JULY

The

15 Cents

Formerly
MODERN
MECHANICS

WORLD'S ADVANCE

In

ELECTRICITY
MECHANICS
INVENTION
SCIENCE

In This Issue

"HOW TO
BUILD A
SIMPLE
CYCLECAR

BUILD YOUR OWN BUSINESS

AS OUR LOCAL MANAGER

We have taken this full-page advertisement to attract high-class agents, because never before was an agent's proposition *so profitable—so strong—so worthy of the highest type of men* who can act as our District Managers. This is the Opportunity of a Life Time. Read every word that follows and then write for our District Manager's proposition for your City, County or State, according to what you think you can handle.

What "THEY" say regarding KOR-KER PUNCTURE CURE

"The most satisfactory accessory we have on our shelves for sale."
Welfare Automobile Co., Wilson, N. C.

"Tire troubles from punctures a thing of the past."
Sidney A. Twinch, M.D., Newark, N. J.

"It will do everything they claim and possibly more."
W. W. Smoak, Winston-Salem, N. C.

"It effectually does away with the inconvenience and annoyance of punctures."
(Rev.) Wm. H. Laird, Wilmington, Del.

"A reducer of expense."
J. O. Metcalf, Weatherby, Mo.

"We could not afford to be without Kor-Ker."
F. F. Dutton, Inc., Sanford, Fla.

"Kor-Ker will do everything claimed for it."
Griffeth Implement Co., Athens, Ga.

"Winter weather has made no difference with the efficiency of Kor-Ker."
William F. Keim, M.D., Newark, N. J.

"I believe in it absolutely."
Haddock-Nixon Taxi Co., Wilmington, Del.

"Since installing Kor-Ker I have forgotten that I had a tire."
J. J. Thomas, Raleigh, N. C.

"No trouble with tires whatever."
L. B. Tompkins, Morristown, N. J.

"Never had to stop on the road for any tire trouble since using."
A. G. Perretz, Brooklyn, N. Y.

"When my tires are once inflated, they stay inflated."
Henry Wagner, Newark, N. J.

"Yet to repair first puncture."
E. P. Burroughs & Son, Madison, N. J.

"Very satisfactory."
L. W. Quick, Watertown, N. Y.

"I have not had my tires off once on account of punctures."
R. C. Northwood, New York City.

ALCEMO MFG. CO.

Manufacturers and Distributors,
32 Bridge Street, Newark, N. J.

THE WORLD'S ADVANCE

Formerly Modern Mechanics

239 Fourth Avenue — New York

A CONSOLIDATION OF:

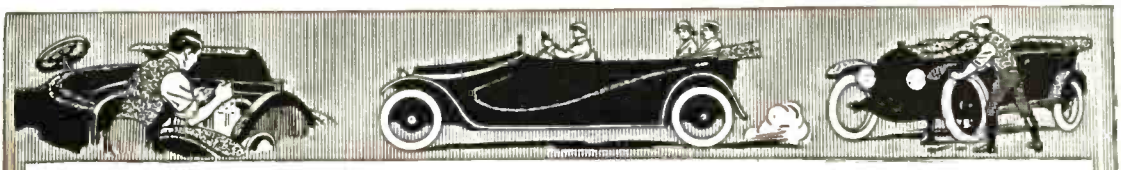
Popular Electricity and the World's Advance
Modern Electrics and Mechanics
Electrician and Mechanic

ORLAND J. RIDENOUR, President — AUSTIN C. LESCARBOURA, Editor

Volume XXXI — JULY, 1915 — No. 1

CONTENTS

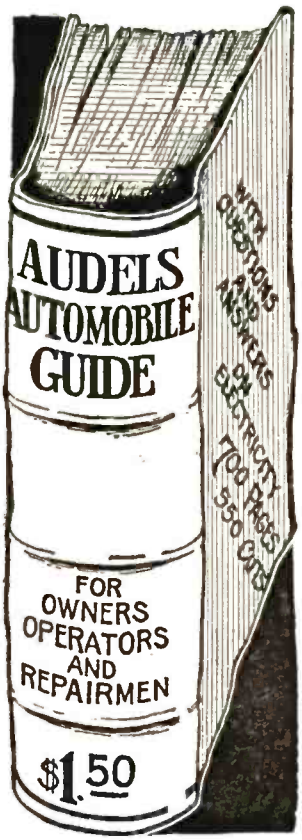
(Continued on page 10)



HOW TO RUN AN AUTO

1915 EDITION **IS SELF-TAUGHT IN** 1915 EDITION

AUDELS AUTOMOBILE GUIDE, $1.50



LATE—CONCISE—PRACTICAL

THE object of this book is to give, in the easiest understood form, the information necessary for the proper operation, care and maintenance of an automobile.

To adapt the book to many needs the subject matter is presented in the form of questions and answers. Technical terms are explained or made clear by the wording of the answer, which is always brief and direct.

Any one of the definite chapters on Carburetters, Ignition, Gas Engine Operation, How to Run an Automobile, Overhauling the Car, Battery Troubles, or Starting and Lighting Systems, are alone worth the price asked for the 30 complete chapters contained in this book of 700 pages, illustrated by 550 illustrations.

The form and size are such that it is convenient to handle and study.

This book is a self-educator, hence: "He who runs may read" and improve his present knowledge of automobile engineering and proficiency.

Handsomely bound in durable Full Leather, Pocket size.

Audels Automobile Guide, $1.50

A BOOK WORTH HAVING

"Understand Your Car" Explained in the following chapters:

1. Ready Reference Index. 2. The Automobile. 3. The Gas Engine. 4. The Cycle of a Gas Engine. 5. Brief Outline of Gas Engine Principles. 6. Cooling Systems. 7. Fuels. 8. **Carburetters.** 9. **Ignition.** 10. Timing and Balancing. 11. **Gas Engine Operation.** 12. Clutches. 13. Transmissions. 14. The Drive. 15. The Differential. 16. The Running Gear. 17. Tires. 18. Brakes. 19. Ball and Roller Bearings. 20. Lubricants and Lubrication. 21. Motor Cycles. 22. Electrics. 23. Electricity. 24. Dynamos and Motors. 25. Storage Batteries. 26. Methods of Circuit Changing. 27. **How to Run an Automobile.** 28. **Overhauling the Car.** 29. **Starters and Starting Systems.** 30. **Electric Lighting and Wiring.**

NONE OTHER JUST AS GOOD

Free Examination

We don't want you to take our word, or anyone else's for it. We are willing to send you the book without deposit. Use it seven days in connection with your car. Then send back the book or remit $1.50. Could anything be fairer?

Cut out and fill in your name and address plainly at the bottom. Place it in an envelope and mail.

This Book Will Speak for Itself

Theo. Audel & Co., 72 Fifth Ave.. New York

Kindly mail me copy of **Audels Automobie Guide** biles, and, if found satisfactory, I will immediately remit you $1.50, or return the book to you.

NAME.....

OCCUPATION .....

ADDRESS.....July W. A.

CONTENTS—Continued

MOTION PICTURES

RADIO SECTION

RECENT AND IMPROVED DEVICES

RECENT NOVEL PATENTS

For Index to Advertisers, see pages 12 and 14.

Magazine issued monthly. Yearly subscription in U. S., $1.50. Manhattan and Canada, $1.85. Foreign, $2.00 in Gold. SINGLE COPY, 15 cents.

THE WORLD'S ADVANCE may be had at all news stands in the United States and Canada; also at Brentano's, 37 Avenue de l'Opera, Paris.

Forms close the first of the month preceding date of publication. Advertising rates on application. Entered as second class matter at the New York Post Office, June 25, 1914, under the Act of Congress of March 3, 1879.

THE MODERN PUBLISHING COMPANY

239 Fourth Avenue **New York City**

THE WORLD'S ADVANCE

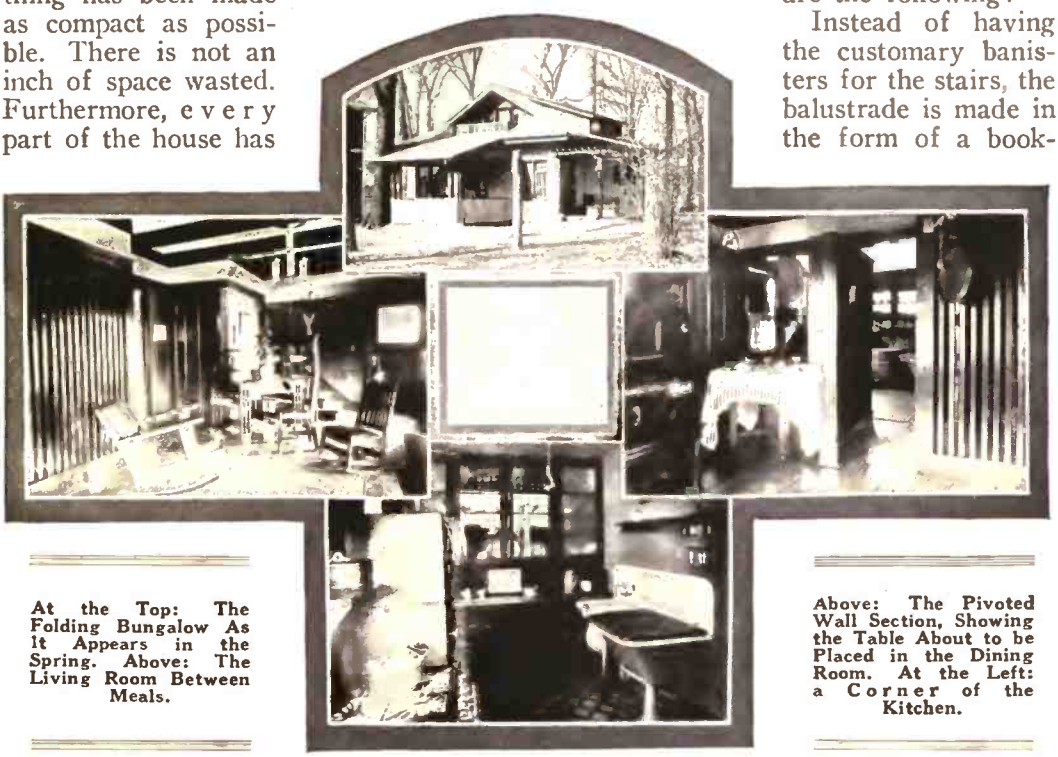
Advertisers' Index

The WORLD'S ADVANCE

Vol. 31 JULY, 1915 No. 1

A FOLDING BUNGALOW

MUCH ingenuity and originality have been displayed in a small bungalow home designed and built by a Chicago chemist. In this home everything has been made as compact as possible. There is not an inch of space wasted. Furthermore, every part of the house has been designed so as to reduce the work of housekeeping to a minimum yet afford the utmost comfort to its owner.



At the Top: The Folding Bungalow As It Appears in the Spring. Above: The Living Room Between Meals.

Above: The Pivoted Wall Section, Showing the Table About to be Placed in the Dining Room. At the Left: a Corner of the Kitchen.

The bungalow was built in six weeks' time, on a foundation of concrete covered with stucco, the total expense amounting to only $2,000. Among the most prominent features of this dwelling are the following:

Instead of having the customary banisters for the stairs, the balustrade is made in the form of a book-case. The walls of the living room are pivoted so that it may be converted into a dining room by merely turning them around. The dining table is kept in the

kitchen until it is set and the meal is ready. It can then be brought into the living room at the time the walls are being turned. The different courses are kept in drawers until needed. The same drawers are used for keeping the soiled dishes until they are washed. At the conclusion of the meal, the walls are again turned and the table and dishes automatically placed in the kitchen.

Aside from the foregoing features there are many other less prominent innovations incorporated in the house. The heating system is quite remarkable and can be operated very economically. While the bungalow offers every possible comfort, it is so cleverly designed that its upkeep is within the means of those with moderate incomes.

TINY ELECTRIC TRUCKS HANDLE HEAVY EXPOSITION FREIGHT

The heavy freight at the Exposition grounds in San Francisco, such as machinery, displays of manufactured articles, furniture, and cases of foreign exhibits, has all been handled by ten small but powerful electric trucks. These trucks are operated from the rear end, one man usually serving both as driver and unloader, and not only extremely heavy loads, but remarkably fast time has characterized this manner of handling the freight. Five to eight hundred tons daily has been the capacity of this unique system of distributing the incoming exhibits from the steamers and trains to the exhibit palaces and state and national buildings. The accompanying illustration shows one of these electric trucks carrying a large and heavy log up an incline to the exhibit of the State of Washington, which is in the Agriculture Building. The trucks handled nine carloads of these logs in 13½ hours. This illustrates the efficiency of modern methods of freight distribution by a system of trucks which take up very little room and can go through small spaces.

Ten Small Storage Battery Trucks Have Been Handling the Heavy Freight at the Exposition Grounds.

FLAMELESS HEAT

It is reported that an English scientist and investigator has hit upon a manner of gas heating that may greatly change our methods of using fuel. When a mixture of gas and air under high pressure is directed against a red-hot firebrick held a short distance away, the mixture will burn at the surface of the brick. Now, if such a mixture of gas and air is forced through the porous brick, and lighted on the farther side, it will burn like an ordinary gas flame; but if more air or less gas is used, it ceases to burn, but the porous surface becomes white hot. In that way it is possible, with great economy of fuel, to get a temperature far above the melting point of platinum. This flameless heater has been used for heating boilers. It is claimed that it will do away with grates, smokestacks and chimneys, that it produces no smoke or objectionable odor, and that it utilizes 90 per cent. of the heat value of the fuel.

A Pennsylvania electric power company is contemplating the installation of wireless telephones for insuring communication between their power houses and substations at all times. These scattered points are now joined by regular telephone, and the radio sets are to be used in emergencies.

DEEP-SEA diving and, in fact, all submarine operations have a subtle fascination for the average person. Perhaps the reason for this is found in the mystery surrounding such operations due to the fact that the layman is not privileged to witness the work. The author of this article gives the reader an insight into the more recent advances made in the art and tells how science is enabling the under-sea worker to operate at depths dreamed of but unrealized in the past.

WE are learning more every day about this supposedly familiar physique of ours; and the thing that seemed impossible for our bodies to endure yesterday is in a fair way to become the commonplace of tomorrow.

Not long ago a chief gunner's mate in the United States navy descended to a greater depth in the sea than any other man has yet gone and returned alive! The average of commercial divers do not go deeper than 150 feet, and two diving experts of the British Navy a few years ago established a record when they went down 210 feet in a land-locked harbor on the Scottish coast. The champion diver of our navy made a submergence of 274 feet!

This astonishing performance rests upon the results of certain investigations carried out by the Deep-water Diving Committee of the British Admiralty some time ago, together with additional experience gained here by experiments made in our own service. Until recently, the naval diver qualified for his work here by showing his capability to operate at a depth of 60 feet, and the men have been seldom called upon to work at a depth of 100 feet. And yet the Navy Department announces that it is believed that divers henceforth can do useful work 300 feet below the surface of the sea and without the danger due to the physical stresses imposed at such a submergence.

With the millions of dollars worth of valuable materials carried to the bottom every year in sinking ships, and many of these resting on the sea bed at depths not exceeding 200 feet, this promise of capacity to work at 300 feet and the actual record performance of a descent to a depth of 274 feet open up alluring prospects in the way of salvage undertakings.

A Diver Taking a Sample of Air from His Helmet in Order to Determine the Amount of Carbonic Acid Present at Varying Depths.

Why has it taken so long to make this possible? Or, rather, how has the human body thus suddenly acquired new powers of endurance? Let us go back to the investigations conducted by the British Admiralty's Committee.

The researches were inspired by a number of deaths among the seamen divers in the Royal Navy, and what made the losses more distressing was that the men seemed to be alright for a period after returning to the surface and then keeled over and died without any apparent reason. There was a reason, but its identity had not been clearly determined previously; so the scientists of that committee set out to unravel nature's puzzle. And we shall see how vital a part animals played in the preliminary experiments leading up to certain amazing tests in which some of the investigators subjected themselves to abnormal and hitherto unreached pressures.

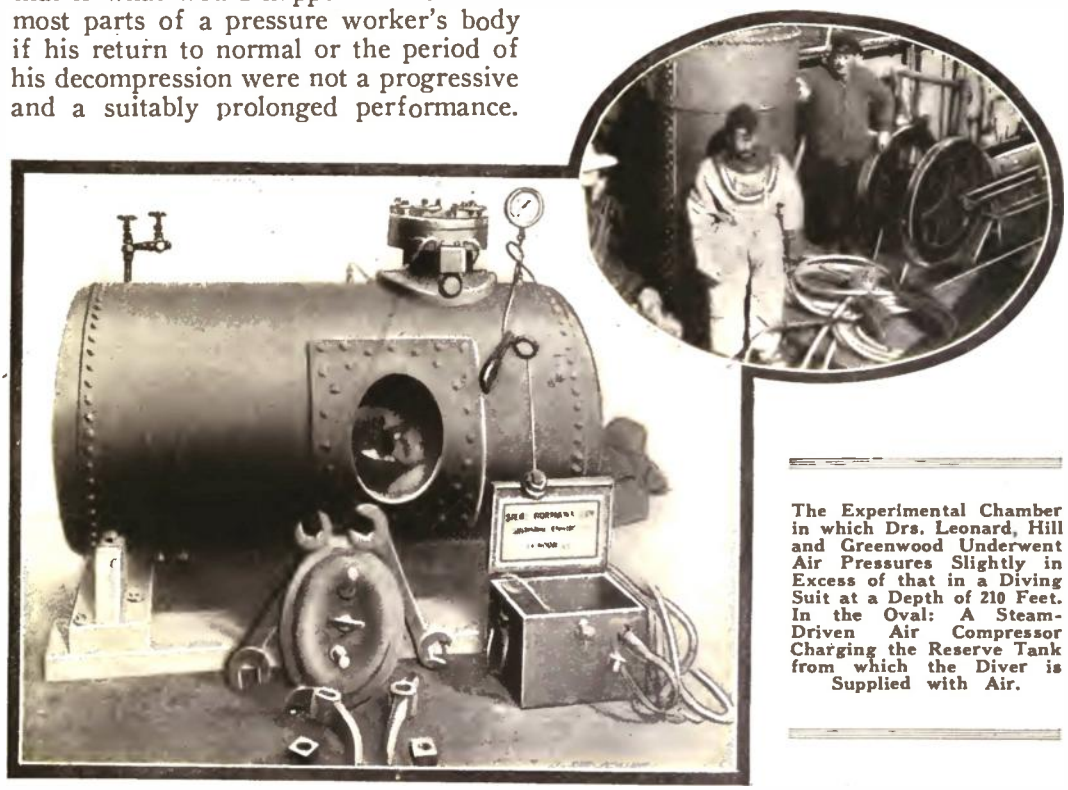
First the physicians studied the effects of increasing air pressure upon small animals, such as rats and mice and rabbits and guinea pigs, and, at the same time, watched their antics or what happened to them when the pressures were suddenly reduced to the atmospheric normal. From these investigations something was learned, but the data was inconclusive and the causes not definitely established. Accordingly, it was then decided to use larger warm-blooded creatures which would enable the researchers to arrive at more pronounced quantitative results, and for this work they chose goats. These larger mammals furnished the exact information needed, and then the physicians themselves did not hesitate to go into a testing cylinder and submit to air pressures corresponding to those called for in a diving suit when submerged at depths of from 150 to 210 feet in the sea.

The air we breathe contains nearly 80 per cent. of nitrogen, and this is the element in the atmosphere that endangers the pressure worker primarily, and it exerts its hurtful tendencies after the diver or the "sand-hog" has returned to the normal air. Bubbles of nitrogen develop in the tissues, in the smallest of the blood vessels, in the fluids of the joints, and in the nerve substances. These bubbles either interrupt circulation or cause pressures—the first leading to asphyxiation and stoppage of the heart, while the latter produces paralysis or the lesser evil commonly termed "the bends." Now these bubbles do not evolve within the body while it is undergoing pressure, nor do they usually manifest themselves during the stages of decompression, but they betray their presence by various symptoms when the pressure upon the diver or the caisson worker has been relieved. The effects may not be felt until many hours later.

The blood in our bodies does not make a complete cycle to every part of our physique in the same period. It penetrates much slower into the tissues and parts fed and drained by the tiny capillaries, and, in turn, it flows from these remote sections of our anatomy with corresponding sluggishness. The active arteries and veins, on the other hand, absorb faster and give off more rapidly the elements of the air breathed, and, therefore, respond more speedily to the rise or fall of external pressure. Now what happens? The capillaries and the tissues fed by them lag in reaccommodat-

ing themselves after a diver or sand-hog has been at work, and it is this lag that was not properly considered until a short while ago. This tardy action on the part of the tiny blood vessels is the real reason for peril to the pressure worker.

When the sandhog or the diver is decompressed too rapidly, especially in the final stages, nitrogen remains in the out-of-the-way regions of the body and has a pressure then in excess of that of the far more active arterial and venous systems, and is also greater than that of the external atmosphere. You have seen bubbles liberated in charged water when the cork was removed. In a general way that is what would happen in the innermost parts of a pressure worker's body if his return to normal or the period of his decompression were not a progressive and a suitably prolonged performance.



The Experimental Chamber in which Drs. Leonard, Hill and Greenwood Underwent Air Pressures Slightly in Excess of that in a Diving Suit at a Depth of 210 Feet. In the Oval: A Steam-Driven Air Compressor Charging the Reserve Tank from which the Diver is Supplied with Air.

Once developed, these bubbles may press against a nerve center and produce paralysis or they may get into the circulation, reach the heart, and induce death. Strange to say, the investigators found out it was not so much the great air pressure within the diving suit that caused the trouble, but rather the after-effects if the surcharged nitrogen were not properly drained from the capillaries and the tissues lying beyond the immediate flood of the active blood circulation.

But don't conclude from this that a man can breathe air at high pressure without running a risk. The worker must have an increased percentage of oxygen, and oxygen consumes the tissues, and if exposed to this attack too long a man would be poisoned by the very excess of this life-giving element under pressure. Therefore, a limit is thus imposed upon man's venturing into the ocean's depths, even though slow decompression when rising toward the surface would save him from the baneful effects of the nitrogen contained in his body.

Now another thing that has to be taken into consideration in diving operations in the ordinary elastic suit is the accumulation of carbonic acid gas—this poisonous element increasing directly with the amount of physical effort made by the deep-water worker. This gas is heavy and can be cleared from the metal helmet only provided the circulation of air be abundant and the pressure of it a trifle in excess of that of the water outside into

which it is exhausted. Now our naval authorities have introduced a modification. The British investigators found that most of the air pumps for divers were quite incapable of giving them the full and abundant supply needful when working at depths of 150 feet and more. The exhaust from the helmet was apt to be too feeble to take up and drive out the gathering carbon dioxide exhaled by the diver. In order to offset this danger and to make the diver independent of toilsomely-driven hand pumps, a steam or electrically-operated compressor was employed and the air stored in a suitable reservoir.

The diver's air tube was connected to this tank with a reducing valve interposed—the tank being charged at a pressure considerably in excess of that required at the operating depths. In this way, the underwater worker had complete control of his air supply by simply turning the little valve in front of him on his suit, and the people on the tender had only to see that the tank was kept duly loaded. Another innovation is the hospital or recompression lock. As you possibly know, the caisson workers on the shore now have a hospital lock where they can undergo recompression and then decompression after coming out from their underground chambers, but this has not been applied until recently to the working facilities aboard a salvage craft.

Ordinarily the diver is brought up to within about 50 feet of the surface and then slowly raised at intervals, covering a decompression period of an hour, possibly, if his submergence has been long and the depth great. In cold water, this is exhausting and adds just so much to the bodily drain already made by his operations on the bottom. To overcome this, a recompression chamber or hospital lock is now utilized, and instead of holding the diver in the chilling water and decompressing him there, he is brought up at a safe speed to the surface and hustled right into the lock where the air pressure is raised to a suitable point. There, his diving dress is removed and dry and warm clothes are put on him, and a cup of beef tea or something of the kind given him. All the while the pressure is being systematically lowered and he is able to talk with the attendant and to relax and rest. In this manner the safety of the diver is looked after as was not the case until latterly, and, at the same time, it is found that these deep-water workers can do more than was previously believed possible. Undoubtedly, divers will soon be able to descend to depths of 300 feet, and this is getting close to the 400-foot submergence which the English scientists declared would be possible provided the diver remained there only a short while. The human body is astonishingly adaptable. The only thing is how to humor it and what must be done to avoid abusing it.

WHALE CUTS OFF SUBMARINE CONNECTION

A short time ago the cable connection was suddenly cut off between Skagway and Juno, up in the Fairbanks district of Alaska, and for some time the trouble could not be located. At last the cableship Burnside found what was wrong. In some inexplicable way a large whale had become entangled with the cable, and the divers from the cable-ship found him with a half-hitch of the cable around his head and lower jaws. They removed the dead whale and re-established the connection by mending the break in the cable.

ARMORED CAR THAT CAN BE DRIVEN FROM EITHER END

Because it is sometimes necessary for an armored motor car to be taken quickly out of a tight corner or narrow lane when it is in action, the designers of the protected fighting autos of the Eaton Motor Machine Gun Battery in the Canadian army have struck upon the original and unique arrangement of having a second steering wheel and an auxiliary set of clutch and brake controls at the rear end of the cars so that the machines may be driven backward as easily and as speedily as in the forward direction. A mechanical difficulty lies in the fact,

To Allow Greater Flexibility of Action, Recent Canadian Armored Automobiles are being Fitted with a Double Set of Controls.

however, that the engines cannot be driven backwards or reversed for long periods because of over-heating on account of the positions of the radiator and cooling fan. The arrangement permits a car to be quickly withdrawn when necessity arises, after which it can be turned around. There are forty armor-plated cars in this battery and the accompanying illustration shows one of the motor vehicles stripped of the "fighting top" for an examination and test. Space is provided in the center for accommodating the machine guns and gun crew. The motor trucks are very rugged, to stand the most severe conditions.

HOW A MILITARY RIFLE IS LOADED

The accompanying illustration shows the Turkish and Spanish Mauser—used also in this same form in Mexico—as well as a clip or charger of modern ammunition ready to be stripped into the magazine. The hand of the soldier is clasped around the rifle, while the thumb presses downward on the top cartridge. The five cartridges are pressed out of the brass clip or charger, which is held in the slots in the rifle frame, until the last cartridge—or the top one as they are shown—is caught by the lip of the magazine.

The forward motion of the bolt drives the clip off the rifle and it falls to the ground. The bullets are the modern sharp point or spitzer type, used by most of the foreign armies as well as that of the United States.

The rifle can be opened, a clip of five cartridges inserted, the rifle closed and one shot fired in less than four seconds by a skilled man. To load the clip of five takes but a trifle longer than to slip one cartridge into the old style, single shot rifle, and so a rapid and continuous fire is afforded.

The French rifle uses a tubular magazine parallel with the barrel and holding eight cartridges. As it is not clip loading, it is very slow to recharge. The British rifle, unlike the Mauser, holds two of these clip loads of cartridges, or 10 in all, but is loaded from the clip like the Mauser.

A NEW DESIGN OF ELECTRIC SWITCH

A recently patented switch presents a new idea of interest. The fuses of the switch are so arranged that it is only possible to gain access to them after the current has automatically been turned off. Another feature of the invention is that the switch is so arranged that only authorized persons can reach the live terminals. The first feature of the device is of importance, since, if a short circuit exists on a line, it is not possible for a person to be burnt while inserting the fuses.

A Mauser Rifle and a Clip of Ammunition Ready to be Inserted into the Magazine. The Clip Method of Loading is Used in Most Military Weapons of Today.

The Return of a Motorcycle Club that Made the Ascent of Mount Wilson, Calif.

MOTORCYCLING A MILE HIGH

The modern high power motorcycle is adapted to mountain climbing as well as to pleasure trips on the easy valley grades. The adjacent view shows the return of a motorcycle club that made the ascent of Mt. Wilson, California, a peak more than a mile high, over a nine-mile road that has grades of from 14 to 28 per cent. This narrow and winding road is considered quite difficult for automobiles, but the motorcycle party made the ascent without trouble, many of the machines carrying two passengers.

THE WORLD'S GREATEST DREADNOUGHT

The United States battleship *Pennsylvania,* recently launched at Newport News, is greater in size and gun power than the famous *Queen Elizabeth* of the British Navy, which has figured so prominently in the operations against the Turkish defences at the Dardanelles.

The main battery of the *Pennsylvania* consists of twelve 14-inch guns set in four turrets, there being three guns to the turret. This is the plan of big gun arrangement which has been employed in the sister ships which preceded her, the *Nevada* and *Oklahoma,* each of which has a tonnage of 27,500, as against 31,400 of the *Pennsylvania.* In these three ships, as well as in the case of the *Queen Elizabeth,* all the turrets are on the center line, so as to concentrate their fire on either broadside.

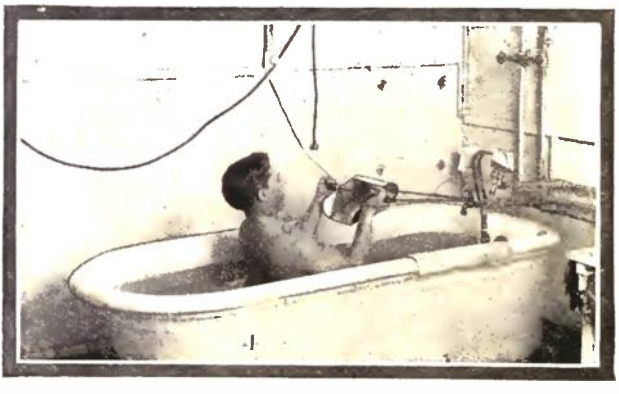
According to well informed experts, the *Pennsylvania* will be able to hurl seven and one-half tons of steel on either broadside from her enormous main battery upon pressing a single firing lever. In addition to this, the battleship will have a secondary battery of twenty-two 5-inch rifles for defence against torpedo boats and submarines.

The interior furniture of the *Pennsylvania,* including wardrobes, berths, dining tables, chiffoniers, bureaus, toilet cases, book cases, desks and office furniture, will be made of art metal. The ship's complement will consist of 65 officers, 863 bluejackets and 74 marines.

The trials of the completed dreadnought are set for November, 1915. The finished craft will cost about $13,000,000.

TAKING THE CHILL OUT OF THE MORNING BATH

The chill of the morning bath is no longer to be dreaded, because a device has been perfected that absorbs the shock and leaves only the exhilaration of the plunge. The new device is known as the rowing bath, because in its operation the muscular activity occasioned by rowing is



The Chill and Shock of a Cold Bath are Removed by this Helpful Form of Exerciser.

closely simulated. It is exceedingly simple, consisting of a tin scoop with a capacity of a half gallon and a loop of stout rubber tubing which can be attached instantly to any bath tub.

To operate the rowing bath, the bather seats himself in the tub, throws the rubber loop over the faucet of the tub and turns on the cold water. As it pours into the tub he scoops it up in generous quantity and dashes it upon his chest. Because of the resistance offered by the rubber attachment, the muscular effort may be made as easy or as difficult as one desires, and it is easily possible to work up generous perspiration even though the temperature of the water is low enough to be uncomfortable were the bather absolutely idle.

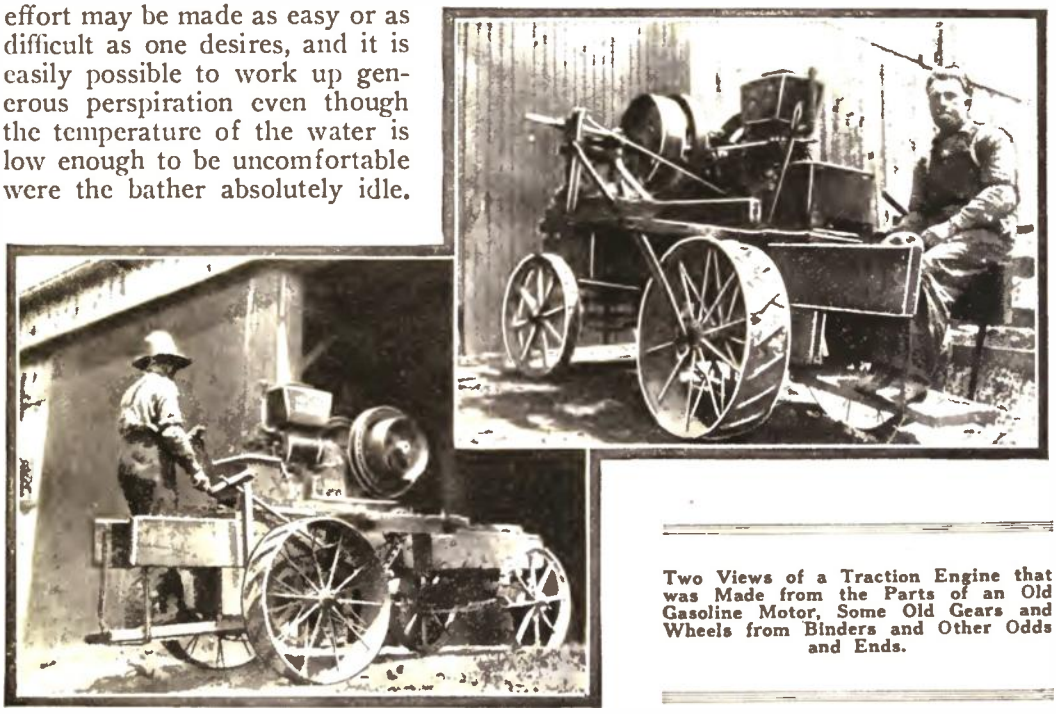
PERFECT TIMEPIECES

An astronomical clock must keep more nearly perfect time than any other instrument. The makers of such clocks must consider how much effect slight changes in the temperature and in the pressure of the air will have upon the oscillation of the pendulum. There have been prepared elaborate tables that show the weights of dry and moist air at varying temperatures and atmospheric pressures.

There is a Riefler clock at Potsdam in which virtually all the influences that affect the swinging pendulum, no matter how minutely, are compensated for. The pendulum of this astronomical clock swings with such precision that after 576,000,000 seconds (more than eighteen years) the error of the clock is only one second.

A HOME-MADE TRACTOR

A traction engine made from parts of an old gasoline motor, some old gears and wheels from binders and other odds and ends found in a barn, is used by a young Canadian farmer to do the chores of his neighbors within a radius of several miles of his home. The motor is connected by chain drive to the two rear wheels, and on a good road the tractor can move at a comfortable speed. Its construction, although crude and cumbersome, is quite ingenious.



Two Views of a Traction Engine that was Made from the Parts of an Old Gasoline Motor, Some Old Gears and Wheels from Binders and Other Odds and Ends.

Mr. Dempster, who was probably the first man to ride a bicycle in England and who was also a distinguished electrical engineer and scientist, died recently at Schenectady. It is claimed that he also built the first commercial telephone in England in 1876.

CEMENT AND CONCRETE ABOUT THE HOME

CEMENT and concrete, although extensively employed for various building purposes, are not used as extensively as they might be around the home. These materials should be more frequently employed for different structures about the farm as well as the city dwelling, since they practically cut down the cost of living in that they eliminate a great deal of work usually involved in erecting wooden structures. Furthermore, when once built a concrete or cement structure is serviceable for a lifetime.

A few examples of the best manner in which to utilize concrete and cement about the house are shown in the illustrations on the facing page. One of the most important of these is perhaps the incubator and brooder house, made of monolithic reinforced concrete; the walls, roof and floor forming one solid mass. The roof is reinforced by electrically welded fabric, consisting of No. 3 wires and having a mesh of six inches. The roof is three inches thick, while the walls are four inches thick and have ½-inch steel reinforcing rods which run both vertically and horizontally. The floor, of course, is solid. The entire shelter is built on the Spanish style of architecture and has a cement awning covered with red tiling along its entire front.

THE VIEWS APPEARING ON THE OPPOSITE PAGE ARE AS FOLLOWS:

(1) Incubator and Brooder House Made of Reinforced Concrete. (2) Attractive Concrete Pergola which Forms the Porch of a House. (3) An Incinerator which is Used for Burning Rubbish of All Kinds. (4) Attractive Flower Box Made of Cement. (5) Flower Pot of Artistic Design. (6) A Motorcycle Driveway. (7) Sun Dial Made of Cement and Cobblestones. (8) Hitching Post of Concrete which has been Given a Bark Finish. (9) Concrete Chicken and Duck House. (10) Cement Clothes Pole. (11) Cement Floor Under a Grape Arbor. (12) Cement Wall Around a Croquet Ground.

The chicken and duck house has three walls and a roof, there being one open side and no floor. The walls are two inches thick, and the open side measures three by three feet. This shelter is sanitary, there being no cracks in which vermin can collect and breed, and cleaning is easily accomplished.

The private incinerator is a very interesting arrangement, mainly for sanitary reasons. It helps keep the home clean, since in it anything in the way of paper, vegetable parings or other refuse can be destroyed by fire. The incinerator is two feet in height and three feet in diameter at its base. Openings for draft have been left on opposite sides, while another opening of eighteen inch diameter is provided at the top. Through the latter the rubbish is introduced into the incinerator. The structure can serve still another purpose beside that for which it is intended. In summer time, when the house is to be kept as cool as possible, the hot water required for washing and other purposes can be heated over the incinerator in the open. This structure, together with the cement clothes pole, forms a useful as well as an ornamental combination for wash day.

