord, which does not always stay out of the way without special attention when ironing.

A cord holder, to overcome this difficulty, is here illustrated and consists of a clamp, spring, rod and holder.

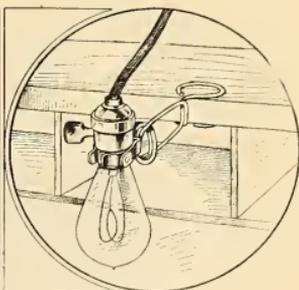
The device can be secured to the edge of a table or ironing board and adjusted to suit the convenience of the operator.



Cord Holder



Polarity Plug



Lamp Holder

The cord is looped over a rubber covered "V" at the end of the rod and the spring at the lower end of this rod has just enough tension to keep the cord from becoming slack. The holder is arranged to accommodate, by adjustment, both right-handed and left-handed operators.

POLARITY PLUG AND RECEPTACLE

It is frequently desirable and often necessary, as in experimental work or battery charging, to be sure that the current from a direct current source shall be always applied in but one direction.

To guard against making a mistake, and in fact making it impossible to do so, a manufacturer is marketing a receptacle and plug having certain peculiarities in formation which fit into each other when the plug is inserted one way and which do not allow the plug to enter the receptacle if an attempt is made to crowd it in any other way. A groove in the receptacle and a projection on the plug, as indicated by the arrows in the illustration, make a mistake as to the polarity of the circuit impossible after it is once determined and, the cord to the plug connected accordingly.

HOLDS LIGHT WHERE WANTED

The Reliable Lite-arm as it is called is an ingenious spring wire appliance for holding an electric lamp in position wherever there is available a rod, a board,

a mud guard, a spoke of a wheel, or in fact any object that the clamps may secure a hold on. By gripping the spring the jaws are opened.

The places where such a convenience can be used are numerous and among them are the automobile shop, at the lathe and drill press, on repair work at the telephone switchboard, in the store-room, on the bed post as a reading lamp, etc. Many other uses will suggest themselves with the appliance at hand.

The device has also proven itself a factor in preventing the breaking of many lamp globes, by placing the light where needed without undue handling.

FIFTEEN H. P. MOTOR DOES THE WORK OF SIX MEN

In rebuilding a church spire in England, recently, a remarkable record was made by a fifteen horsepower motor, which was employed to do the hoisting. The average load carried was 1500 pounds, at a speed of 130 feet per minute. The total quantity of material raised during 23 weeks was 360 tons of stone, 200,000 brick, all the timber of scaffolding, the mortar and so on. The cost for the current used to operate this hoist averaged \$1.50 a week, whereas had manual labor been requisitioned to perform the same work, the cost for labor would have averaged \$37.50 per week. By using electricity the labor of six men was dispensed with and the work was carried out more rapidly and efficiently.

Electrical Men of the Times

FRANK KOESTER



When electricity shall have come to its own in the rural districts of both this country and Germany, the subject of this sketch will be first among those to receive credit.

Mr. Frank Koester's birthplace was Sterkrade, Rhineland, Germany, and his early environment had much to do with his keen interest in the application of electricity to agricultural purposes, for

the Fatherland is many strides in advance of this country in that respect. He has persistently urged the presentation of this subject in the technical press and is the author of "Electricity for the Farm and Home."

When a boy he desired to study architecture and sculpture, but his dreams in this direction not being realized, he applied himself to engineering, in which

field his two brothers were already engaged. Several plans for steam-electric power plants and hydro-electric power development undertakings in Austria, Germany and Norway, executed by him and exhibited at the Paris exposition in 1900, were awarded a gold medal.

After receiving a theoretical and practical training in Germany, Mr. Koester came to New York in 1902 to enter the engineering department of the Interborough Rapid Transit Construction Company, where he remained for about four years during the building of the 33 mile subway system of the city. Subsequently he was engaged for several years with working out engineering problems in the United States, South America, Alaska and the Philippine Islands while affiliated with the Guggenheim Exploration Company, the American Smelting and Refining Company and engineering concerns in Baltimore and New York City.

Since 1911 Mr. Koester has been engaged in consulting engineering work. During the administration of Governor Dix, the development of the water powers by the state of New York was an issue and the services of Mr. Koester were retained to study the financial aspect of the hydro-electric transmission system of the Hydro-electric Power Commission of Ontario, Canada.

Mr. Koester has had considerable experience with German municipal undertakings and the city planning movement in America, and in 1912 presented a paper on city planning from the engineer's point of view, at the City Planning Congress, Duesseldorf, Germany.

Again being invited in 1913, he presented a paper at the International Congress for City Planning and Maintenance at Ghent, Belgium. Believing that with proper city planning, the protection of small industries against the more powerful trusts is essential, Mr. Koester originated what he called "communal industry." This is a new method of reviving small industries and is now

being introduced for the first time in Morgantown, W. Va.

Mr. Koester has contributed more than 200 addresses and papers to the scientific press and institutes and he frequently advocates the study of European methods and practice in order to stimulate the progress in our own engineering undertakings. Among treatises which he has written are "The Utilization of Exhaust Steam from Central and Isolated Plants in Ice-Making," "The Co-operation of Architect and Engineer in Engineering Undertakings," "The Use of Electricity in Agriculture" and "Turbo-Air Compressors and Blowers." Besides his "Electricity for the Farm and Home," Mr. Koester is the author of "Hydro-electric Developments and Engineering," "Steam Electric Power Plants" and "The Price of Inefficiency." Exemplifying the last mentioned book is his work for the Consolidated Gas, Electric Light and Power Company of Baltimore, where he pointed out a yearly saving of \$50,000 in the running expenses. In another instance, in 1904, Mr. Koester, being identified with a large power plant in New York City, pointed out a yearly saving of over \$200,000 in running expenses, without realizing that such proceedings would come to be known as "Scientific Management."

On one occasion Mr. Koester in company with two or three friends attended an evening meeting of engineers where papers were read upon the application of motors to farm machinery. The principal speaker read a somewhat extended paper on the subject, much to the amusement of Koester's friends, since the main body of this paper had been taken from a journal to which Mr. Koester had sent the article his name not appearing with it when published.

Mr. Koester is a bachelor, 37 years old, and a member of the American Institute of Electrical Engineers, Society for the Promotion of Electrical Engineering Education and Society of German Engineers (Berlin).



Electrical Interests of Women



EDITED BY GRACE T. HADLEY

A Growing Profession for Women Workers

Among the various vocations open to women, the field of telephone operating offers many advantages. The rapid growth of telephone business and the opening of many new exchanges require the almost constant employment of additional people. The work is clean and pleasant and of such a character that young women seeking employment have no hesitancy in entering upon it. In business colleges a tuition fee is required from the student and there is often a protracted course of study.

The Chicago Telephone Company in its school offers free instruction and in addition pays a salary to the student while learning the business and furnishes an immediate position in one of its exchanges to all graduates upon leaving the school. In fact, this plan is followed by most of the large telephone operating companies throughout the country. Telephone work is really a profession and one in which a student after once qualifying as a competent operator has acquired a profession which is in itself a valuable asset and upon which a steady income may be realized at any time in practically any city. This profession is free from direct and sometimes unpleasant association with the public as is often the case with women's work, since here the employees are shielded from direct personal contact.

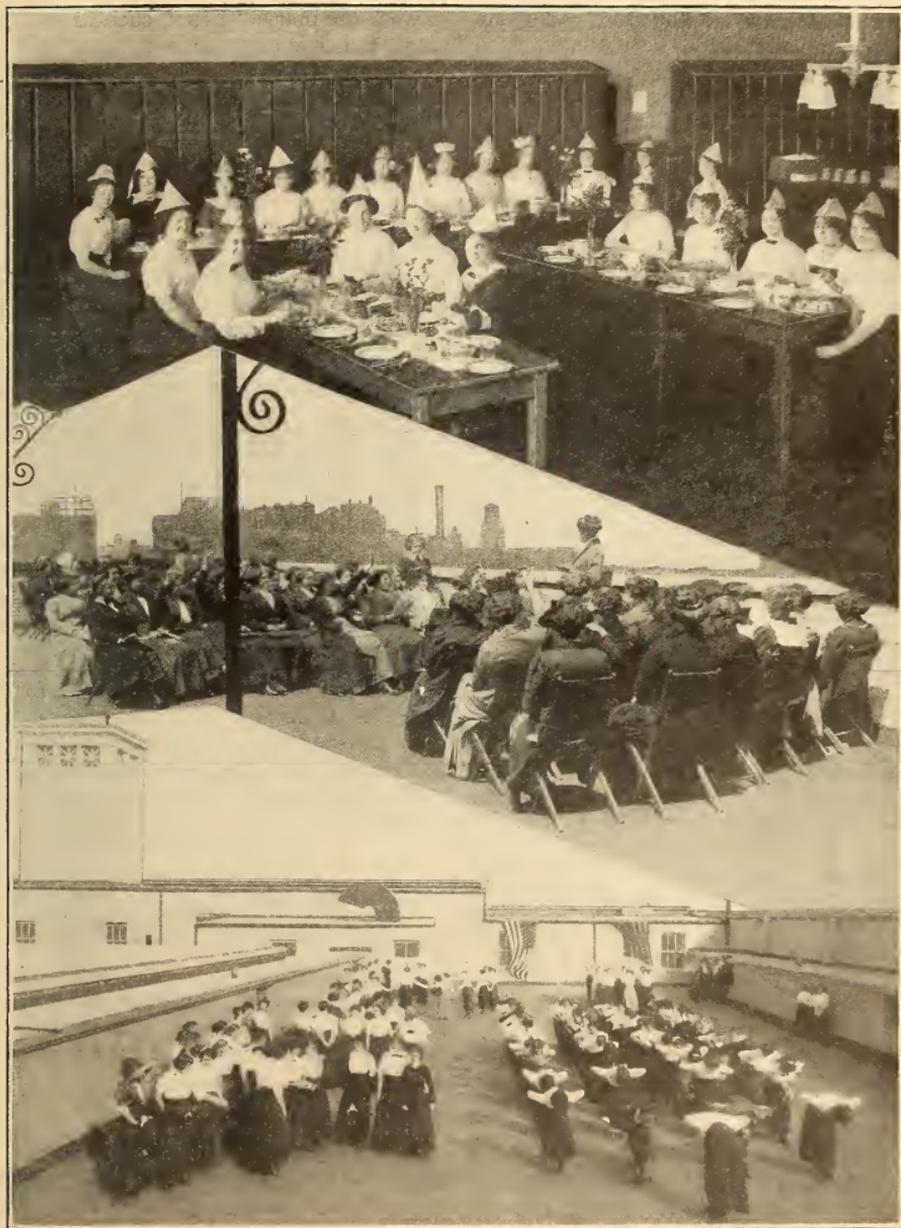
Eleven years ago Mrs. Catherine Moore of the Chicago Telephone Company organized and developed a training school

for women operators and a recent visit to this school proved most interesting. A student must first make proper application for entrance, then pass a physical examination by the medical matron and then spend a month in the training school for operators, during which time she is paid five dollars a week and luncheon is furnished by the company.

The students first study the switchboard or special apparatus provided for connecting or switching the different lines together. The work includes training in calisthenics, breathing, voice culture, concentration, lectures on hygiene and personal cleanliness, closing with a heart to heart talk on morality.

"The rising inflection is to the voice, what cheerfulness is to the face"—is one of the keynotes of Mrs. Moore's work with the girls and her everyday rules of life have much to do with the good results which she achieves. No girl can take a month's training in this work without being better and more efficient in every way. Oral recitations are conducted over the telephone with the teacher seated at her desk. The students with their operating sets occupy chairs which are fitted with a set of jacks, so that the girls get the necessary practice in talking over the telephone and answering calls, the teacher assuming the part of a subscriber.

In the spring when the weather permits, the students go up on the roof and classes are conducted in the open air, also calisthenic drills take place on the roof of



Operators at a Prize Luncheon Given at Lincoln Exchange
Student Class Reciting on the Roof

Gymnastic Exercises on the Roof of the New Chicago Bell Telephone Building, 22 Stories above Street Level

the palatial new building which cost about a million and a half.

Every month there is a service competition among the various exchanges and the one receiving the best mark for good work and efficiency gets a cash prize of \$25 which they may expend in any way they wish. Some of the exchanges have invested the prize money in pictures or a piece of furniture for the rest room, and recently the Lincoln exchange gave a prize luncheon with the money they won.

The welfare work under the able management of Mrs. F. E. Dewhurst of the Chicago Telephone Company is operating for the physical betterment and social development of the army of girls that assists in handling a vital portion of the city's vast business. Good luncheons are provided free of charge for the 7,700 girl operators in the city of Chicago. Beautiful rest rooms are provided where the girls may sing or dance or amuse themselves during the relief periods.

In telephone usage the tone and manner of speech and the choice of words have everything to do with the feeling created. The spoken word and its inflection conveys whatever impression each party gets of the others. Under such conditions, courtesy both on the part of the operating force and the public is like oil to machinery,—necessary to prevent friction. There are three parties to a telephone call: yourself, the telephone company and the person with whom you talk. It is not sufficient that one or two of these do their work properly: the co-operation of all three is necessary.

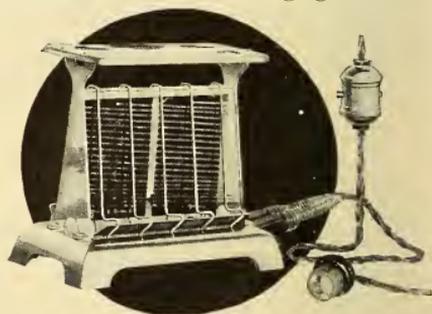
Another important point in the telephone business is this: The service must never stop and there are numerous instances of telephone operators calmly serving subscribers under conditions that would try the nerve of fearless men; in an operating room threatened with fire and filled with smoke, they sit at their posts with fine self-control, trusting to the manager and to the firemen.

Always willing to meet the demands of unusual traffic caused by special events,

to work the unusual hours, such as evenings, Sundays and holidays, many and varied are the qualifications that go to make up the telephone operator of to-day.

VERTICAL ELECTRIC TOASTER

The vertical electric toaster has a new feature in its construction which will interest the particular housewife. This toaster may be used on an uncovered table without fear of damaging the finish



Vertical Toaster

of the wood. This will be good news for *la femme de ménage supérieure* who has always been careful to put asbestos mats underneath hot dishes and who would under no circumstances put a cooking utensil upon a polished dining room table. The protective asbestos mat has been incorporated in the base.

This handsome little device is said to be highly efficient and therefore more economical in operation. This efficiency has been increased by a reflector at the base of the toaster and the insulating asbestos board prevents direct heat radiation or conduction. It has a record of 6000 hours for toasting.

During his stay in Paris, Sir Humphry Davy was conducted over the great Louvre, but famous pictures did not excite his wonder. He hurried through the galleries merely remarking to his guide on an extremely good collection of fine frames.

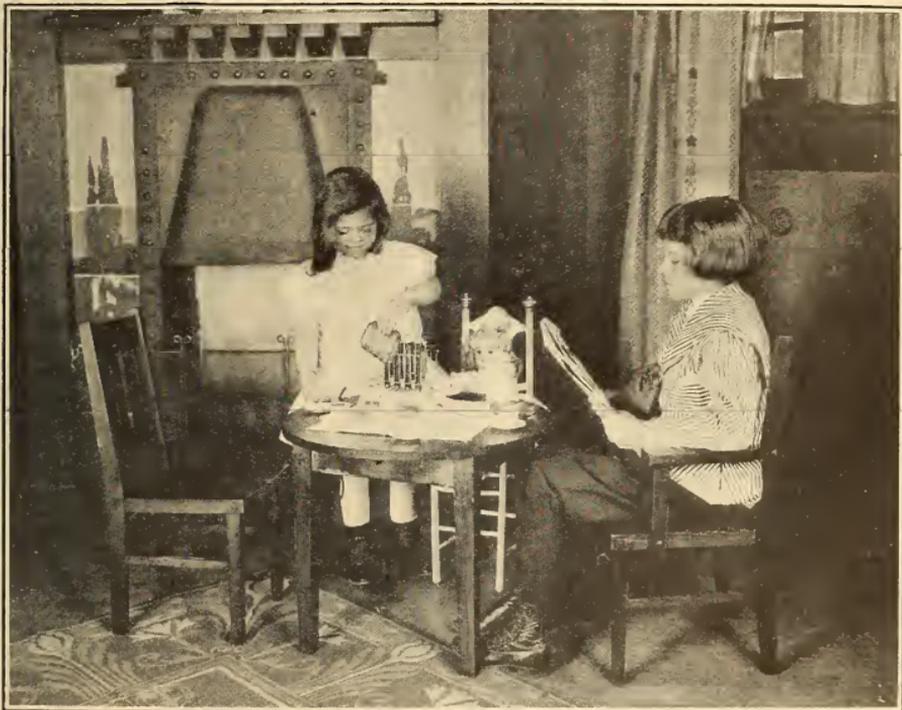
AN ELECTRIC PARTY

Father was away for the day and very busy in his office. Mother had gone to a matinée. It was cook's afternoon out so the coast was clear for a little house party.

Who can fathom the joy of a party? No matter how simple it may be, the

most dignified way, he was sure he was just like father in every respect.

Then Dimple did the thing she had been longing to do just as she had seen mother do it. She got the new electric toaster, attached it to a near-by socket and made crisp brown toast, just as mother did it. No matches were required. A little



Who Can Fathom the Joy of a Party?

imagination of children invests it with a joyousness wonderful to behold. Perhaps there is a new element in the party, a wish to do something all by one's own self. There was in this party.

"Now, Ned, you are the papa and I am the mamma," cried Dimple, "and Brown Eyes is our child." The new doll in her pretty white chair was pulled up to the table. Ned made coffee just as he had seen father do, then he borrowed father's glasses and found the morning paper. Settling back in his chair in the

turn of the switch and the current was on and the bread began to be a beautiful brown. What fun to play with the electric toaster! No flame to set fire to curtains or draperies and no burned fingers, as she had once when she cooked on the old cook-stove.

Suddenly there were steps in the hall, a manly form filled the doorway and there was cousin Don, with his camera.

"Oh," cried the children, forgetting for the moment that they were real grown-ups, "oh Don," and they fell

upon him with mighty hugs and kisses.

"Now you kiddies go right back where you were and I shall make a picture of you," said Don when he had disentangled himself from a miscellaneous assortment of arms and curls and kisses.

"I trust that I am not intruding," he

began, with a merry twinkle in his eyes.

"Not at all," said Dimple just as mother would have said it. Then they scampered back to their places and were dignified for five whole minutes, while Don made what he calls, "The Electric Party Picture."

MEETING NURSERY PROBLEMS

Electric heating in the nursery is all that can be desired. An electric radiator uses up none of the life giving oxygen in the air. It does not vitiate the air in

its favor. There are no smuts to fly about the room and lodge upon every available place. The conveniences of the electric radiator are many: it is small; it



Electric Heat is Cleanly and Healthful in the Nursery

any way. This is very important where there are babies or very small children in the family. There is an excellent reason why the electric radiator is such an invaluable means of heating the nursery: it does away with that fruitful source of bronchitis, the sulphur fumes from coal fires.