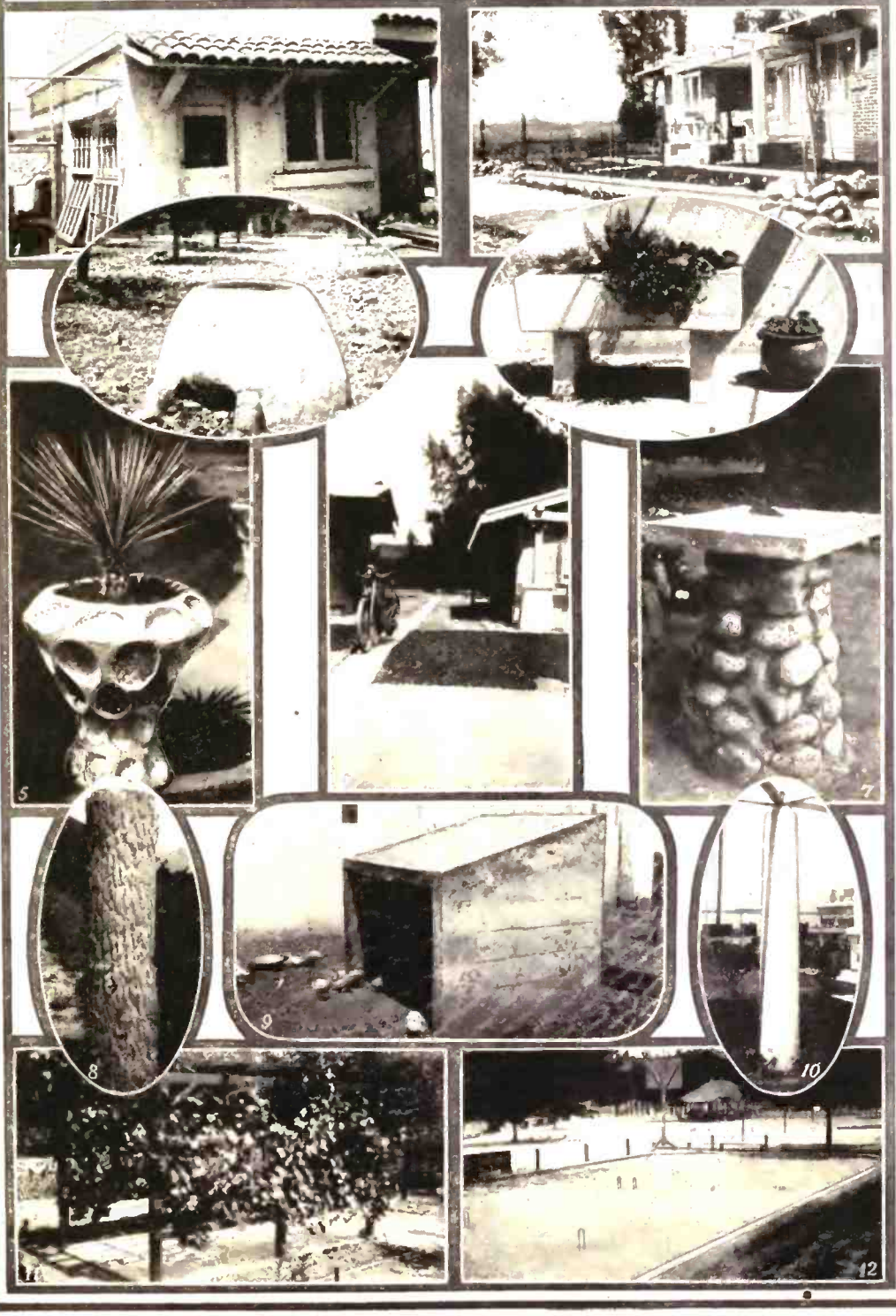
The cement post, shown in one of the views, is solid and has received a sanded finish to match the house beside which it stands. It is seven feet high and tapers gradually from ten inches in diameter at the base to eight inches at the top. When near the top it narrows abruptly to the point upon which the cross arms rest.

Other interesting features in cement and concrete construction are the cement floor of the grape arbor and the floor of the enclosed wire cage, which is intended as a breeder of blooded cats. In the latter instance the cement floor prevents the cats from digging under the fence and escaping.

The motorcycle driveway is a clever innovation. It consists of a strip of cement, eighteen inches wide, running from the sidewalk in front of the house back to the garage in the rear. In this instance the driveway is eighty feet long. To modify it into an automobile driveway, it is only necessary to lay another strip of similar size a few feet away and parallel to the first one.

A cement croquet ground in the form

CLEVER APPLICATIONS OF CONCRETE AND CEMENT



of a cement enclosure wall is a practical application and can be very easily built. The wall is about twelve inches high and four inches thick.

A hitching post similar to that shown in one of the views can be made four feet in height and twelve inches in diameter, in one solid piece of concrete. The fastening ring may be located a few inches from the top and the surface of the post given a finish that resembles the bark of a tree.

Other structures in cement and concrete are the flower boxes, pergolas, flower pots in many unique designs, and a sundial to decorate the lawn. The latter can be made extremely attractive by using cobblestones which are held together by cement. The top slab, which serves as the dial, is two feet square and made of solid concrete.

The foregoing descriptions are offered in the way of suggestions and serve to illustrate the large number of ways in which cement and concrete may be artistically and usefully employed. Practically any one can make the simpler of the structures described, while the more difficult ones can be made after some practice.

A SALES GARDEN THAT BRINGS BUSINESS

Many stores, even in closely built retail districts of our large cities, maintain a fairly large rear court which is merely a catch-all for packing cases, rubbish, barrels and excelsior — a fire menace and a waste of immensely valuable space.

A Progressive Dealer has Materially Increased His Trade by Building this Attractive Resting Place, which was Formerly an Unsightly Back Yard.

In the heart of Los Angeles, in a section which is said to command a larger rental in proportion to the population than any other retail center, precisely such conditions exist. The accompanying view illustrates how one retailer managed to turn such a danger and waste into profits. The back yard, extending from the rear of the store to an alley, had almost the ground area of the store itself on which he was paying a fancy rental. On one side was the brick wall of an adjoining building; on the other, a high board fence. The entire yard was littered with rubbish; accordingly, the first step was to pay a man to remove it and to arrange for frequent removal of old cases and other waste.

A gardener was then employed to turn up the ground and apply fertilizer to the flower beds, and gravel to the walks which he laid out. A carpenter constructed a pergola of rough timber over the entire area, over which vines could be trained, while flower and fern baskets were hung from the beams. Ferns and exotic plants and flowers were set out, a tiny fountain constructed in the center, and comfortable benches and outdoor furniture placed where the patrons of the store could sit and enjoy the restful

surroundings. Even a few Navajo rugs were spread where their barbaric colors would brighten the corners. Then the public was invited to make a rendezvous of the garden, and the response was prompt. The store sold talking machines and records, so a noon-time concert was an attraction and a large number of sales resulted from placing the customers in pleasant surroundings and making them comfortable.

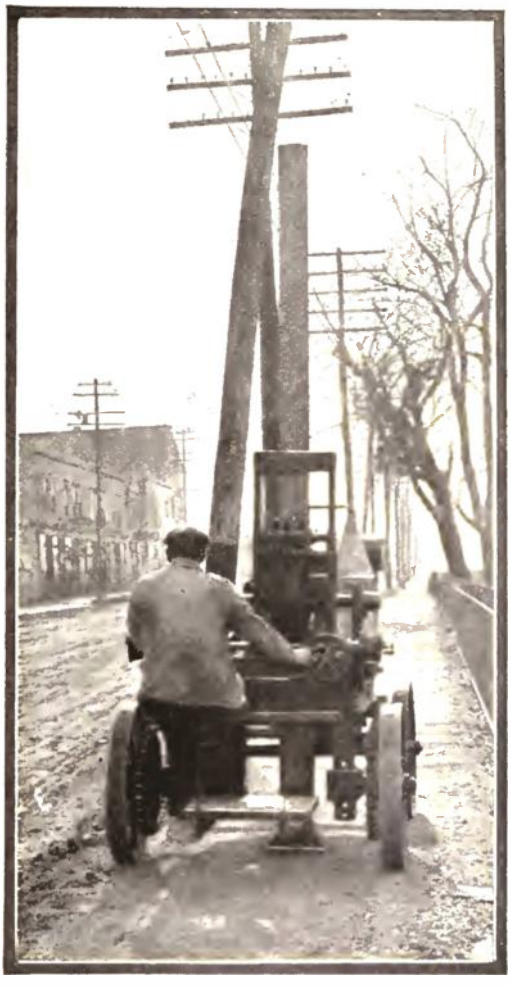
FEDERAL JURORS EAT CAKE MADE OF EGGS TEN YEARS OLD

Cake made of eggs ten years old was served to jurors in the Federal district court during the hearing of a suit brought against a former collector of the port of New York by an importer, to recover $12,000 damages because a consignment of Chinese preserved eggs in which he had an interest was destroyed as unfit for use. The eggs had been preserved by boracic acid in a solution, and tasted good to the jurors who ate them, despite their extreme age. A professor of biological chemistry testified that it is possible to keep eggs 100 years by this method without impairing their quality or taste.

A GASOLINE-OPERATED TAMPING MACHINE

One of the latest additions to the ranks of labor-saving machines is a tamping equipment that is operated by gasoline power. The machine not only does the tamping in a more efficient and expeditious manner than is possible by manual labor, but it also effects a considerable saving in the cost of work of this kind.

The tamping machine operates a 150-pound ram at the rate of forty to fifty 22-inch strokes per minute. Comparing the machine with manual labor immediately discloses its vast superiority. The average laborer with even a fifteen-pound tamper will not average more than twenty strokes per minute, and with a heavier tool the rate is proportionately less. Furthermore, he will hardly lift the tamper more than nine or ten inches. Not only does this indicate that the machine tamps down the ground in a more firm manner, but it also proves that the speed is far greater.



The Gasoline-Operated Tamping Machine is a Recent Addition to the Ranks of Labor-Saving Devices. It Does the Work of Several Men.

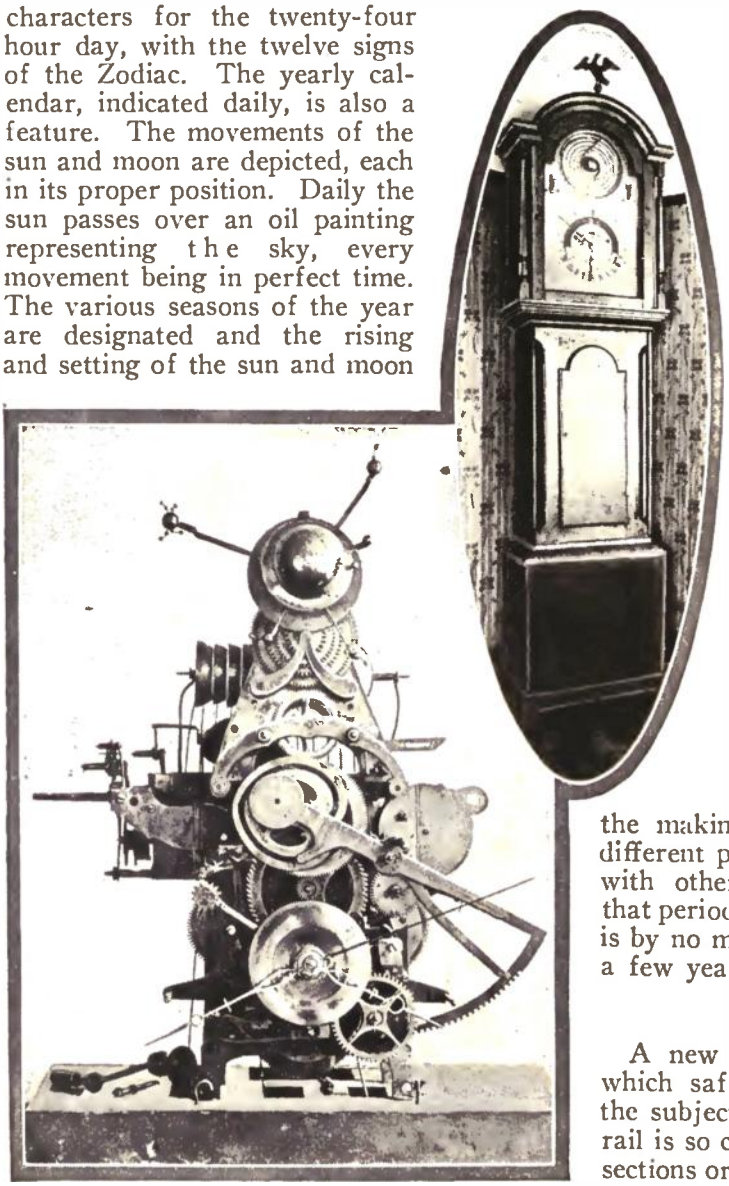
The tamping machine can travel about under its own power at the rate of eleven to thirteen miles an hour. When at work it travels forward or backward at a speed ranging from six to fifteen feet per minute. The motive power is furnished by a four-horsepower gasoline engine.

It is claimed that the tamping machine will replace from eight to ten men under favorable conditions, and even under the most adverse conditions, such as short jobs, it replaces anywhere from three to five men.

THREE-CENTURY OLD CLOCK KEEPS PERFECT TIME

After ticking its way through the ages from the seventeenth century, an unusual clock, imported recently from England to the United States by a native of Los Angeles, California, is still counting out the seconds and tallying off the seasons. This specimen, which is eight feet in height and two feet wide, is made of mahogany and has a large solid brass dial. The dial contains characters for the twenty-four hour day, with the twelve signs of the Zodiac. The yearly calendar, indicated daily, is also a feature. The movements of the sun and moon are depicted, each in its proper position. Daily the sun passes over an oil painting representing the sky, every movement being in perfect time. The various seasons of the year are designated and the rising and setting of the sun and moon during these changing periods may also be seen.

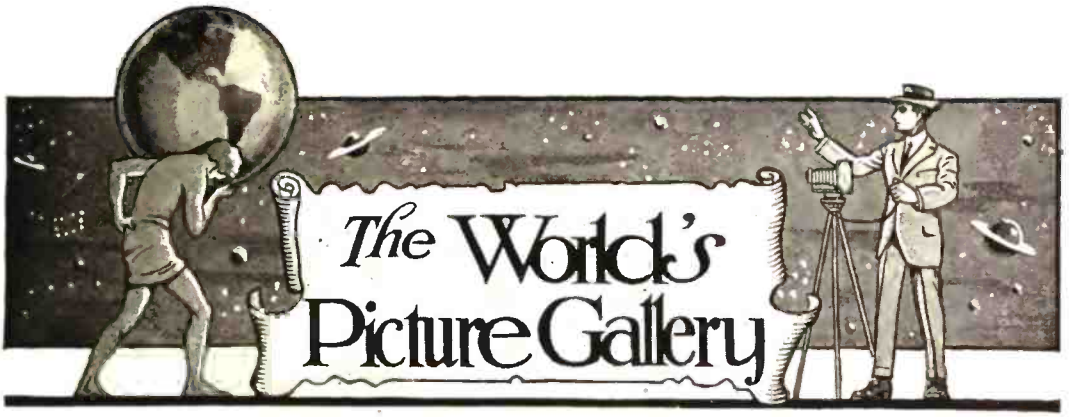
This unusual, mammoth timepiece shows the entire solar system, including Venus, Mercury, Mars, Earth, Saturn and Jupiter, each of these planets carrying its allotted moons and revolving around the sun. A novel feature is the comet which may be seen starting from the side of the dial, passing around the sun, thence back again to the side of the dial. The clock contains also a series of bells. At the close of each hour this queer orchestra plays a selection which was popular when the Stuarts were reigning in England. There are two ancient-shaped figures on the face of the dial which go to prove the antiquity of the clock. One of these is holding a telescope pointed to the dial representing the universe, while the other automatically beats time to the tunes played on the chimes. The name of Eva Falmouth is inscribed on the dial.



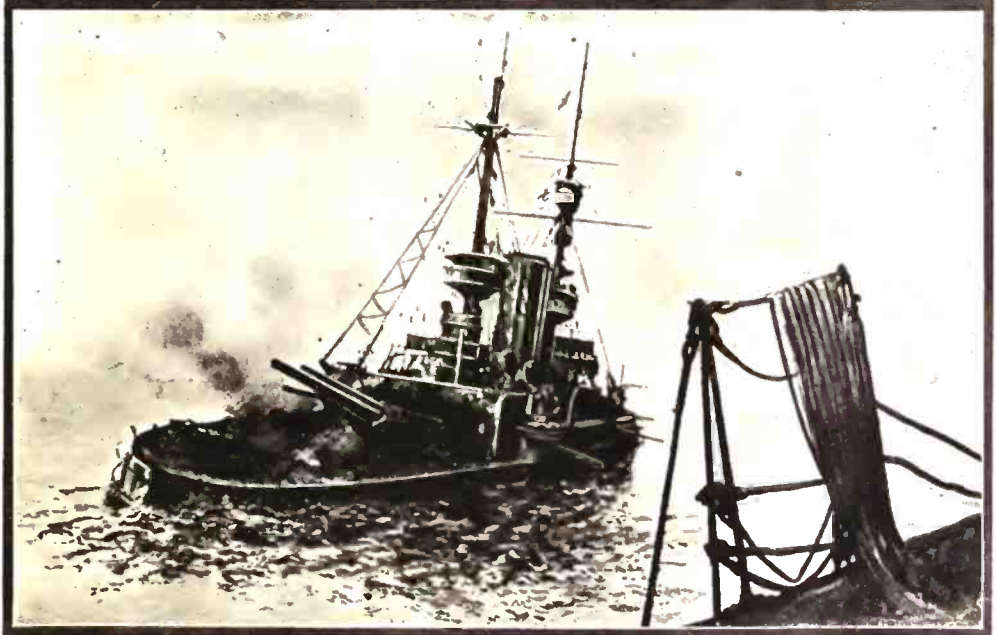
Although More than Two Hundred Years Old, this Clock is a Marvel of Mechanical Ingenuity.

In order to perform the various functions already mentioned, the mechanism of this clock must necessarily be quite complicated. And so it is, and no little ingenuity has been displayed in the making and assembling of the different parts. This clock, together with other clocks and watches of that period, proves that watchmaking is by no means an art that dates but a few years back.

A new design of third rail, for which safety is the main claim, is the subject of a recent patent. The rail is so constructed that its various sections or units do not carry current until the train is just about to make use of them.



A DRIFTING MINE'S VICTIM



THE SINKING OF THE BRITISH BATTLESHIP "IRRESISTIBLE"

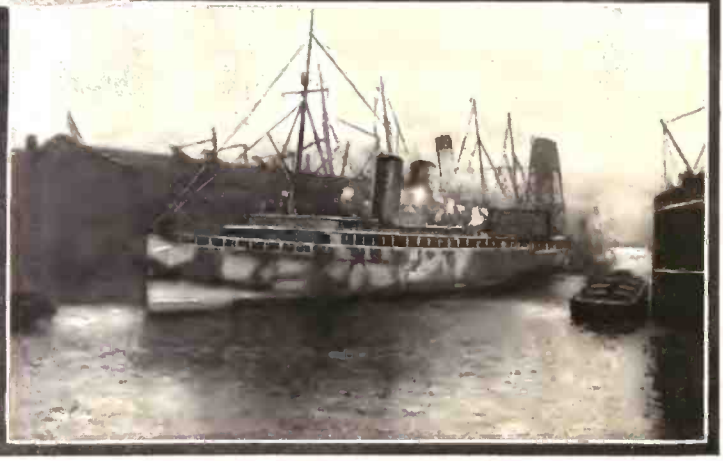
IT was at the height of a terrific bombardment of the Turkish forts by the combined French and British fleets in the Dardanelles that the battleship "Irresistible" was sunk by a drifting mine. On the same day, March 18, a similar fate befell another British fighting ship, the "Ocean," as well as the French battleship "Bouvet." The crews of the two British ships were saved for the most part, but the "Bouvet" sank so rapidly that almost every man on board was drowned.

HOW DECEPTION IS PRACTICED BY BELLIGERENTS

French aviators have discovered the fact that guns painted in various colors are quite invisible at high altitudes and thus escape detection by the enemy's airmen. Accordingly, the French have painted their guns many different colors, as in the instance of this 75-millimeter field piece.

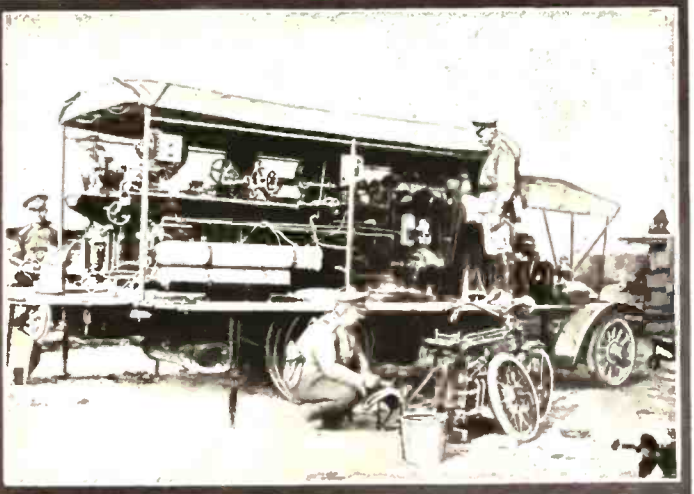
This improvised fake gun, consisting of a drain pipe, two cart wheels, a sheet of iron and other odds and ends, was used by the French during operations in the north of France. It caused the Germans to waste a considerable amount of ammunition in an effort to destroy it.

The British are providing bases for their hydro-aeroplanes at sea in a very novel way. They are employing steamers on which special landing platforms have been constructed. These ships are so painted that their outlines are not visible to the enemy. In this view is seen one of these steamers and its peculiarly painted hull.



IN THE TRENCHES AND AT THE REAR

Contrary to the general opinion that the Russian army is ill equipped, the accompanying view proves that the Slavs are not to be outdone by other fighting forces in the matter of materiel. Here is seen one of the many repair shops on wheels, which keep the aeroplanes, automobiles, motorcycles and other machines in perfect shape. These shops usually contain a lathe, drill press, planer and all kinds of hand tools. Some of them even have an oxy-acetylene torch outfit.



Above: King's African Rifles intrenched during a lively engagement in East Africa. In the oval: German transport wagons traveling over the Polish plains near Suwalki. In this view, as far as the eye can see, there are transport wagons, bringing food and war materials to the German lines. At the right: A remarkable line of trenches used by the Austrians in Galicia. The barricade in the water serves to partly conceal the trenches on the bank.

THE DESTRUCTION OF CIVILIAN PROPERTY

One of the many pathetic incidents of the war: An elderly woman returning to what was formerly her home in the northern provinces of France, only to find it in ruins. Homes have not been spared by the soldiers when they have been found interfering with the fighting. And in many instances the houses have been converted into strongholds by the soldiers during the house-to-house fighting in some of the French villages and towns.

Remains of bombs dropped by Zeppelins during a recent raid over the East Coast towns of England. These particular bombs are of the incendiary variety and are calculated to spread conflagration when dropped on the crowded houses of a town or city. Fortunately, the raids are made at night, and most of the bombs fall harmlessly into open fields, due to faulty aiming on the part of the airmen.

A house which was wrecked by bombs from a Zeppelin during a recent raid over English territory. In this instance an explosive bomb was employed by the airmen with telling effect. It is said that the Zeppelins are now carrying a larger and more perfected type of bomb than heretofore, and that the effects are consequently more to be dreaded than in the earlier raids.

INTERESTING GLIMPSES OF THE GREAT WAR

The novel projectile seen protruding from the muzzle of the gun is used by the French in cutting the barbed wire entanglements erected in front of the German trenches. The gun is fired in such a manner that the projectile falls amidst the entanglements, carrying a long cable with it. The soldiers then pull on the cable, and in so doing tear down the elaborate barbed wire defences.

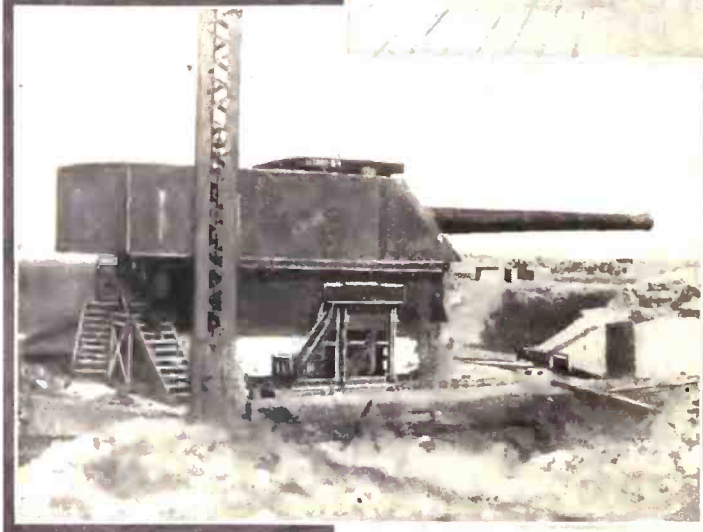
The remains of a German monoplane that was brought to earth by accurate rifle fire. Every part has been consumed by fire except the tail of the machine.

The prevailing spirit in the French army is that of good cheer, despite the many hardships and privations. For days at a time the soldiers have to live in water-filled trenches and suffer intense cold, besides being constantly in danger of death.

The British battleship "Queen Elizabeth," the largest fighting ship in the world, which has been taking an active part in the bombarding of the Dardanelles fortifications.

PEACE ACTIVITIES AND NEW DEFENSE GUNS

A delegation of prominent American and British women who sailed on the Holland-America liner "Noordam" for The Hague, Holland, to discuss peace measures. The party included Jane Addams of Hull House fame, Mrs. Pethick Lawrence, the British suffragette, and Mrs. L. Post, a prominent suffrage worker.



A fourteen-inch gun installed in a land turret at the Sandy Hook proving grounds where the turret is being thoroughly tested. The idea of using a turret for land guns is not a new one, but it promises to give greater combative power to coast defenses.

Members of the Regular United States Coast Artillery swabbing out a fourteen-inch gun. Should the tests of the land turrets prove them to be satisfactory, they will be installed in the various fortifications. By the use of the turrets the gun crews will have greater protection against hostile shells than at present.

DEATH-DEALING SHELLS AND TORPEDOES

A twelve-inch Austrian shell which fell inside the French fortress of Troyon and failed to explode. It is reported that of late many of the German and Austrian shells used on the western front do not explode, and that this is due to inferior manufacture caused by lack of necessary materials.

A German torpedo that was washed up on the shores of France. This torpedo was probably intended for a warship or merchant vessel but missed its mark, and after expending its motive power it drifted about until washed ashore

A huge hole in the hold of a German ship that was captured by the British and used in the Dardanelles operations. This hole was caused by a Turkish torpedo, and strikingly illustrates the explosive power of modern torpedoes. In this instance the hole was above the water line and the ship remained afloat.

INTERESTING WAR SCENES THE WORLD OVER

A storekeeper in New York collecting old gold and silver for the German government, giving to the Germans who turn in their jewelry and other valuables a certificate and an iron ring which bears the famous Iron Cross insignia. The money obtained from the old gold and silver is forwarded to Germany.

A Russian column passing through one of the main streets of Przemysl, the former Austrian stronghold in Galicia, which was captured by the Slav forces after an investment of several months. The Russians brought food into the city and relieved the suffering inhabitants who were famished.

A stock of barbed wire in the rear of the French lines. A great quantity of this wire is constantly being required because of the miles of wire entanglements that must be erected for properly protecting the intrenched positions of the French.

Russian soldiers placing notices in the streets of Przemysl announcing their occupancy of the town to the populace. A recent strong defensive movement by the combined German and Austrian forces has caused the fighting in Galicia to be carried back close to Przemysl. There is a possibility that it may again be besieged, this time by its original masters.

ZEPPELIN BOMBS AND GERMAN SHELLS

A hole in the roof of a home caused by a bomb dropped from a Zeppelin during a recent raid over England. Aside from the hole in the roof, the only other damage was a broken window. No one was injured.

A striking view of the clouds of smoke caused by bursting shells. This scene was taken in northern France during a recent engagement.

Another victim of a Zeppelin raid over the east coast of England. In this instance the house struck by the bomb was greatly damaged, although no one was injured.

The smoke toward the left in this view is caused by a bursting shell, yet the sheep do not appear alarmed at the noise of the detonation. The animals, as well as the men, near the battle front have become accustomed to the artillery fire and shells, and disregard them.

BRITISH MINE SWEEPERS AND THEIR CREWS

Two of the British mine sweepers tied up at their dock. These ships perform the important duty of clearing the mines from the waters surrounding the British Isles.

The crew of a British mine sweeper in the Dardanelles using rifles for the purpose of exploding floating mines.

The crew of a British mine sweeper. These men constantly wear life belts and life collars when performing their work, owing to the constant danger of the ship being struck by a mine. This little-heard-of branch of the naval service is perhaps the most hazardous calling of any of the enlisted men.

WITH THE SOLDIERS BETWEEN BATTLES

Austrian engineers repairing a bridge in the Carpathian mountains that was destroyed by the Russians. Here they are seen building a large column of timber for supporting one of the spans of the bridge. Below: Another view of the bridge

Below: A disinfector equipment used for infectious clothes and bedding at the Duchess of Westminster's Hospital in France. This disinfector is employed especially for the bedding used by patients having typhoid fever.

Below: French Colonial troops doing their own washing in the sea, at St. Raphael, on the Mediterranean.

WAR ACTIVITIES IN DIFFERENT LANDS

Above: Panoramic view of the Golden Horn, Constantinople. The warship at anchor is the former German cruiser "Breslau," which, in the early days of the war, escaped to the Dardanelles and was taken over by the Turks.

Above: British soldiers digging trenches in an Egyptian desert. At the left: A Serbian gun that was put out of action by Austrian fire during the bombardment of Belgrade. The dead gunners may be seen lying about the gun.

Mechanics making the final adjustments on a British military aeroplane just prior to its flight over the enemy. This view conveys some idea of the sturdy construction of the British flying machines. Not alone the machines but the pilots as well deserve considerable credit for their excellent work in the present war.

TOMORROW is the day of machinery; the man who works solely with his hands will soon be eliminated from the industrial world. Levers, cams and gears, made of brass, steel and other inanimate substances, are already replacing what was formerly considered skilled labor. Brains only cannot be replaced by the mechanical creations of man's ingenuity.

THIS page which you are now reading is the result of a large number of castings. It required 1936 moulds and eight pounds of metal to cast the perfect type faces which printed these two columns. Fifty-two times the brass moulds used in the work have been assembled in their proper order and molten metal poured into them so as to cast as many slabs of type—each slab being a single line of reading matter.

As complicated as the task may appear to be, its execution is a very simple matter—at least as far as the human element is concerned. An operator has simply to manipulate a keyboard with no greater effort than is required to operate the conventional typewriter, the different moulds dropping into place and the lines of type being cast without any attention whatsoever.

It is the great elimination of the human factor that has made modern printing so efficient and speedy. Take away the typesetting machines and our newspapers would not be what they are today. Neither would the magazines be as large and as moderate in price, for the cost of labor involved would be several times what it is at present. Due credit must necessarily be given the marvelous presses and binding machines now in use, but these do not concern us now.

The typesetting machine, of which there are two designs in general use—the linotype and the monotype—is a monument to man's ingenuity. It accomplishes a task which was considered impossible prior to its inception—that of setting up type by machinery. Any one who has watched a printer set the type by hand knows what the work involves. To begin with, the various pieces of type are placed in their proper order in a sort of holding device known as the "composing stick." After the printer has assembled enough words with spaces between them to make one line, his next task is to increase or decrease these spaces between the words in order that the type line will be of a certain width. All the lines in a printed column must

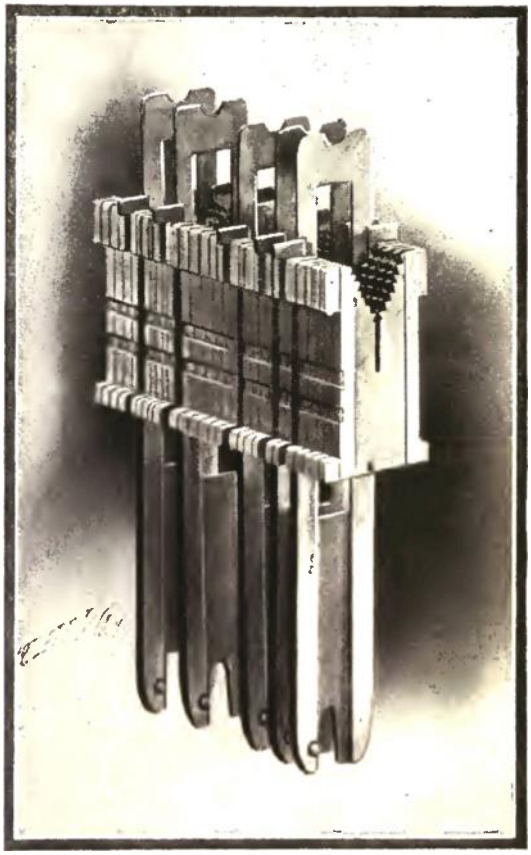
Each Line of Type Set on the Linotype Machine Consists of One Slab of Metal.

be of equal length: whatever difference there may be in the width of the type is compensated by spacing blocks between the words. This is known as "justification." Having accomplished the foregoing, the printer is now ready to clamp the type matter in a suitable frame and place it on the press.

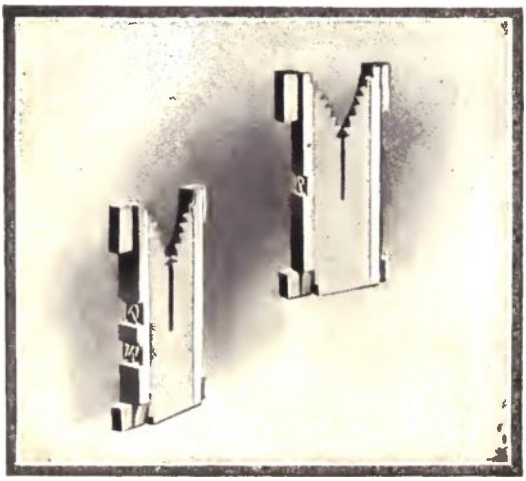
Setting up the type and printing does not complete a printing job. There still remains another task for the printer to do. He must take the type out of the clamping device and place every individual type back in its proper place, so that it will be available for the next job. Obviously, it would be foolhardy to use the type but once and then discard it.

The typesetting machine was a necessity. It had to come. While typesetting by hand was practicable for small jobs, it was certainly unsatisfactory for large printing jobs such as newspapers and magazines. Not only was it exceedingly costly, but it lacked the speed which daily newspapers made imperative. Despite the many mechanical problems presented in evolving the typesetting machines, the ever-increasing demand caused it—one could say with impunity, forced it—to be invented and subsequently perfected.

The work of the modern typesetting machine is a two-fold one: it casts its own type and sets it up in proper order. And what is more, after the type has been used it can be thrown back into the melting pot of the machine and the metal used over again for the next job. Not only is it unnecessary to take up time in distributing the type, but fresh, clean, sharp type faces are available for each printing job when using the typesetting machine.



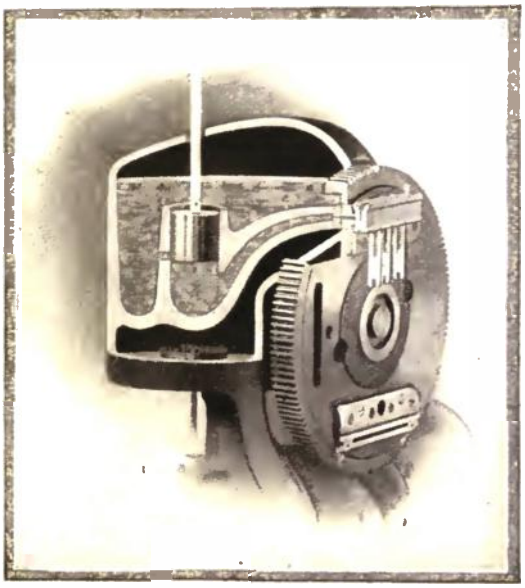
A Line of Matrices and Space Bands as they Appear When Assembled, Ready for Casting.



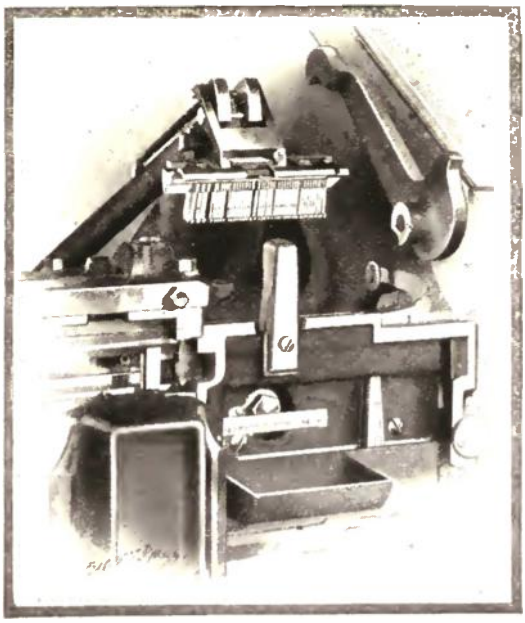
Single and Double Letter Matrices, Showing the Moulds and Teeth Combinations.

Let us examine one of the typesetting machines, the linotype, and study how it performs the various functions which are so human-like: In general appear-

ance the linotype is a very cumbersome machine—and cumbersome it must be for the reason that its operation requires so many intricate and awkwardly-shaped parts. In front of the machine is a keyboard not unlike that of a typewriter, although somewhat larger and containing a greater number of keys. The operator sits before the keyboard and runs the fingers of both hands lightly over the different keys. As he presses them the little brass moulds or "matrices" are released from their respective brass channels and drop on a belt conveyor which carries them to the assembling mechanism. Between the words the operator presses a space bar which causes a steel wedge arrangement known as a "space band" to drop between the groups of matrices forming the words. A bell rings at the end of the line and the pressure of a lever by the operator causes the spacing between the groups of matrices to be automatically adjusted so that the line about to be cast will be of the desired length. The matrices and space bands are then transported to the mouth of the mould and an instant later a plunger pressing downwards in the melting pot causes molten metal to be forced into the mould and the matrices that cap it, the metal being soon cooled into a fairly smooth casting in the form of a slab with the type faces along one edge. Whatever irregularities there may be in the slab or "slug" are subsequently removed by trimming knives, after which the slug is delivered into a tray at the side of the operator.



The Casting Mechanism of the Linotype, Showing the Melting Pot, Plunger, Mouth of Mould and the Assembled Line of Matrices.



The Elevator Arm in the Act of Taking a Line of Matrices which are to be Carried to the Distributing Mechanism.

Meanwhile the operator has forgotten about this particular line and has been pressing the different keys for the next one. At the same time the matrices which have served their purpose are being taken care of. A long arm swoops down from the rear of the machine and picks up the row of matrices, leaving the space bands behind it. The latter are pushed over to one side where they are available for the next call. The matrices are carried upward to a screw conveyor arrangement at the rear of the machine and, one by one, started on a journey. As the different matrices reach a position above the opening of their respective channels they drop into place and are again ready for use.

The foregoing is but one cycle of operation of the linotype machine. The same steps are involved in the casting of each line. The operator keeps right on with his work and the machine automatically takes care of the justification of the lines, casting, trimming and delivery of the slug, and distribution of the

matrices and space bands. It is not uncommon for a machine to have one line of matrices in the act of being assembled, one line being cast and the matrices of a third line being distributed, all at one time. Each of the steps is independent from the others.

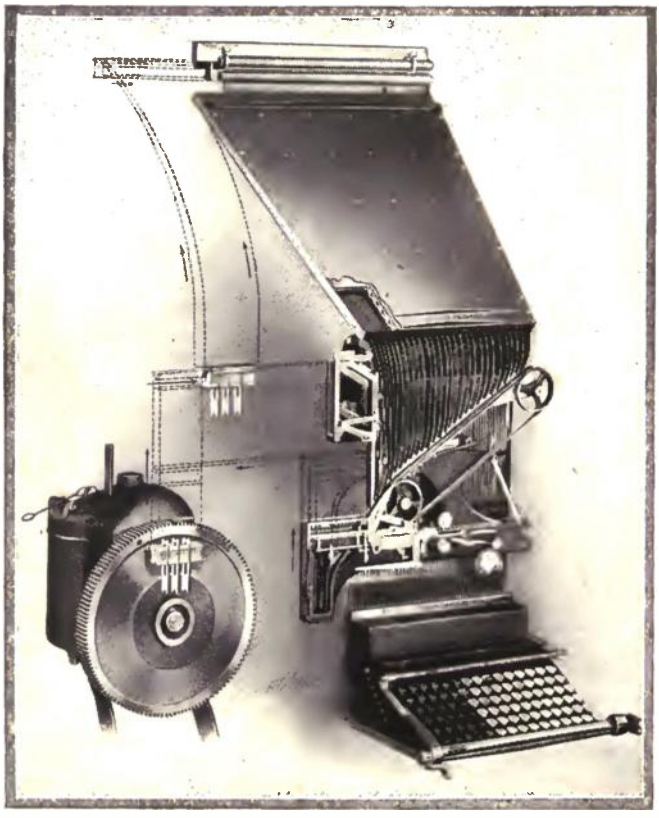
Two questions now remain to be answered: How are the lines automatically justified, and what causes the matrices to drop back in the proper channels? Here are the answers:

The brass matrices have a V-shaped notch, the sides of which are toothed. No two matrices have the same arrangement of teeth, for these correspond to the combination of ridges that run above the screw conveyor at the rear of the linotype. As the matrix with a certain combination of teeth reaches the corresponding combination of ridges, it is released and falls into the mouth of the channel below.

On the other hand, the automatic justification is even a more simple mechanical application, although strange to say it was the last problem to be solved in perfecting the linotype. The secret of automatic justification is found in the space bands, each of which consists of two wedge-shaped pieces held together. The wedge sides slope in opposite directions so that upon pressing the movable member upward the device spreads and becomes wider. The two outer sides are straight and parallel. Thus, when the matrices and space bands are assembled the pressing upward of the movable members of the space bands causes the spaces between the groups of matrices to be equally adjusted and to fill out the line.

As wonderful as the linotype machine is, it has a competitor in the monotype system which vies with it in mechanical ingenuity. The latter consists of two separate units—a keyboard and a caster—and its operation is as follows.

An operator presses the different keys of a keyboard in much the same way as in typewriting, causing a paper ribbon to be perforated with a series of holes, giving it the appearance of a piano-player record. The flashing and ringing of a lamp and bell inform the operator when the end of a line has been reached, whereupon he or she glances at the indicators on the machine, which indicate what keys to press in order to justify the line. After the operator has finished with his work, the paper ribbon is removed and brought to the caster.



A Diagrammatic View of the Main Parts of the Linotype Machine, Showing the Various Steps in One Complete Cycle of its Operation.

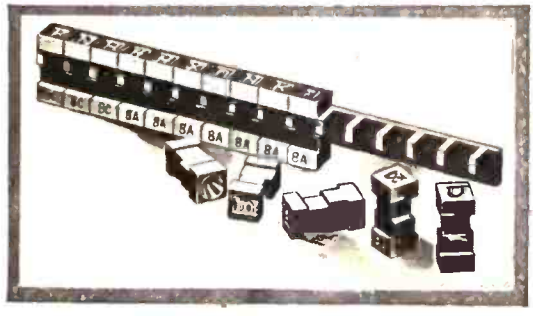
The monotype caster is a type foundry in miniature, with its melting pot, moulds and smokestack for carrying away the lead fumes. As the paper ribbon passes through the mechanism of the caster the different pieces of type are cast and assembled on a brass tray in the proper order, line by line. Each type face is a separate block of metal as in handsetting. Between the groups of type forming

A Typical Newspaper Composing Room, in which a Number of Linotype Machines are being Used to Set up the Reading Matter. Many Linotypes are required by Every Daily Newspaper, Because of the Vast Amount of Type Matter that Must be set up within a Limited Time.

the words are inserted the spacing blocks of proper width, the size of these having been determined by the keyboard.

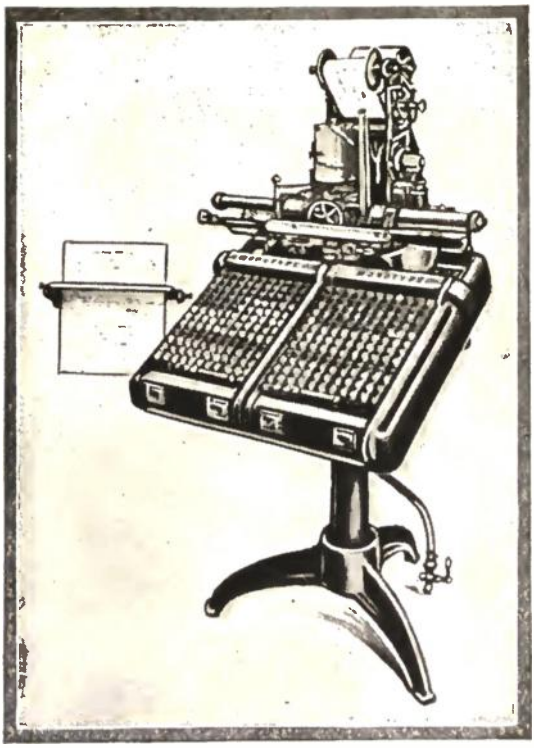
The mechanism of the monotype caster is not difficult to understand. Its moulds are quite different from the matrices of the linotype, for they are square blocks of brass with the intaglio letter at one end and a cone-shaped hole at the other. The moulds are assembled in a framework which is so mounted that it can be moved right or left and forward or backward. In all there are 225 matrices—fifteen on a side—held in the frame. Automatically the mechanism moves the matrices to bring the desired one in position above the mould, and then clamps it firmly over the mould; a pointed plunger pressing down in the cone-shaped recess of the matrix centers the mould and holds it in place. Compressed air passing through the holes in the perforated paper ribbon is the agent that moves the matrix frame, just as the same force operates the different hammers in a player-piano. When once the matrix is in position, the width of the mould is adjusted and molten metal then forced in from the bottom. It soon cools and is delivered on a brass tray in the form of a perfect type, along with its companions and spacing blocks that form the line.

The remarkable feature of the monotype machine is that the paper ribbon is a permanent piece of work, good for all time. It may be kept any number of years and then passed through the casting machine if the type is desired. Likewise, any number of times the type may



Matrices or Moulds of the Monotype Caster, Showing the Method of Holding Them in a Frame.

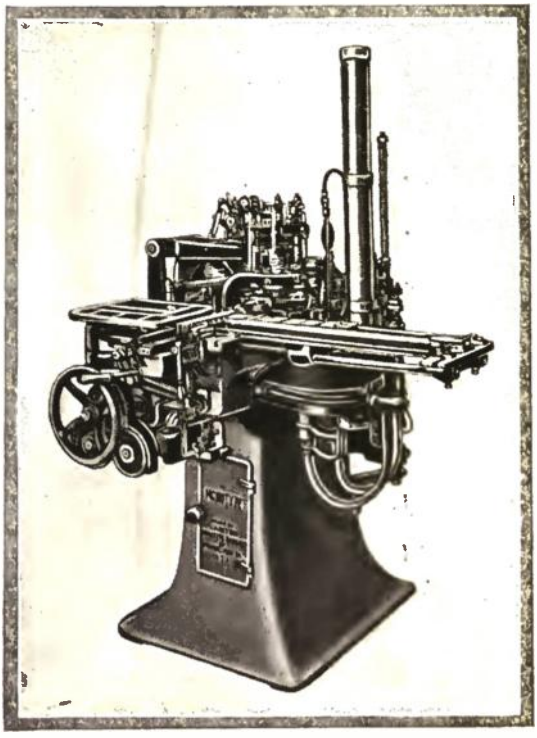
be set up in any size and style of type face by passing the ribbon through the caster as many times. And again, the keyboard, which occupies but a trifle more room than the conventional typewriter, may be used in any office or home, if need be, and the caster installed in a distant printing office. The records can be sent any distance through the mails and the type set up at some far-off point.



A Monotype Keyboard which Perforates a Paper Ribbon that is Afterwards Placed on the Casting Machine.

The linotype and monotype machines have their own individual fields and followers, as is the case with everything else. As a general rule, however, the former is largely employed for newspapers and magazines, while the latter is most popular in book and catalogue printing.

As in most other lines of industry, the human element is slowly but surely being eliminated from the printing trade. What was formerly costly manual labor has now been replaced by mechanical contrivances that invariably perform



A Monotype Caster which Sets Up the Type According to the Arrangement of the Perforations in a Paper Ribbon.

their tasks more economically and efficiently—and do not make mistakes. Truly, the day of the man who works with his hands only is limited—the competition of mechanical help is daily becoming more formidable. Machinery is bound to replace everything except brains.

INSPECTING A WELL

A novel method of examining the sides of a deep well is that devised by the superintendent of the water-works of a western town.

A well 1,400 feet deep was found to be yielding impure water. The superintendent ordered the pump to be removed, and, lowering a cluster of electric lights slowly into the well, he inspected the casing carefully with a fieldglass as the lights moved along. At a distance of 110 feet down, where the diameter of the casing diminished from 12 inches to 9, the packing was seen to be loose. The entrance of surface-water at that point was the cause of the trouble.

If you enjoy THE WORLD'S ADVANCE, tell others; if not, tell us.

MUNICIPALITY MAINTAINS "MOVIE" DEPARTMENT

A NEW use has been found for the motion picture—that of advertising a municipality. A motion picture advertising department has been made a permanent feature of the work of the Chamber of Commerce of Redlands, California, which probably is the first city in the world to establish and maintain a department of this character.

Purely as an experiment this motion picture advertising was put in effect about a year ago. At that time a special event held in the city was pictured and the results obtained by this picture being thrown upon the screens in that section of the country were so very remarkable that the promoters were persuaded to try something in this line on a larger scale. As a consequence, the citrus business, one of the largest industries in that city, was photographed from start to finish—from the planting of the trees to the packing and shipping of the ripened fruit. This necessitated about three reels of film and was quite an expensive feature, but, we are told, the returns were more than worth the expense and effort.

The method of exhibiting these pictures after they have been finished is of interest. The first move is to show them in the home town, giving each of the picture houses a chance at the pictures. After the home territory has been covered the pictures are shipped to the headquarters of the nearest motion picture circuit, and from that point the pictures are shipped to all of the picture houses on that "beat." When these houses have all shown them, the films are sent to the next circuit, and so on. These theatre men are permitted to run these pictures free of charge, and it goes without saying that they are more than glad to get them. They make great "special attraction" material. The pictures go from circuit to circuit until they are worn out. It might be stated that a picture that was started out about a year ago is still in good enough condition to "show."

The outfit required for this picture work is not prohibitive in price. The camera and complete finishing out cost in the neighborhood of $325. Redlands pays about $150 for the average reel of film of 1,000 feet. This figure represents only the actual cost of materials, however, for a local photographer does the work and in payment for his time and labor he is permitted the use of the picture camera during such times as it is not being used in municipal work. According to estimates received by this motion picture department it would cost between $500 and $600 to take and finish an average reel of this advertising film.

The Vitagraph, Lubin, Essanay and Selig studios will be described in forthcoming issues of THE WORLD'S ADVANCE.

MOVING PICTURES HELPING EDUCATION

A recent canvass made by a New York newspaper of thousands of schools and colleges throughout the United States discloses that these institutions are unanimously in favor of using films for educational purposes. And this is not surprising, in view of the fact that any one familiar with the problem of education has noticed that the eye is able to grasp facts with greater speed and precision than the ear. Furthermore, the impression received by means of the eye is found to be of longer duration.

It is rather unfortunate that scientific films have not found greater use in American schools. A large number of educational films on many different subjects have existed for a long time and are available for the use of schools, among these being reels on geography, history, science and natural history.

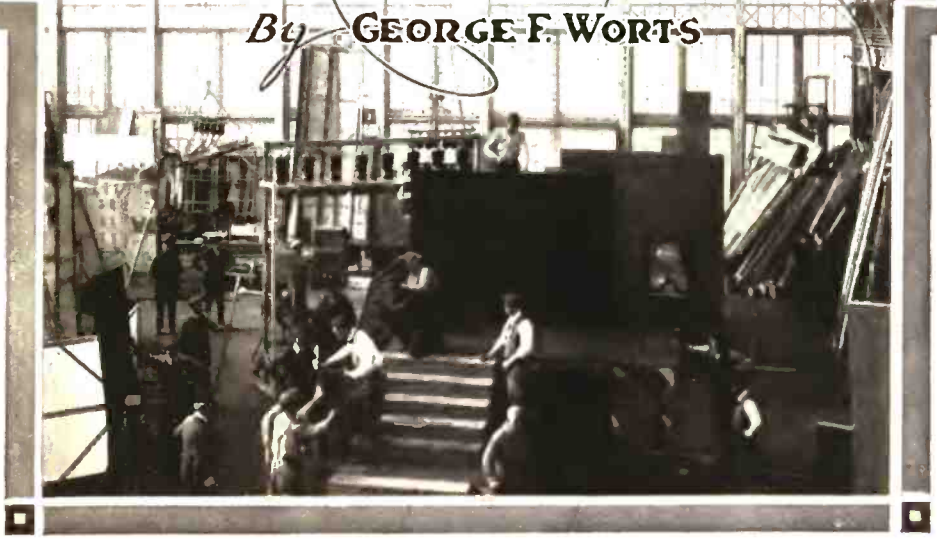
NEW WIRELESS TELEPHONE IN THE "MOVIES"

Aside from being a very interesting serial film, the "Exploits of Elaine" deserves no little credit for introducing many scientific inventions in a startling, yet instructive, manner. There is hardly a single new device that has not made

its appearance in the reels of this Pathé serial. A striking example is presented in a recent episode in which a wireless telephone system of new design is employed by Craig Kennedy, the detective, who is the hero of the story.

REELING the DRAMA in JERSEY

By GEORGE F. WORTS



NEW JERSEY, along the Palisades of the Hudson, is the birthplace and the home of the independent movie, where the first successful efforts to combat "the trust" were made. A half dozen companies produce there continuously. Others come and go over night. A visitor can hardly walk through the streets of this settlement without running the risk of becoming an involuntary movie actor.

"THE CHAMPION idea first saw light when the moving picture trust put me out of business. I had a theatre in Philadelphia, with a strong competitor next door—a larger theatre, which the trust, for some reason or other, seemed to favor more than mine. They showed newer and better pictures—because I couldn't get any others. So I closed up shop, made up my mind to produce pictures myself, and give the independent exhibitor a chance. After several unsuccessful attempts—for the trust was very strong—I finally opened the Champion Studios here in Coytesville. That was seven years ago. Now——"

The speaker, M. M. Dittenfass, manager of the "Champion," leaned from his seat in the automobile, and pointed beyond a clump of trees near the road to

the spidery framework of a huge steel building that could just be seen in the distance.

"That will be the new factory of the Universal," he continued, "the finest moving picture plant in the world. Jersey—along the Palisades—is the home of independent movies, you know. Half a dozen other companies besides ourselves have sprung up—are doing a big business here now."

He smiled. "I'll wager that per square mile, more drama is made and put up in tin cans in this locality than any other place in the world! Down the road a little way is the Solax—just around the bend are the Peerless and Hillit Studios. Others come and go over night. You can't walk through one of the streets in this neighborhood without running the risk of becoming an involuntary moving picture actor!"

A Question of Sunlight

We had drawn up before a long, low yellow building, before which a small wooden sign was swinging to the breeze. It read, simply: "Champion Studios." In the back, a glass-covered structure, rearing to a height of thirty or forty feet, glittered in the warm spring sun like a huge floral conservatory. To all appearances the Champion was a faithful replica of the studios on the Pacific Coast; and, as a matter of fact, the conditions for photography along the New Jersey palisades closely resemble those which exist at Los Angeles.

Actinic conditions, for picture making, so they boast in the West, are the finest in the world. Yet the Jersey producers claim identically the same thing.

"New Jersey sunlight," so one director told me, "cannot be equaled in any part of the world. Italian skies may be blue, but Jersey skies are bluer! We are several hundred feet above the Hudson River, and the air is remarkably clear. Just look at that sky!"

It was a pure, robins-egg crystal-blue, and the sun was dazzling. California and New Jersey, three thousand miles apart by bird line, are indeed remarkably alike in blueness of sky and brightness of sun. Possibly the nearness of the ocean has some influence in both cases.

Under the crystal roof of the Champion, a rural sheriff's office was being erected. Harry Meyers, who follows a double life there as director-in-chief and leading man, was reading a letter aloud in tones unmistakably vehement. This was not a part of the filmed drama at all. He was angry in earnest.

"Just listen to this!" he shouted, waving the letter in the direction of the other members of the company. "You cannot grasp a girl's ankle with a leer—and you cannot spit tobacco juice!"

The letter, we could plainly see, was typed on the official stationery of the National Board of Censorship.

He turned to his leading lady, Miss Thelby. "Rose," he demanded, "did you ever see me grasp a girl's ankle with a leer, or spit tobacco juice in a picture?"

"Of course not, Harry," she laughed.

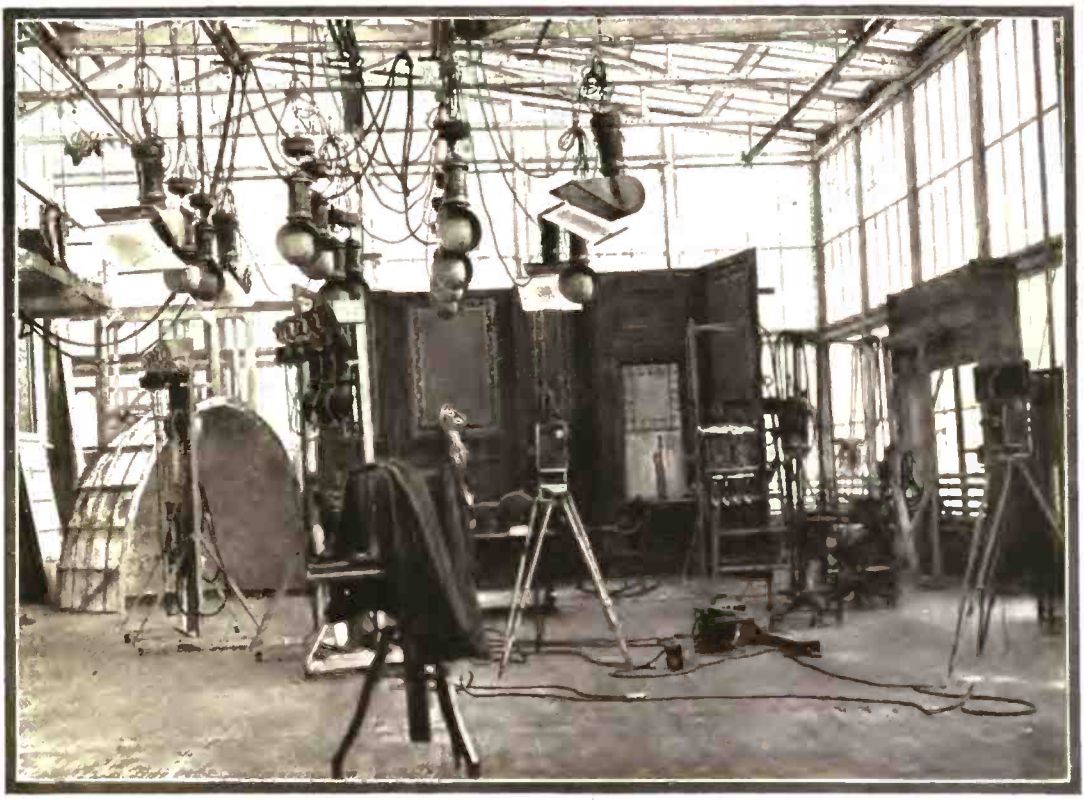
"It makes me tired," he grumbled. "Just because certain so-called actors pull off that rough stuff, we innocents get insulting letters like this!"

Harry Myers is a typical westerner in appearance, although not in reality. He is large and powerful of build, and he smokes Turkish cigarettes incessantly. He was attired, that day, rather curiously—half western, half rural. The net result was largely a problem in the mind of the beholder. A bright red skull cap was perched recklessly on one side of his head. The rest of the costume was made up of a light shirt, open at the throat, riding trousers, cloth puttees and heavy yellow boots.

When I questioned him, he laughed. "Why, I'm a simple little farmer boy, and Rose, over there, fresh from the bright lights of Broadway, is a simple little farmer girl."

In their startling make-up and odd-looking costumes they resembled anything but the parts they were creating. But when I saw the picture in a theatre some time later, the miracle which transpires in the lens—of transforming artificiality and inconsistency into the truest realism—became a little more apparent.

The story is told of a famous actor of the stage who once performed before a camera. The first time he saw the fin-



At the Time the Writer Visited the Solax Studios the Players were Indulging in a Brief Rest Between Reels. The Arc Lights were Extinguished and the Cameras and Stages were Deserted.

ished picture was in company with several friends at a theatre. As the film progressed, an expression of complete disgust settled on his face. Finally, he turned to the man nearest him. "Honestly," he whispered, "if my acting's as bad as that I'm going to move back to the farm."

Nothing but Mistakes!

The majority of movie folk who "see themselves as others see them" do not, of course, view their efforts in quite so bitter a light. But they do see their mistakes more glaringly than the most critical of audiences.

In a miniature replica of a moving picture theatre at the Champion—a projecting room, as it is called—the players are given a free opportunity for self-criticism.

"I call it 'The Chamber of Horrors,'" remarked the leading lady. "No matter how satisfied I am with my part when I'm playing it, a visit to this little room afterwards takes away all the joy!"

We were following a picture in which Miss Thelby played an important part. She was watching the screen intently.

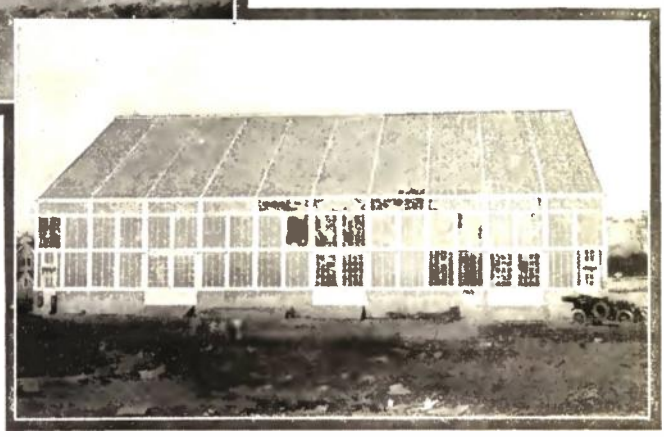
"How do you enjoy yourself?" some one asked her.

"Nothing but mistakes!" she laughed. "I've counted twenty poses so far that should have been different."

The Passing of the "Friendly Studio"

The Champion is one of the few remaining links between the "friendly studios" of a decade ago and the growing factory type of to-day. Its atmosphere is warm and personal. For that reason, if none other, Champion films are bound to have a warmth of personality which one finds lacking to a sad extent in the majority of "factory brands."

Members of the charmed circle at the



Above: The Solax Finishing Plant, Which Is One of the Most Compact and Efficient in this Country. At the Right: A Daylight Studio Which Might Well Be Taken for a Huge Flower Conservatory When Viewed at a Distance.

Champion know each other by first name only—with the exception of Mr. Dittenfass, who demands respect not only as the visible tie that binds the Champion to the Universal system, but as the paternal head of the Champion family.

They were staging a rural scene on the road leading towards the Solax studio when I last saw them. Harry, in his bright red skull cap, was giving Charlie, the placid cameraman, instructions, while Rose, the leading lady, from her perch on a fence rail, was laughingly advising several wide-eyed Coytesville school girls just how to become movie actresses.

Siberia à la Jersey

The Solax studios were indulging in a brief rest between the reels of a lengthy film-version of Service's poem, "Dangerous Dan McGrew." The huge crystal-roofed studio was nearly empty. A bank of flaming arcs, unlighted, stood in one corner with a camera on its brawny tripod, while, at the other end of the room, two property men were at work, one on an eskimo igloo, the other stuffing a dummy to be used in a death leap scene.

The Solax Company specializes during the winter months on Alaskan and Siberian pictures. To these, the rigors of the Jersey winters and the ruggedness of the Jersey landscape lend a surprising amount of assistance. An escape from Siberia, which we saw in the projecting room, was realistic enough to satisfy the most doubting of audiences.

A Stage that Follows the Sun

Probably the most ingenious feature of the Solax plant is an outdoor revolving stage. The platform is pivoted in the center to a block sunk in the ground. It revolves on wheels on a circular steel track. By the use of this stage for a long act, the sun, as it moves in its path across the horizon, can be followed, and the usual undesirable shadows are thus avoided.

Near the revolving stage was a large wood box which appeared to have been at one time a swimming tank in miniature. A smaller box was connected to it by a large pipe, and elevated a few feet above the ground. These tanks, so the director explained, were recently the "props" for a prison picture in which a

convict escaped through a sewer. The large tank was painted to resemble a prison cell and the smaller one filled with water.

The actor-convict broke the thickness of stone which covered the opening of the pipe, and escaped by holding his breath and crawling through the rushing water into the upper tank. The feat was daring, unquestionably, but not nearly so thrilling as the finished picture, which, of course, did not disclose the trick.

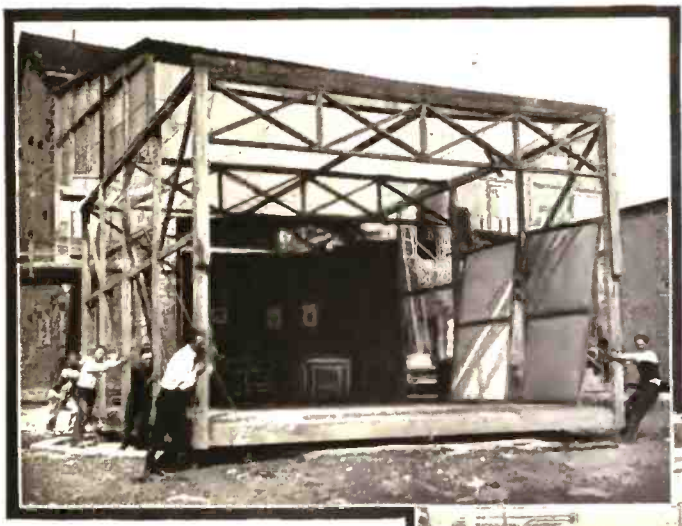
A Talk with a Pioneer

Just across a narrow driveway from the executive office and studio of the Solax is situated a low brick building where the films are developed and printed. It is one of the most compact finishing plants in this country. Thousands of feet of film are turned out daily, an amount which represents not only the product of the Solax, but the output of other companies in the vicinity. A small projecting room, where the positives are examined by censors, is in one corner of the building; developing, printing, drying and finishing rooms fill up the remainder of the floor space.

The films are developed on wooden racks in deep metal tanks, and dried in an adjoining room on immense web-like reels, which are revolved slowly by electric motors.

The Technical Director, Mr. F. Doublier, who is the guiding genius in the handling of the films, was one of the first men to ever operate a moving picture camera. He was a pioneer with the Lumieres of France, and he has a fund of interesting and amusing anecdotes of the early days of the motion picture.

"I took one of the first moving picture cameras," he remarked, "on a trip through Europe and the Orient. Of course, we had no such elaborate printing and developing machines as these. I developed films in pails on the floor of my bedroom and printed by the light of a kerosene lamp. I travelled through Siberia—China—Turkey, and when I returned, I showed the pictures in many cities of Russia and the Netherlands. In Moscow and Amsterdam, especially, the



At the Left: A Stage That Follows the Sun—the Platform Revolves on a Circular Track. Below: Behind the Scenes at the Peerless Studios. Here Are Scene Painters at Work on Backgrounds for Coming Productions.

films were very much in demand."

"Were the audiences afraid at first?" I inquired.

"Afraid! I should say they were! I recall one film that stampeded nearly every house. It was a picture showing the Nord Express flying into the station at St. Petersburg. I took the picture with the train coming head on at full speed. When the audiences would see that train rushing down the screen directly for them, they would shriek, and run pell-mell out of the theatre. I had to stop showing it finally; it spoiled my business!

"It has been interesting," continued Mr. Doublier, "to watch the wonderful growth of the moving picture industry and particularly the improvements in moving picture machinery. Just look at these machines—" He indicated, with no little pride, a clattering group of automatic printers. "They turn out miles of film a week. We often call a day's work from seven in the morning until two the next morning. It's a little different from the good old days with Lumiere!"

A Star Who Did Not Shine

A brisk, fifteen minute walk through a farm yard and along an interurban car track separates the Solax plant from a group of new buildings, whose shimmering crystal roofs and walls mark them, even from a distance, as movie studios. Down the street which leads to these studios—the Hillits and the Peerless—a girl, whose poise and trimness stamped her, certainly in these parts, as a movie actress, was walking rapidly. Our meeting was a coincidence. Just as I was about to pass her, a sharp explosion sounded in the road beside us—a street gang was blasting a ditch for a pipe line. She turned a pair of startled, well-trained eyes upon me and gasped: "Is there any danger?"

The foreman of the gang shouted, just then, that the blasting was over, and that we could proceed. I asked my companion if she were with the Peerless.

"No—not yet," she replied. "I have been with the Solax—I've just put on 'Dan McGrew.'"

"Did you by any chance play the part of Lou—the heroine of the poem—the lead, of course?"

"Oh, yes, that was my part."

We passed the first of the two Hillit Studios, which was being refinished for rental. The manager of the "World Comedies" Company, which occupied the second building, was conversing with one of his directors when we came up. He nodded brusquely to the girl.

"Anything open to-day?" she asked.

"Nothing doing," he replied coldly. "Better try the Peerless." The girl left abruptly.

The manager jerked his thumb towards her. "Some of these third rate ingenues who try to put across the Mary Pickford impressions make me tired," he grumbled.

"I thought she was playing a lead with the Solax," I put in, surprised.

"Her?" he exclaimed in disgusted tones. "Why, she's nothing but a filler. We let her play some unimportant society stuff once in a while. Movie actresses as a rule are the most imaginative and the most unreliable—"

"You're wrong," interrupted his companion, laughing. "One of your most dependable actors threw up his job this afternoon when we were in the midst of an important road scene—spoiled the day!"

"Who did that?" demanded the manager.

"The dog! He absolutely refused to work—ran away with six understudies that were trailing us!"

Trying Out a New Face

A few minutes later, while the manager was eating a hasty afternoon lunch consisting of a ham sandwich and a pail of coffee, having seated himself on an upturned box in one corner of the littered studio, the director, whom, I had learned, was Thomas Jefferson, son of the famous actor, was testing an applicant's ability of facial expression.

She was a pretty girl, with a great deal of confidence; but she was totally unprepared for Mr. Jefferson's rather startling trying-out methods.

"Sit down before the camera," he requested her, "and when I talk to you, make your facial expressions conform instantly to the character of my conversation."

He adjusted an arc lamp, so that its rays concentrated on her face. The camera man began turning the crank.

"Oh, Miss Jackson," exclaimed the director, his voice brimming with stage-pathos, "just think of a poor old man—with white hair flowing—walking across the path of an approaching street car! See that car! Good heavens! It's bearing down upon him—it's going to hit him!—is he being ground by those merciless wheels!—Ah! The car has stopped! What's that? Ha Ha. Why, Miss Jackson, the old man has jumped up and he's beating the motorman over the head with an umbrella! Stop, camera!"

"Do you realize what facial stunts Jefferson made that girl perform—in that short trial?" the manager was saying between gulps of coffee. "Something like this: comprehension—sympathy—excitement — fear — indignation — horror — remorse — relief — amusement — and various shades in between. The more numerous and the more distinct the facial expressions, the greater are the actor's or actress's chances for becoming famous. The shape and size of the face are important, too. On the screen, a thin face looks drawn and haggard; a fat one, balloon-like. The girl that Jefferson has been trying out is a favorable prospect. The film, however, may prove that she is useless for our purpose. We will develop it in our darkrooms to-night, look it over and give her our decision to-morrow morning. We try to do everything on the same short-cut yet effective scale as that. Our production consists of nothing but comedies—and we have revolutionized the "Broadway Stars" idea in films—by showing stage favorites in single reels. Many producers have the mistaken notion that you can't put a Broadway star on the screen and make money unless you show several miles of him. Our pictures—and our pocketbooks—prove just how foolish that idea is!"

Above: A Drying Room in Which the Wet Films Are Dried on Wooden Drums. In the Oval: The Inspecting Room—One Corner of the Systematized Solax Finishing Plant.

Above: Method of Developing the Films at the Solax Plant. The Strips Are Placed on Wooden Frames and Dipped in Narrow Tanks of Chemicals.

Watchful Waiting

Around the corner from the Hillit Studios looms the gigantic concrete-and-glass home of the Peerless. This is one of the distinctly factory types of studio, with a time clock, an appreciable office

force and a waiting-room-full of actors and actresses. Here I again saw the "leading lady" from the Solax studios. She was sitting haughtily aloof from the others. In fact, the majority of these position seekers seemed to have affected a haughty and a rather bored attitude. However, when a director would enter the room, their expressions would promptly become galvanized into eager animation. They represented a variety of types, and they are known by their particular type much more commonly than by their names—sober-faced English butlers—young and pretty school girls—pathetic looking "Grandmothers" —stolid Irishmen—apathetic Italians—and even an occasional ruffian.

The path of a moving picture player is not an easy one to travel. The supply greatly exceeds the demand. Unless a player is well-known, his lot is that of the crowded waiting room.

The New Idealism of the Movies

It was nearly closing time and my trip through the studio was a flying one. The Peerless is done throughout on the factory plan. The studio is enormous—a spacious, glass-covered affair, with ten thousand square feet of floor area, providing ample room for the production of a half-dozen plays simultaneously. "The Pit," "Trilby," "Love in the Moonlight," "The Boss," and "An Indian Idol"—all featuring well-known stage players—were being photographed that afternoon. The result was a scene of feverish activity. Directors at temperamental white-heat were urging on their little bands of actors, to conclude their particular sets before the fast reddening sunlight should die away entirely. In the darker corners, stacks of vapor lamps were shedding their ghostly light already.

"We are compelled to work at top speed every minute," remarked my guide. "Weeks are required to finish a long play —and it is essential that the pictures reach the public before the plays become stale."