The perfect cleanliness of the electric radiator is also an important argument

is portable; it is quickly available in the nursery. It requires no matches and it is easily controlled by the turn of a switch.

An electric milk warmer is a device for the nursery which is appreciated by every mother, especially in cold weather. It will heat a bottle of food in a very few minutes; although the milk warmer is intended for the preparation of infants' food, it is equally serviceable for heating any liquid. It is very convenient for use in the bedroom when a little hot water is wanted quickly.

AN ELECTRICAL POEM

It is related that Lord Kelvin got his idea of the mirror in his galvanometer from a casual observation of the reflections of light from the monocle which, being short-sighted, he wore round his neck with a ribbon. It was the perfection of this galvanometer that was to be of such great importance in the development of submarine telegraphy. It served not only, states Lord Kelvin's biographer, as a "speaking" instrument for receiving sounds, but as an absolutely invaluable appliance both at sea and in the laboratory for the most delicate operations of electric testing.

It appears that soon after the Kelvin galvanometer became known, it inspired Clerk Maxwell to compose the following "electrical poem":

A LECTURE ON THE GALVANOMETER

The lamplight falls on blackened walls,
And streams through narrow perforations;
The long beam trails o'er pasteboard scales,
With slow, decaying oscillations.
Flow, current! flow! set the quick light spot
flying!
Flow, current! answer, light spot! flashing,
quivering, dying.

O look! how queer! how thin and clear,
And thinner, clearer, sharper growing,
This gliding fire, with central wire
The fine degrees distinctly showing.
Swing, magnet! swing! advancing and receding,
Swing, magnet! answer, dearest, what's your
final reading?

O love! you fail to read the scale
Correct to tenths of a division;
To mirror heaven these eyes were given,
And not for methods of precision.
Break, contact! break! set the free light spot
flying!
Break, contact! rest thee, magnet! swinging,
creeping, dying.

EVERYDAY RULES OF LIFE

Mrs. Catherine Moore, director of the Operators' School of the Chicago Bell Telephone Company has formulated these everyday rules of life:

To be joyous in my work, moderate in my pleasures, chary in my confidences, faithful in my friendships.

To be energetic but not excitable, enthusiastic but not fanatical, loyal to

the truth as I see it, but ever open-minded to the heaven light.

To be careful in my promises, punctual in my engagements, candid with myself, frank with others.

To do my work, live my life so that neither shall require defense or apology.

To honor no one simply because rich or famous and despise no one because humble or poor.

To be gentle and considerate towards the weak; respectful yet self-respecting towards the great; courteous to all, obsequious to none.

To seek wisdom from great books, and inspirations from good people.

To invigorate my mind with noble thoughts as I do my body with sunshine and fresh air.

To prize all sweet human friendships; to have charity for the erring, sympathy for the sorrowing, cheer for the despondent.

To leave it when I must, bravely and cheerfully, with faith in God and good will to all my fellow creatures.

ALL STUCK UP!

The coming of Hallowe'en brought with it another case of pin cushion trouble, this time in the Winchester (Va.) exchange. A trouble man was sent out on what was reported to be an unusually puzzling case. He found the subscriber about equally excited over the failure of the telephone service and the making of a gown for a Hallowe'en ball.

When the pins she had been sticking into the cord of her desk telephone set were removed, the trouble at once disappeared.—*The Transmitter*.

As a schoolboy Faraday attracted no special attention, but he tells us himself, "I was a very highly imaginative person and I could believe in the Arabian nights as easily as in the encyclopedia but facts were important to me. I could trust a fact and always cross-examine an assertion."

To Wire a Home

Every householder with an unwired home has said at some time or other, "Some day I will put electric light in this house," and his wife has replied, "Wouldn't that be fine!"

To-day no house is too old to be wired for electricity, nor any house too small or too large, nor is there any reason for the supposition that the wiring of a ready built house involves extensive alterations, turmoil, demolition or inconvenience. It will be found that to install electric lights in a house already built does not mean tearing it apart, does not mean opening up walls, taking up carpets, cutting up hardwood floors, does not mean noise, confusion or anything of

called, will enter your house perhaps in the attic, or possibly in the cellar or at a side or a back porch and the main switch and fuses and the meter are placed at that point. If this service outlet is



Two Electricians Will Appear

the sort. You would scarcely know there was a workman in your house. In a day or two 'tis done and the bill, when received, surprises you by its smallness.

It is well first to have the house looked over by an expert estimator, then when you place your order, two electricians will appear with a bag full of electrical tools, a few coils of wire and conduit, a bag of porcelain insulators, fuse blocks and other necessities. The bag is deposited in a corner of the cellar or the attic, from which point the work is unobtrusively begun.

Now the service wires, as they are



He Will Jiggle This Up and Down

downstairs, then a pair of wires will be "fished" up to the attic through a side wall, between the beams. It is really surprising the way the electrician can "fish" his lines up and down between walls and back and forth under the flooring. He will probably take up a single floor board at the side of the attic and lower a thin steel tape called a "snake." He will jiggle this up and down and maybe try between two or three sets of beams before he finds a clear drop; but finally his helper downstairs gets hold of the end of the "snake" and fastens on his wires which are pulled up.

The next step is to run the lines to connect these two wires in the attic with the points where the lights are to be placed. At each point a small round hole is cut in the plaster and lath on the wall or ceiling, large enough to pull the wires through, but small enough so that the canopy on the fixtures will cover it.

So they work, the electrician and his helper, fishing the wires back and forth, up and down, in and out, one man at the hole, the other down on his knees in the corner. Every piece of closet flooring is nailed back as soon as the wires are in place; every little hole in the wall is covered by a fixture canopy or a switch plate. The little sawdust on the floor is swept up and the chunks of plaster are



The Little Sawdust on the Floor is Swept up

caught as they fall. All that is left to remind you of the electrician when he is gone is his handiwork—the fixtures, the switches and the light. The modern method of installing wires and conduits in already built houses is such that the domestic economy of the household is not in any way disturbed.

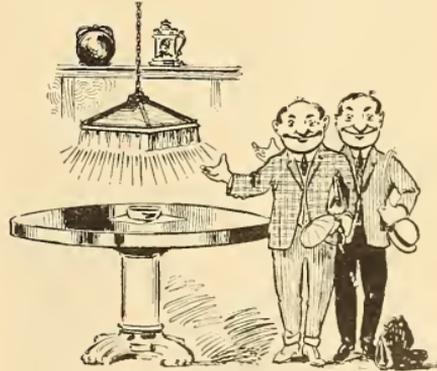
The Brooklyn Edison house wiring plan provides for a \$49 electric equipment on the installment method, \$9 down and \$10 monthly. Of course it does not mean the wiring of the entire house; that cannot be done for \$49, but the living rooms, parlor, dining room, kitchen and hall, are completely equipped with all the necessary fixtures, wiring, glassware and lamps, everything ready to turn on the light, for the sum specified.

In this equipment there is a choice of two distinctive designs in fixtures, which,

though not elaborate, are in harmony with simple artistic standards. Each fixture is equipped with a pull-chain socket so that the light may be turned on or off by pulling the chain.

The parlor fixture has three lights; for the dining room the lamps are enclosed in a dome suspended from the ceiling by a brass chain; in the kitchen and hall, a single light fixture is used. The entire equipment is fitted with tungsten lamps each of 20 candle power and appropriate reflectors are installed in parlor, kitchen and hall. The 20 candlepower lamps in this equipment give a brilliant white light and consume a quarter of a cent's worth of current per hour. During the entertainment of friends in the living room, three lamps may be turned on, giving 60 candlepower of attractive illumination at a very small cost.

In Chicago during the year of 1913 about 3000 requests for estimates on house wiring were sent in and about



In a Day or Two 'tis Done

1300 contracts were closed and more than 30,000 electric lights installed. During this year the amount of money involved for wiring, equipment and installation of the 30,000 electric lights up to and including the month of October was \$181,551.



NEW BOOKS

SHOP MATHEMATICS. By Norris and Craigo. New York: McGraw-Hill Book Company, Inc. 206 pages with 218 illustrations. Price, \$1.50.

The volume presents the second half of the instruction papers in shop mathematics as developed and used in the Extension Division of the University of Wisconsin. The book offers such of the principles of algebra, geometry, trigonometry and logarithms as have been found to be of practical value in the shop. It also aims to give the student good mathematical preparation for technical study.

THE ELECTRIC VEHICLE HAND-BOOK. By H. C. Cushing, Jr., and Frank W. Smith. New York: H. C. Cushing, Jr. 1913. 354 pages with 161 illustrations. Price, \$2.00.

This is the first comprehensive hand-book published to give the electric vehicle owner, operator and garage man the information he requires regarding vehicle batteries, their care and operation, battery charging, current measurement, tires, bearings, transmissions, motors and various accessories. It represents up-to-date, strictly accurate information.

ACCIDENT PREVENTION. By James B. Douglas. Philadelphia: The United Gas Improvement Company. 111 pages with 88 illustrations. Price, 75 cents.

It has been variously estimated that from 30 per cent to 50 per cent of industrial accidents are preventable. This book by pictures and descriptions calls the reader's attention to a great number of preventable accidents and is an amplified revision of an illustrated talk on "Accident Prevention in Certain Public Utilities," presented at the National Electric Light Association, Chicago, June 4, 1913.

TRANSFORMER PRACTICE. By William T. Taylor. New York. McGraw-Hill Book Company Inc. 271 pages with 191 illustrations. Price, \$2.50.

This is the second edition of this work which furnishes data concerning the connection, installation and operation of transformers. This edition has been brought up to date.

HARPERS BEGINNING ELECTRICITY. By Don Cameron Shafer. New York: Harper and Brothers. 1913. 265 pages with 84 illustrations. Price \$1.00.