The pay-roll of the Peerless aggregates thousands of dollars weekly, chiefly because of the costly services of the principals.

The Peerless ideal is shaping towards a higher dramatic standard of filmed plays. D. W. Griffith, probably the highest authority in the motion picture business to-day, predicted recently that five dollar photoplay productions will come as a matter of course—the result of public demand and the sincere efforts of the producers to meet it. That is one reason why the theatre with the screen is rapidly gaining ascendancy over the theatre with the stage.

The policies of the directors at Movieville are widely varied; yet they all point towards a higher dramatic standard of picture plays in general. Big things can be expected from the glistening crystal buildings along the Jersey Palisades, because big things have been done in the past. A tremendous initiative took root there seven years ago—and it has borne fruit in an astonishing fashion ever since.

MOVING PICTURE ACTING NOT ALWAYS FUN

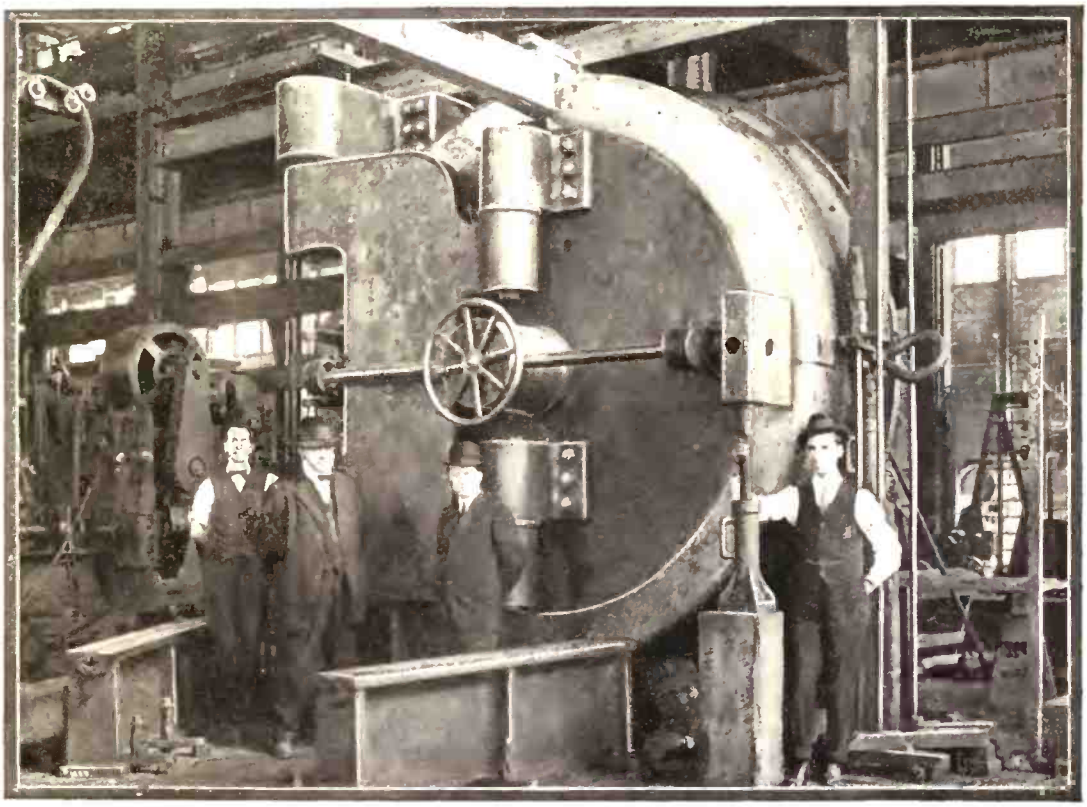
Missing death by a hair in a desperate race with a thundering express train, as well as dropping nearly one hundred feet from a racing motor car over a cliff into a raging torrent, are two of the remarkable feats that have had to be undertaken by actors in the production of the serial picture "The Diamond from the Sky," now being produced by the Flying "A" studio. In the matter of the automobile being driven right across the track and in front of a fast approaching train, the main feature in staging this picture was accuracy. The speed of the train as well as the automobile had to be carefully timed. In the latter picture, however, it required sheer pluck on the part of the actor. While the machine was dropping over the cliff the actor disengaged himself from his seat and leaped out of the machine. He alighted with a splash in the water some distance away from the automobile.

A MODERN BANK VAULT DOOR

The largest circular vault door and vestibule ever constructed were recently built at South Bethlehem, Pa. The enormous size of the safe may readily be imagined from the illustration in which several men of average size have posed to facilitate comparison by the aid of the eye.

In figures the vestibule is 10 feet 8 inches in diameter, the size of the door proper adjusting of which will permit the door to be swung open.

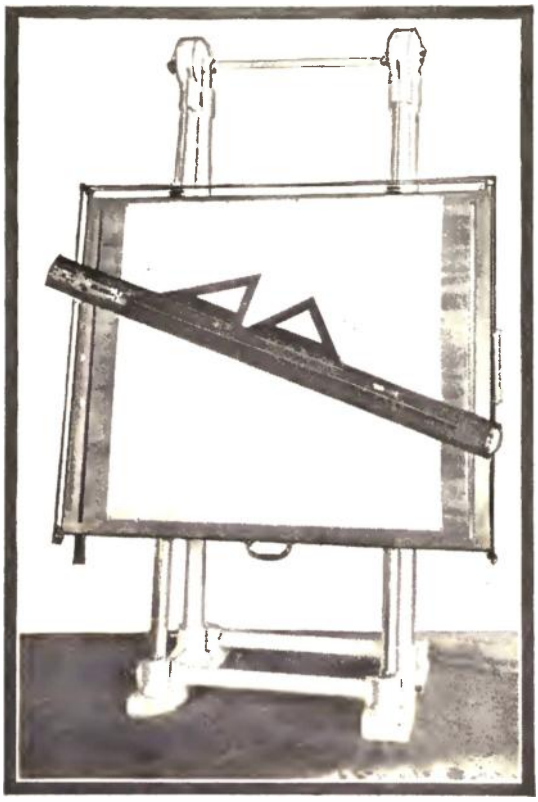
The door swings on a seven-ton cast steel crane-hinge and is so well balanced and adjusted that it can easily be swung open by hand. In closing the door it is forced to a watertight seat by means of heavy pressure mechanism, thus preventing the introduction of any liquid explosive. The main vestibule weighs 51,000 pounds, while the main door with the bolts and mechanism weighs 80,000



The Largest Circular Vault Door and Vestibule Ever Constructed, on the Floor of the Factory, Ready for Shipment. So Wonderfully Balanced is the Huge Door that it May be Swung Open by Hand.

is 8 feet 8 inches outside diameter and 7 feet 8 inches inside diameter, or clear entrance through the vestibule. The door is 45½ inches thick and is controlled by twenty solid steel locking bolts 5 inches in diameter, which are in turn controlled by the latest design timelock having four separate movements. The operation of any of these movements releases the mechanism, which in turn is again checked by two of the largest and most up-to-date combination locks, the pounds. The emergency vestibule alone weighs 40,000 pounds. The resistance one would encounter by trying to drill the metal may be estimated at about 2,880,000 pounds per linear foot.

If you enjoy THE WORLD'S ADVANCE, tell others; if not, tell us. Have you any suggestions to offer? The magazine is edited to please its readers and meet their requirements. Accordingly, suggestions are welcome at all times.



Although a Radical Departure from the Usual Practice, the Vertical Drafting Board has Many Distinct Advantages.

A VERTICAL DRAFTING BOARD

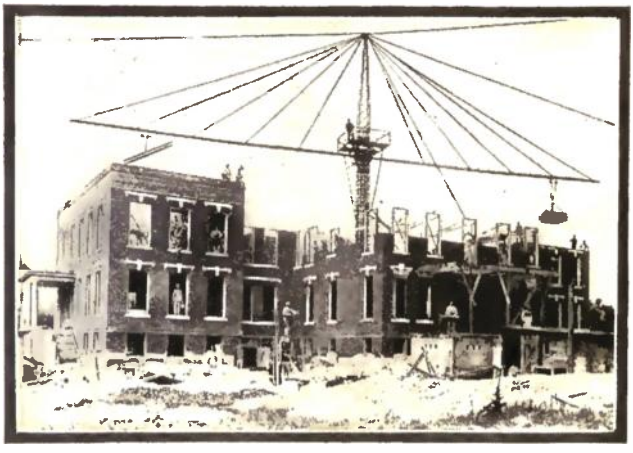
Vertical drafting boards have several distinct advantages over the horizontal type, and they are being adopted to an increasing extent in the most up-to-date drafting rooms. A new vertical board has been devised which permits a draftsman to work either sitting or standing. From any position he can bring any section of the drawing before his eyes. The board is fixed at an angle which has been determined by scientists and engineers who have been using the vertical board for years. The drawing implements are placed on a small shelf which moves with the parallel rule, many unnecessary movements being thus saved. An advantage of this arrangement is that the tools are not in the way and that, quite contrary to the usual custom, the drawing is visible and not littered with tools, papers and dirt.

It will be seen that the rule can be set at an angle and moved up and down parallel to whatever position it was set in originally. The balancing mechanism is concealed and moves noiselessly. The frame is of enameled metal and can be dissembled easily.

A REVOLVING CRANE MAST

In an endeavor to employ the most economical method to handle the stone and concrete work as well as the bricks, a middle west contractor designed and used a revolving mast crane with a cantilever boom in building a school. So successful has this device been in the construction of this building that a patent has been applied for covering the use of this style of crane in constructional work.

As will be seen in the accompanying illustration, the school under construction extended over quite an area. However, by the use of the revolving mast crane with cantilever boom, it was found possible to place cut stone at any desired spot and at about one-third of the estimated cost. In placing the cut stone the first operation was to lift it high enough to clear the walls, revolve the crane to the proper position and then run in the trolley over the spot desired. The motive power was supplied by a five horsepower motor at the base of the mast.



A School Building Being Erected with the Aid of a Revolving Crane Mast. Much Time and Labor are Saved by the Use of this Equipment.

Extremely delicate controls permitted the work to be carried on with the greatest speed and accuracy.

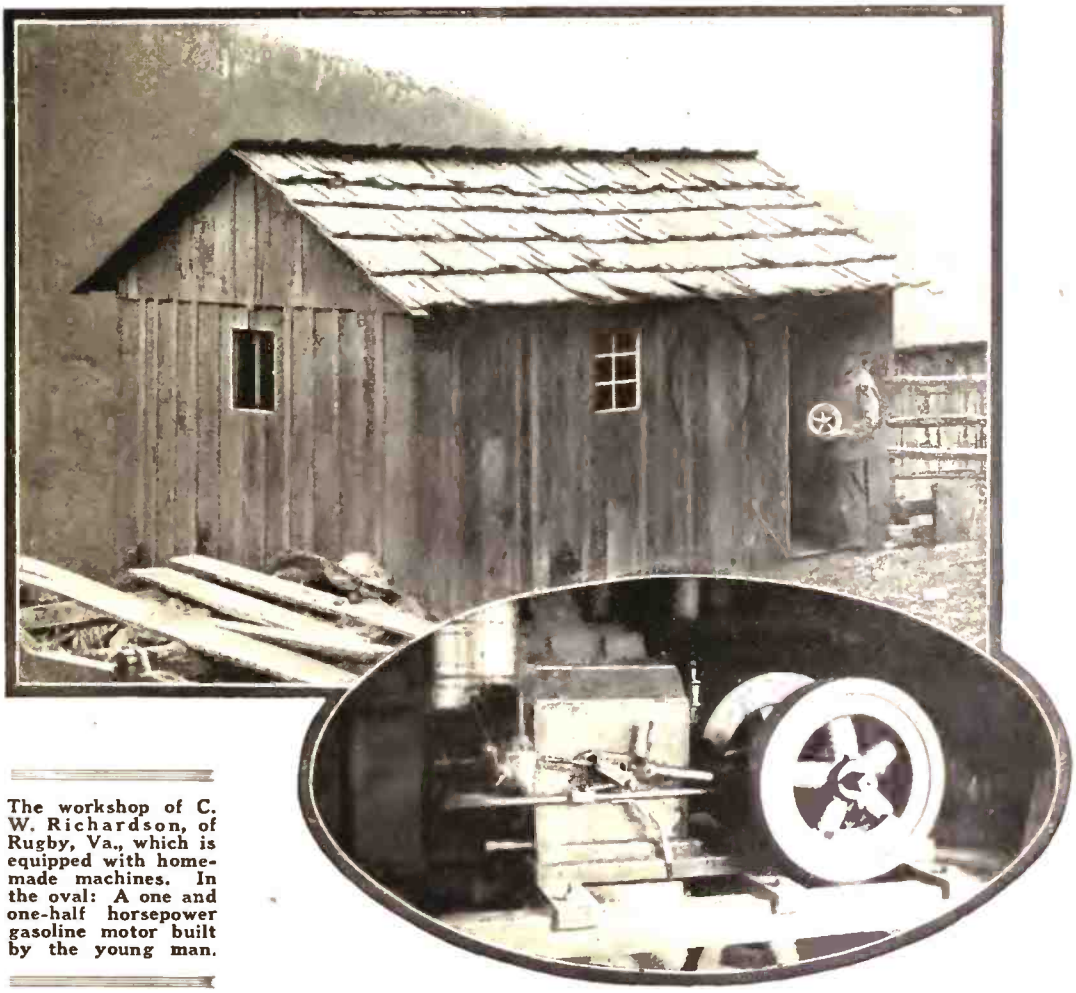
A MARINE HARVESTER

Not long ago there was placed in use at San Diego, Cal., the first sea-mowing machine for the purpose of cutting the millions of tons of kelp and seaweed that grow along the coast. A gasoline-launch was fitted with a horizontal jack-shaft revolving at right angles to the keel. Two vertical shafts were fitted with four-foot blades that revolved at high speed ten feet below the surface.

The mowed kelp floats ashore, is taken out and dried, and later is hauled to a factory to be converted into fertilizer.

BUILDING MACHINERY FROM BOOK AND MAGAZINE INSTRUCTION

Considerable credit is due C. W. Richardson of Rugby, Va., for the ingenuity he has displayed in building his own workshop and equipping it with a modern set of hand tools and machinery. While this young man has not had the advantages of a technical education, he has acquired a vast amount of knowledge from books and magazines, which has enabled him to construct his shop and its equipment. At the beginning he had at his disposal a few hand tools, a small foot-driven engine lathe and a buzz saw. That he made the utmost use of this crude equipment is proven by the fact that he has already built a practical 1½



The workshop of C. W. Richardson, of Rugby, Va., which is equipped with home-made machines. In the oval: A one and one-half horsepower gasoline motor built by the young man.

horsepower gasoline motor which he now uses to drive his machinery. Aside from the engine, he has constructed two phonographs, numerous telephones and several other instruments. His work has also resulted in the invention of a governor on which he has secured a patent.

THE STUDY OF GEOGRAPHY MADE INTERESTING

In order to make the study of geography a more interesting subject to the youngsters, a teacher of Southern California has designed and built a clever electrical map which he has found very successful in use.

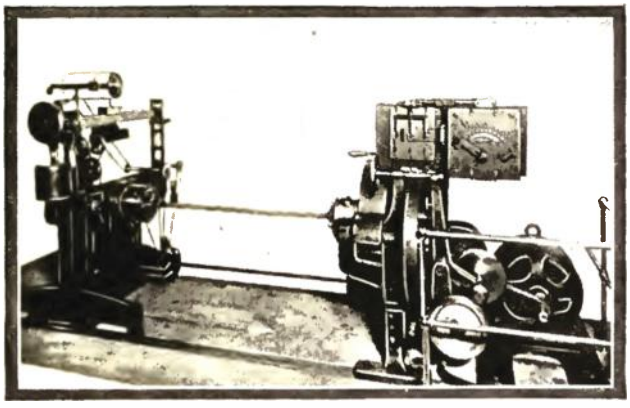
The particular subject in which this teacher is interested is Palestine, as will be seen from the illustration. However, the idea can be extended to a map of any other part of the globe. The location of the various cities, rivers and mountains is designated on the map by brass-headed tacks which are connected by wires to a switchboard bearing the geographical names. An indicator of suitable form and having an electric bulb attached to its extremity is also connected in the circuit. The bulb is enclosed in a wire cage which serves the double purpose of protecting the bulb and as a means of making contact to complete the circuit.

By the Novel Application of Electricity, the Teaching of Geography is Made Attractive to the Pupils.

When the map is to be used, one boy acts as switch tender. The teacher asks another boy to locate one of the cities or spots figuring on the map. Meanwhile, the boy to whom the duty of switch tender has been assigned introduces a plug into the switchboard at a point which is labelled with the name called out by the teacher. The answer is given by the boy not in words, but by placing the extremity of the indicator at the right point in order that the cage containing the electric bulb will come in contact with the tack identifying the city or other point to be found. If the pupil is correct the contact will be established and the bulb will illuminate the spot. Should he fail to select the right location the bulb will not light.

There is nothing complicated in the construction of the electrical map, and one may readily be made by any person possessing a working knowledge of electricity. If desired, the electric light may be replaced by a buzzer or bell, or, if the most striking result is sought, both the light and a buzzer or bell may be employed together. The suggestion this map offers may be applied to other subjects in which charts are employed, with equal success.

It is announced that electric-pneumatic brakes are to be used on the passenger trains of the Pennsylvania Railroad.



A Machine for Testing Strength of Steel, which has a Capacity of 230,000 Inch Pounds.

TORSION-TESTING MACHINE

One of the interesting exhibits at the San Francisco Exposition is a machine for testing the twisting strength of steel, which records autographically the torsion curve of the piece of metal under test. Heretofore this measurement has been calculated, with more or less accuracy, by the person making the test. It has a capacity of 230,000 inch pounds and will test specimens ranging from one-eighth of an inch to two and a half inches in diameter, and of any length up to eight feet.

ELECTRICITY EVERYWHERE

A house that is being exhibited at the Panama-Pacific Exposition is equipped with labor-saving devices throughout, all of which are driven by electricity. The kitchen is equipped with electrical devices of all kinds, a potato peeler and refrigerator. The dining room is arranged to show how light lunches can be prepared with electric chafing dishes and stoves. At the rear of the house is an electric workshop and garage ready for recharging batteries.

THE TREE SUMMER SEAT

The fact that summer rest seats do not have to be expensive to be attractive is demonstrated in the seat seen in the accompanying illustration. The seat has been termed the "Tree Summer Seat," from the fact that it is really built around a tree which was at one time growing at the point where it now stands. Upon finding that the tree had lost all signs of life, the gardener in this park devised the novel idea of turning the dead trunk into this artistic seat, rather than dig it out bodily.

Suiting the action to the decision he cut the main limbs off about six feet from the ground and to the top of these fastened a pretty roof, which is made of palm branches. This done, the seat, which runs all around the trunk at a distance of about a foot and a half from the ground, was made out of sections of palm branches. In addition to being inexpensive, this seat is one of the most attractive in this very elaborate park.

This suggestion might well be followed by others. It is not an uncommon sight to see unsightly dead trees in public parks, which might be converted into useful and ornamental objects instead.

An Attractive Summer Seat and Shade Built About the Trunk of a Dead Tree.

The Lifting Power of this Deck Girder Bridge is Furnished by a Gasoline Engine.

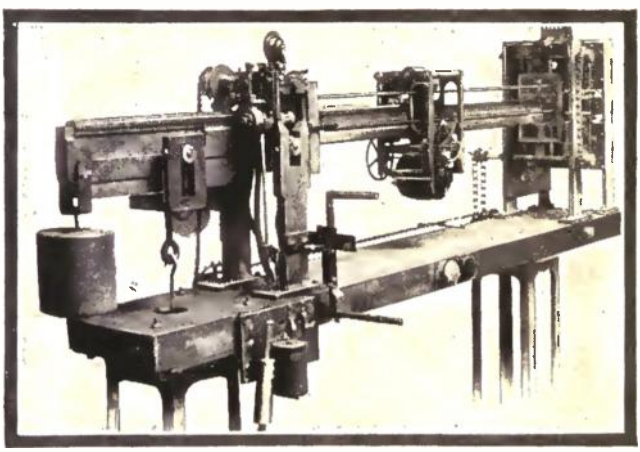
GASOLINE ENGINE OPERATES DECK GIRDER BRIDGE

There has recently been constructed for the Canadian Northern Railway at Kamloops, British Columbia, a deck girder bridge 1,209 feet long and a deck girder lift span 93 feet long. There are 12 fixed spans also of 93 feet length. Approaches at both ends of the bridge total about 1,100 feet. The lift span weighs 118 tons and is fully counter-weighted. The sixteen 1¼-inch lifting cables are equalized in the attachment to the span. Centering castings provide for keeping the span in proper alignment as it comes down to bearing and also take the longitudinal braking thrust. The lift of the span is 53 feet, giving a 55-foot clearance above high water. The motor is capable of raising the span in 100 seconds. The lifting power is a gasoline engine, which, with all the machinery except the operators' levers, is located below the deck, at the middle. Limit switches coming into operation near the ends of travel of the span control the igniter circuit of the engine.

A SCALE IN WHICH ELECTRICITY DOES ALL THE WORK

A scale engineer of Columbus, Ohio, has recently demonstrated the first working model of an automatic weighing and recording scale. It is stated that his invention bids fair to revolutionize the manner of weighing coal, iron, lead, zinc, copper and other mined products. His scale can work as high as twenty loads per minute, and have each weighing operation accurate to within an ounce on each 100 pounds, while printing at the same time a ticket showing each weight and also recording on a tape the consecutive number of each load and its weight. The scale is operated by electricity and thus eliminates all chance of mistakes common to human operatives.

The scale is said to be not only entirely automatic in operation, but also fool and cheat proof. It is believed that the use of this type of scale in the Colorado coal mines will go a long ways toward settling misunderstandings between miners and mine owners, now so commonplace.



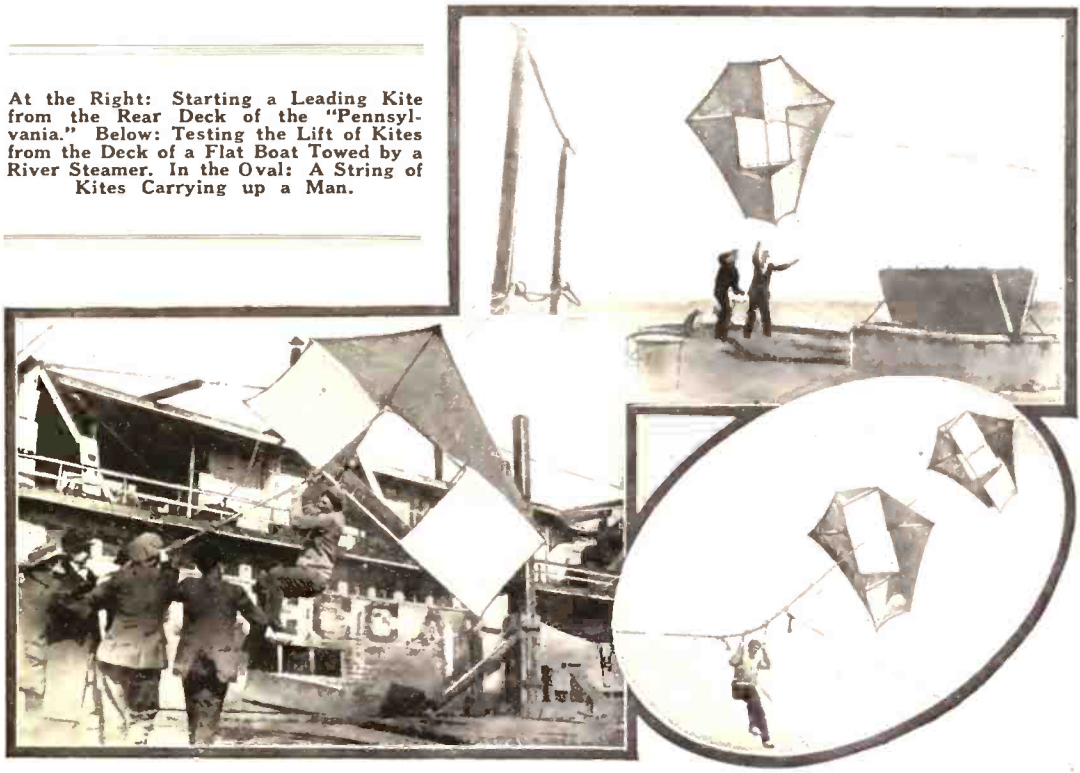
A Scale in which Electricity Does all the Work, Both Automatically Weighing Truck Loads and Keeping a Permanent Record.

Combating Submarines with Kites

By Stanley Yale Beach

THE sinking of the *Lusitania* has caused many inventors to suggest new means for protecting ships from attacks by submarines. Among the best suggestions is that of Mr. Samuel F. Perkins of Boston, Mass., who proposes to use kites to detect the approach of submarines.

The following experiments carried out by Perkins show that he was able to obtain practical results without meeting with any serious accident: At the Harvard-Boston Aero Meet, held in September, 1910, he sent up a number of men to a height of about 200 feet by means of a string of from six to fifteen of his huge 18-foot aeroplane kites. At Forest Park, St. Louis, on Thanksgiving Day, 1910, he was raised to a height of 350 feet by his kites, breaking all previous records; and at Los Angeles, on Christmas day, he ascended to 400 feet, and for the first time sent wireless messages. At San Francisco Aviation Meet, in January, 1911, Perkins demonstrated his man-lifting kites for army purposes, and in a duration test he remained aloft for 1½ hours at a considerable elevation. Finally, in September, 1911, at the Nassau Boulevard Aviation Meet, over 350 people were taken aloft by fifteen kites in a single afternoon, including all the aviators who participated in the flying events of that meet.



At the Right: Starting a Leading Kite from the Rear Deck of the "Pennsylvania." Below: Testing the Lift of Kites from the Deck of a Flat Boat Towed by a River Steamer. In the Oval: A String of Kites Carrying up a Man.

In sending up his kites Perkins generally sends two or three leader kites up about a half mile in order to get them in the steady wind. Then he sends up a group of six, eight or ten lifting kites, directly beneath which, on the main line, is suspended a sort of bo'sun chair or swinging cradle. If there is a heavy wind this cradle sometimes swings violently and the occupant has to be careful not to be thrown out. In light winds an ordinary hexagon kite is used, but in heavy winds a special kite called an aeroplane kite—which has a square hole in its

center for the circulation of air and a triangular body beneath—is used. In two of the illustrations Perkins is shown above the Allegheny River at Pittsburgh, and testing the lift from a float towed by a river steamer. In the latter instance five lifting kites were on the line above the one shown. The ropes in the view showing him aloft are guide ropes which help to steady the line when landing. The third illustration shows the first leading kite, which has a ten-foot side, being sent up from the stern of the battleship *Pennsylvania* when cleared for action. Some of the lifting kites are 18 feet long.

The experimenter's most important work was done on the *Pennsylvania* from January 24 to February 4, 1911, when he made a 500-mile cruise off the Californian coast at the request of Rear Admiral Pond, in order to demonstrate to the Navy what he could accomplish. He sent up in succession Lieutenants Rogers and Charlton to a height of over 400 feet when the cruiser was steaming 20 knots and going through war maneuvers. The men aloft were able to sight vessels 40 miles away. Submarines operating in the vicinity of the cruiser were easily detected, especially when the *Pennsylvania* was "on soundings," that is to say, in water 50 to 60 fathoms deep. When observers at the masthead were unable to see anything, the men carried up by the kites could distinctly observe the submarines at a distance of a mile or so from the ship. Even in the open sea, when traveling between San Francisco and Los Angeles, they could pick out the submarines with but little less difficulty.

The experiments mentioned prove that a merchant vessel which has a speed of 12 to 15 knots is able to carry a string of kites and send them aloft with a sailor in a bo'sun chair in order to secure ample protection against submarines. The kites are available at practically all times. Rain does not affect the kites, and when there is a gale that no aeroplane could live in they can be sent aloft quite readily, and then possess the added advantage of being able to carry two light observers instead of but one.

RUNNING A STREAM BENEATH A STREAM

An engineer in the western part of this country was up against the proposition some time ago of making a stream cross a stream, and in order that this might be done he built above the main stream a concrete bridge or trough through which stream No. 2 might pass. In a word the situation was like this: An irrigating canal twelve feet wide and four feet deep ran through a certain stretch of country. Running at right angles to this ditch are a number of natural storm drains. It was desired that the water from these storm drains should not empty into the main ditch and to avoid this these bridges were constructed. The water in the main ditch is used to irrigate valuable orchard land, while that from the various washes goes direct to a nearby river.

A Concrete Bridge that Serves to Carry One Stream Above Another.

The bridge shown in the accompanying illustration is fifteen feet in width and sixty feet long. Its walls are eight inches thick and forty-two inches in height. The sides and floors of this

A View of a Portion of the Celilo Canal in Oregon. This Waterway Is the Second Largest in America, and was Built at a Cost of Six Million Dollars.

bridge are of solid concrete, decoratively finished as may be seen in the illustration.

GREAT BRITAIN BUILDING BIG JAMAICA RADIO

Although no technical details are available, it is now known that Great Britain has under way a most powerful radio station to be installed in Jamaica, B. W. I.

THE CELILO CANAL

At a cost of six millions in money and the labor of hundreds of men continuously for almost ten years, Uncle Sam has at last completed the Celilo canal in Oregon on the Columbia River. The big ditch was formally opened May 5th by a celebration which actually began May 1st and did not conclude until May 8th. The celebration was a progressive affair, beginning at Lewiston, Idaho, 500 miles from the river's mouth and the present head of navigation on the Snake River, the Columbia's principal upper tributary, and continued on down river to Portland on the Willamette River, the principal stream emptying in the Columbia on its lower stretch. Those participating in the several programs traveled by steamboat in honor of the opening of the great waterway—the second largest in America—through the various locks and the entire length of the remarkable canal just then completed.

Celilo canal is one of the marvels of modern construction. It is eight miles long and the greatest part of it was bored through solid lava rock stone so hard that the construction cost averaged almost $1,000,000 per mile. At some points a sheer cut of 70 feet through live rock was necessary. All types of wall construction obtained, from the reinforced concrete to ordinary masonry and dry masonry.

At several points workmen found the charred trunks of trees buried deep in the lava where they had been overwhelmed centuries ago when the great stream of molten rock flowed across the

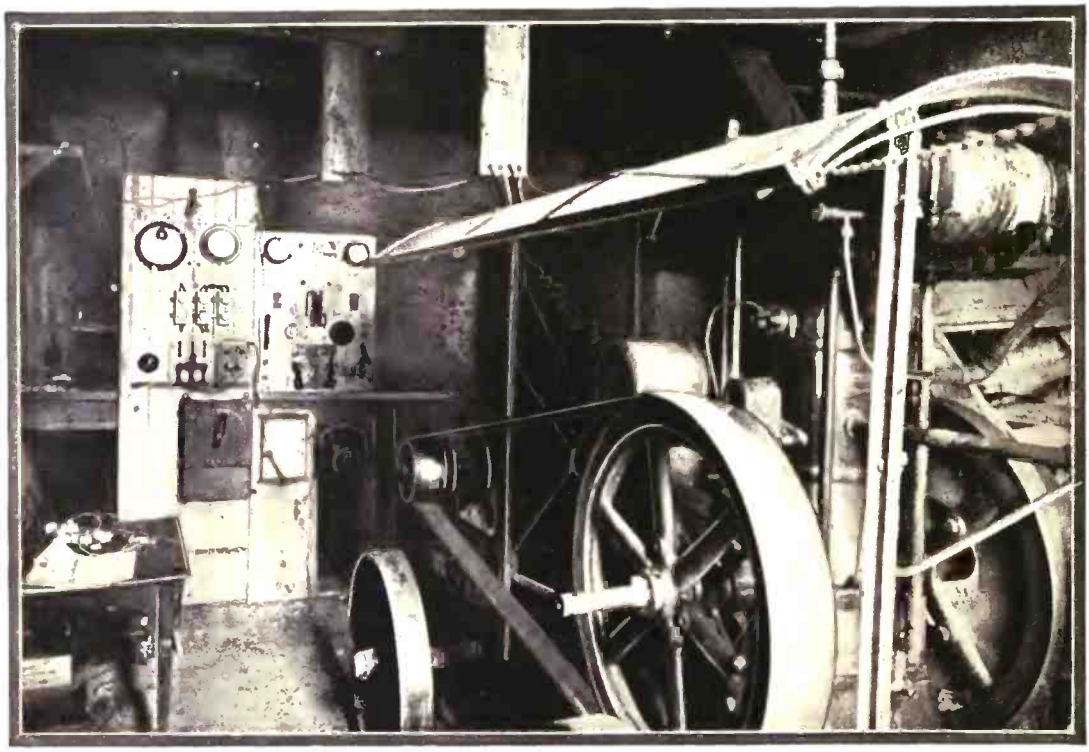
valley floor and dammed the river, creating the Celilo falls and rapids around which the locks are built.

Construction of the canal began in October, 1905. There are five locks, with ten passing basins for vessels, that overcome an 82-foot fall made by the river between the head and foot of the ditch. The minimum depth of water in the canal is eight feet.

Owing to the fact that the river annually experiences a heavy flood, spillways are built along the canal walls at regular spaces to relieve pressure from flooding, while the sixty-ton lock gates are each braced against concrete stands, 21 feet wide, to withstand the tremendous weight of water which they must bear against. The lock gates are operated by hydro-electric power.

IMPROVISED ELECTRICAL PLANTS FOR WAR

Power plants of the Benz type are in general use by the German Army in the field, for the immediate utilization of the captured French and Belgian plants.



The German Army is Using this Type of Electric Generating Plant Mounted on Wheels and which can be Immediately Installed at Any Desired Point for Supplying Current for Illumination and Other Purposes.

The accompanying illustration shows a plant wherein a traction motor of the Benz system is furnishing the necessary current to a field hospital. As for every other military task, soldier specialists also operate the improvised plants.

SAFETY LOCK FOR SLEDGE HAMMERS

To minimize the possibility of injury to workmen when a sledge hammer is being used, a safety lock has been devised consisting of three steel castings. One is a circular flange cut with a hole slightly tapered into which two wedges fit. Two holes are drilled in the head of the sledge to conform to the holes in the flange. The wedges are then fitted to the handle close to the head of the sledge, the ring

A New Type of Sledge Hammer in which the Danger of a Loosened Head is Entirely Eliminated.

is slipped over the wedges and connected to the sledge by two rivets. When the lock is in place, it is impossible for the head of the sledge to fly off. The sledge may break into two pieces at the eye, but the lock will hold them together. As may be seen in the accompanying illustration which clearly shows the various parts as well as the complete hammer, the design is quite simple and ingenious.

PORTABLE ELECTRIC SHADE WASHER

The invention of a portable electric shade washer by William A. Richardson, chief electrician of the Chicago Post Office has solved the problem of cleaning the 14,000 lamps and shades used in this building. Formerly it required a man about six months to make the rounds, at the end of which time the first lamps had become very much soiled again. With the aid of the new device, however, all of the lamps can be cleaned once each month.

The lamp and shade washing machine, which has now been in use three or four years and is said to be the only one of its kind, consists of two galvanized iron tanks, the one appearing at the left in the illustration being the washer and the one at the right the rinser. The washer is equipped at the bottom with a propeller such as is used on a motor boat, which serves to throw the water against veins attached to the inner surface of the tank. These veins direct the flow of the water so as to throw it up through the shades and down over them again. The shades are placed sixty at a time in a wire basket, which is then lowered into the washer. The water is heated electrically by means of an electric immersion coil placed at the bottom of the tank. It requires from three to five minutes to clean one basketful of shades.

In the rinsing tank ammonia is added to the water, which serves to give a lustre to the shades. After rinsing they are left on a shelf in the second tank, where the water on most of the lamps drains off, saving the necessity of drying them with a cloth.

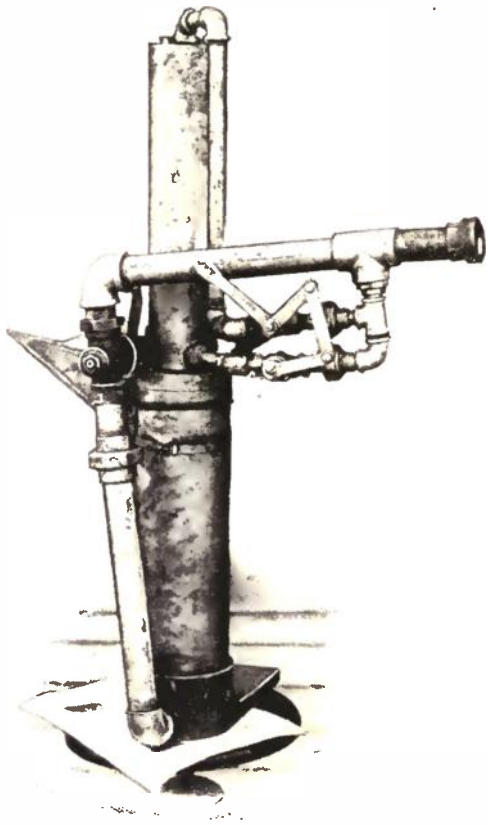
On the end of the motor a buffer can be placed to clean and polish any lamps. The buffer enables the glassware to be cleaned in much less time than would be possible by hand. This is especially the case when cleaning fancy pressed glass shades that have many ridges in which dirt accumulates and can only be dislodged by a very vigorous and lengthy application of a brush and soap.