This is essentially a boys' book and explains electricity very simply in connection with experiments which any boy can do and devices which any boy can make. In addition there is an appendix containing a number of interesting short stories in connection with historical electrical events, also a condensed electrical dictionary.

WIRELESS TELEGRAPHY AND TELEPHONY. By Chas. R. Gibson. Philadelphia: J. B. Lippincott Company. 1914. 152 pages with 28 illustrations. Price, \$1.00.

A book interestingly written, covering the two subjects and assuming no previous knowledge of these fields on the part of the reader. The author takes nothing for granted, defining his terms and leading from simple ideas up to the theoretical ones.

EXPERIMENTAL WIRELESS STATIONS. By Philip E. Edelman. Minneapolis, Minn. 1914. 219 pages with 80 illustrations. Price, \$1.50.

This book is intended for experimenters who regard the art as more than a mere idle plaything and to serve as a stepping stone to a serious preparation for positions in the practical field. This is the second edition.

HOW TO MAKE AND USE A WIRELESS STATION. By Philip E. Edelman. Minneapolis, Minn. 1913. Five pages with one illustration. Price, ten cents.

A small booklet containing five pages of information upon wireless.

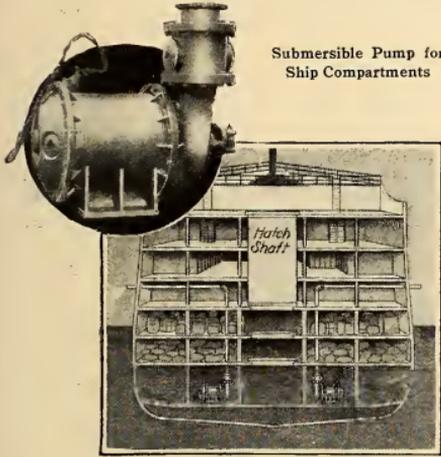
UNDER WATER ELECTRIC PUMPS

A submersible electric motor will find an immediate application in sea-going vessels, large and small, and this particular need is now supplied by an English firm which is placing on the market a motor that runs equally well in or out of water. The motor is fitted with a centrifugal pump under the same casing.

All liners of to-day have double bottoms and should they strike a submerged

object and damage the outer bottom, it does not at all follow that the inner bottom will be damaged to the same extent. The suggestion is that all passenger steamers should be fitted with submersible electric pumps in each compartment and the discharge pipes brought

Submersible Pump for
Ship Compartments



to the upper deck. Should an accident happen and any compartments be flooded, the motors could be switched on immediately, although under water, and thus keep the vessel afloat if possible. It is recommended that an oil engine generating plant be used for supplying the electric current. This plant would be quite independent of the boilers and could be placed on an upper deck, so that the risk of water interfering with its operation would be reduced to a minimum.

WHAT'S IN A NAME?

The origin and meaning of the term Mazda, applied to electric incandescent lamps, is often the cause of much speculation. Mazda was the God of Light, and one of two spirits recognized long before the Christian era in connection with an early Aryan folk religion known as Mazdaism. The fundamental doctrine of Mazdaism assumed that in the begin-

ning two spirits, one good and one evil, governed the actions of mankind. Mazda was the spirit of all good, glorified as the Creator and God of Light.

From what has been learned from the sacred works of the ancient Persians, it is believed, so the statement runs, that Mazdaism was constructed on a clearly conceived plan and stood on a high moral level for its time, a great advance in civilization. It appears from the oldest sources that it accompanied the introduction of agriculture and of settled life among the Iranians who occupied the eastern part of Ancient Persia, then extending as far east as the River India. Probably at some time previous to the Tenth Century before the Christian Era, Mazdaism made its way over Media and Persia proper where it came under the influence of the priestly tribe of the Magi. This religion then fell into decay, to be restored about 226 A. D. as a state religion of the Neo-Persian Empire. It retained its influence until overthrown by the Mohammedans in about 641 A. D.

" CONDUCTRESSES " OF TALCAHUAN



Shifting the Trolley

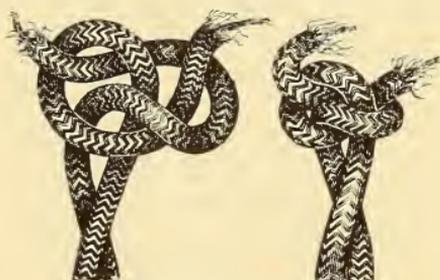
In the city of Talcahuan of the state of Concepcion in Chili, the local street cars are operated by female conductors. So far the women have not aspired to the seat of the motor-man but are content to reign masters of the rear platform, collect the passengers' fares and "switch" the trolleys. The accompanying photograph shows the crew of a Talcahuan street car getting ready to make a return trip.



For Practical Electrical Workers

KNOT FOR FLEXIBLE LAMP CORD

A knot that pulls tight and lays almost flat like a washer slipped over the cord is valuable in

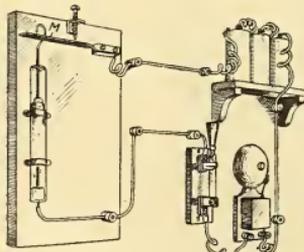


Knot for Sockets and Rosettes

wiring up lamp sockets and ceiling rosettes. Such a knot can be made by carefully studying the illustration. If pulled up evenly it will form a flat, solid knot.— MAXWELL SNAVELY.

BEDROOM TEMPERATURE ALARM

The falling of the temperature of a sleeping room below a certain point may result, during the night, in a very bad cold for the occupant, who may keep a window open. A reliable and inexpensive alarm to wake the sleeper and warn



Temperature Alarm

him to close the window, may be made as follows: Procure a glass tube four or five inches long and $\frac{1}{4}$ or $\frac{1}{2}$ inch in diameter and close

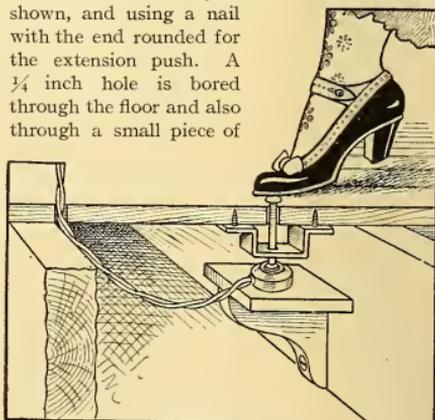
one end, used for the bottom, with sealing wax through which the bare end of a No. 20 gauge magnet wire projects. Fill the tube almost full of mercury. A float of wax in which a bare piece of the same magnet wire is inserted is now placed on the mercury and bent as shown. This wire is guided by a hole through a wooden cover.

Two clips of metal hold the tube of mercury to the base. The adjustable lever (M) is attached at the upper end of this base. The electric connections are made as indicated.

Should the temperature fall during the night, the mercury will contract, the float descend and the circuit will close, ringing the bell. The adjustable lever allows the alarm to be set for various differences of temperature.—MAXWELL SNAVELY.

FLOOR PUSH BUTTON

An ordinary push button can be used for a floor push button by placing it on a bracket or shelf attached to a joist under the floor as shown, and using a nail with the end rounded for the extension push. A $\frac{1}{4}$ inch hole is bored through the floor and also through a small piece of



Dining Room Floor Push

metal fastened beneath the floor, at the right place to direct the nail so that it will rest directly upon the push button.— MAXWELL SNAVELY.

Elementary Electricity for Practical Workers

By W. T. RYAN

CHAPTER XI.—MEASURING INSTRUMENTS

Induction Ammeters and Voltmeters: If a suitably mounted hollow conducting cylinder or disk is placed in a rotating magnetic field, currents will be induced due to the relative motion of the two. The eddy currents in the cylinder or disk will produce lines of force which will react on the rotating magnetic field in such a way as to cause rotation. One way of producing such a rotating or rather a shifting magnetic field for single phase instruments is shown in Fig. 71.

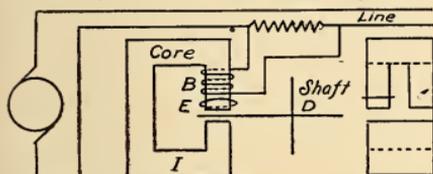


Fig. 71. Working Principle of Single Phase Induction Ammeter

The current in the circuit or a certain portion of it passes through the coil (B) which surrounds the iron laminated core (I). In the end of the iron core is a slot around one half the core and in this is wound a heavy band of copper (E). The alternating current flowing through (B) induces an alternating flux in the iron core. When the magnetic flux is increasing it will in-

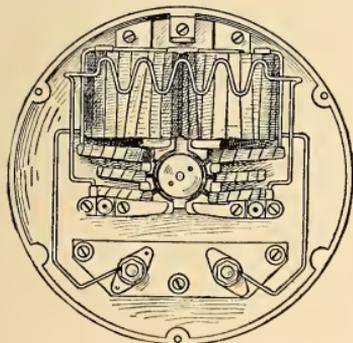


Fig. 72. Westinghouse Induction Ammeter

duce a current in the short-circuited copper band (E). This current is in such a direction that it opposes the building up of the flux in the part of

the core surrounded by the copper band. While the current is increasing the magnetic density will be greater in the part of the iron core that is not surrounded by the copper band. While the current is decreasing the conditions are reversed. The flux density in the unwound part of the core will decrease to zero before that in the other part and vice versa. Therefore the magnetic flux shifts from the unwound part to the wound portion of the iron core. This shifting flux penetrates the disk (D) and induces in it eddy currents which cause the disk to rotate. The controlling force is a coiled spring fastened to the shaft supporting (D). The principles of the voltmeter are the same except that there is connected in series with coil (B) a high resistance non-inductive coil.

The latest and most familiar type of induction meter is the one invented by Mr. Frank Conrad and manufactured by the Westinghouse Electric and Manufacturing Company.

Figs. 72 and 73 fully illustrate the instrument.

In Fig. 73 the laminated iron circuit of an ammeter is shown. (G) is an air gap between an aluminum drum, which is free to rotate, and the iron core. (PP) represents a primary winding through which passes the current to be measured. (SS) is a short-circuited, secondary winding. The dotted line ϕ_p represents the path of the flux due to the winding (PP). ϕ_s represents the path of the flux due to the winding (SS). The current in the winding (SS) is a maximum shortly after the current in (PP) passes through zero. The fluxes ϕ_p and ϕ_s are similarly related, therefore combine to produce a resultant flux through the disk which rotates as the currents and resultant fluxes alternate. The con-

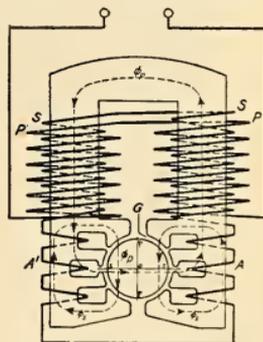


Fig. 73. Principle of Westinghouse Induction Ammeter

trolling force is a coiled spring attached to the aluminum disk.

In the case of the voltmeter the primary coil is wound with fine instead of coarse wire and an external series non-inductive resistance wound with wire having a zero temperature coefficient is used.

Hot Wire Instruments: The expansion of a wire when heated by the passage of a current through it is utilized in some instruments for measuring current or voltage. About 1885, voltmeters using this principle were quite generally used for alternating current work, but of late years they have been superseded by the types described above. The expansion of the wire through which the current to be measured is passing causes a certain amount of slack which

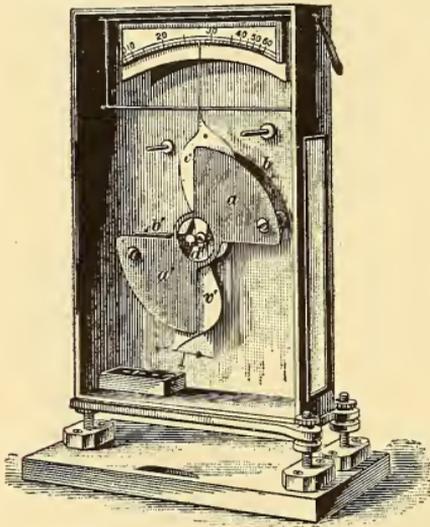


Fig. 74. Electrostatic Voltmeter

is taken up by a spring. The motion of this spring is transmitted to an indicating pointer through a small drum over which a cord passes. The instrument has some very good features. There is no induction since the wire is not formed into coils. It is not sensitive to rapid fluctuations, hence is "dead beat."

Electrostatic Voltmeters: Another class of voltmeter suitable for alternating current work is one which depends on the attraction or repulsion of two surfaces carrying electrostatic charges. They are generally employed for measuring unusually high voltages. The type invented by Lord Kelvin is shown in Fig. 74.

The fixed quadrants (aa') and (bb') are mounted so that the aluminum vane (vv') swings between them on the pivot (d). The quadrants are connected to one side of the circuit and the swinging vane to the other, so that when they become charged, the vane is attracted and drawn in between the quadrants and the voltage indicated by the pointer. This type of instrument requires no power whatever for its operation.

Wattmeters: The instrument most commonly used for measuring power is called a wattmeter. There are two types in common use; the moving-coil-fixed-coil type and the induction type. Fig. 75 shows the principle of operation of the first type.

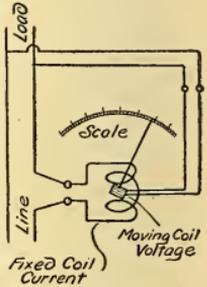


Fig. 75. Moving-coil-fixed-coil Wattmeter

In Fig. 75 the line is connected in series with the fixed coils which consist of a few turns of heavy wire. The moving coil is connected across the line. The strength of the magnetic field is proportional to the strength of the current flowing through the fixed coils, therefore is proportional to the line current. The moving coil is connected across the line, therefore the current in it depends upon the voltage. Hence the force due to the two coils depends upon the product of the current and voltage and therefore upon the power in the circuit.

Assuming the inductance of the voltage coil and current coils to be negligible, the above type of wattmeter also gives the average power on alternating current circuits. At any instant the deflecting force is proportional to the product of current and voltage at that instant. The average deflecting torque will then be proportional to the average of the product of current and voltage. It can be demonstrated mathematically that this is equal to the product of current \times voltage \times power factor.

Since both the voltage and current coils of a wattmeter possess resistance, some power will be consumed in the instrument itself. This power though small should not be charged up against the load circuit. In Fig. 75 it is evident that the current through the series coil is the sum of the load current and the current in voltage coil. Weston portable wattmeters are provided with a compensating coil as shown in Fig. 76.

The compensating coil is connected in series

with the voltage coil, its winding being reversed with reference to the current coil. The number of turns in the compensating coil is carefully adjusted so that the counter torque due to the voltage coil current is just equal to the direct torque due to this same current when flowing through the current coil. Such a compensation

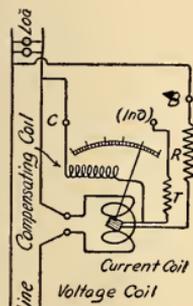


Fig. 76. Weston Wattmeter Showing Compensating Coil

calibrating the instrument by means of two different sources of current, one for the current coils and another for the voltage coils. It is also used in measuring power in high potential circuits when the current coils are connected to a series transformer and the voltage coils to a potential transformer.

Induction type wattmeters operate on the principle of the rotating magnetic field. The essential parts of a single phase induction wattmeter are shown in Fig. 77.

(D) is a pivoted disk or drum, (V) is the pressure coil, (C) the current coil. The copper or aluminum disk (D) is pivoted at its center and carries a pointer not shown in the figure. The controlling force is a suitable spiral spring. The voltage coil is highly inductive and the current in it lags almost 90 degrees behind the current in the line and almost 90 degrees behind the current in coil (C) which is non-inductive. Thus

when the magnetic flux is a maximum through (V) it is zero through (C) and vice versa. This produces a shifting magnetic field which induces eddy currents in (D) and tends to make it rotate.

It can readily be shown that the torque is proportional to the product of current \times voltage \times power factor.

A diagrammatic sketch of the windings of the Westinghouse induction wattmeter is shown in Fig. 78.

The magnetic circuit is similar to that of the induction ammeter made by the same company.

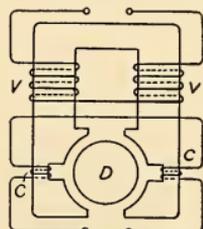


Fig. 78. Windings of Westinghouse Induction Wattmeter

The windings are modified to suit the conditions of power measurement. The windings consist of two principal coils (VV) and (CC). The coils (VV) are connected across the line through a resistance. The coils (CC) are connected in series with the load. The coils (VV) have high inductance and the coils (CC) very little inductance. The flux due to (V) is a maximum when the flux due to (C) is almost zero and vice versa, thus producing a rotating magnetic field which induces eddy currents in the drum (D), tending to produce rotation as explained before.

Recording Wattmeters: The two general types in common use are the moving-coil-fixed-coil type, and the induction type. Fig. 79 shows the essential features of the first type.

The fixed winding consists of two coils (BB) through which the load current passes. The moving coil or armature (A) consists of several coils of very fine wire connected through a re-

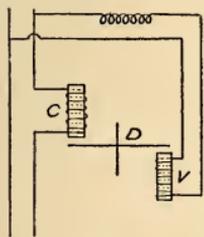


Fig. 77. Single Phase Induction Wattmeter Principle

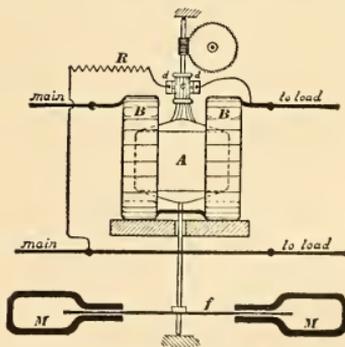


Fig. 79. Principle of Recording Wattmeter

sistance across the line. Upon the shaft of the rotating armature is mounted a commutator to which the ends of the several coils making up the armature are connected. The moving system is

mounted between supports, the ends of the shaft resting on jewels. The instrument is thus seen to be similar to a shunt motor except that there is no iron in either the armature or the field. The torque is proportional to the strength of field (hence to the current in the fixed coils), and to the current in the armature (hence to the voltage), therefore is proportional to the product of the current and voltage. In order that the driving torque may remain proportional to the power, there must be present a counter torque that increases and decreases with the load. This counter torque is obtained by mounting upon the armature shaft a disk of aluminum which rotates between the poles of two permanent magnets (MM). The flux between the permanent magnets is constant. The disk in rotating cuts these lines of force and produces in itself eddy currents in proportion to the speed of the disk. Hence a counter torque proportional to the speed results, and neglecting friction, the speed of the armature is proportional to the load. The total number of rotations of the disk is a measure of the energy or quantity of electricity, transmitted to the circuit. The number of rotations is recorded by means of a suitable train of gears and dials.

The induction watt-hour meter works on the same principle as the induction wattmeter except that the spring control is replaced by a disk rotating in a magnetic field and the number of revolutions are recorded by a suitable train of gears and dials.

(To be Concluded.)

MELTING POINT OF COPPER ALLOYS

"The Approximate Melting Points of Some Commercial Copper Alloys" is the subject of a report, which has just been issued as Technical Paper No. 60 of the United States Bureau of Mines. The director of the bureau, Washington, D. C., has copies for free distribution.