A Complete Outfit for Cleaning and Polishing Electric Shades, which is Being Used in One of Chicago's Public Buildings.

COMPRESSED AIR BLOWS BALLAST UNDER TRACKS

A machine for injecting ballast under ties after the track has been lifted is the invention of a Canadian. His machine, which has been designed to work in conjunction with compressed air, will probably mean an economy in cost of labor amounting to an average of 75 per cent.

The operation of the compressed air ballast is quite simple. By means of a series of valves and pistons, the air is caused to act upon the ballast. The toe of the machine, which is placed underneath the end of the tie, is equipped with a gauge capable of adjusting the toe's aperture for admission of gravel of various sizes that is employed in lifts of from one-eighth of an inch to two inches.



By Means of This Device it is Possible to Inject Ballast Under Railroad Ties After the Track has been Lifted.

To illustrate the value of the new injector, it is claimed that one motor car equipped with compressed air pumps will operate eight of the machines at a time with a capacity of four miles a day and a maximum cost of about $100 per mile. On the other hand, the cost of maintaining roads in the usual way is about $250 a mile, the basis for this cost being the fact that one laborer averages 56 feet of track a day.

The machine stands three and a half feet high, and is generally made of steel material. It weighs 47 pounds. It is also made in aluminum, in which case it weighs only 27 pounds.

The inventor of the compressed air ballast injector has spent many years in railroad maintenance work.

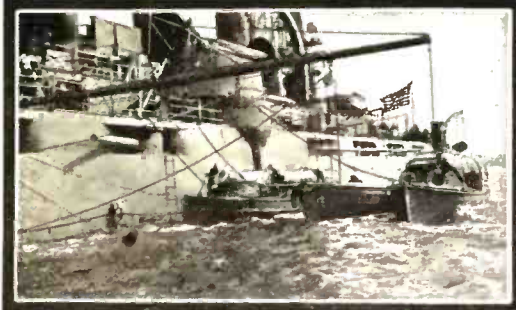
CURIOUS ACTION OF FALLING BODIES

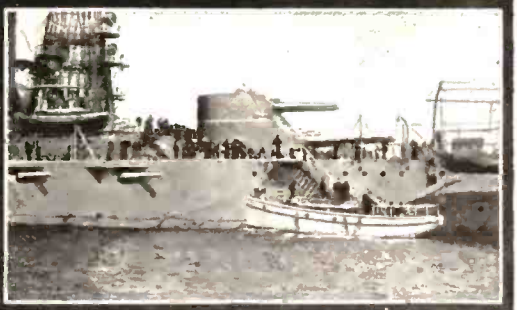
Investigators have made some interesting experiments with falling bodies in the deep vertical shaft of a copper mine at Calumet, Mich., one of the deepest in the world.

The experimenters tried to drop into a box of clay 4,200 feet below two metal balls, two inches in diameter, one from the center of a shaft, nine feet wide and thirty feet long, and one from the southwest corner of it. Neither of the balls reached the box of clay. One was never found; the other, probably the one dropped from the center, was found lodged in the timbers of the east side of the shaft, 800 feet from the surface. In fact, bodies dropped into the shaft invariably lodged in the east wall, because the earth rotates on its axis from west to east. If a load of ore were spilled into the shaft, most of it would cling to the side of the shaft, or land on the levels to the east.

There is now in use a compression hammer that greatly reduces the labor of tearing up pavements — always a hard task, but especially so when the pavements are of asphalt or concrete. The hammer is driven by compressed air, forced through long pipes by a portable air pump. The workman has merely to hold the tool in place while the sharp-pointed hammer quickly cuts away the hard asphalt or breaks apart the hardest cobblestones. The saving in time effected by the use of this device is considerable.

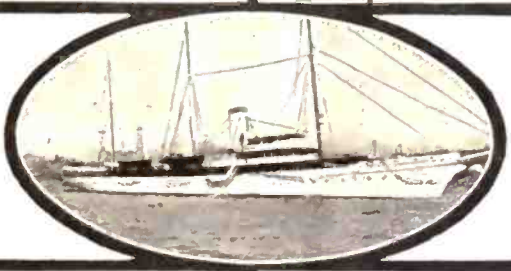
REVIEW OF UNCLE SAM'S BATTLE FLEET

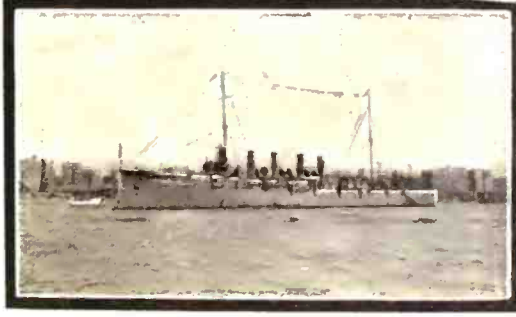




A gala week on the Hudson River at New York. Here the United States fleet of battleships, dreadnoughts, torpedo boats and destroyers, as well as the flotilla of submarines and submersibles was assembled for review during the week of May 8th.

The majestic fighting ships, supplemented with a gorgeous array of palatial private yachts, presented a spectacle against the picturesque New York skyline that will long be remembered by visitors to the review.



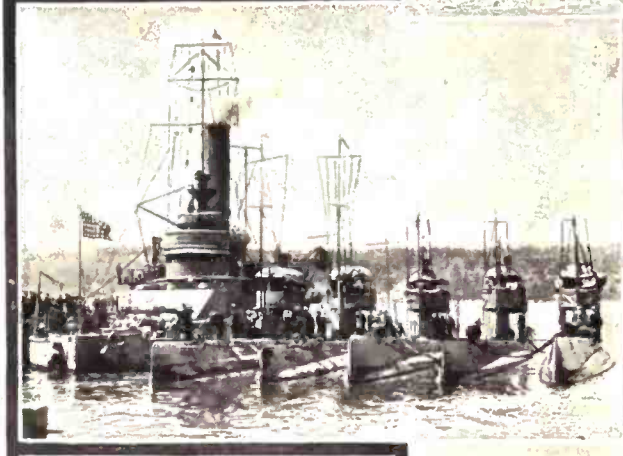


Photos. by Editorial Staff of THE WORLD'S ADVANCE.

SUBMARINES A CENTER OF ATTRACTION

Not the least interesting among the many sights for the visitor was the fleet of submarines. To the left is seen one of the latest models in our navy.

To the right may be seen a group of recently remodeled submarine torpedo boats in condition for cruising. The work of vessels of this type in the European war has given the little fighters a degree of importance hitherto unattained, and, as a result, the submarine flotilla has been a center of attraction during the review.



To the left: A group of United States submarines with their mother ship, a vessel of the monitor type. The monitors were originally intended for coast defense work and are capable of being partially submerged, although they are in no sense submarine boats.

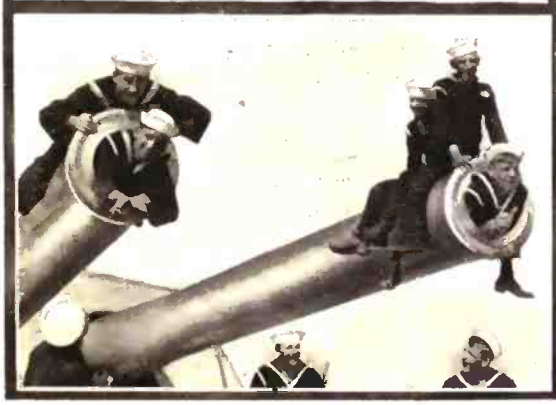
To the right: An impressive line-up of the battleships and dreadnoughts of the United States Navy as far as the eye could reach greeted the visitor.

Photos. Copyrighted International News Service.

GLIMPSES OF LIFE ON BOARD SHIP

The lads of the Navy are natural born entertainers, and their hearty good fellowship has done much to enhance the interest of the public in our Navy and its workings. During the review visitors to the ships have been accorded a splendid reception. The Navy boys took pride in showing the visitors how the big guns and other fighting equipment are handled.

The illuminations have been gorgeous beyond description. Rows of incandescent lamps outlining the shapes of the vessels, the play of the searchlights, the fireworks—all have done their part in the celebration and helped to make the fleet as interesting by night as by day, if not more so.



Photos. Copyrighted International News Service.

A MANGLER WITH A SAFETY GUARD

One of the most dangerous features of a laundry is the mangling machine, which is used for pressing flat pieces. The mangler consists of two iron rollers, heated from the inside. The danger arises in the fact that the laundry worker, in feeding towels, napkins and other flat pieces between the rollers, becomes careless, and the fingers, or sleeves are drawn into the rolls and a serious accident results.

Among the various new appliances to be given a trial in the "safety first" movement of Cincinnati's new $4,000,000 hospital is a mangler in which safety is obtained for the laundry worker in the form of a little steel fence running along the entire length of the big roller. This arrangement effectively prevents fingers or sleeves from being accidentally drawn into the machine. All laundry machines in the new hospital are carefully screened and cog wheels guarded so that the possibilities of accident are minimized. Nearly $30,000 was spent by the city of Cincinnati to safeguard this laundry.

STEEL REINFORCING IN CONCRETE

Steel is always to be preferred to wood for reinforcing concrete, as both steel and concrete adhere together satisfactorily. Steel has also the advantage over wood in that it does not swell or shrink under the influence of moisture. It is also known that the safe working stress in long leaf yellow pine is about 1,200 pounds per square inch, while the safe working stress for mild steel is 1,600 pounds per square inch.

While wood is claimed to be quite satisfactory by some who use it for this purpose, there is considerable controversy in this matter. It would seem that for big concrete work the steel reinforcing should unquestionably be used.

A Little Steel Fence Along the Entire Length of the Roller Prevents the Worker's Fingers from Being Caught in the Mangle or Ironing Machine.

ELECTRIC DRIVE for the BATTLESHIP of the FUTURE

By THOMAS STANLEY CURTIS

WHEN first one hears of electric propulsion as applied to a modern dreadnaught, the thought which instantly forms itself is that the system must be inordinately complex and costly; furthermore, it would seem to introduce the combined losses of a turbine, an electric generator and an electric motor. The utter fallacy of this hasty conclusion is readily seen when the facts presented herewith are digested. How the United States Government is building the world's first electrically driven battleship—and this at a saving of some $200,000, together with a significant gain in operating efficiency—is told in the accompanying article, which was secured expressly for THE WORLD'S ADVANCE.

THEY do say it is bad form to start an article with an apology; just for that, let us decline to admit that this first paragraph is an apology—let us call it, instead, an explanation. When the writer went forth in search of information bearing upon the new battleship *California,* the primary object in view was to secure the details of her electric drive—a radical departure in propulsion mechanism. Before the quest for data was finished, the interviewer realized that battleship-building and ship-building are two separate and distinct trades. In other words, he was given an intensely interesting glimpse of the stages through which one of our gigantic fighting ships must go before a rivet is driven in her hull. Therefore, at the risk of being accused of a digression from the subject suggested by the title of this article, he endeavors to take the reader, in imagination, through the enormous planning rooms of the New York Navy Yard, where the *California* is at this writing undergoing the first steps in her construction. But first of all, lest the digression be too pronounced, let us stop to consider the ingenious arrangement of the driving mechanism which is to put this monster craft in a class by itself.

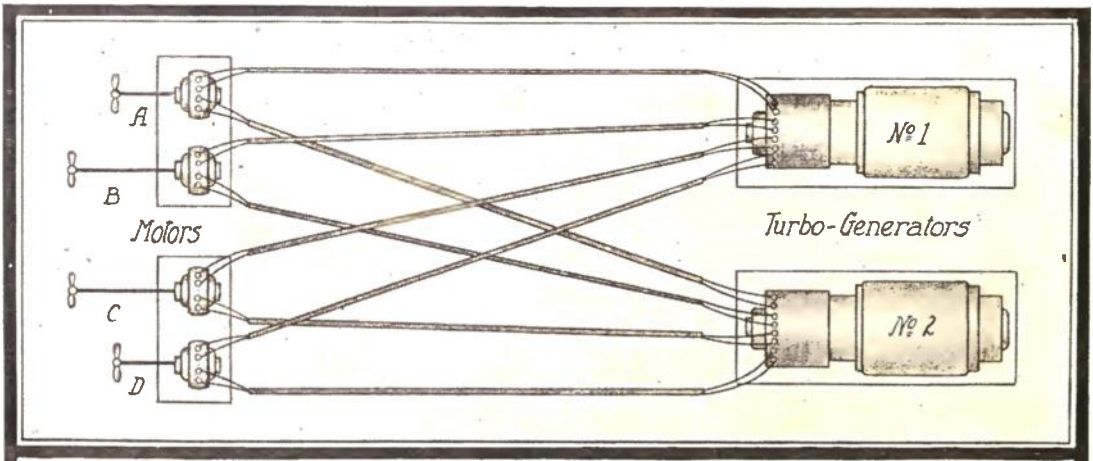
The steam turbine has long been conceded to be the ideal source of motive power for heavy marine work; it is subject to certain limitations, however, which detract from its value. For in-

stance, while the turbine operates at its highest efficiency when driven at a very high rate of speed, the screw propeller of the ship attains its maximum efficiency when turning at a speed approximating one hundred revolutions per minute. This means the introduction of gearing or some other mechanism to reduce the speed of the turbine to that best adapted to the propeller. Added to the cost of this mechanism is its liability to damage, for the transmission of several thousand horsepower of mechanical energy is no small problem to contend with. Furthermore, the steam turbine runs inherently in one direction only. If it be made reversible, the rotor must be in duplicate, which means that not only must the working rotor drive the propeller but it must also carry around the idle rotor. The only other alternative is in the installation of a second set of turbines for backing purposes only and the tremendous cost of this system is obvious. Flexibility of control in both backward and forward movements is of the highest importance in the fighting ship and for this reason the builders have been forced to employ a driving mechanism embodying every possible feature of advantage regardless of the cost of installation and subsequent operation.

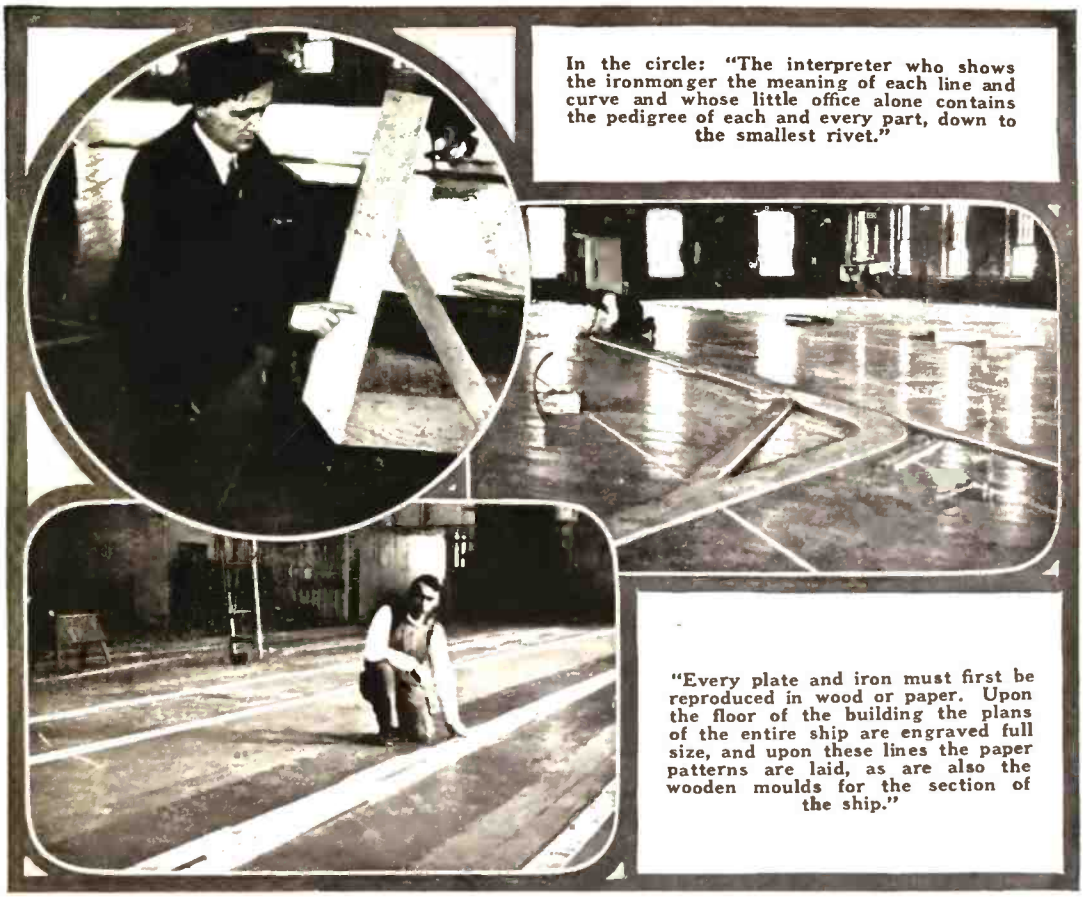
Another essential in the propulsion of a battleship is that it shall be capable of cruising day in and day out at a speed of some fifteen knots per hour and at the same time be able to make a sudden, though perhaps long-continued, spurt at its maximum speed of twenty-two knots. The turbine is essentially a one-speed machine. As remarked before, its ideal operating speed is a high one. In order, therefore, that it be made capable of attaining the higher speed, it must be operated for the greater part of the time—*i. e.*, while cruising, at comparatively low efficiency.

The great flexibility of control found in the electric motor admirably adapts it to the purposes of ship propulsion. The speed, moreover, is in accordance with that at which the propeller should be driven. Granting this, the problem has been to so combine the motor with a generating unit that the very utmost of efficiency could be realized at all times and under all conditions from each individual unit of the entire plant. Apparently this result has been secured in the system under our consideration. The original installation of the kind was placed in the U. S. collier *Jupiter* some two years ago and during the interim there is not a single case of electrical trouble on record although the ship has been in practically constant and trying service.

An examination of the simple diagram which is reproduced on this page will serve to make clear the plan of the



Two turbo-generators, operating either independently or in tandem, supply the current which operates the electric motors that drive the propellers.



In the circle: "The interpreter who shows the ironmonger the meaning of each line and curve and whose little office alone contains the pedigree of each and every part, down to the smallest rivet."

"Every plate and iron must first be reproduced in wood or paper. Upon the floor of the building the plans of the entire ship are engraved full size, and upon these lines the paper patterns are laid, as are also the wooden moulds for the section of the ship."

driving mechanism. The generating plant is composed of two independent turbo-generators, each of which is capable of delivering one-half of the total power necessary to run the ship at her maximum speed. The driving motors are of the three-phase variety and each motor is equipped with two sets of pole pieces—one of twenty-four poles and the other of thirty-six. The electrical reader will understand that by operating the motors on one or the other set of poles, the speed is changed without impairing the efficiency in any way. The plan of operation is to drive the motors at the lower speed for cruising with only one turbo-generator in operation, while for the greater speed the two generators would be operated in tandem with the motors arranged to run at their maximum speed. Thus it will be seen that when cruising, the one generator is running at its full efficiency as are also the motors, while the second generator is idle. Likewise, when full speed is required, the second generator is started and run also at its peak of efficiency.

The installation on the *Jupiter* does not combine the feature of a double turbo-generator, but in all other respects it may be said to correspond with the plant to be installed in the *California*. Hence, it is safe to assume that with the added safeguard of a duplex generating unit, the drive for the *California* will fulfill all of the expectations of the designers.

Having elicited the foregoing information relative to the propelling mechanism of the new vessel, the writer ventured an inquiry as to when the actual work upon her would be started. To his surprise the answer came that the preliminary work had been going on for six weeks past and that the moulds for the keel were being laid. Now, to the green landlubber this statement brought up a mental picture of enormous traveling cranes lifting into position huge pieces of material in the ship-

yard and the natural curiosity to see what was going on impelled the investigator to turn toward that portion of the Navy Yard where Uncle Sam's big fighters come forth.

After dint of much fruitless inquiry, the writer found himself in the hands of a kindly-spirited individual who bore the official title of the "planner" and to whose kindness and generosity the reader is indebted for the insight into the mysteries of battleship building the writer is enabled to give. The guide escorted his visitor to an enormous building which instantly gave the impression that it was a gigantic ball room the moment we entered the door. A closer inspection of the polished floor, however, disclosed a bewildering array of curves and lines, each of which bore a number or letter. Entering the modest office, the guide explained that he would introduce the man who laid the moulds for the splendid dreadnought *Arizona,* at the time resting on the ways and almost ready for the launching. Incidentally, the same man bears the responsibility for the pattern from which each and every plate and iron in the *California* is to be made. The man who shoulders this burden proved to be young, quiet and unassuming, but with an air of confidence born of knowledge in his work and the men under him.

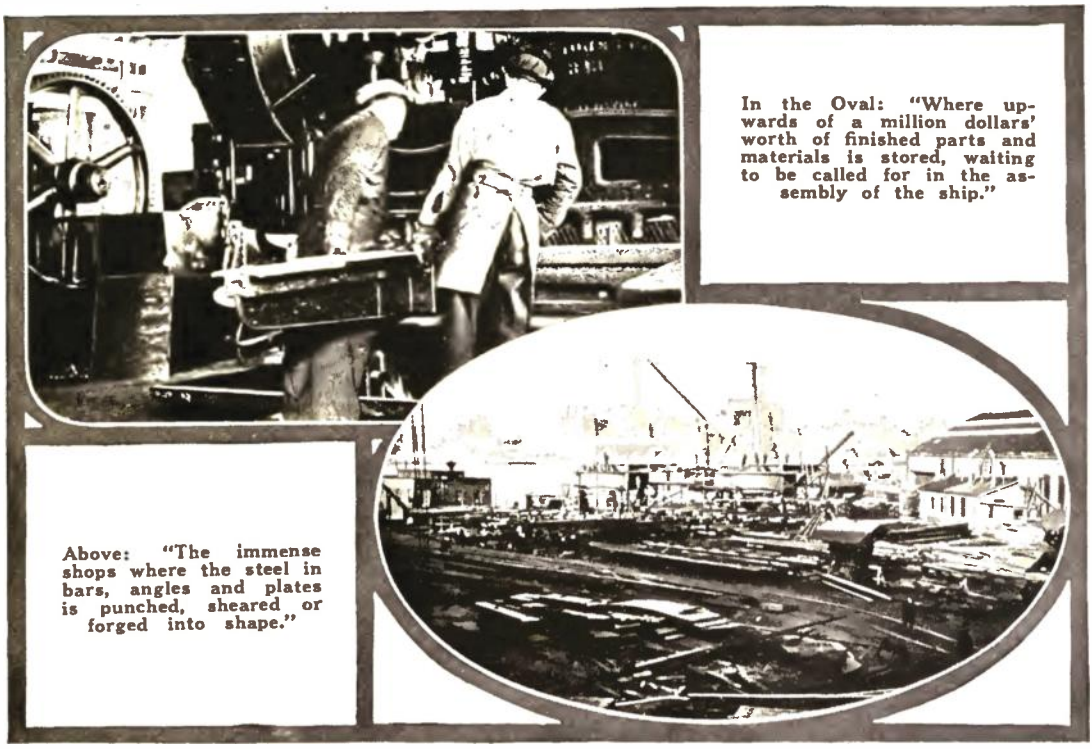
Every plate and iron, so my new guide explained, must first be reproduced in either wood or paper. Entering again the "ball room" of my imagination, the guide pointed out how the floor of the building represented a gigantic drawing board upon which the plans of the entire vessel are engraved in the full size of the finished ship. Upon the lines in the floor the paper patterns are laid for the plates as are also the wooden moulds for the sections of the ship.

The importance of this system can readily be appreciated when it is stated that a saving of some $50,000 has been realized in the building of a single battleship through the elimination of errors in the ordering of materials. Furthermore, the plan enables the work of the draftsmen to be positively checked and many expensive errors are avoided in consequence.

From the main planning room the visitor was conducted to a smaller one

Below: After having been marked from the patterns, the plates are cut to their required shape by means of an oxy-acetylene blow-pipe.

Above: "The raw materials are marked from the patterns in one big room and passed through to the shops, from which they issue, bearing identifying numbers, to the storage yard."



In the Oval: "Where upwards of a million dollars' worth of finished parts and materials is stored, waiting to be called for in the assembly of the ship."

Above: "The immense shops where the steel in bars, angles and plates is punched, sheared or forged into shape."

in which the *California's* keel was being laid. For the keel moulds, long wooden strips were used and in each piece the holes for the rivets as well as depressions for the several straps which cross the keel were clearly indicated. An interesting point in connection with the making of the patterns and moulds was brought out by an inquiry as to the effect of moisture on the accuracy of the mould. The planner explained that the difficulties were many; in the case of a keel piece twenty-eight feet long, the length in very damp weather would increase by an inch and a half. In such a case it is necessary to dry the strip until it measures the correct length by steel tape prior to its application to the steel to be laid out.

From the plan rooms the writer was conducted through the immense shops where the steel in bars, angles and plates is punched, sheared or forged to shape. The raw materials are marked from the patterns in one big room and passed through to the shops from which they issue, bearing identifying numbers, to the storage yards. As a fitting close to a most interesting tour, my guide pointed out of the window to the yard where, in his words, "is stored at times upward of a million dollars' worth of finished parts and materials, each piece bearing its number, and waiting to be called for by the section foremen as it is required." Truly, the building of a battleship is more than a matter of drawing the plans and riveting the plates and irons together. My hat comes off to the man who shapes each piece—the interpreter who shows the ironmonger the meaning of each line and curve, and whose little office alone contains the pedigree of each and every part, down to the smallest rivet, of some of our mightiest dreadnaughts.

STEEL TOWERS FOR GOVERNMENT RADIO STATIONS

Twelve steel wireless towers have recently been completed for the United States Government. Eleven out of the twelve are 300 feet high. The shortest one, which is 200 feet high, has been sent to Beaufort, N. C. Two of the towers were shipped to Washington, D. C., two to Boston, four to the Canal Zone and three to a point in the West.

These steel towers will be employed in the wireless stations that are to form the links of a powerful chain of Government stations, now being arranged.

TIDAL TRANSPORTATION

Some of the finest grindstones in the world come from the bottom of the Bay of Fundy. The stonecutters there have a simple method of moving them to the shore. Workmen quarry the stones from the solid rock when the tide is out, and fasten them to a large flat-bottomed boat. The tides in the Bay of Fundy are the highest in the world; they rise from 50 to 70 feet, and rush in with great swiftness. The tide lifts the flatboat with the stones attached; the workmen bring the boat ashore and remove the stones at their leisure when the tide is out.

STARTLING ADVERTISING

A man dangling by his hands from the roof of a building is apt to startle passersby and cause them to stop and almost call for help. It invariably makes a man pause long enough to investigate. This fact has been adopted by a western firm in conjunction with its advertising. In these days when so much advertising is done by billboard, it takes either a very clever or startling device to attract the attention of the passerby and take his thoughts away from his own affairs.

A Dummy Figure Dangling from the Eaves of a Roof and Carrying an Advertisement Makes the Average Passerby Pause Long Enough to Investigate.

A CENSUS OF POLES

The 900,000 miles of telegraph and telephone wires that now form a vast network over almost every part of the United States and Canada require the support of no less than 35,000,000 poles. It is said that about four million poles are needed annually for renewals and new lines. Well-stocked German forests, which are the best managed forests in the world, produce only 250 trees to the acre; the poles now standing would thus represent all the timber growing on more than 130,000 acres. In Canada considerably less than one hundred poles are cut to the acre, so that nearly 500,000 acres of forests have been cut to obtain the poles now in use, and about 50,000 acres are cut over each year to furnish the poles for renewals. That means cutting at the rate of a hundred acres a day.

A TWENTY-YEAR CALENDAR

While there are a multitude of calendars in existence which enable any one to determine a desired date ten, twenty or even a hundred years hence, there are but few of them that are ready for instant use. Most of them require considerable figuring, tabulating or the moving of shifting scales in order to secure the desired date.

A Brooklyn man has recently published a twenty-year calendar which has for its main feature extreme simplicity. Any date can be found immediately, and it is so simple that even a child can consult it.

PANAMA PACIFIC EXPOSITION NOTES

by

H.A.EVELETH

THE details of the fire-patrol system, employed in the National Forests under the supervision of the Department of Forestry, are disclosed in an interesting exhibit in the Palace of Agriculture. The paramount feature is a reproduction of one of the fire-lookout structures with the customary equipment of signalling apparatus. These observation towers are located on the higher mountain peaks where an unobstructed view may be had of the surrounding country, one or more of the other towers and if possible the office of the supervisor; the last named being the central station and headquarters of the system. The different stations or look-out towers and supervisor's headquarters are inter-connected by telephone and thus the presence of a fire in the forest may be brought to the attention of the latter in a minimum of time. The essential piece of apparatus on the observation platform is the fire locator, which consists of a map of the surrounding country, an alidade and a protractor. The alidade consists of a metal bar bent so that it forms three sides of a rectangle, the longest side, about twenty inches in length, serving as a base for the instrument, while the two shorter sides stand upright from the base and serve as a means for its orientation; the one having a narrow vertical slit and the other a wider vertical slit along the center of which is stretched a vertical wire. The base is pivoted, near the end bearing the narrow slit, at the center of the map. In use, the alidade is oriented until the eye of the observer, the rear slit, the vertical wire and the smoke from the fire are in line. The angle between this position and a predetermined base line is then read and telephoned to the supervisor. In the meantime a similar process has been going on at one or more of the other look-out stations and the observed angles are telephoned to the supervisor. Here is located a map similar to that used by the lookout men and, knowing the position of the lookout stations and any two of the observed angles, the location

of the fire may be readily determined and the necessary action taken to prevent it from spreading. The observation stations are also equipped with a field-glass, a heliograph which serves as an auxiliary to the telephone, and a portable telephone. The last named may be put into commission by merely grounding one terminal and connecting the other to the main telephone line.

The fire-fighting tool box, a cylindrical, galvanized-iron object, next attracts the visitor's attention. It is about six feet high by three feet in diameter and access to the interior is by means of a hinged door built into the side. These receptacles are painted red and, together with weather-proof iron-box telephones, are placed along the routes of travel followed by patrolmen and campers. The equipment of the fire-fighting tool box consists of several axes, saws, picks, rakes and shovels; a lantern, a kerosene torch for backfiring, a carbide light for fighting after dark, water-bags and a compact set of cooking utensils for four men.

The following six golden rules for fire prevention are posted conspicuously about the exhibit: (1) Be sure your match is out. Break it into two before you throw it away. (2) Don't throw away burning tobacco. (3) Make your campfire small and in a safe place. (4) Put out your fire with water and then cover it with earth. (5) Don't make large bon-fires. (6) If you find a fire, put it out; if it is too big, notify a ranger.

A novel exhibit in the Palace of Education is that consisting of a huge relief map of the state of New York on which are shown, by means of miniature electric lamps, the location and classification of all the educational institutions in the state. The map is approximately twenty-five by thirty-five feet in size. Each class of schools is represented by a certain color of lights and the various colors flash on and off in definite order. The elementary schools are represented by 12,138 white lamps, 496 of which are huddled together in New York City. Over fourteen thousand lamps are used in the exhibit.

The fire assay laboratory of the U. S. Bureau of Mines in the Palace of Mines and Metallurgy is employed to demonstrate the fire assay method of determining the value of gold and silver ores. The ore to be tested is pulverized and mixed with a flux (soda litharge borax) which aids fusion. Granulated lead is now added to the mixture, the whole is placed in an earthenware crucible and the latter with its contents is put into an oil-burning furnace of the Braun-Muffle type. Fusion takes place at about 1600 degrees F. and the liquid mass is poured into a conical-shaped mould to solidify. The slag, containing the waste materials of the ore, rises to the top, while the heavier lead settles to the bottom, forming what is called the lead *button*. Lead has a property of absorbing gold and silver, when in a molten state, and hence all the gold and silver formerly contained in the pulverized ore is now present in the lead button. The slag is broken away from the button and the latter is placed in a *cupel* and put into the furnace where it attains a temperature slightly above the melting point of lead. This cupel is made of a mixture of bone ash and cement and has a property of absorbing liquid lead at "red heat," while gold and silver are not affected. Thus the lead of the button is oxidized, and absorbed by the material of the cupel, and a small globule of gold and silver remains. These two metals are next separated by dissolving the silver in nitric acid. The final speck of pure gold is placed on a balance having a sensitivity of six millionths of one ounce, and, by a comparison of its weight with that of the pulverized ore tested, the "run" of the ore is computed and its value determined.

He who is wandering about in the Palace of Liberal Arts will be attracted by the sight of a monstrous typewriter. This prodigious machine is 21 feet long by 15 feet wide and is, in detail, an exact reproduction of one of the standard typewriters manufactured by the owners of the exhibit. It is 1728 times larger than the standard, weighs 14 tons and was built at a cost of $100,000.00. The carriage weighs a ton and a half, the key cups are seven inches in diameter and the printed letters are three inches high.

It is operated from the keyboard of a standard machine located on a desk a few feet in front. The keys of the two machines are connected electrically and the motive power for the larger is obtained from electric motors. The operation of typing is necessarily slow, but the machine serves admirably for attracting the attention of visitors.

One of the features attracting considerable attention at The American Pulley Company's exhibit in the Palace of Machinery is the demonstration which shows the perfect balance of all "American" pulleys. A large 72-inch diameter by 36-inch face, triple arm, steel split pulley, weighing approximately 1,500 pounds, is turned with perfect ease by a thread of the finest silk. The pulley is in such perfect balance that no starting other than that of the motor is necessary to put it in motion. In other words, the silk thread is capable of taking care of the starting load. A new device called an "Efficiency Indicator," measuring accurately to 3-1000 of a h.p., shows the exact amount of horsepower required to revolve any pulley.

The U. S. Weather Bureau maintains an instructive exhibit in the Palace of Agriculture. The first instrument of interest is a seismograph, used for recording the undulatory motions, duration and direction of an earthquake. It consists essentially of a horizontal arm several feet in length, attached to a vertical upright in such a manner that it is free to oscillate in a horizontal plane. A heavy mass is placed at the outer extremity of the arm to damp the vibrations. The magnitude of oscillation is magnified by a mechanical system of levers and the seismic tremors are recorded by a pen on a slowly revolving sheet of paper traveling at right angles to the direction of oscillation. The vibration of the floor, due to a person approaching the instrument, causes the recorder to move through an arc of several inches.

The next instrument, a pyrheliometer, is used to determine the amount of insolation or radiant energy received from the sun at place of exposure. A cloud nephoscope is of interest in that it measures the azimuth, angular velocity, direction of motion and apparent velocity of motion of the cloud under observation.

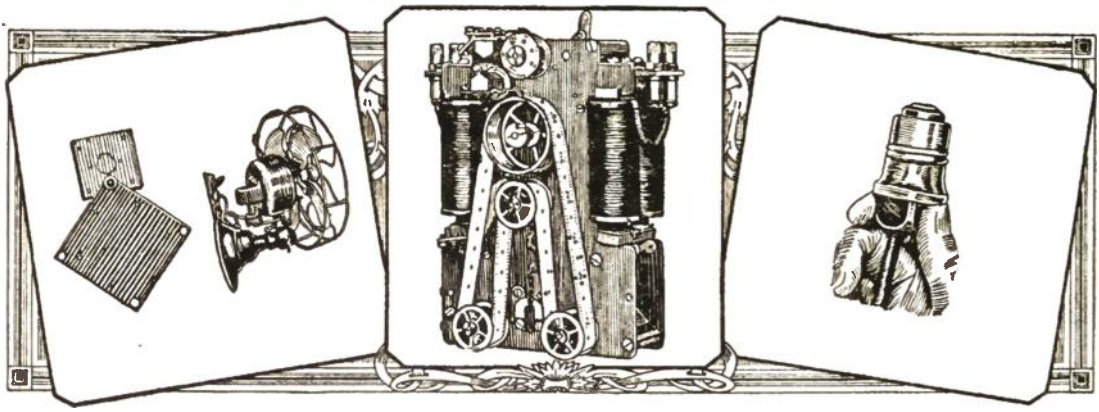
A kite meteorograph is used for recording four conditions of the atmosphere. One pen actuated electrically by the kite anemometer traces a record of the velocity of the wind, a second pen traces a record of the temperature of the air, and a third pen traces a record of the percentage of moisture in the air. The meteorological balloon tugging away at the floor is also of interest. It is about four feet in diameter and carries a small wicker-work basket in which is placed the balloon meteorograph. This instrument has recorded a temperature of minus 92 degrees F., an altitude of 20 miles and a horizontal distance of over 260 miles.

A snow sampling tube and weighing scales are used for determining the water contents of a snow layer and the approximate number of acre-feet of water in the form of snow on any water shed. The weekly floating rain gauge makes an automatic record of the beginning, ending, rate and amount of every shower of rain during the period of a week and requires attention but once in such period.

Other instruments shown are anemometers, for measuring the velocity of the wind; airmeters, for measuring drafts; psychrometers, for measuring moisture; hygrographs, which write the relative humidity for the week; barographs, for recording air pressure; and thermographs, maximum and minimum thermometers, aneroid and siphon barometers, evaporimeters, rain gauges, snow stakes, river stage indicators and weather charts.