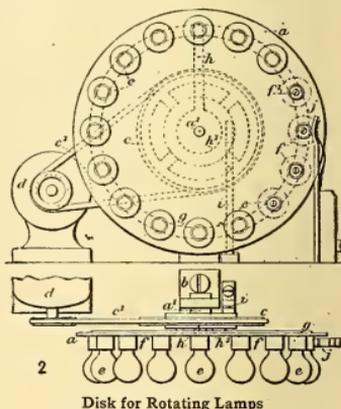
JAMES J. HILL FARM

Near White Bear, Minn., James J. Hill, the railroad man, is erecting a \$150,000 home on a 7,000 acre farm. The most prominent feature on this farm will be the use of electric power to perform as many farming operations as possible, and it is figured that about 65 horsepower will be the amount of energy needed. Current will be furnished from a central station—one of the Byllesby properties. Before signing a five year contract with the power company, Mr. Hill carefully considered the isolated plant proposition.

APPLICATIONS OF "COLD LIGHT"

Recently we gave some facts relating to Professor Dussaud's experiments with cold light. The illustrations herewith indicate the method of operation, which is so simple that it can be repeated by anyone having a little mechanical ingenuity, and the necessary current at hand. M. Dussaud applies what he calls the law of repose to the electric current in such a way as to obtain a light of great brilliancy without the production of appreciable heat. The principle is to illuminate a lamp for a few seconds, and then to allow it to rest before relighting. Under these conditions the efficiency of the lamp is found to be considerably increased.

The arrangement consists of a series of metallic filament lamps (e), preferably tungsten, mount-



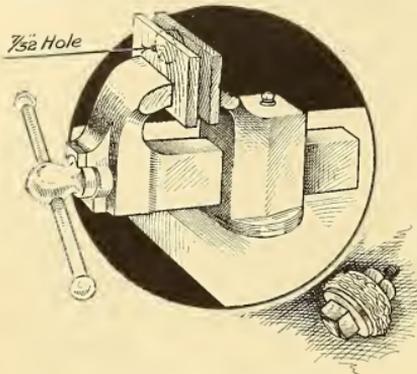
Disk for Rotating Lamps

ed on the circumference of a disk (a) of insulating material, set upon an axis (a') and turning in the support (b). Upon this axis, which is also insulated, is fixed a pulley connected to a motor or other means of power. Each lamp is set in a socket (f) screwed into the disk, the socket being in connection with one lamp terminal while the other is in contact with the screw (f'). In order that the current may reach the lamps the end of each screw (f'), which holds the sockets, passes into a metallic crown or ring (g) on the back of the disk, which is connected by plates (h) to a conductor (h') applied against the metallic pulley (c). On this pulley rubs the brush (i), bringing current from the source of electricity. The other lamp terminal communicates with a brush (j) set at a point in the path of the sockets.

With this arrangement it is found that the greatest voltage that the lamps will stand may be sent through them without injury, on account of

MAKING MICA WASHERS

Having occasion to repair an electric flat iron recently, I needed some mica washers which I made in the following manner: I took several waste pieces of stove mica and an old mica chimney and roughly cut them to circles about



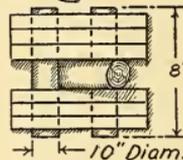
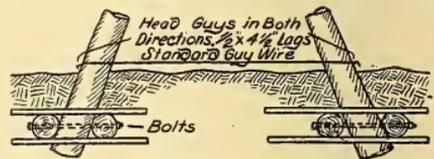
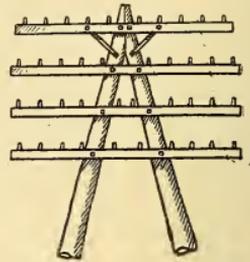
Washers Clamped in Vise

one inch in diameter. Clamping these circles between two small boards in the vise, I drilled a $\frac{3}{32}$ inch hole through boards and mica. Selecting those pieces where the hole had most nearly pierced the center I strung them on a $\frac{1}{8}$ inch stove bolt upon which I first placed a $\frac{1}{16}$ - $\frac{1}{2}$ inch iron washer. After putting enough on to make a thickness of about $\frac{1}{2}$ inch, I placed another washer of the same size as the first on the bolt and screwed the nut up tight. Putting the whole business in the vise I filed the mica down to the size of the washer at each end.—CHAS. E. BELL.

SPECIAL TELEPHONE CONSTRUCTION

The "Figure A" construction shown is made up of two straight poles, the butt of each pole being securely anchored with logs, and the tops of the poles being beveled to make a good tight joint. This top joint is important because a loose joint would allow water and moisture to collect and rot the tops of the poles in a very short time. By making this joint tight and giving it two or three coats of good paint, it will last a long while. Galvanized iron crossarm bolts are used to bind the two poles together at the top. The bottom of the poles at the ground line are fastened together with a piece of standard guy or messenger wire which is prevented from creeping up the pole by the use of a $\frac{1}{2}$ by $4\frac{1}{2}$ inch lag bolt. This wire prevents the butts of the poles from spreading, which would natural-

ly happen unless the wire was pulled up taut. This style of construction is used on a side hill or some other place where the conditions are

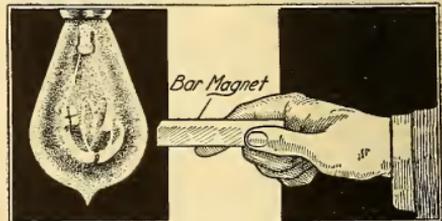


"Figure A" Construction

exceptionally severe or where there is little or no room for side guying. A head guy should be run in each direction from the pole, however.—GEORGE MADISON.

DIRECT OR ALTERNATING CURRENT?

To ascertain whether the current in a lighting circuit is alternating or direct, take a permanent bar magnet in the hand and hold it close to the



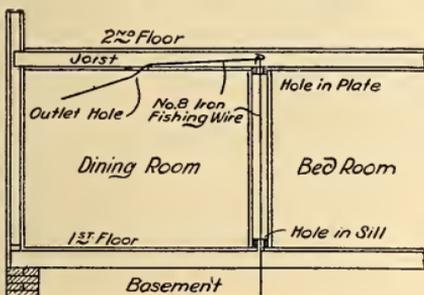
How to Hold Magnet

filament of a lamp on the circuit. If the current is direct the filament will lean towards or away from the bar magnet, but if the current is alternating the filament will vibrate.—H. PETERSON.

FISHING PARTITIONS WITH HOOKED WIRES

It is frequently feasible to fish from a cellar to the space above the first floor ceiling, with two "snakes," each having a hook bent in its end as illustrated. One snake is pushed from the outlet hole to a point over the partition. The other snake is pushed upward from the cellar and the two are manipulated each by a man, one at the first floor outlet and the other in the cellar until the two hooks engage. Then one snake can be drawn through with the other and the conductors drawn in by attaching them to the second snake. No. 8 iron wire has been found to make very effective snakes for the work just described.

The holes through the floor and ceiling plates and through the bridges in the partition (if there are any) can be bored with an extension boring tool which should be found in the kit of every old-building wireman. Such an extension tool is



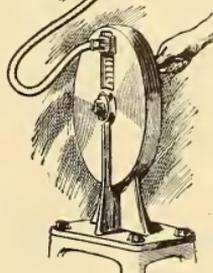
Hooked Wires in Partition

made by fastening the shank of a bit in the end of a piece of $\frac{1}{2}$ inch conduit, possibly four or five feet long, threaded at the end away from the bit shank. In another length of conduit the chuck of an old bit brace is fastened, and the end of this piece distant from the chuck is also threaded; then, as many short lengths of $\frac{1}{2}$ inch conduit are provided as may be required to enable the extension boring tool—when all the lengths are screwed together—to reach the distance that it is required to bore up or down in the partition. In using the arrangement the wireman screws to the conduit having the chuck in it the one with the bit shank. Then he bores up or down as the case may be through the floor plate, ceiling plate and bridges in the partition. If the two lengths of conduit are not long enough to enable the bit to be turned through all of the obstruction in the partition, a third and a fourth length of conduit can be added as the boring proceeds. By continuing in this way it is possible to bore

even two or three stories, up or down, within a partition.—GEO. V. JEROME.

CONDUIT FISH-WIRE MACHINE

A grooved disk with a crank and handle, for crowding fish-wire into conduit is a device recently patented by Benjamin Dahl, Minneapolis, Minn.



Fish-wire Machine

Upon the face of the disk is a shield. A sliding guide follows the wire as it leaves the groove in the disk and passes out through a tube at the end of which it is fed into the conduit. The machine is designed to prevent the wire from kinking and buckling.

DARK ROOM LIGHT

Procure an ordinary two-quart glass fruit jar, break out the porcelain lining in the cover and cut a hole through the metal, just large enough to fit over the socket as shown. Then solder cover and socket together. Line the inside of the jar with two thicknesses of orange paper. One can use almost any eight candlepower lamp, but the best for the purpose is a sliding case lamp, of



Jar with Lamp

eight candlepower, as shown in the illustration. Screw the lamp into the socket and turn the cover onto the jar. With cord and plug of good length the light can be readily moved where needed about the dark room.—MAXWELL SNAVELY.



Popular Electricity Wireless Club

FALLING LIQUID TELEPHONE

Telephoning over space for 600 miles is the astonishing feat accomplished by Prof. Vanni, a prominent Italian scientist and this result marks a step which will be remembered in the history of wireless work.

The present experiments were made at the Military Wireless Telegraph Institute and at the Cento Celle station not far from Rome. With his new apparatus Prof. Vanni was able to transmit speech across the Mediterranean to

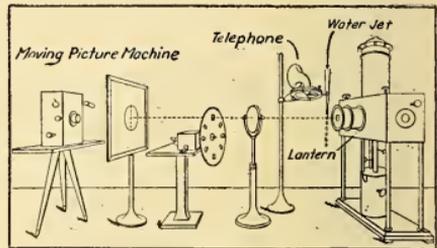
Tripoli, a hitherto unheard of feat, for the distances formerly covered by wireless telephony were far less. The telephone which he uses is not at all of the ordinary kind, for it works, in fact, by falling drops of water. Although not the first to make use of this principle, for the American inventor Chichester Bell and later on Prof. Majorana employed it, it remained for Prof. Vanni to bring it to the present remarkable state of perfection. Supposing we make use of a very fine stream of water falling from a hole in the bottom of a vessel and then connect the vessel to a telephone membrane in the proper way. When we speak against the membrane it vibrates in the way with which we are familiar and the liquid stream also vibrates in



Vibrating Milk Drops

the same way. Such a vibrating liquid stream shows some very curious properties. The vibration causes it to take the shape of separate drops which cannot be perceived by the eye, as they pass too fast, but when properly photographed it is seen that each separate drop vibrates under the action of the voice, becomes flattened out and then takes its proper shape, keeping up this trembling movement while it is falling.

M. Lansiaux took views of milk drops with a moving picture machine, a part of one film being shown. It will be seen that the drops are quite flattened out, then spring back to the usual



Taking Picture of Falling Drops

shape. Part of the stream may remain straight and part of it separate into drops, according to the way the stream is vibrating. This principle is used to make up the telephone transmitter, the details of which lie, however, outside of our present space.

JAPANESE SYSTEM OF WIRELESS TELEPHONY

A Japanese, M. Torikato, has invented a system of wireless telephony which, after a series of exhaustive experiments by the government, has been adopted upon all the ships of the navy. No description has as yet been given of the apparatus, but as the inventor is taking out patents in France, details will undoubtedly be forthcoming in the near future. All that is known is that the system gives wireless communication within a radius of about 60 miles.—J. H. BLAKEY.

COST OF WIRELESS VS. CABLE

In comparing the cost of wireless with the cost of cable, the cable between the United States and Honolulu cost \$20,000,000, while two wireless stations to work between these points cost \$500,000, or one-fortieth as much. The cost of operating and up-keep is in about the same proportion.

TRAINS MAY SEND OUT "S. O. S."

The accompanying pictures will give the reader some idea of the wireless telegraph equipment now in operation upon the "Lackawanna Limited" train of the Delaware, Lackawanna and Western Railroad.

While conducting experiments to determine the value and feasibility of such equipment in train service an incident occurred which goes far in demonstrating its usefulness.

The conductor, D. T. Sickles, in charge of the limited train which runs between Hoboken, N. J., and Buffalo, N. Y., was taken ill while his train was running 50 miles an hour, 30 miles

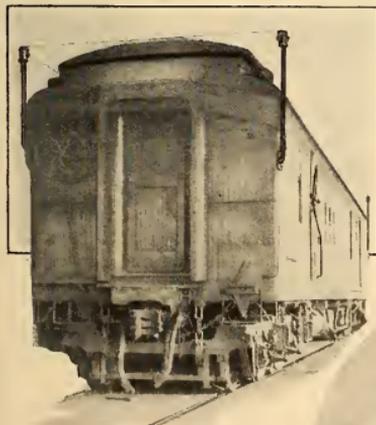


The
Wireless
Operator
on the
"Lackawanna
Limited"

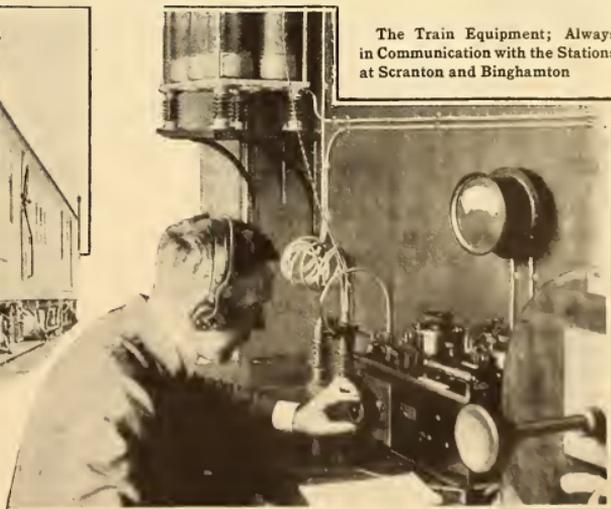
out of
Scranton, Pa.
Ordinarily a
delay for changing
conductors
would have been
necessary but the
wireless operator immediately sent the following message: "P. N. Place, Supt., Scranton, Pa. Conductor Sickles ill. Wants to be relieved at Scranton if possible. Signed, Wireless Operator No. 3."

While this message was being sent the train was rushing along at 50 miles an hour and high mountains lay between it and the Scranton receiving station. When the train pulled into Scranton, however, a relief conductor stepped aboard and the other conductor stepped off and sought a physician.

Wireless towers have been completed in



Arrangement of the Antenna on the Coach



The Train Equipment; Always in Communication with the Stations at Scranton and Binghamton

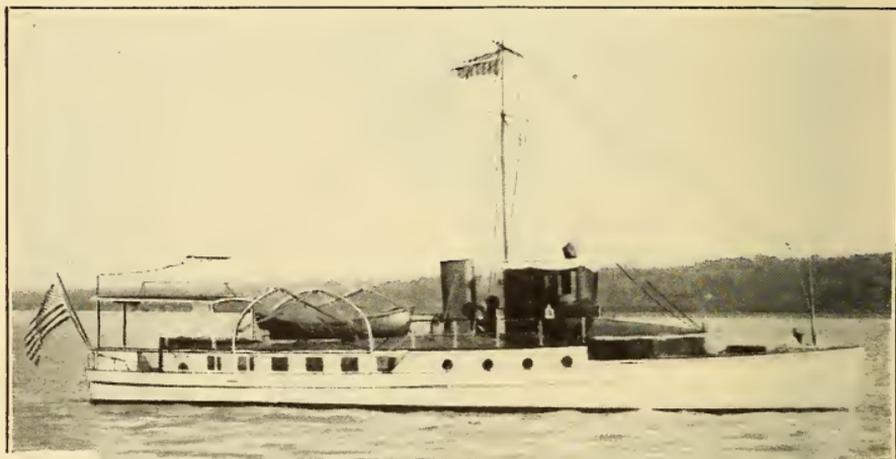
both Scranton, Pa., and Binghamton, N. Y., and in a short time work will be started on towers in Hoboken and Buffalo. Work is now being rushed installing equipment in four new coaches and placing aerials on a number of others.

UNCLE SAM'S RADIO-TELEGRAPH POLICE BOAT

The enactment of the new United States radio-telegraph laws and regulations has imposed new responsibilities upon the Bureau of Navigation of the Department of Commerce—the branch of the Federal government having jurisdiction in this particular field. It now devolves upon the government officials to exercise supervision over all wireless station public and private, to be

On board is a Federal radio-inspector who reports to Washington, by wireless or otherwise—violations of the radio-telegraph laws,—a proceeding that is likely to be followed by the imposition of heavy fines upon operators of unlicensed sets or other transgressors.

The government did not have the Tarragon constructed for the work in hand, but merely adapted to the purpose a motor boat purchased from a private owner for the sum of \$5,000. In point of seaworthiness, however, under all sorts of weather conditions, the boat could not be better adapted for the role of marine patrol had she been designed with this end in view. The Tarragon is about 61 feet over all, of 13½ feet beam, and four feet draft. Propulsive power is supplied by a four cycle, six cylinder, Lamb



The Tarragon, Uncle Sam's Wireless Telegraph Boat

watchful for interference and for sets operating without license, and to ascertain whether there is conformity with the law in respect to wave length, etc.

To better keep tab on wireless stations along our far-flung coast line, the Bureau of Navigation has placed in commission a craft that is probably unique in the world and which will doubtless be the forerunner of several others having a similar purpose. The vessel is the Tarragon, a staunch and powerful motor boat. Officially she is known as an "inspection launch," but it is more expressive of her unusual functions to designate her a "radio-telegraph police boat."

engine rated at about 70 horsepower. The draft of the vessel enables her to go into bays and rivers when occasion demands, and her latitude of inspection work is still further widened by the circumstance that she carries as a tender a twelve foot boat, fitted with a two horsepower motor, which will carry the inspection officer to any point which could be reached by an ordinary row boat.

The Tarragon is thoroughly up to date from an electrical standpoint, having a model switch-board, searchlight, etc. but her most notable possession is a wireless installation which is acclaimed the last word in such equipment. It

was important, for one thing, that the police boat have a set of maximum dependability and efficiency in order that there be no danger of the interruption of her inspection work. Then again there must be taken into account the limitations of room on a small vessel such as the Tarragon. Finally there were extraordinary technical demands relative to quick changes of wave lengths, etc.

This exacting assignment was turned over to Uncle Sam's chief expert in this field, Mr. Frederick A. Kolster of the National Bureau of Standards, and he, unhampered by any limit on expense, evolved the ideal radio set which has just been installed aboard the Tarragon. So compact is it that it has a place in the vessel's cabin without encroaching any valuable space. The distinctly new feature of the set is found in a preventative of interference by transmitter adjustment which renders three different wave lengths available by a single change or manipulation. This instantaneous manipulation is in contrast to the conditions which require from five minutes to half an hour to make a change of wave length. Mr. V. Ford Greaves, the radio-engineer of the Bureau of Navigation, declares that this new radio set is not only adapted to use on small craft of all kinds but would prove an ideal auxiliary apparatus for a large ship. The novel features are not patented and Mr. Greaves is willing to give particulars to interested persons. The Tarragon's set has a radius of 50 miles during the day and 100 miles at night, but it is thought that such a set on a large vessel should have a radius of 125 miles during the day and 250 miles at night.