The smallest electric motor and steam engine in the world are on display in the North Dakota state building. They are the work of Mr. Ivan T. Nedland of that state and documentary proof is given as to their actual working ability. The motor runs by the current from a dry cell, while the engine is operated by compressed air.

If you enjoy THE WORLD'S ADVANCE, tell others; if not, tell us.



Bracket Fan Hanger. Bell Ringer and Whistle Blower. Single Turn Attachment Plug.

Recent and Improved Devices

Fixture for Hanging Bracket Fans

With the approach of summer and electric fan season many electrical manufacturers are introducing not only fans but fixtures for use in connection with them. One of the most practicable of these is an adapter plate which can be used in conjunction with a special outlet box.

As shown in the sketch, the outlet box cover is provided with a bolt that serves to hold the adapter plate. The bolt passes through the upper screw hole of the plate as well as through a hole in the rim of the fan base, at a point opposite the fan switch. Both the plate and the fan are held in place by a washer and nut placed on the bolt. It is a simple matter to remove the fan at any time for cleaning or repairs.

Ringing Bells and Blowing Whistles Automatically

It will no longer be necessary for some one person to keep a watch on the clock and always be on hand to blow whistles or ring bells at certain times, for there has been placed on the market an equipment which takes care of these tasks. The device is an electrical one and functuates by means of a perforated paper ribbon.

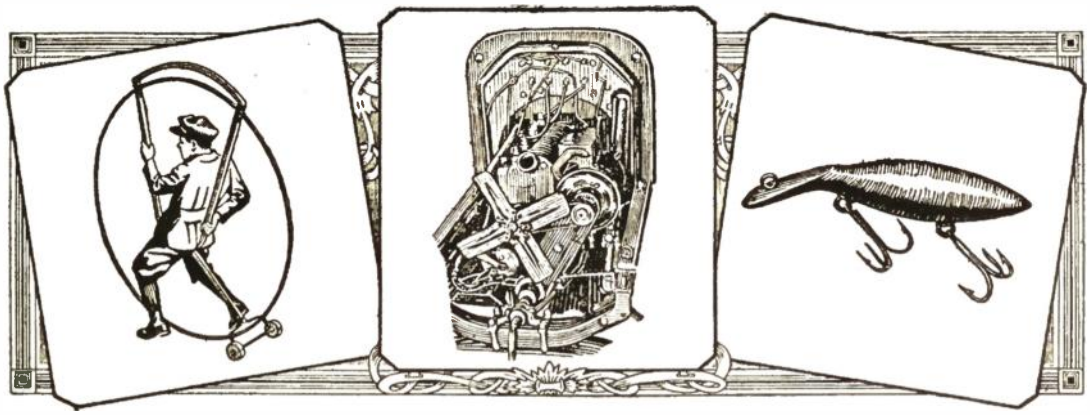
The automatic bell-ringing and whistle-blowing device or program instrument is operated by electric current. It has no delicate parts to get out of order. The schedule is controlled by a paper tape which is printed in divisions of time and punched at the points where contact is to be made. Each tape can take care of two schedules. The instrument will automatically change and operate the same signals on different schedules on different days, and will automatically cause any schedule to remain silent on any day or days desired. If it is desired to change schedules on account of seasons or other causes, such changes can be made in a few moments by the substituting of a fresh tape punched for the new schedule. The program instrument is connected in a circuit controlled by a master clock, which sends out minute impulses.

A New Type of Attachment Plug

A new type of attachment plug has recently made its appearance and which has for its main feature extreme simplicity and convenience. It can be placed in any receptacle with but a single turn.

As may be seen in the illustration, the

Space does not permit these interesting devices to be described at greater length. However, any reader desiring more detailed information concerning devices described in these columns can secure it upon request.



New Sport for Boys. Electric Self-Starter. Fishing Bait of New Design.

new plug has a cylindrical shell with a short thread instead of the usual screw shell with many threads. Furthermore, the center contact member is fitted with a spring which exerts sufficient pressure on it so that the plug is firmly held in a receptacle and at the same time establishing good electrical contact. The plug will not loosen from vibration, and it may be taken out of a receptacle without arcing.

A New Sport for Boys

What promises to be a most popular sport for boys is offered by a recently devised type of vehicle known as the "unicycle". In reality, this vehicle consists of a large hoop on which is mounted a framework carrying the seat and provided with two smaller wheels. The hoop is made of one-half inch gas pipe welded into a ring, while the framework is of durable wood.

The unicycle affords much fun to the boys and is a sport that is entirely unique and incomparable to existing ones. Its main use is for coasting, in which it is possible to attain high speeds. The rider rests on the seat and keeps his feet off the ground. The small wheels are also raised off the ground so that the rider is actually being carried by the hoop alone. The device is so light that it can be immediately controlled by placing the feet on the ground, either to steer it or slacken the speed, as well as to bring it to a stop.

The unicycle is made in three sizes, the smallest having a 48-inch hoop, the next a 54-inch hoop, and the largest a 60-inch hoop. The respective weights of these various sized machines are 22, 23 and 25 pounds. There is nothing fragile in the construction of the unicycle, and anyone weighing even in excess of 150 pounds can safely ride on any of the models.

An Electric Self-Starter

One of the leading electrical manufacturing companies has recently placed on the market an electric self-starting and lighting system for Ford cars.

The principal member of the system is a single electric machine which is used both as the generator and motor. It is wound for twelve volts and is employed in conjunction with a six-cell, 42-ampere hour battery. This battery serves the function of starting the car as well as furnishing current to the head, side and tail lights.

The motor-generator member of the equipment weighs about 52 pounds and is supported rigidly on the right-hand side of a Ford engine by means of a pressed steel bracket secured at three points. The storage battery is carried on the right-hand running board of the car. When the automobile has attained a speed of about eleven miles per hour, the electric machine acts as a generator developing an electromotive force suffi-

Water Heater and Radiator. Attractive Table Fan. Electric Water Heater.

ciently high to overcome the normal voltage of the battery and permit charging to take place. At this point, the reverse current relay operates, closing the circuit between the generator and battery. Charging then begins at a low rate, the current gradually increasing as the speed of the car is augmented, until the current reaches a maximum of slightly over ten amperes.

Fishing Bait of New Design

Having the dip, dive, wiggle and swimming motion of a live minnow in action, a new design of bait recently placed on the market is proving very popular with the fishermen. This bait is of a peculiar design and made of wood. The line is attached to a screw eye, and the hooks, acting as ballast, cause the swimming motion of the bait to resemble that of a live minnow. The bait is said to be ideal for trolling and casting. When not in action, it comes to the surface, thereby avoiding the possibility of catching on the bottom or the entangling of the line. The hooks being placed behind the body of the bait causes it to be practically weedless. When being drawn through the water the bait sinks immediately to a depth of from eighteen inches to two feet, according to the tension on the line.

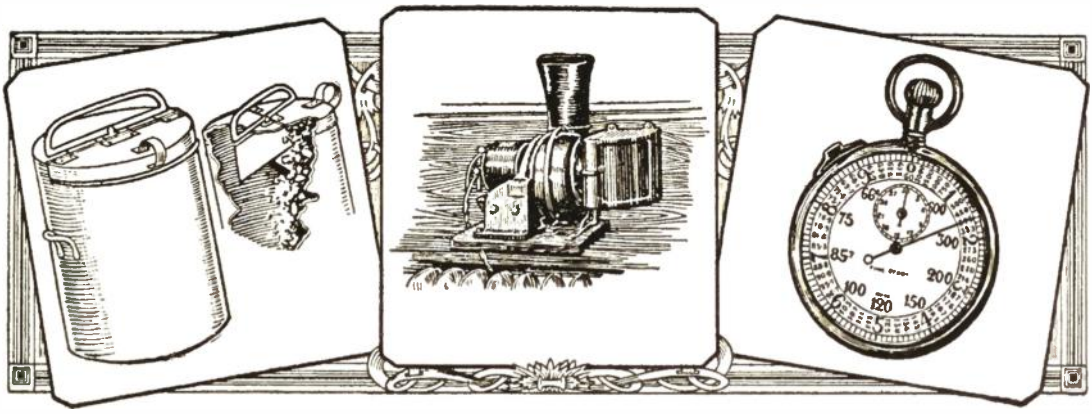
It is said that remarkable results are being obtained with this form of bait, due to its peculiar action when drawn through the water.

Electric Radiator and Water Heater

An electric radiator has recently been placed on the market by a western manufacturer. In general appearance the radiator resembles the conventional hot-water type and is filled with a circulating medium. The heating elements are inserted through the top and bottom of the radiator. In order to provide a range of different temperatures, the heating element is divided into several sections which may be connected to a multiple switch either mounted directly on the radiator or placed at some remote, convenient location. The radiator is very economical in operation, consuming but 30 watts per square foot of radiating surface on high heat, 15 watts on medium heat and 8 watts on low heat. Current for operating the heater can be taken from any lighting circuit of the proper voltage, thus insuring a source of heat that is available at any time without any more trouble than the turning of a switch.

An electric hot-water heater suitable for domestic purposes has also been introduced by the same manufacturer. It is made in the form of a metal tube containing a high resistance heating coil. The entire device requires but little space, measuring 3 inches in diameter by 30 inches high, and can be installed for the heating of water in any sized tank from 30 to 30,000 gallons capacity.

If THE WORLD'S ADVANCE pleases you, tell others about it; if not, tell us.



Odorless Garbage Can. Electric Ventilating Equipment. Improved Stop Watch.

A Table Fan of Attractive Design

A table fan of radically new design is now available. The original feature of this fan is that it is so constructed as to permit of placing a dish on top of it, thus making it unnecessary to devote valuable table space to it, and also giving it the ornamental appearance of a pedestal.

The table fan is of the universal type and can be operated on either direct or alternating current of any frequency. It is being made for use on circuits of from 100 to 220 volts. The fan is provided with a three-speed regulating device for controlling the amount of breeze. The operation of the motor is said to be noiseless.

Hot and Cold Water from the Same Faucet

An electrical device for heating water, which has recently been placed on the market, makes possible the securing of hot and cold water from any faucet. The device is attractively finished and may be attached to any faucet.

The electrical water heater is 12 inches in height and is made to be connected immediately to any cold water faucet. Two wires are provided for connection to an electric circuit. By turning the handle of the device to the right or left, it is possible to secure cold or hot water instantaneously. The temperature of the hot water is controlled by the rate of flow. If boiling water is desired, the faucet is turned but a trifle so that the water will take a longer time to flow through the heater, and intermediate temperatures are secured by a proportionately slower flow. The advantage of the hot water heater is that it saves plumbing expenses since it is only necessary to run piping for the cold water.

Making the Garbage Can Odorless

With a view to making all garbage cans both odorless and sanitary, an American inventor has perfected a lid that has many advantages. The patented lid does much to give a garbage can a more attractive appearance and make its use more agreeable.

The device is made in the form of a high lid that fits on any garbage can. At the top is a handle that may be turned completely around, as well as a hinged cover. Inside the lid is a metal shelf that extends over just one-half the area of the can, as well as a metal blade that is pivoted to the shaft of the handle and made so as to be turned around at will.

The action of the odorless lid is quite simple: The lid may only be opened when the handle is not covering it and consequently when the metal blade is in such position as to shut off the shelf from the lower part of the can. After the garbage has been placed in the upper compartment of the can, the handle is turned, with the result that the blade

turns, pushing all the garbage that has been placed on the shelf into the can. In order to empty more garbage into the can it is again necessary to place the handle in the right position, and when the lid is lifted the shelf is again found perfectly clean.

Equipment for Hygienic Ventilation

The Chicago ventilation commission some years ago came to the conclusion that ventilation with cold outdoor air is impracticable owing to the tendency of very cold air to resist diffusion with the warmer air of the room. The air warmed by the radiators goes to the ceiling, while the cold air falls to the floor.

A new design of ventilator just placed on the market overcomes the foregoing-mentioned difficulty in two ways: First, by blowing the cold air to the ceiling with sufficient velocity to cause it to creep along the ceiling until it falls away in all parts of the room, and, secondly, when the weather is very cold (below 25 degrees Fahr.) by mechanically mixing enough warm air to bring the temperature of the mixture to a normal coolness (about 30 degrees Fahr.). The result is that a uniform temperature exists from floor to ceiling and absolutely no drafts are felt; in fact, it is impossible to feel that cold air is coming into the room.

The ventilator consists of a motor-driven blower fitted with a combined duct and mixing chamber for bringing outdoor or indoor air to the blower, or a mixture of the two sufficient to maintain a comfortable atmosphere in the room. When the slide in the duct is brought forward the blower draws only cold outdoor air; while on the other hand, when it is pushed back, the cold air from the room is recirculated. When the slide in the duct is open half way the result is that both outdoor and indoor air are taken into the mixing chamber and passed through the blower. By adjusting the slide any temperature can be had at the nozzle, between the outdoor and indoor temperatures. The cold mixture upon being blown to the ceiling, spreads out against it, and, after losing its momentum, gradually sinks through the warm air and is breathed by the persons in the room.

The ventilating equipment is operated by current taken from the ordinary socket. No special wiring is necessary. It can be installed or removed in a few minutes, and the placing of the window board in the window frame, which serves to hold it in place, causes no damage to the woodwork.

A Watch for Studying Time

Modern efficiency methods as applied to factories and shops often make it necessary to study the time required for different operations in the manufacture of certain products. For this work it is absolutely necessary to have a stop watch. However, the conventional stop watch leaves much to be desired for the reason that, while it gives the time elapsed for a certain operation, it is necessary to indulge in considerable calculation for determining the output per hour or day.

A time-study watch of new design has recently been evolved for the purpose of eliminating all computation and making it possible for an observer to read from the dial the quantity desired. The circumference of the dial of the watch is divided into 100 parts, as in the well-known decimal dial, but instead of these divisions being numbered in the ordinary manner, they are marked with figures which indicate the number of operations per hour, when the time of a single operation is represented by the elapsed time. In the instance of very short operations, ten operations instead of one can be timed and the figure read off the dial is then multiplied by ten.

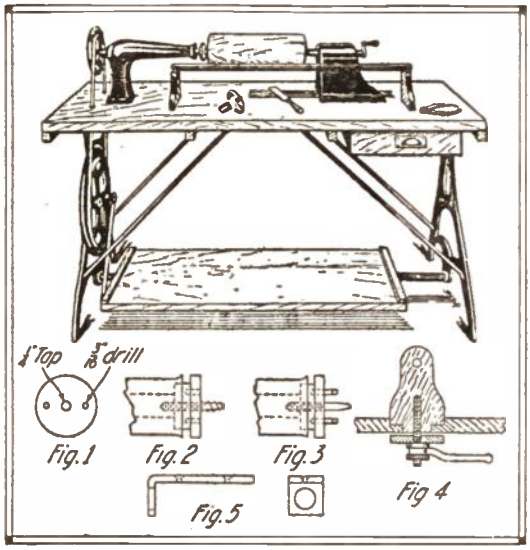
The hand of the watch can be started or stopped by pushing a lever at the side. The hand can be returned to zero by giving the crown a push.

A device for counting persons entering street cars, which operates by means of an electrical mechanism connected to the steps, has recently been patented by two Wisconsin inventors.

WOOD-TURNING LATHE MADE FROM A SEWING MACHINE

By Harvey N. Bliss

A serviceable wood-turning lathe can be made from an old sewing machine. The arm of the machine should be cut off near the end and any fixtures removed, leaving only the spindle, which has a two-inch plate on one end and a wheel on the other. The plate should be drilled with three holes, as shown in Fig. 1. The center hole should be tapped out with a ¼-20 tap, to accommodate a screw center made from an ordinary wood screw the head of which is cut off and the shank threaded with a ¼-20 machine thread. When a live center is required, three points should be fitted into the hole, the outside two having screwdriver points and the center one a tapered point, as shown.



Figs. 2 and 3 show the screw and spur centers. The headstock is now complete, and for the reason that it has a large iron base it can be set firmly on the bed of the lathe.

The bed, which should be made of inch boards, should measure about 4 ft. x 2 ft., with a 2-inch base running lengthwise from the headstock to the opposite end. Another layer of inch boards should then be nailed on. These should be chiseled out on the under side so that they will fit over and cover the large iron base. A 4-inch space should be left in which the tail stock will slide.

A wooden tail stock will serve very well. It should be built up of boards shaped roughly at first, then fastened tightly together and smoothed. It may be held at any desired place by a board about 4 in. wide and as long as the tail stock. This should be hinged at the back to the bottom of the tail stock and provided with a bolt having a handle passing through at the front into an imbedded nut in the tail stock. The dead center can be made of a bolt, pointed at the end, turning through two imbedded nuts, with a small wheel or handle of some sort at the head. The cross sectional view, Fig. 4, shows the tail stock, the groove in the bed and the method of locking.

The bed should be supported by the cast iron braces of the sewing machine. However, these should be placed about 3½ feet apart and braced with several ½-inch iron rods. The old rod which crossed the bottom will be too short, so it should be cut in half and the two pieces driven into a 3½ foot length of gas pipe so that only the threaded ends

protrude.

A treadle should be made of wood and fastened to the bar by two drill braces, as is indicated in Fig. 5. The bar should be made rigid by pins set in holes drilled through the pipe or by thick washers with set screws.

A good tee rest is rather difficult to construct properly, but a section of pipe or rod supported by a block at each end at the correct height will answer the purpose very well. The supports should be 6 in. long and fitted with strips of brass along the top.

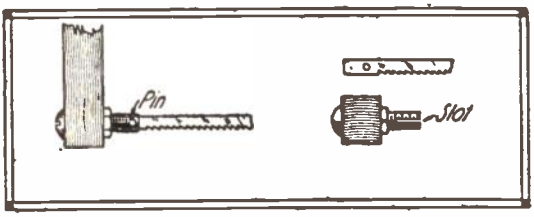
Holes should be drilled through each end of the pipe, and pins passed through the pipe into the supports. By changing the pins the rest can be moved back and forth. When a rest at right angles to the one mentioned is required, a block of wood, shaped roughly like the tail stock, and sliding in the same groove, should be used.

The speed of the lathe will not be more than 1,000 r.p.m. with the treadle alone, but by running a belt from the lower wheel to a small pulley attached to a bicycle wheel, a much greater speed may be obtained.

This lathe, although, of course, not adapted to heavy work, will prove very useful for all sorts of wood turning as well as grinding, polishing and light metal turning.

To Lock a Scroll Saw Blade

A scroll blade may be fastened securely to the guide arms by boring holes into the ends of the arms large enough



to admit stove bolts. The threaded portions of the bolts should be slotted with a hack saw and drilled with small holes at right angles to the slot. A pin should be inserted through these holes and through the holes in the ends of the saw blade.

Contributed by

WM. HALK.

Shoe Polish on Woodwork

Black wood cabinets that have lost their lustre can be restored to their original brightness by the application of shoe blacking paste, followed by brisk rubbing with a flannel cloth.

Contributed by WALTER G. CHICK.

A Funnel to Hold Twine

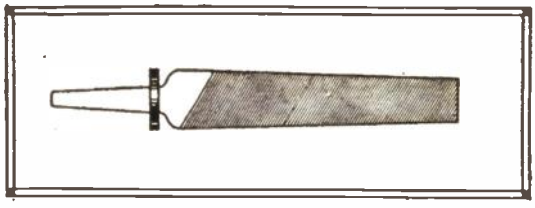
A ball of twine is always handy—if it can be found when needed. A funnel provides a very simple holder for keeping the ball in its place and preventing the string from becoming entangled. Three holes should be punched at equal distances around the rim and lengths of twine passed through, knotted together and hung from a nail or hook. The end of the twine should be pulled from the middle of the ball and passed out through the stem of the funnel.

Contributed by

H. J. GRAY.

Washer Prevents File Handle Splitting

A small washer driven on the tang of



a file will act as a stop for the handle and prevent it from splitting.

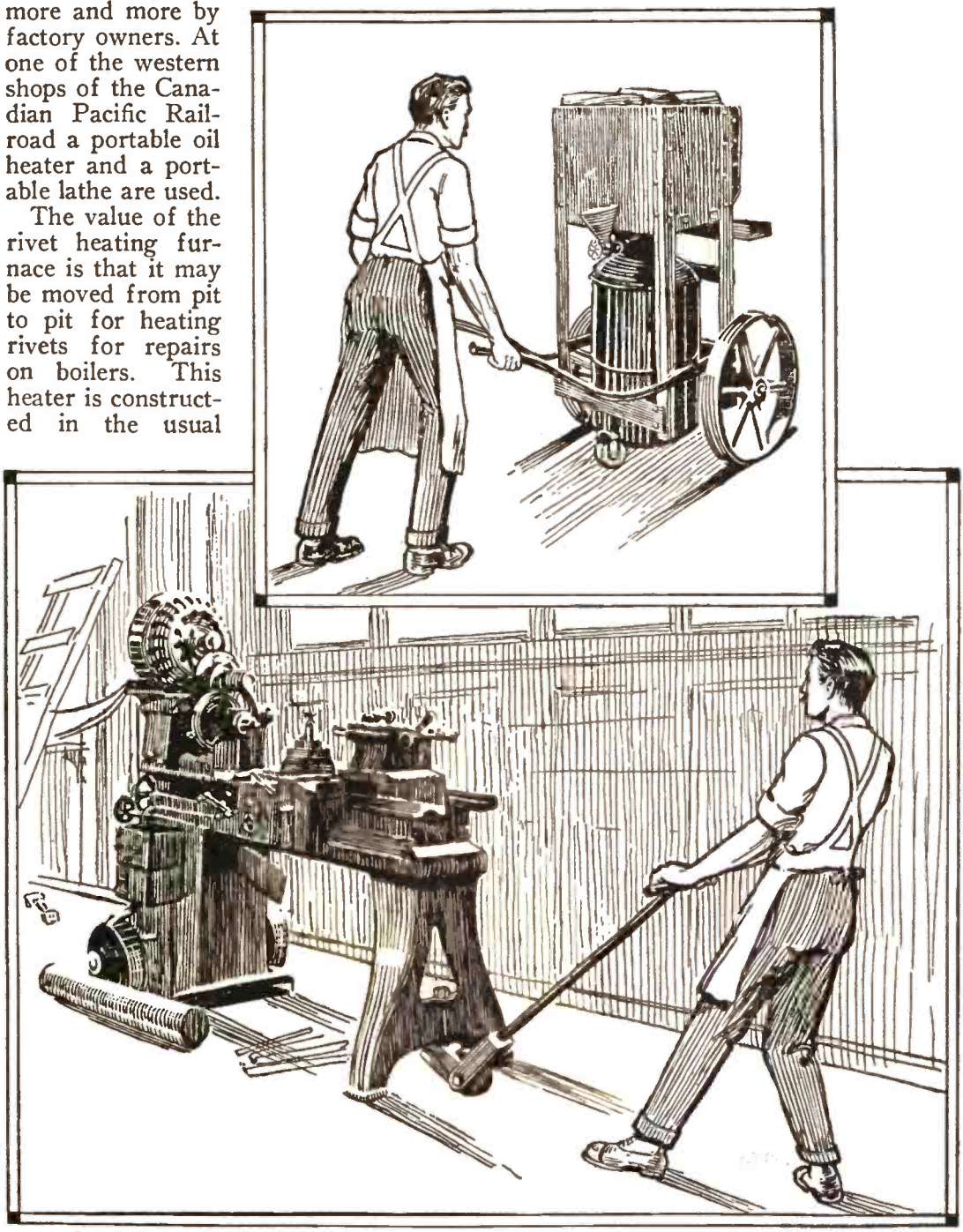
Contributed by WM. HALK.

Portable Tools in Large Plants

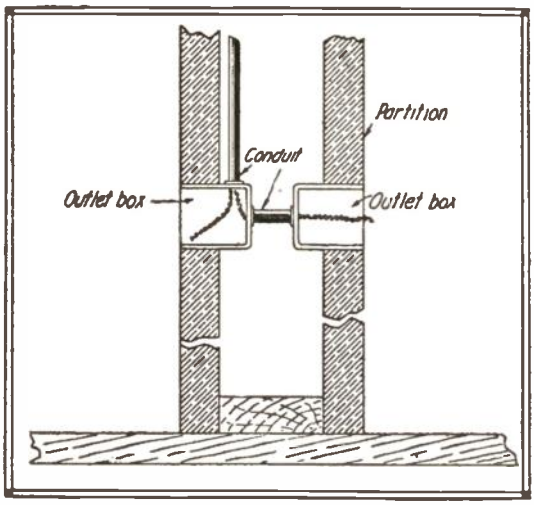
The convenience of portable tools and machines of every conceivable type is being recognized more and more by factory owners. At one of the western shops of the Canadian Pacific Railroad a portable oil heater and a portable lathe are used.

The value of the rivet heating furnace is that it may be moved from pit to pit for heating rivets for repairs on boilers. This heater is constructed in the usual way, with the oil reservoir below. It is carried from place to place in wheel barrow fashion, being provided with side handles and a small wheel in front.

The portable lathe when not in use rests upon three small wheels, so that it can be hurriedly pushed to a convenient spot in case of an emergency.



Contributed by P. W. BLAIR.



Economical Wiring for Bracket Outlets

In wiring a house by the "knob-and-tube," the conduit, or, in fact, by any method, considerable material and labor will be saved if the wireman locates the bracket outlets in adjoining rooms, so that the outlets will come directly opposite each other. Where the wiring is being installed in conduit, a short conduit nipple can be used to connect the two metal outlet boxes, and all bending, as well as the use of excessive lengths of conduit, will be avoided. Where knob and tube wiring is being put in, similar savings will be effected if the bracket outlets are intelligently located. Every bracket outlet ought to be located a distance of 5 feet 6 inches from the finished floor line, inasmuch as this is the standard height in residences in the United States.

Contributed by

ARTHUR GOODNOW.

To Prevent Poured Lead from Exploding

When melted lead is poured about a damp or wet joint, it "explodes," or scatters, due to the pressure of the steam suddenly generated. This trouble may be averted by melting a small piece of resin with the lead in the ladle, before it is poured.

Contributed by EDGAR JOHN.

Flux for Wire Soldering

Resin and wood alcohol make a good soldering flux for electrical work. An added advantage is that the joint will not corrode. To prepare the paste, the resin should be powdered and mixed into the alcohol until a moderately thick consistency is obtained. The paste should be applied freely to the surfaces to be soldered.

Contributed by

IRVING FARWELL.

A Safety Hint for Motorists

The possible danger of a "kick back" from an automobile engine when it is first cranked can be avoided if the crank is turned several times before the battery cells are switched on.

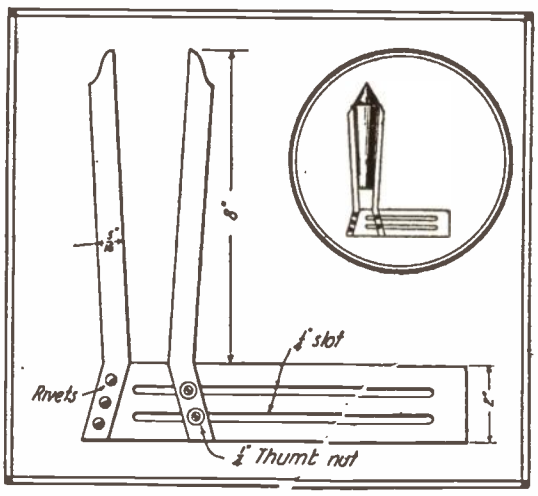
Contributed by

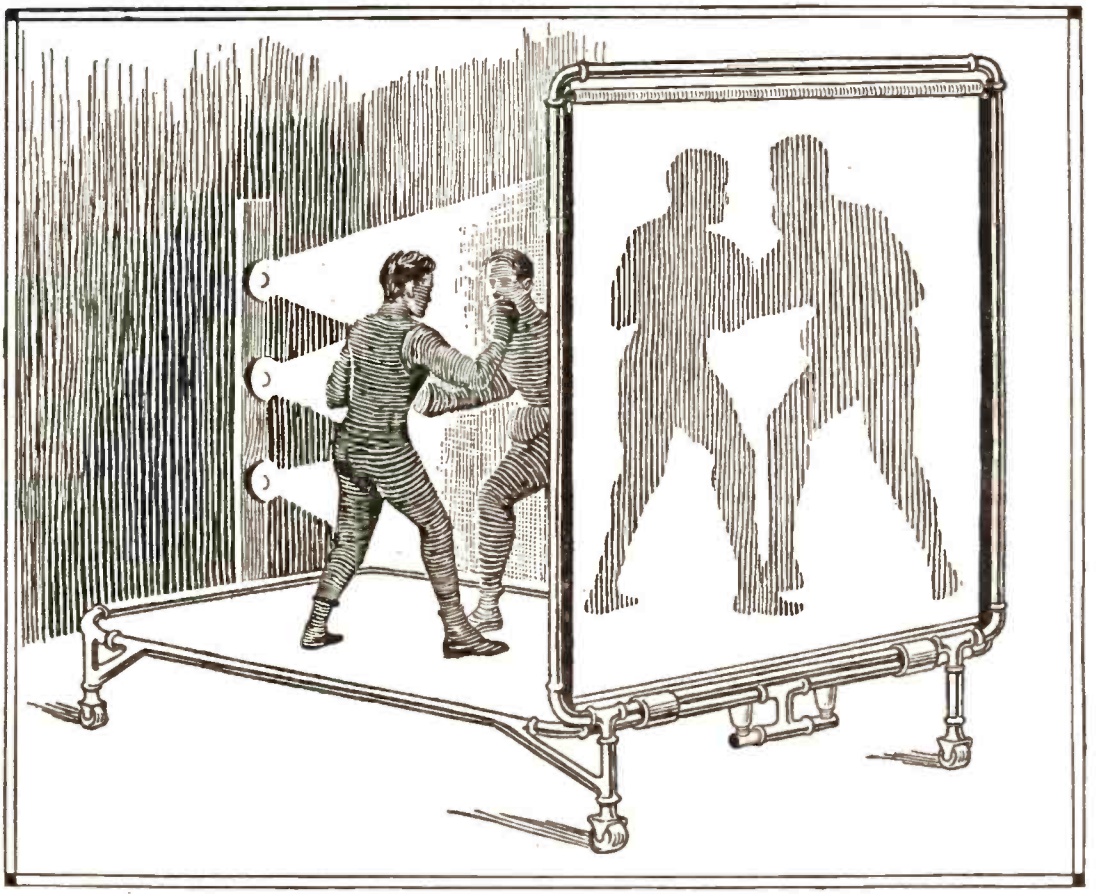
IRA MOSS.

An Ingenious Taper Gauge

Instead of using the ordinary taper gauge for fitting tapers, as is the common practice, a tool machined according to the accompany drawing may be used with much better results. Thumb nuts should be provided for the sliding bar, so that it may be adjusted without difficulty.

Contributed by JAS. MCINTYRE.





The "Spirit Shadow" Illusion

The effect of the spirit shadow illusion, as it is called, is secured by means of a darkened stage on which a brightly lighted platform on wheels is placed. The front end of the platform is covered with a curtain which works in a frame, the frame being set at right angles to the platform. Bright lights are at the back of the frame. The illusion is made possible by a trick of optics. The lighted curtain dazzles the audience. Between the curtain and the lights, figures perform various antics, and their silhouettes are thrown sharply on the screen.

Contributed by

HANDY MAN.

For Bending Wire

A simple wire-bending machine can be made by drilling holes into a plate of iron or steel and driving pins into them. These pins should be spaced according to the size of the wire. Should more than one turn be required, a number of such pins can be made, the length of succeeding pins being greater in order to allow the wire stock to be raised to clear the pins used for the bending operations following.

Contributed by

WM. HALK.

To Bend Tubes Without Kinking

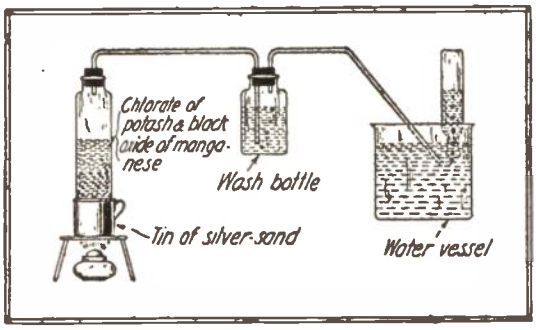
Tubes can be bent into any desired shape without kinking if the tube is previously filled with fine sand. After the bends are made, the sand can be easily poured out again.

Contributed by

EMERSON SMITH.

An Oxygen Generator

Oxygen generators are indispensable to the chemical laboratory. They can be made in a variety of forms, one of the simplest yet most reliable of which is



shown in the accompanying drawing. Its action is based on the fact that when a three-to-one mixture of chlorate of potash and black oxide of manganese is heated, free oxygen is given off. The chemicals should be heated very slightly. The best way to accomplish this is to rest the bottle in a tin cup partly filled with silver sand under which the flame is placed. A glass tube should lead from a rubber cork in the generator bottle into a wash bottle filled with water. The gas is thoroughly cleaned here and flows through a glass tube which terminates in a water vessel, where the gas is collected in bottles, as indicated. The corks should be sealed with shellac to prevent leakage.

Contributed by

H. A. McIlvaine.

Makeshift Ruby Lamp For Traveling Photographers

An emergency ruby lamp for the amateur photographer whose developing kit lacks a standard dark lamp can be made by tying a piece of red paper over the bulb of a pocket flash light. Extreme care should be taken in selecting the paper which is to be used. A better plan, probably, than the foregoing is to carry a small ruby bulb which can be substituted for the regular bulb of the flash lamp.

Contributed by T. N. Slocum.

Chewing Gum a Puncture Remedy

In an emergency a puncture in a bicycle tire can be repaired by chewing gum forced into the hole and held in place by a handkerchief bound tightly around the tire.

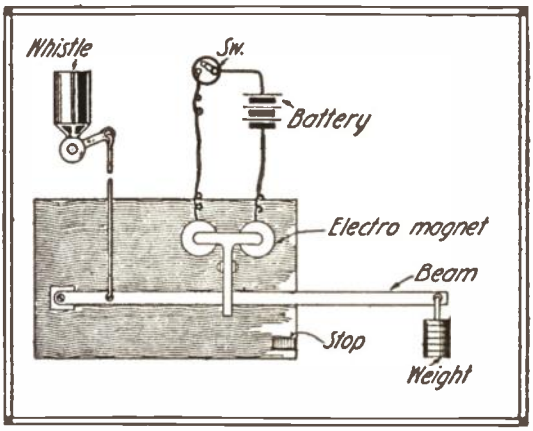
Contributed by

Donald Olson, Jr.

Pulls Whistle Electrically

In water power or electric lighting plants in small towns, where expense prohibits the installation of the usual electric fire whistle, an attachment can be fitted to the plant whistle, which will serve the purpose practically as well as the costlier made-to-order installation.

A heavy board should be nailed to some support below the whistle. A long metal beam, weighted at one end and pivoted at the other to a small pedestal, should be attached by a wire or stout cord to the whistle valve. A pair of electromagnets should be mounted on the board, and a pivoted release bar placed below them so that a broad flare at the upper end of the bar will come within a fraction of an inch of the cores. The flare acts as an armature. When current is sent through the coils of the magnets



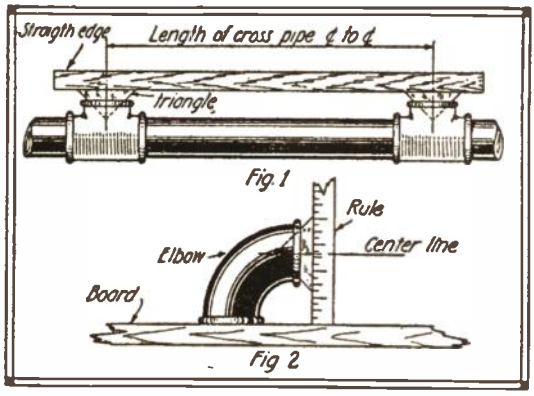
the armature is drawn down, a catch at its lower end releases the weighted beam, and the whistle blows until the beam is put back in place.

A small block of wood should be nailed at the lower corner of the board to act as a stop.

Contributed by Frank Sahlman.

Locates Centers of Pipes and Fittings

To locate the centers of pipes, elbows and other fittings, a wood tool can be used which will give accurate results. A triangle should be cut from ⅜-inch board, and glued tightly to a pocket rule. If an elbow is to be centered, it should be placed upon a smooth surface, and the triangle inserted. The exact center line will be found by consulting the ruler. The distance between centers of two pipes disposed in parallel can be



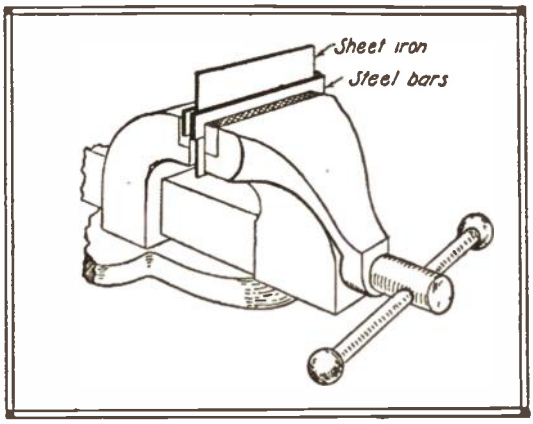
found by using two of these triangles and measuring the distance between their center points.

Contributed by
ARTHUR L. KREBAUGH.