GOLDSCHMIDT SYSTEM OF WIRELESS

It is interesting to note that the Goldschmidt system of wireless telegraphy was frequently mentioned in connection with the Marconi Company Commission of Inquiry held in London last year, the report of which was submitted to the House of Commons. The Marconi Company had long realized the importance of this system and had endeavored to purchase Professor Goldschmidt's inventions but without success.

Dr. Fleming, the scientific adviser of the Marconi Company, in an address to the British Association last year referred to Professor Goldschmidt's invention, adding, "The advent of a commercial machine of this kind will, no doubt, make it a formidable rival to the existing methods," while he also declared that it would

make "telephony across the Atlantic quite within possibility."

WHAT IS STATIC?

No one knows exactly what static is. Combining long observation and careful study with a lot of hearsay evidence, it would appear that charges of electricity gather on the outside of particles of dust and water and in this condition these charges are static—they are standing still. Then the particles of dust and moisture come together, forming a cloud, the outside of which is not of course as great as the sum of all the outsides of the particles. Not having as much room as before, part of the condensed electricity jumps off to the earth or to another cloud. In this form it is known as lightning.

This electrical current, which does not always appear as lightning, sets up powerful electromagnetic waves in the ether as it flows to the ground or to a cloud, or back and forth. The waves strike the antennæ of the wireless station and the unusually powerful currents are heard in the operators' head phones.

That is about the best explanation we can give. Maybe some one else can give a better one, but it must include the fact that static seems to have some relation to lightning. Rapid changes in the vicinity of the station, such as heavy winds, rain, and approaching storms also influence the currents and static has appeared when there was a blue sky overhead.

Many inventions have been brought forth purposing to eliminate static, but the majority of these have cut down the signals also. While there is probably a handsome reward awaiting the man who can devise a practicable static preventer, little is feared from atmospherics in these days of vastly improved wireless sets. Where static formerly interfered with and often temporarily-suspended communication, the present day operator looks upon it only as an annoyance, overcome by the application of more power and employing a higher musical note which can be heard above the atmospheric disturbances.—*Marconiagraph*.

The German government has prepared plans for the erection of a long-range, wireless telegraph station in Togoland, German West Africa, with sufficient power to have communication directly between Togoland and Berlin, thereby connecting Germany directly with all its African colonies.



On Polyphase Subjects

SOLD AT THE INSTANT IT IS MADE

In making a very striking address before the annual convention of the Investment Bankers of America on "Electric Securities," one speaker drew particular attention to the fact that electric current was about the only product that had to be sold the instant it was made; that is, if sold at a profit and without waste on the investment.

The term "peak load" is more or less familiar to readers of this magazine. It indicates the period or time when an electric plant is taking care of the greatest demands made on it during the 24 hours. It does not necessarily mean that a plant is at its fullest capacity, but it does mean that it is selling most nearly all that it can produce with its generating capacity. Then, when the demand on its capacity slackens; that is, when the use of current dies down, there is a loss, because the cost of operation still continues and the investment cannot with profit be kept idle.

It would perhaps be more exact to say that to save the expense (rise in cost as the load as use of current decreases) a means must be found to effect a sale or keep up as near as possible a constant load. Hence the constant commercial branching out in the way of finding outlets for the sale of the current, which must be sold as soon of made.

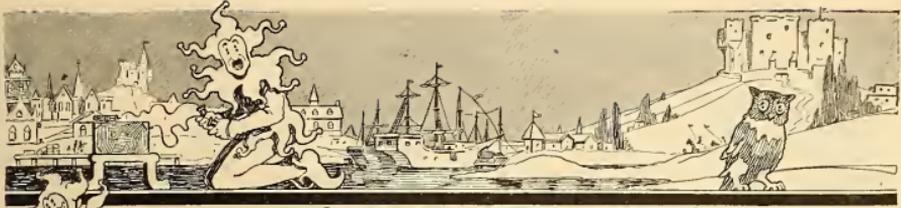
Street railways, drainage systems, pumping systems, vehicle battery charging, agricultural service in the daytime, in fact every kind of service that comes on during "off-peak" periods is, therefore, desirable, and every effort is being made by the companies to add such service, for in so doing they lower the cost of production in relation to sales. The steadily increasing success of their efforts in this direction is one of the reasons why the cost of electric current to the consumer has been steadily going down.

THE TIDES OF THE AIR

Until within recent years, when men began to navigate the air and give study to its currents and movements, but little attention was accorded to the behavior of the upper atmosphere. Now aviators talk knowingly of "holes in the air," "atmospheric tides," "top currents," etc.

Not long ago a distinguished British scientist laid before a scientific body in London some unique facts touching air tides that are not generally known.

The moon, as we know, causes the marine tides by its attraction. It draws the water upon the surface of the earth toward it in a "hump" on the side that is exposed to the lunar influence, and it draws the earth itself away from the water on the opposite side, thus leaving a corresponding "hump" of water. The air, it appears, is affected in the same way. The atmosphere about the earth rises, falls and flows more freely than water, since it is lighter; so the tide comes more quickly in the air at a given spot than the marine tide. This rise and fall, it should be added, means just as much to the navigator of the air as the tides of the sea do to the mariner, and it must be taken into account by the aviator who has a due regard for his safety.



Short Circuits

"I was out motoring the other day!"

"So?"

"Yes; and I came to a river, but could find no means of getting my machine across."

"Well, what did you do?"

"Oh, I just sat down and thought it over."

* * *

Village Grocer—What are you running for, sonny?

Boy—I'm trying to keep two fellers from fightin'.

Village Grocer—Who are the fellows?

Boy—Bill Perkins and me.

* * *

Some time ago a gentleman 90 years of age called at an insurance office with the intention of taking out a policy on his life. After ascertaining the man's age the clerk remarked:—

"But, my dear man, we can't insure you at your age." The elderly applicant thought a moment, then put this question to the clerk:—

"Don't more people die before the age of 90 than after?"

* * *

Staff Photographer—I've caught a snapshot of the fleeing gambler!

City Editor—Good! Now take a time exposure of the police in pursuit.

* * *

"I want a license to marry the best girl in the world," said the young man.

The clerk nodded smilingly and replied, "Sure. That makes 1,300 licenses for that girl this season."

* * *

"Pa, what's an agnostic?"

"It's one of those poems where the first letters of the lines spell out a word. Now run along and let me read."

* * *

Simmons had returned from his vacation. "I certainly enjoyed the husking-bees," he said to a young woman. "Were you ever in the country during the season of husking-bees?"

"Husking-bees!" exclaimed the girl; "why of course not! How do you husk a bee, anyway, Mr. Simmons?"

* * *

A lady had her hand in a sling, and explained to a friend that the hurt was due to reckless driving.

"Of your auto?" asked the friend.

"No," said the sufferer, "of a nail."

A subscriber in Charleston, W. Va., had a little trouble on account of reaching wrong numbers, and the matter was discussed at length among the members of the family. A five-year-old son was an interested listener to the proceedings. One day his mother, hearing an unusual noise at the telephone, investigated and found that the little fellow had climbed upon a chair, lifted the receiver, and when Central answered, said: "Central, I want the wrong number."

* * *

"Say, my man," said the automobilist to the farmhand, "am I on the right road to Bladenburgh?"

"Yes, sir," replied the countryman, "but if you want to get there you had better turn around and go the other way."

* * *

Some little surprise was created around the festive board when Jones ordered a "Frisky Mouse."

The waiter stood by nonplused, so Jones explained: "We call it a 'Frisky Mouse.' You see, one time a glass of this drink was spilled on a certain bar-room floor and a mouse that was passing that way stopped to lick it up. He drank and went away. He came back and went away—doing so a half-dozen times. At last he reared on his haunches and said 'now show me the cat.'"

* * *

In a certain London borough is a market street containing many butchers, of whom A and B were rivals, each trying to score off the other.

A put up a notice in his shop window, "Best sausages only 6d. per pound," causing B instantly to proclaim, "Best sausages only 5½d."

The first purveyor, not to be outwitted by his cute fellow-tradesman, put up another notice: "Best sausages 5d. per lb. Sold to the King."

The next day there appeared in the other shop window the printed announcement, "God save the King."

* * *

Two men in an auto slowed up beside a man on the street.

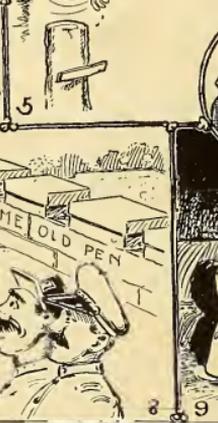
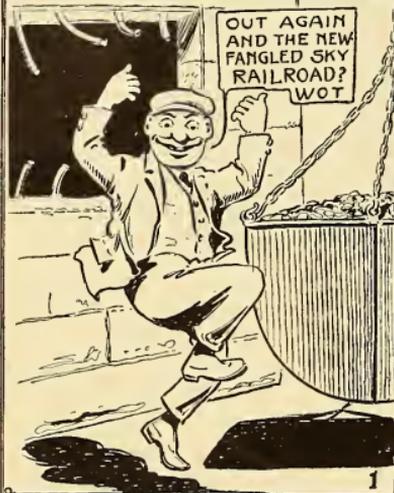
"Can you tell us the way to Bolton, Pat?" asked one.

"Begorra, and how did yez know my name was Pat?" he asked in reply.

"We guessed it."

"Then guess the way to Bolton," came the quick reply.

SLIPPEEY SAM SERIES



BY POP PALETC CHICAGO