Novel Tubes for Loose Couplers

If the paper or cardboard which is used in making loose coupler tubes for wireless receiving sets is soaked in flour paste, a much stiffer tube can be made than by the ordinary methods. Heavy paper is preferable to cardboard.

Contributed by G. L. PETTYCREW.



To Saw Thin Metal Strips

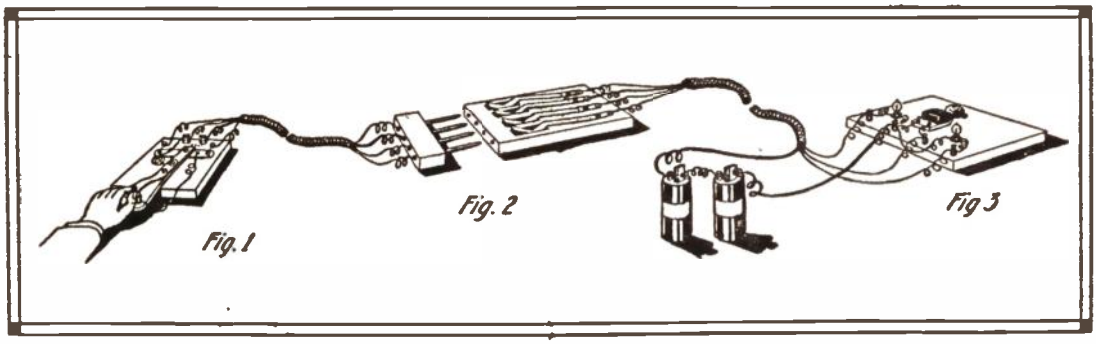
The uneven, ragged edge which usually results in an attempt to saw thin metal strips can be prevented if the stock is clamped tightly in a vise between two parallel steel bars. The cut should be made with the hack saw guided by the smooth surfaces of the bars.

Contributed by
C. P. CLEARY.

Electric Signals for Directing Tractors

Nearly all road graders are drawn by traction engines, and considerable difficulty is encountered in conveying the "stop," "go ahead," "go to right" and "go to left" signals from the grader to the man driving the traction engine. This difficulty may be overcome by the use of an electrical signaling system, which is quite easy to construct and is certain in its results.

The signaling apparatus should be attached to the engine so that it is in full view of the engineer. Two miniature electric lamps and a door bell will be re-



quired. The lights and bell should be fastened to a wood base which is bolted to the engine frame. The connections for the bell and lights, together with the necessary dry cells, are shown in one of the accompanying drawings.

The switches are to be screwed to a board which is installed in a convenient place on the grader. They should be constructed in such a way that easy and quick manipulation is possible. Fig. 1 illustrates the switch. The handle can be turned from hard wood stock and when finished should have a length of about 8 inches. Various adjustments of the switch will cause different contacts to be closed which will result in the bell or one of the lights giving a signal.

Fig. 2 illustrates the connecting plug, which should be bolted to the frame of the tractor. It comprises a long, flat, wooden block, bored out lengthwise with four small holes into which four spurs attached to another block will fit. Brass springs should be screwed upon the face of the large block and bent to fit into holes so that they will come in contact with the four spurs.

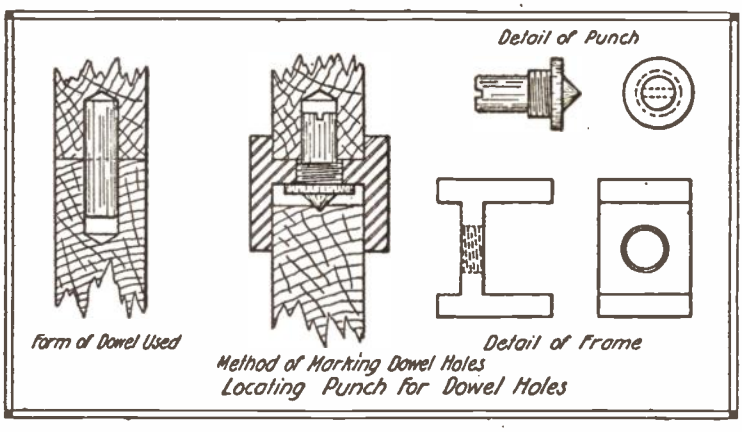
In signaling, the operator on the grader throws the switch either to right or left, according to which direction he desires the tractor to turn. The switch is depressed when he wants the tractor to stop.

Contributed by

J. C. LUNDHOLM.

Punch for Locating Dowel Holes

The task of locating with the necessary degree of accuracy a pair of dowel holes in wood is frequently a difficult one. The little device shown in the illustration will materially aid the workman in performing the task, and, considering the ease with which the tool may be made, it should find a place on every workbench where woodworking is done.



The punch is made up of two pieces, *i. e.*, the punch proper and the frame or holder. This is desirable because the construction is economical and it makes the device interchangeable. The punch can be removed from the frame and another inserted in the event that a hole of a different size is desired. The reader will note that the upper end of the punch is fitted with a slot in order that it may be quickly removed or replaced with an ordinary screw driver.

The device is invaluable for marking off dowel holes in the edges of boards used for table tops and in other places where it is essential that accurate work be done. By fitting a set of these punches to a board that has been drilled for the dowels, and bringing up the adjacent board, all of the holes in the second board can be marked off together and in exactly the correct relation to each other. There are other uses to which this suggestion may be put.

Contributed by

JOHN LEAFSTROM.

To Remove Scratches from Hard Rubber

Shallow scratches or engraving can be obliterated from the surface of India rubber by passing a heated soldering copper over a thickness of paper which is superposed upon the surface of the rubber.

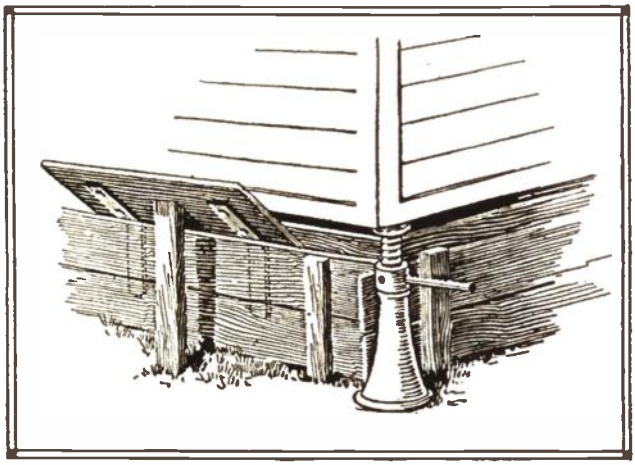
Contributed by

P. J. HOFFMAN.

Filling Foundation Trenches

When building foundations it is sometimes difficult to reach the forms after they have been put in place, in order to pour in the concrete. The problem can be solved by an arrangement similar to that shown in the illustration, which can be erected with materials usually available about the house, and without the use of special tools.

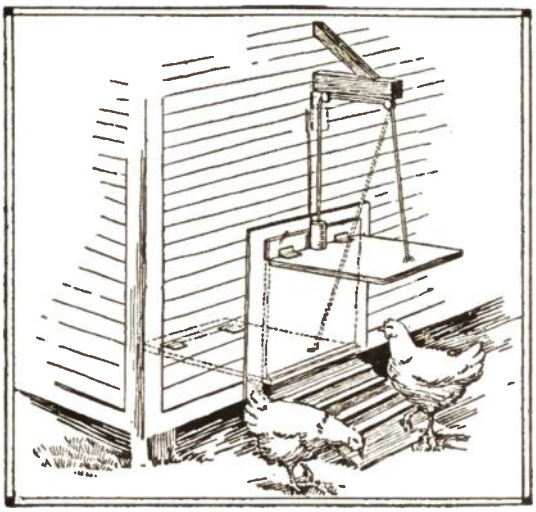
A simple plan is to bolt two pieces of iron strip on a board and slip their lower ends into the form where they are bent back, so that the board slopes outwards at an angle of about 45 degrees. A piece of wood or other material fastened to the middle of the board on the outside has its free end on the ground, thus holding the board in the proper position.



The concrete poured on this board will slide down into the form without the least trouble.

Contributed by

MARGARET W. MOODY.



Automatic Door for Chicken Coop

To obviate the unpleasant necessity of arising too early to open the door of the chicken coop and let the poultry into the yard, an automatically opening door can be easily made according to the design suggested in the accompanying sketch.

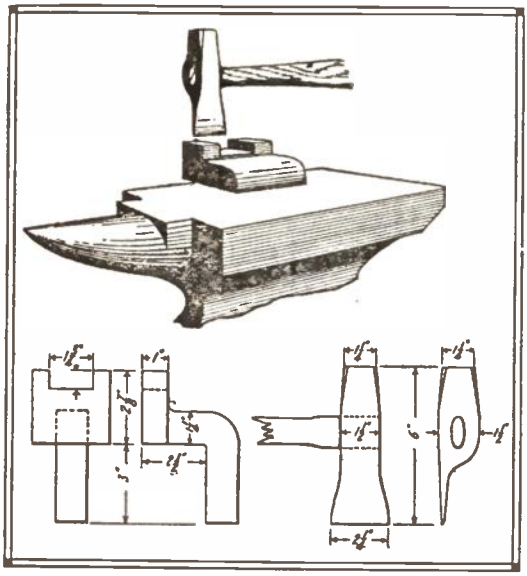
The first step in the work is to provide a hinged platform inside the chicken coop under which is placed a spiral spring of just enough strength to give away under the weight of a hen. A door is next made and hinged at the top as shown. To this door is fastened a rope leading to a weight that is heavy enough to lift the door. A small strip of wood is nailed across the front of the hinged platform, completing the work. The details are clearly shown in the sketch and require no further explanation.

The action of the automatic door is quite simple. As a hen steps on the platform the strip at the front end is pressed downward, releasing the door, which flies open because of the weight attached to it.

Contributed by

E. I. BRADSHAW.

Have you any ideas for this department? Why not send them in? Ideas are paid for at space rates when published in these columns.



An Ingenious Chisel Cutter

In the accompanying drawing the dimensions are given for the construction of a chisel cutter that can be used in dressing chisels, chisel bars, etc., by squaring off the ends. This tool comes under the "safety first" classification, as provision is made in the design to prevent the chipped portions from flying in the direction of the workman.

Contributed by

JOSEPH K. LONG.

Dollar-Saving Hint for the Woodworker

A handy device for use in cutting boards to given lengths is suggested herewith; in one instance alone its use has resulted in a saving of hundreds of dollars in the course of a year.

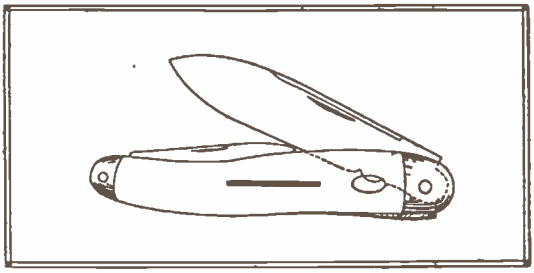
Referring to the drawing: The board *D* is placed upon the movable table, the stop *A*, which turns upon a pivot, is pushed up out of the way, and the end of the board is forced against the stop *B*, which is clamped to the guide *C*. The end of the board is trimmed, after which its position is reversed and the newly cut end placed against the stop *A* which has been dropped back in place. The unfinished end can then be sawed. The distance of the clamp on the guide *C* from the saw can, of course, be varied to accommodate boards of various lengths.

Contributed by

V. P. RUMELY.

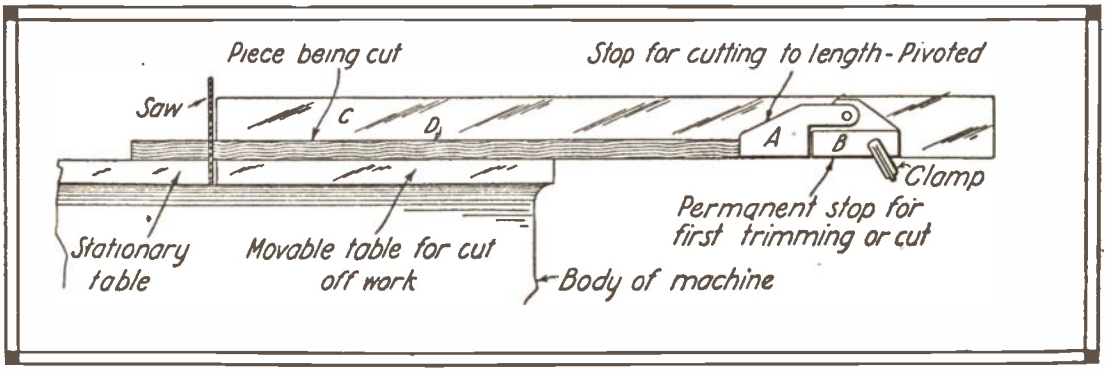
To Remove Rusty Pen From Holder

Rusty pens can be extracted from penholders by pen knives if a slight alteration is made to them. A 3/16" hole



should be drilled through the handle of the knife and filed to an oval shape. The portion of the edge of the knife which covers the hole should be filed to fit the concaved surface of the pen.

Contributed by MICHAEL JOHNSON.

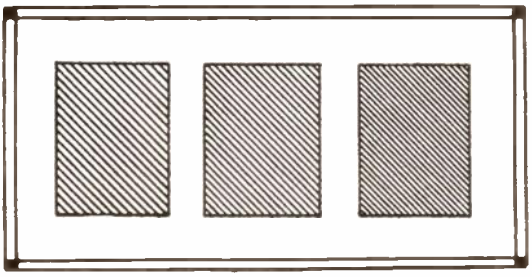


A SERVICEABLE SECTION LINER

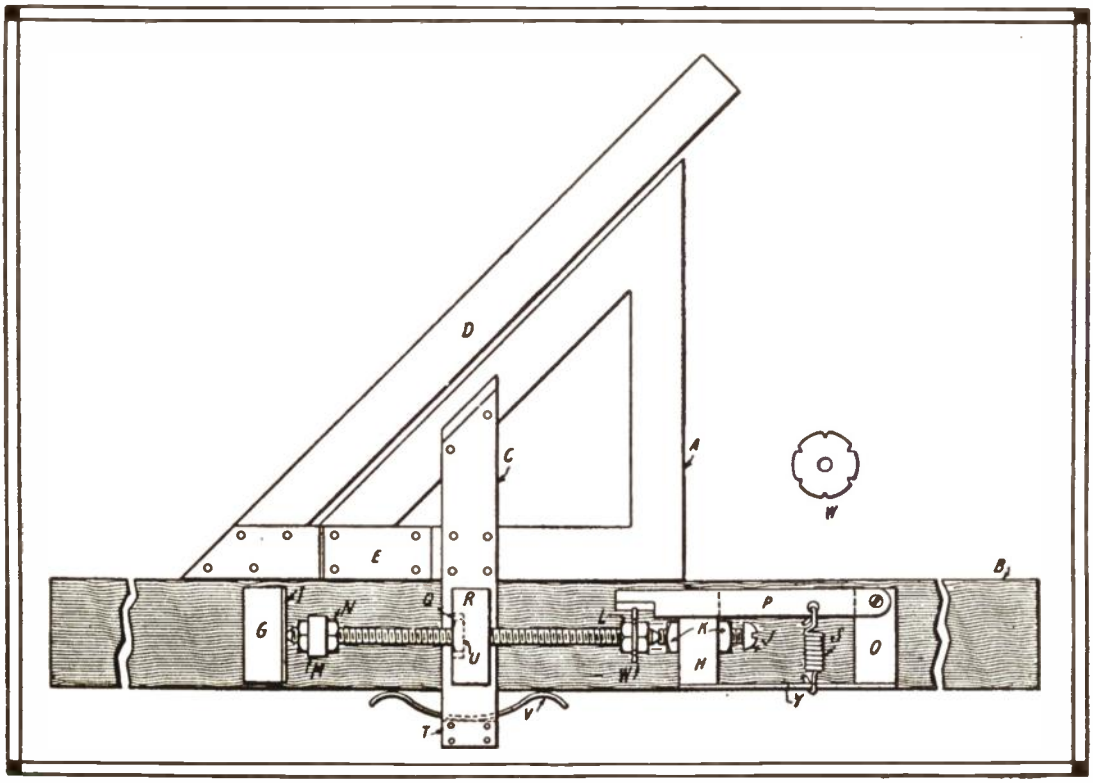
By C. H. Patterson

A section liner with which cross lines may be drawn with absolute accuracy is shown in the accompanying drawing. By means of a rachet, the consecutive lines will be drawn exactly the same distance apart. This distance may be varied easily.

The base of the section-liner consists of a strip of hard wood, *B*, which is pinned to the drawing board so that an angle may be obtained. The straight edge, *D*, is secured at its lower end to a 45-degree triangle, *A*, by means of brass plates, *E*. The triangle, in turn, is nailed to an upright strip of wood, *C*, to which the spacing mechanism is attached. At the lower end of this strip, a spring, *V*, is attached which provides rigidity in the straight edge, as well as smooth working qualities. The spring is held in place by a brass cap, *T*. A threaded wooden block, *R*, is nailed or glued to the upright strip and countersunk to accommodate a square nut, *R*, which is held securely in place by metal strips, *Q*. At right angles to the upright strip and through the block *R* a threaded metal rod, tapered at the ends, is passed. At one end of this rod, the rachet is placed. This consists of a metal plate, *Y*, soldered to the ends of brass blocks, *HO*, which are nailed to the base, *B*; and a spring, *S*, which



exerts a downward pull on the arm, *P*; the arm *P*, sharpened at the outer edge drops into the wedges of a brass adjusting knob *W*. The threaded rachet rod turns in a bearing consisting of an iron



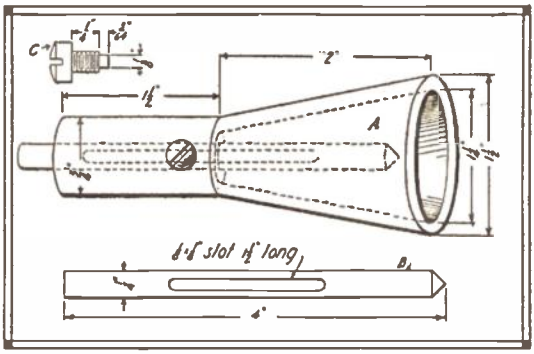
screw, *J*, which passes through the block *H*, and is held in position by the nuts, *K*. The rachet, *W*, is held in place by the hexagonal nuts, *L*.

The opposite end of the rachet rod revolves in a bearing *GI*. An adjusting knob, *M*, of rubber or brass, is held in place by hexagonal nuts, *N*.

In operation, the base, *B*, is pinned to the drawing board at whatever angle is desired. A line is drawn across the straight edge, *D*, the knob, *M*, is turned until the rachet clicks, when the rule will have been moved far enough to the right for another line to be drawn. If a wider space between the line is desired than a single action of the rachet wheel provides, the knob may be turned until the spring clicks twice, or three times. Care must be taken then, of course, that the number of rachet spacings is borne in mind at the beginning of each line.

Centering Tool

An idea which will be found useful by mechanics for centering rough stock



is shown in the accompanying sketch. The tool should be fashioned from tool steel or cold rolled steel, case hardened. A rod, 3⅝ inches long and 1½ inches in diameter, should be adjusted in the lathe chuck until it runs true. After centering, a 15/64-inch hole should be drilled entirely through and reamed out with a ¼-inch reamer, after which the front end of the piece should be cut out, as shown, until the large opening measures 1¼ inches across. This should be smoothed carefully. The opposite end should then be cut to a diameter of ¾ inch and a 3/16-inch hole drilled, tapped and countersunk.

The plunger, *B*, should be made from hard steel, machined to a point at one end so that a 30 degree angle is formed, and a slot, ⅛-inch x 1½ inch, milled in the center. The slot prevents the plunger from sliding out after the 3/16-inch screw is set in its proper place.

The screw, *C*, should be turned in the lathe at the threaded end so that it will fit in the slot of the plunger.

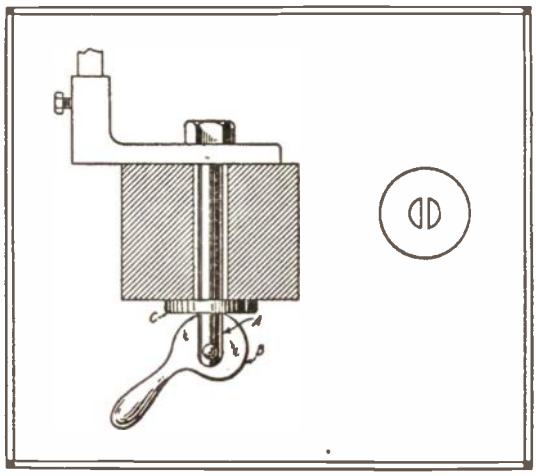
In use, the tool is fitted over the end of the stock to be centered, and a sharp blow struck with a hammer on the protruding end of the plunger.

Contributed by

JAMES MCINTYRE.

Handy Lock for Lathe Rest

A quick-acting lock for a wood-lathe rest is illustrated in the accompanying drawing. The rod, *A*, should have a diameter of approximately ¾ inch, and



have a slot at one end to admit the cam, *B*. The washer, *C*, should be cut at the center to fit loosely over the slotted bolt.

Contributed by M. A. PIPER.

A Modern Reminder

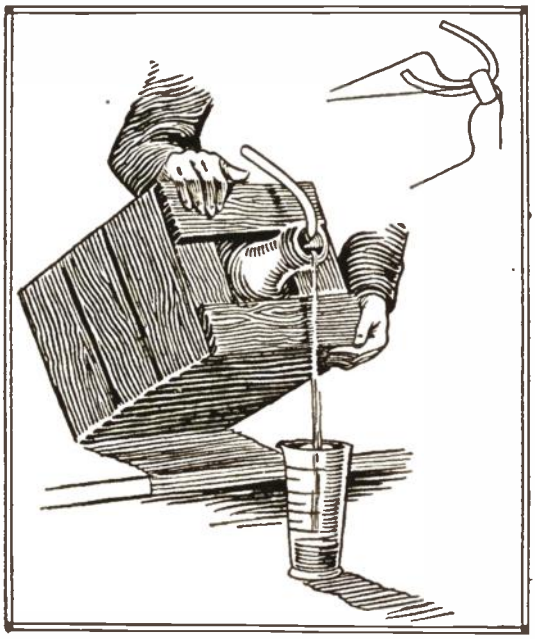
Instead of knotting a string about the finger to prevent the forgetting of an important duty, several initials may be written in ink on the face of a watch. Each time the watch is consulted, the memory is stimulated sufficiently by the initials so that the particular duty will not be easily forgotten.

Contributed by

E. A. HODGSON.

To Pour Acid Safely from Carboys

The danger involved in pouring sul-



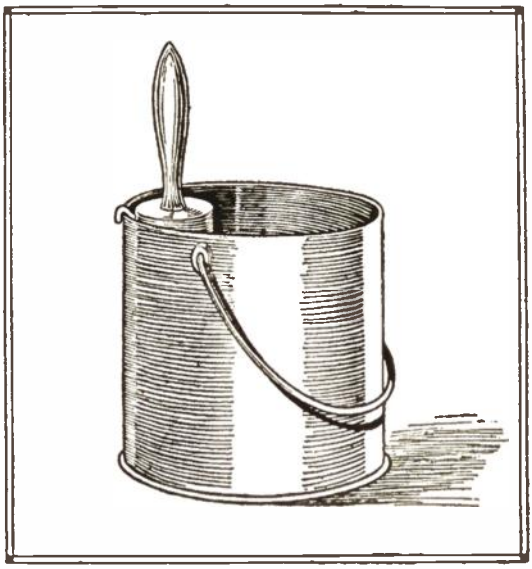
phuric acid from a carboy can be avoided if a bent glass tube is inserted into the neck of the bottle so that the partial vacuum caused by the liquid gushing out is equalized.

Contributed by

GEO. S. SCHOONOVER.

A Brush Holder

It is often necessary to lay aside a brush during a painting job and if it is placed in the can there is a possibility of its becoming entirely covered with paint, which is obviously unpleasant. In order to eliminate this trouble, a screw hook or bent nail can be placed in the



handle of a brush, as shown in the sketch. Thus, when the brush is not required for the moment, it may be placed in the can without danger of its becoming entirely covered with paint.

Contributed by

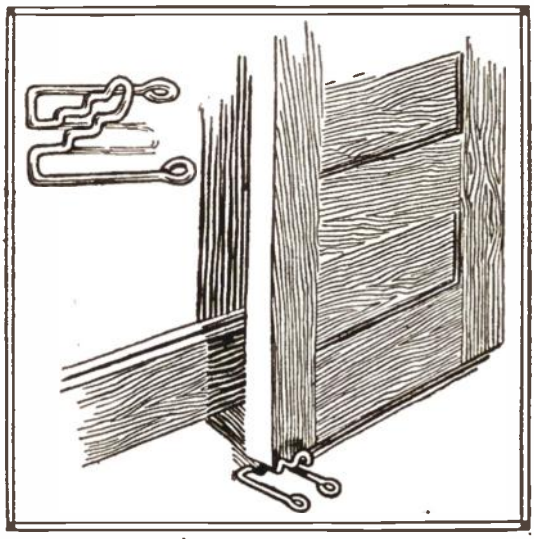
GLENN G. FOGLESONG.

Bent Spring Holds Door Ajar

A handy catch for the door, which will prevent its being blown shut when ajar, can be made from stiff brass or steel wire of 10 or 12 gauge.

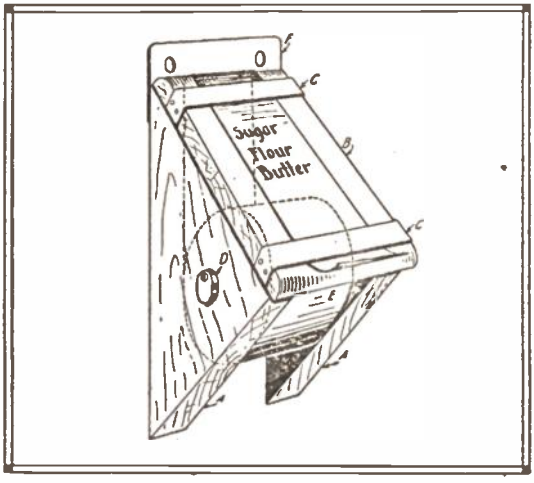
Contributed by

EMERSON SMITH.



Memoranda Holder for the Housewife

A very handy kitchen memoranda-holder for the busy housewife, on which she may jot down articles to be ordered, is illustrated in the accompanying drawing. It requires but three pieces of board, three pieces of tin and a piece of



wooden or metal rod to hold a roll of paper, such as is used in adding machines, or any other roll of paper that may be obtainable—the roll determining the size of the parts for the holder.

The two side pieces, *A*, are sawed out alike from 5/8-inch or 3/4-inch stock, clamped together and the holes for the roll shaft bored. Then the top piece, *B*, with tin strips, *C*, attached, is fastened to them. Wood or metal discs, *D*, with a screw-hole off center, should be used to cover the shaft holes so that shaft will stay in place, yet may be swung aside to remove shaft in renewing rolls, *E*.

The holder may be attached to the wall by the tin piece, *F*, which is fastened to the back, and a pencil hung close by on a string to be always at hand.

Contributed by

ARTHUR A. HORN.

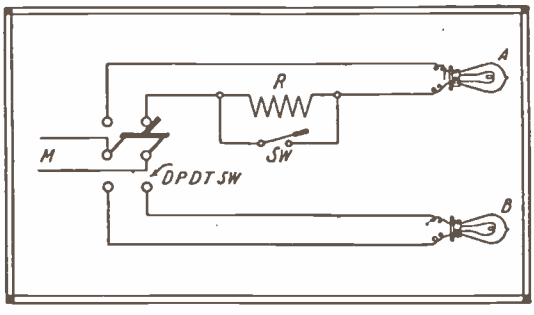
Temporary Repair for Gasoline Cock

If the drain cock of a gasoline tank on an automobile is in a leaky condition it can be temporarily repaired by removing the plug key and smoothly wrapping several thicknesses of thin tinfoil around it. The plug should be pushed in tightly and the washer, spring and cap-screw replaced.

Contributed by JOHN HOECK.

Correct Lighting for the Dark Room

The proper illumination of a photographic dark room should consist of three lights, one of which is white, another bright red and the third dim red. These results can be obtained if two 16 c.p. lamps, one of clear glass, or frosted, and the other red, are used. A small resistance, *R*, composed of a length of German silver wire wound upon an asbestos core, should be inserted in the circuit in which the red lamp, *A*, is connected. A single-throw single-pole knife switch, *SW*, should be shunted across this resistance coil so that the intensity of the light can be quickly changed from brightness to dimness. Current from *M* flows through the double throw double pole knife switch, which is indicated as *DP DT SW* in the drawing, into either



the red lamp circuit or the white lamp circuit, as desired.

Contributed by

J. QUINCY HOLMES.

A Lubricant Chart for the Machine Shop

Various types of machinery require different grades of oil for their correct lubrication. This important fact is often disregarded in many of the most up-to-date machine shops. A chart of lubricants, which has been carefully worked out from experiments covering a long period, appears on the facing page. If

Type of Machine Tool	MACHINE PARTS					
	Plain Bearings	Ball Bearings	Gears	Driving Chains	Slide & Guides	Vertical Bearings
Engine Lathe	B	Petrolatum	Petrolatum	A	Engine Oil	B
Turret Lathe	B	C	V	A	Engine Oil	B
Shaper	Machine Oil	Petrolatum	Petrolatum	A	Engine Oil	B
Milling Machine	Machine Oil	Petrolatum	Petrolatum	A	Engine Oil	B
Planer	Machine Oil	Petrolatum	Petrolatum	A	Engine Oil	B
Screw Machine	B	C	V	A	Machine Oil	B
Threading Machine	Machine Oil	Petrolatum	Petrolatum	A	Machine Oil	B
Drill Press	Machine Oil	C	Petrolatum	A	Machine Oil	Engine Oil, Machine Oil
Tapping Machine	B	C	V	A	Machine Oil	B
Grinder	B	C	V	A	Engine Oil	B
Punch Press	Engine Oil	Petrolatum	Petrolatum	A	Engine Oil	Engine Oil
Broaching Machine	Machine Oil	Petrolatum	Petrolatum	A	Engine Oil	Engine Oil

A	10 parts tallow, 2 parts cylinder oil, 1 part powdered graphite, mix while hot.
B	1 part lard oil, 1 part machine oil, 2 parts paraffine oil.
C	Petroleum jelly thinned with paraffine oil.
V	Viscous mineral oil
S	5 lbs. sal soda, 41 gallons water, 3 gallons lard oil, 15 lbs. soft soap. Mix by boiling 1 hour.
T	3 lb. flour of sulphor to 1 gallon of lard oil.
O	2 parts lard oil, 1 part mineral machine oil, 1 part paraffine oil.
P	Paraffine oil

Operation	MATERIAL											
	Cast Iron	Tool Steel	Mild Steel & Wrought Iron	Yellow Brass	Red Brass Bronze	Copper	Aluminum	Zinc, Nickel, Tin.	Babbit Bearing Metals	Die Casting	Wood Bakelite Condensite Fiber	Hard Rubber Gutlapercha
Drilling	None	O	O. S.	None	None	O	Kerosene	None, P	None	None	None	None
Boring	None	O	O	None	None	O	None	None	None	None	None	None
Reaming	None	O	Lard Oil	None	O	O	Kerosene	P	Kerosene	None	None	None
Tapping	O. S.	O	O	O	O	O	Kerosene	P	Kerosene	Kerosene	None	None
Turning	None	None	None S	None	None	None	None	None	None	None	None	None
Shaping	None	None	None	None	None	None	None	None	None	None	None	None
Planing	None	None	None	None	None	None	None	None	None	None	None	None
Cutting off	None	O, S	S	None. S	None S	None. S	None	P	None	None	None	None
Threading	O	Lard Oil	Lard Oil	Lard Oil	Lard Oil	O	Kerosene	P	Kerosene	Kerosene	None	None
Gear Hubbing	None	Lard Oil, S	T. S	Lard Oil, S	Lard Oil, S	Lard Oil, S	Kerosene	P	None	None	None	None
Milling	None	O	O. S	None. S	O, S	O	Kerosene	None	None	None	None	None

the suggestions offered are followed, burned bearings will be less frequent, and a considerably higher efficiency will result.

Regarding the tabulated lubricants, several important points should be borne in mind. The compound, *S*, is commonly known as soda water, and its composition can be varied to a certain extent. It should not, however, be allowed to become caustic, or it will injure any metal with which it comes in contact. Where lard oil is referred to, No. 1 pure raw lard oil is meant. The machine oil mentioned in the tables and in the oil compounds should be pure mineral oil—very fluid, rather viscous, and having a flash point of about 500 degrees F.

Contributed by

F. B. HAYS.

Porcelain Tube Sharpens Knife

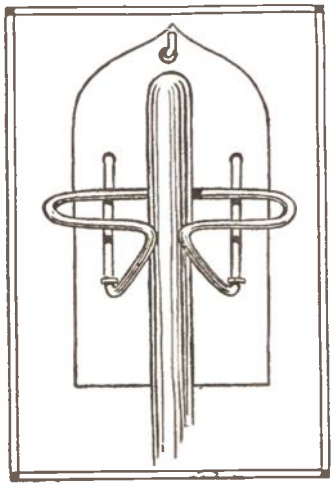
An unglazed porcelain tube or cleat makes a good whetstone for sharpening a jack-knife. Either of these can be secured at any electrical supply store at a cost of a few cents.

Contributed by

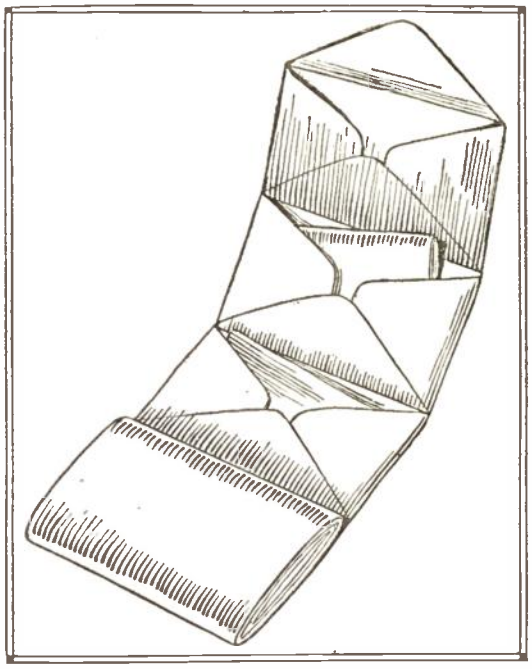
O. S. WADE.

Broom Holder Made from Spring Wire

A handy holder for brooms when not in use can be made from stiff spring wire bent to the shape shown in the accompanying drawing and fastened with brads to a small wood block which may be suspended from a screw-eye driven in the wall. The wood can be painted to match surroundings.



Contributed by H. DOLPH.



A Home Made Portfolio

A cheap portfolio can be made from four ordinary envelopes by gluing the flap of the first to the face of the second; the flap of the second to the face of the third, etc. Different sizes of envelopes can be used for various requirements.

Contributed by

WILLIAM OJA.

To Remove Tarnish from Copper

Tarnish may be removed from copper by simply rubbing the surface with a common ink eraser. The "grit" in the eraser removes the tarnish without scratching the metal.

Contributed by

WILLIAM A. CAWLEY.

Hints for Motorists

In nearly every case of a slipping clutch the difficulty can be overcome by the application of carbide ashes to the face of the clutch. If carbide ashes are not available, a good substitute is either tire mica or tire talc.

A useful starting crank holder can be made from an ordinary screen door spring and a harness ring. The ring

should be fastened to one end of the spring, the other end being attached to the car frame or lamp bracket. The crank handle is placed in the ring and allowed to drop to a natural position, where it will stay until used again. This arrangement affords a better means of holding a crank than the usual leather strap.

To avoid the trying experience of picking screws out of the drip pan by hand, an implement is suggested which may be constructed as follows: Break a piece about an inch long from an ordinary horseshoe magnet and fasten it to a rod 18 inches long. Iron screws which fall into the drip pan can be restored very easily with the aid of this magnet.

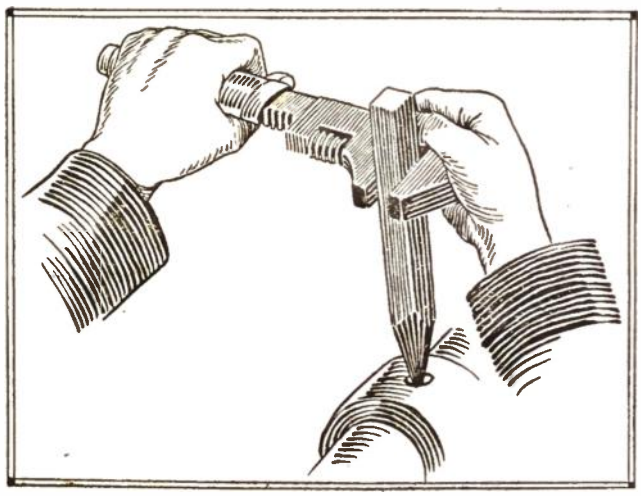
Contributed by

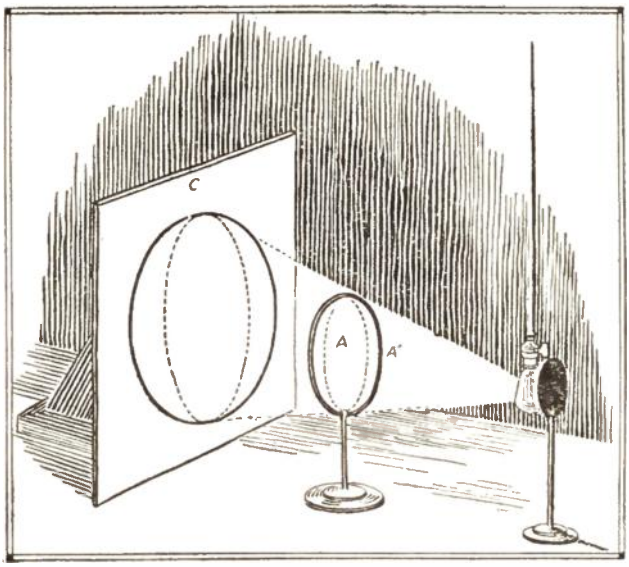
F. P. DICKOVER.

To Remove a Broken Machine Screw

A broken set screw can be removed with a small square chisel which has been sharpened to a point at one end. A small hole should be drilled a short distance into the broken screw, the chisel point inserted and the blunt end struck a sharp blow with a hammer. By means of a wrench clamped to the chisel the screw may be turned and removed with little difficulty.

Contributed by E. E. DICKSON.





Drawing an Elipse with a Shadow

A perfect elipse can be drawn on paper by mounting an iron ring on a stand between an electric lamp and a vertical drawing board. A shadow will be cast on the board from the ring, and will assume various forms of elipses as the ring is turned. The size of the elipse may be varied by moving the circle nearer to or farther from the lamp.

Contributed by JAS. MCINTYRE.

Acid Ink Eraser

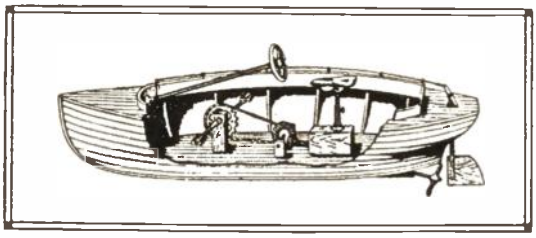
An attempt to erase ink with an ordinary ink eraser or a knife usually results in an unsightly blotch. Acid or chemical ink erasers have a decided advantage, although they are usually rather expensive. A good acid ink eraser, however, can be made quite cheaply.

Into a liter of distilled water dissolve 110 grams of chloride of lime and allow the solution to stand for 24 hours. Strain through a cotton cloth and add 10 parts of acetic acid to each 25 parts of solution.

Apply the eradicator with the reversed end of a pen holder and absorb the surplus with a blotter when the ink has entirely disappeared.

Contributed by

W. S. ZEHRUNG.



Boat Propelled by Foot Motor

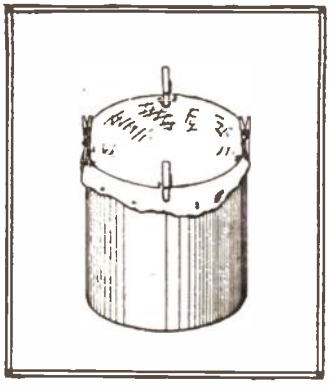
Although boats propelled by "man power," which is applied through any other form than oars and paddles, are not relatively efficient, they are a distinct novelty and afford a great deal of entertainment. The driving mechanism will depend entirely upon the resources of the constructor; ordinarily, discarded parts from old bicycles, a couple of second-hand cogs, and the shaft and propeller from a worn-out motorboat, will be sufficient. Pains must be taken in the design, so that the parts will co-relate with the general proportions of the anatomy of the man who is to do the work of propulsion.

Contributed by

CARL HANCOCK.

Holds Strainer Cloth in Position

An improvement over the old method of fastening the strainer cloth which is used for straining liquids by binding it along the edges with cord is suggested in the adjacent illustration. Small clothes pins will do the work equally as well and are easier to handle.



Contributed by

B. W. VERNE.

Ideas submitted for this department are paid for at space rates when published.

To Renew a File

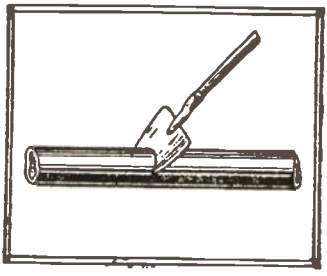
Old files can be renewed by a thorough cleaning with a fine wire brush, followed by a bath in dilute sulphuric acid.

Contributed by

JOSEPH MISKINIS.

A Pipe Scraper

A pipe which is covered with dirt or grease can be cleaned with an old spade which has been ground out to fit the diameter of the pipe. The method of using the spade is shown in the accompanying sketch.



Contributed by

B. W. VERNE.

A Labor Saver for the Washerwoman

The heavy task of emptying the water from a wooden washtub can be obviated by boring a small hole in the bottom of the tub near the edge and fitting it with a wooden plug.

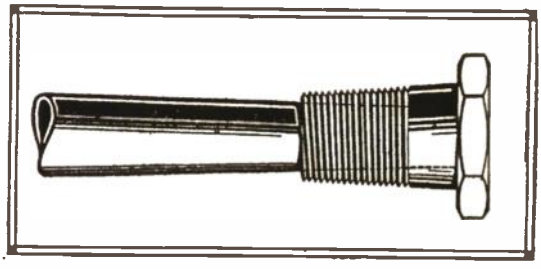
Contributed by

R. D. SOUTHERN.

Emergency Repair for Stuffing Nut

A worn packing nut can be repaired temporarily by driving a taper mandrel into the center, so that the threads of the nut will expand sufficiently to again fit tightly.

Contributed by J. N. BAGLEY.



A CRAFTSMAN SUMMER COTTAGE

Describing a Summer Dwelling that May Be Constructed by the Average Handy Man at Low Cost.*

By Ralph F. Windoes

Instructor of Manual Training, Davenport High School, Davenport, Ia.

Illustrations from drawings made by the author

LAY the flooring on the frame, as constructed from our previous instalment, at right angles to the joists. Select very straight pieces for the first boards layed, and nail through the tongue into each joist, using the 8d nails. The latter should slant toward the center of each piece so as to draw up boards that have a tendency to hold out. The pinch bar and a short piece of 2 by 4 will help very materially in pulling up obstinate members. Joints should be broken on joists only.

Cover the entire floor, porch, living room and kitchen so that there will be provided a level surface to frame the walls upon

Fig. 12 shows the construction of the framing at one corner, while Fig. 13 gives details of the front and rear wall frames of the living room.

Frame the front section first, nailing it together while it is laid out flat on the floor. Select two straight 2 by 4's for plates, as long as the floor is wide. If it has been built accurately according to dimension, these will be 23′ 6″, but to make sure it is safer to lay them out from the floor width.

From the 16-foot batch of 2 by 4's, cut twenty-six that are 14′ 4½″ long, for full length studding. Be very sure that you cut both ends *square*. Measure up from the lower ends 8′ 8¼″, and mark the *top* edge of the ledger board cut, then *back* 4 inches, as illustrated in Fig. 13. The ledger boards will be set in their full thickness, ⅞″, hence the constructor must cut this amount from each stud before it is nailed into place.

Select twelve of the studs for the front wall, and spike two pair of them together for the corners (see Fig. 12). Nail these in place through the plates. From the *center* of each plate measure over each way 24″ distances, and put in studs at these marks so that the center of each will coincide with the marks, as illustrated in Fig. 13. Leave spaces for the door and the window frames, which can be put in place temporarily and fitted around.

*This article is one of a series that has appeared in every issue .f THE WORLD'S ADVANCE, beginning with the May number. The concluding instalment will appear in the August issue. Back numbers may be obtained at 15 cents each while the supply lasts.

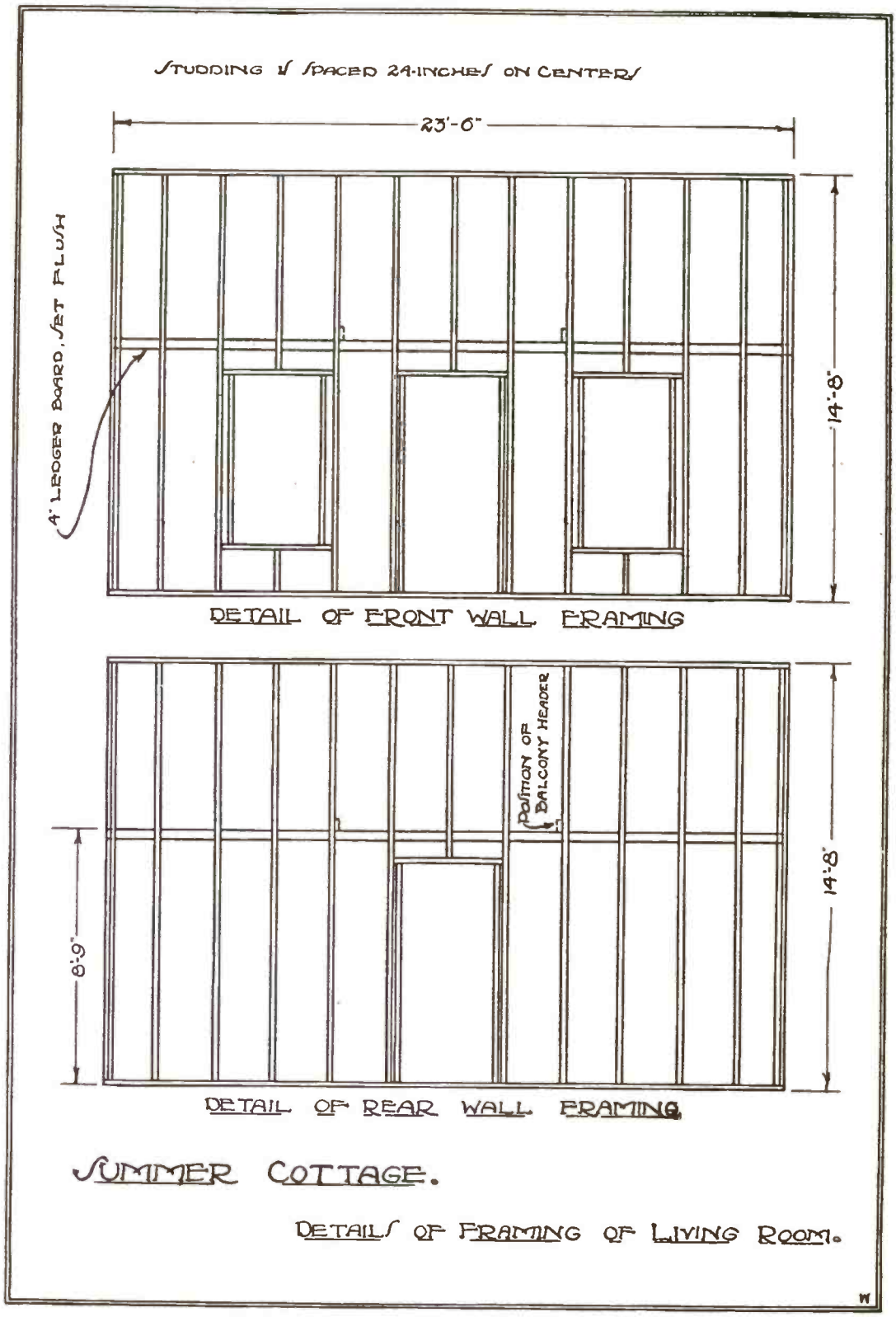


Fig. 13—Details of the Front and Rear Wall Frames of the Living Room.

Fit the door frame first, and nail the header across. Remember that when the frame is erected the floor plate crossing the door opening will be removed and the sill of the frame will drop to the floor — hence the header will be lowered a little on this account.

The top window headers will be on a level with the door header, and the bottom will be fitted from the window frames. Place the uprights in each opening, allowing about ½ inch clearance on each side of the frame. Put in the short length studs, and cut out the ledger board lap in them. The ledger can be ripped from a piece of flooring. The reader will understand that it is used to help stiffen the frame and as a support for the balcony headers.

Remove the door and window frames if you have not already done so, and raise the wall frame into position. It must be square with the wall line, and rest over the double joists in the floor

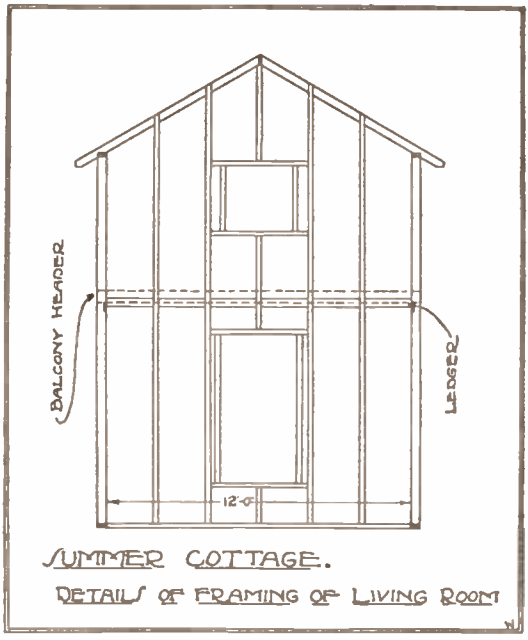


Fig. 15—Showing the Spiking and Bracing of the Rear Wall.

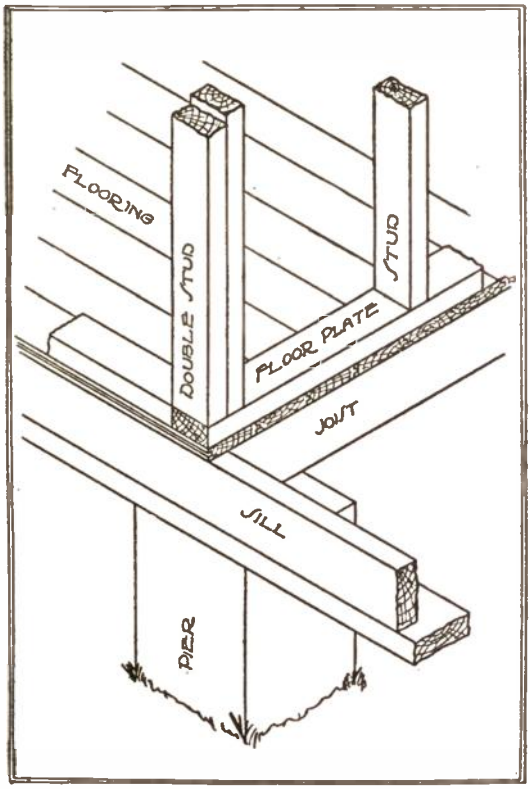


Fig. 12—Showing the Construction of the Framing at Floor.

frame. It must also be plumb. Spike it to the floor through the plate and stiffen it with diagonal braces, as suggested in Fig. 14.

Frame the rear wall in exactly the same manner and raise it into position. Spike and brace it firmly 12 feet from the front wall, as seen in Fig. 15. The best method of doing this is to cut the two side wall plates 12 feet long and nail them into position, after which the rear wall frame can be butted against their ends. When plumb, firmly brace it as you did before, and nail the balcony headers in place. They will help to hold the walls together.

Next frame the roof. This is one of the most difficult parts for the beginner, but we have endeavored to illustrate a method altogether shorn of technicalities. Although it is not exactly accurate, and would not pass as a good method for a master builder to use, it will do very well for the work at hand.

Select one straight 2 by 4 by 10 feet, and at the upper end, *a*, in Fig. 16, lay the steel square so that the 13½" mark on the blade just touches the outside edge at *b*, and the 7 13/16" mark on the

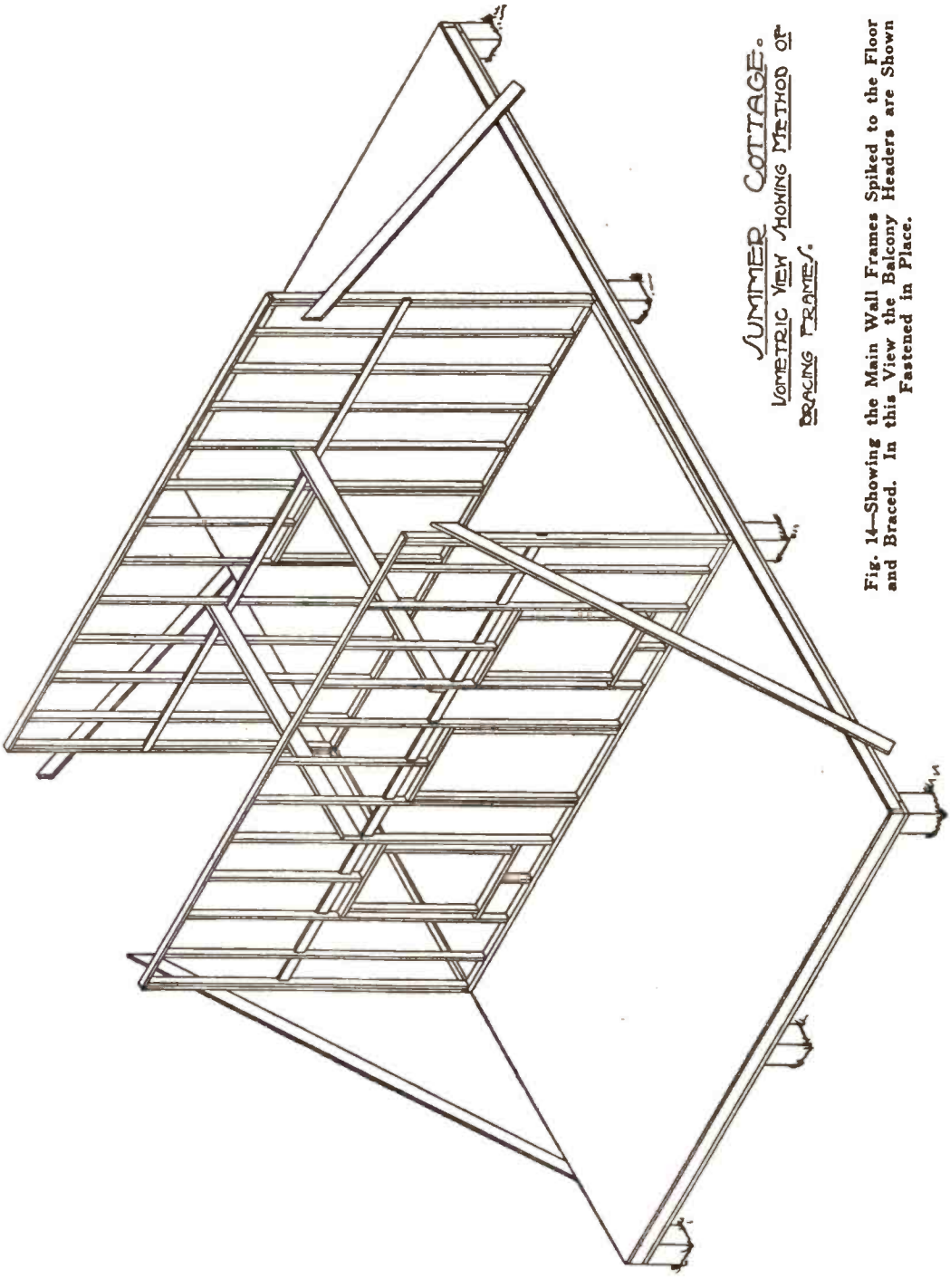


Fig. 14—Showing the Main Wall Frames Spiked to the Floor and Braced. In this View the Balcony Headers are Shown Fastened in Place.

tongue is exactly on the corner. Along *a-c* draw a line, and this will give you your plumb cut.

Now from *a* measure down 7′ 3″ to point *d*, and, in exactly the same way, using point *d* as you did *a*, strike *d-e*, which will be parallel with *a-c*. Then, in the position that we have it illustrated *d-e-f*, draw the horizontal line of the heel cut. When finished, the heel cut should have its dimensions as detailed. The lookout, from *d* to the end cut, is 12 inches.

Saw these cuts exactly square with the edge, and lay out another rafter in the same manner. Nailing a small block, which is substituted from the ridge board, on the plumb cut of one piece, put these rafters into position on the plates. If the work has been accurately done, and the plates are just 12 feet apart, the heel cuts will come exactly right and square with the plates. If not, then you must cut and fit the rafters until they are satisfactory. When accurately fitted, use the best one as a pattern, and cut twenty-four more exactly like it. Select a piece of straight flooring that is two feet longer than the width of your cottage, and nail the rafters in place, as illustrated in Fig. 17.

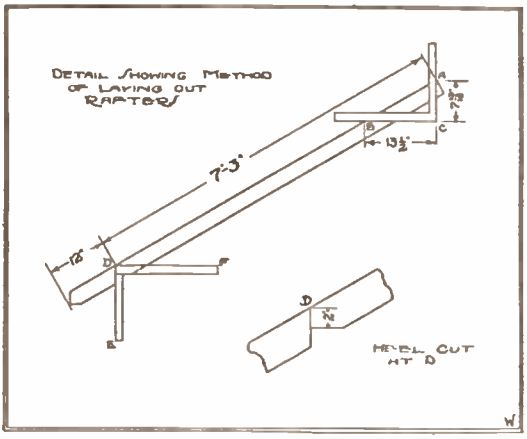


Fig. 16—Showing the Method of Laying Out the Rafters.

They are also spaced 24″ on centers, and should be accurately layed out on both sides of the ridge and on the plates.

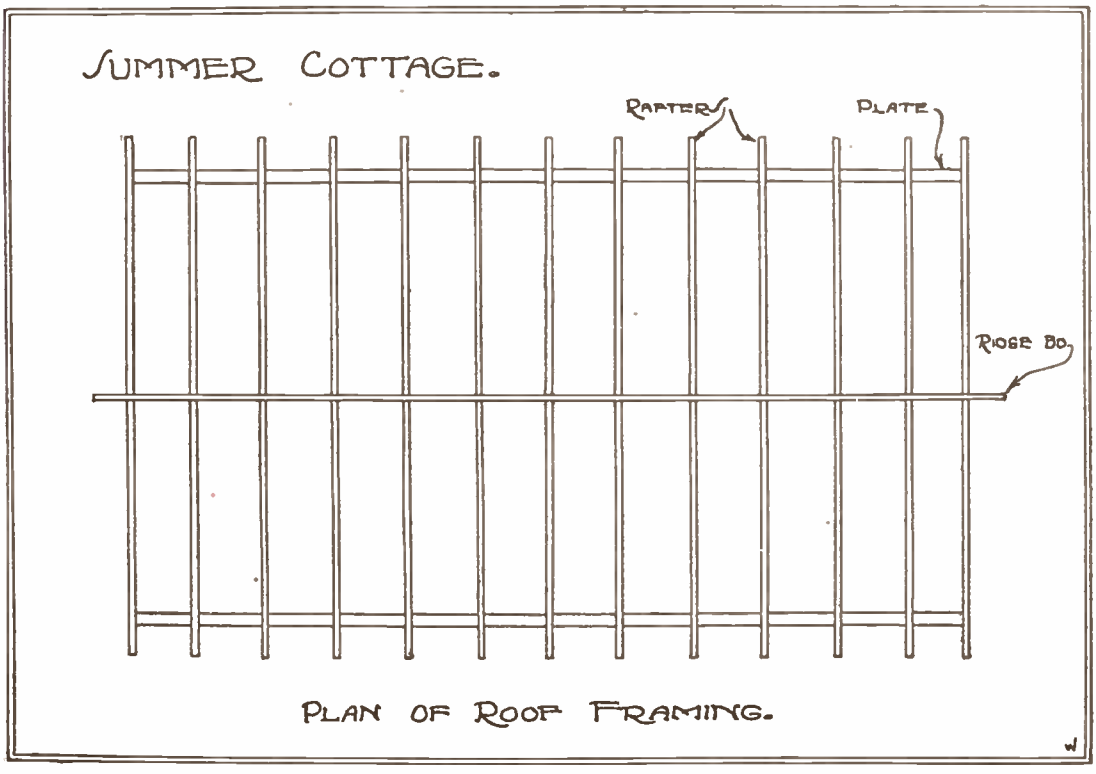


Fig. 17—Plan of the Rafters as they Should Appear After Being Nailed in Place.

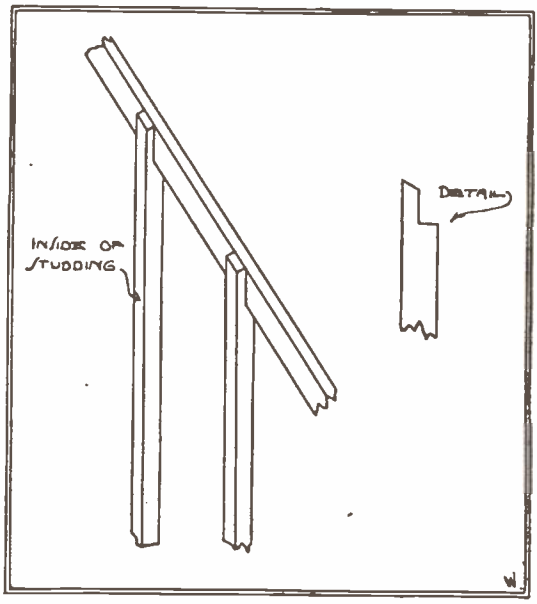


Fig. 18—Detail of Upper End of Studding at Gable.

Next, fit the end studding in between the floor plates and the end rafters, as seen in Fig. 15. Fig. 18 gives a detail of the upper end which is cut around the rafters on the outside. They are spaced 24" on centers, and have a ledger board whose top edge comes two inches above the ledger boards on the front and rear walls. This is necessary because the headers are 2 by 6's, and the joists but 2 by 4's, and their top edges must be level.

Rip a 2 by 4 and nail one-half of it on the inner edge of each header, as pictured in Fig. 19, and place the balcony joists into position. Of course, they are spiked to the studding at their outside ends. If the builder desires he may at this time place the flooring upon them, and put in the 1½" pipe support under the center of the headers, as is also seen in Fig. 19. This will provide two strong platforms upon which he may work while fitting the roof boards and the siding.

In following the detailed instructions and sketches, the reader should be very careful and refer constantly to the floor plans and elevations given in the May instalment of the series, in order to check up the various dimensions.

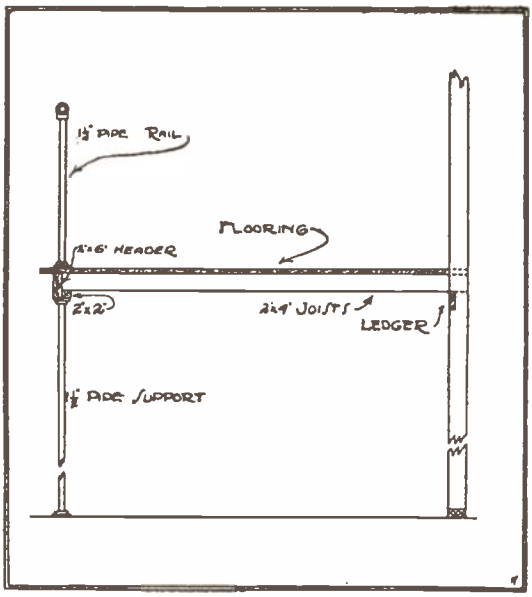
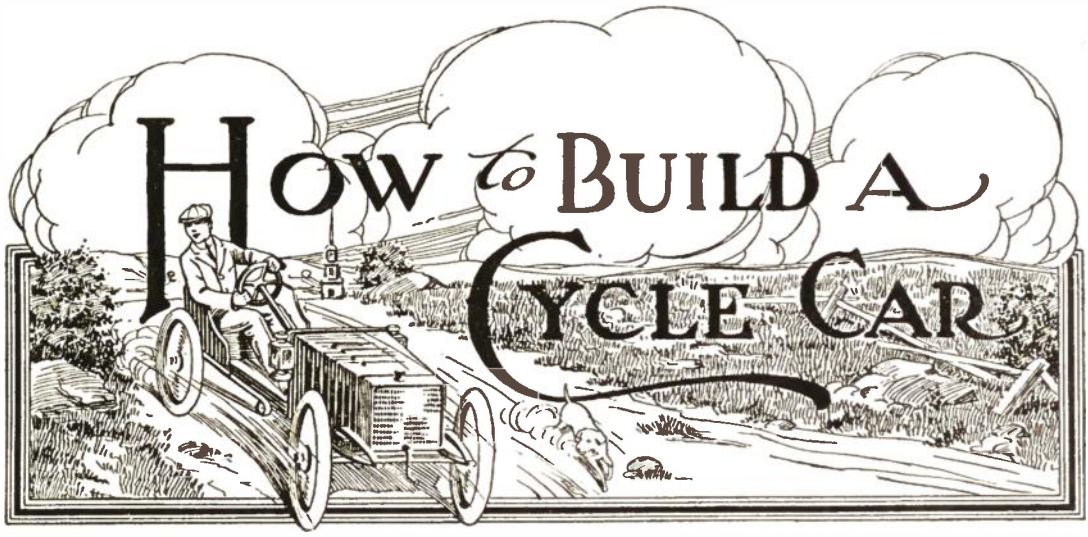


Fig. 19—Detail of Balcony Construction.

AN IMPROVED BRAKE

There has recently been tested an improved brake system that actually stopped a train of twelve steel passenger cars and a locomotive, weighing in all nearly a thousand tons, within a thousand feet, or the length of the train, when running at a speed of sixty miles an hour. The energy generated by a train of that weight running at that speed corresponds to that of a blast of dynamite powerful enough to blow the entire train 120 feet into the air. The high-speed brakes now in general use would in an emergency stop the same train within a distance of from 1,600 to 1,800 feet.

American manufacturers of electrical devices would do well to consider carefully Siberia as a possible field for their wares. In that country the development of electricity is now taking place, and there is an increasing field for electrical devices.



How to Build a Cycle Car

WHILE this article is intended primarily as a series of suggestions to the amateur mechanic who contemplates building a cycle car, still the design has been worked out down to minute details as a glance at the drawings will show. Therefore, by closely following the specifications the builder may feel reasonably certain that his finished product will equal the car shown in the illustrations.

SIMPLICITY has been the aim throughout in the planning of the little car* to be described, for it is realized that special forgings and even castings of intricate parts, while not actually beyond the amateur mechanic, are still formidable to contemplate, and, as our car is to be strictly a home product, with the possible exception of engine and wheels, every effort has been made to incorporate only those fittings which might be easily obtained. It is fully realized that the design has many shortcomings and the builder who is capable of better things will certainly not use a wrought iron pipe tee when he can just as well employ a forging. To such a builder, the author merely offers the design as a broad, general suggestion in the hope that it may prove of some assistance in the working out of something better.

The tools actually required for the construction of our car are comparatively few and simple. The possession of a lathe is a fortunate one, but the amateur who has access to a near-by machine shop need not hesitate to undertake the work, even though he has no lathe of his own. The machine work on the car is very simple and therefore inexpensive, even if done on a time basis in a shop. The principal requisites are a fairly good set of carpenters' tools, a pipe vise and cutter, as well as a set of pipe dies, an assortment of metal drills, a substantial breast drill with chain for tension, a hack saw, files, wrenches, etc. The pipe fitting tools may even be dispensed with if the machine shop is close

at hand, for all the threading can be done better in the enginee lathe.

The workshop should preferably be spacious; a barn or carriage house is excellent. It is very likely, however, that the place to be used for the final housing of the car will have to answer the purpose. While the author may be accused of using chestnuts, still, it seems advisable to repeat the time-worn story of the chap who built his boat in the cellar and then had to tear out the side of the house in order to get his handiwork to the water. The moral of this, as applied to our workman, is not so much that he could not get the car out of the cellar, but why build it there when he would only have to provide a place subsequently for its storage? If it is necessary to build a garage of some sort, far better it is to build the house before starting the car.

Constructional Features

A brief inspection of the drawings will disclose the fact that this is essentially a car without springs. The construction is so simplified through the elimination of the conventional spring that the loss of this important member is believed to be justified. At the same time, if the complications arising through the introduction of semi-elliptic springs, particularly at the steering gear, can be tolerated, the builder is by all means advised to insert them. As it appears in the drawings, however, the car has certain spring qualities inherent in its construction. The members which support the weight of passenger, body and engine, are struts of ash and obviously they form springs in themselves. The body and hood of the car stiffen the struts to such an extent that they bend only at points near the center.

The wheels are of the standard motorcycle type or even substantial bicycle wheels, if the latter are the more readily obtained. Steering is accomplished through the usual knuckle arrangement, which has many advantages over the method in which the entire front axle turns. The drive to the rear wheels is by means of belts which are arranged in such a manner that they may be tightened through the agency of idlers controlled by a convenient lever. Braking is accomplished by tightening a piece of steel cable around a pulley affixed to the hub of each of the rear wheels, the brakes being applied by a foot pedal.

The differential gear was omitted owing to its complexity and not through lack of recognition of its great importance. The narrow tread of our car,

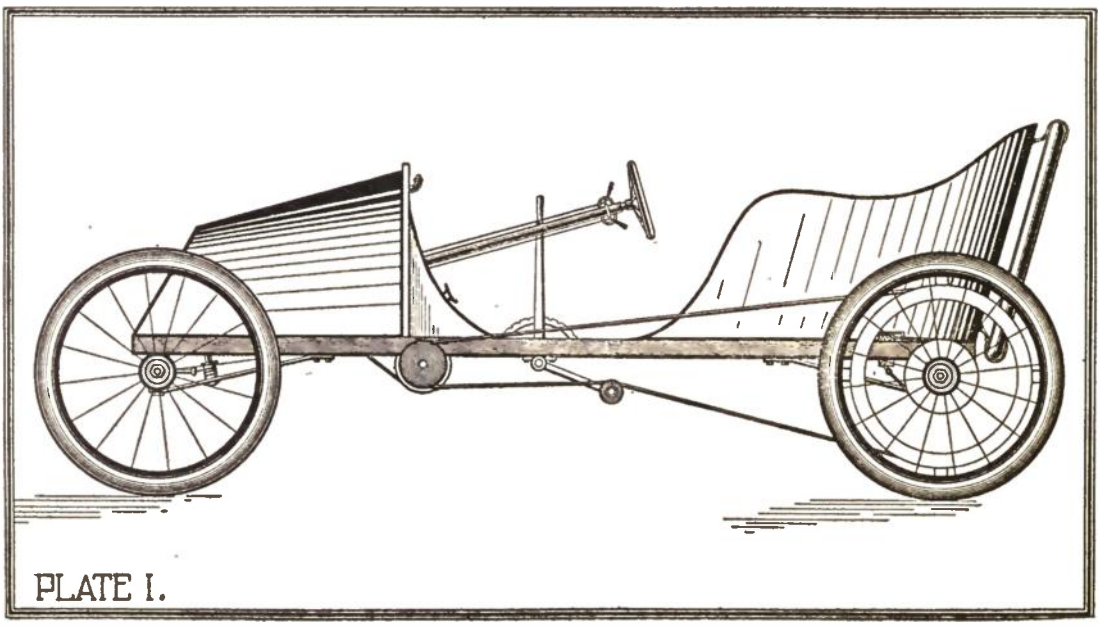


PLATE I.

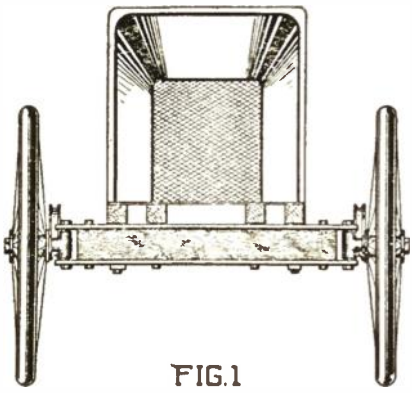


FIG.1

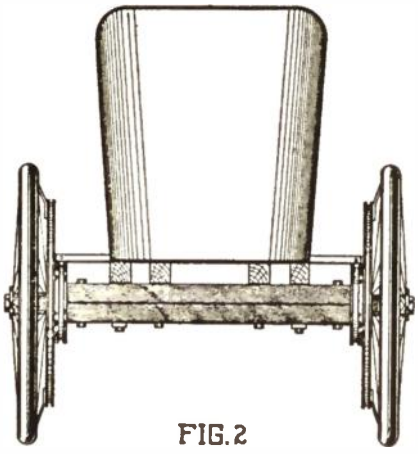


FIG.2

PLATE II.

together with the fact that in turning a corner the driver would naturally ease up on the driving idler in order to reduce the speed, will serve to make up for the omission, and the absence of the differential will scarcely be felt.

While the design shows but a single seat, the chassis is sufficiently substantial for two passengers. While the double seat may be of the side-by-side variety, the tandem arrangement is strongly advised in order that the weight may be kept well centered. In the event of tandem seating, the "body" proper can be dispensed with and two light seats mounted, one in front of the other, directly upon the struts, by means of steel rods forming the legs of low chairs, as it were.

With the foregoing description of the car and its general characteristics, it is assumed that the reader will by this time have a fairly good conception of the various drawings, and we shall accordingly turn our attention to the details of the parts in the order of their assembly. Very few dimensions are given, as it is believed that they are confusing, as a rule, and not conducive to a thorough understanding of the construction. The drawings are all to absolute scale, however, and the scale at the bottom of the drawings is appended in order that it may be cut out of the page and used upon the reproduction to serve the purpose of a rule.

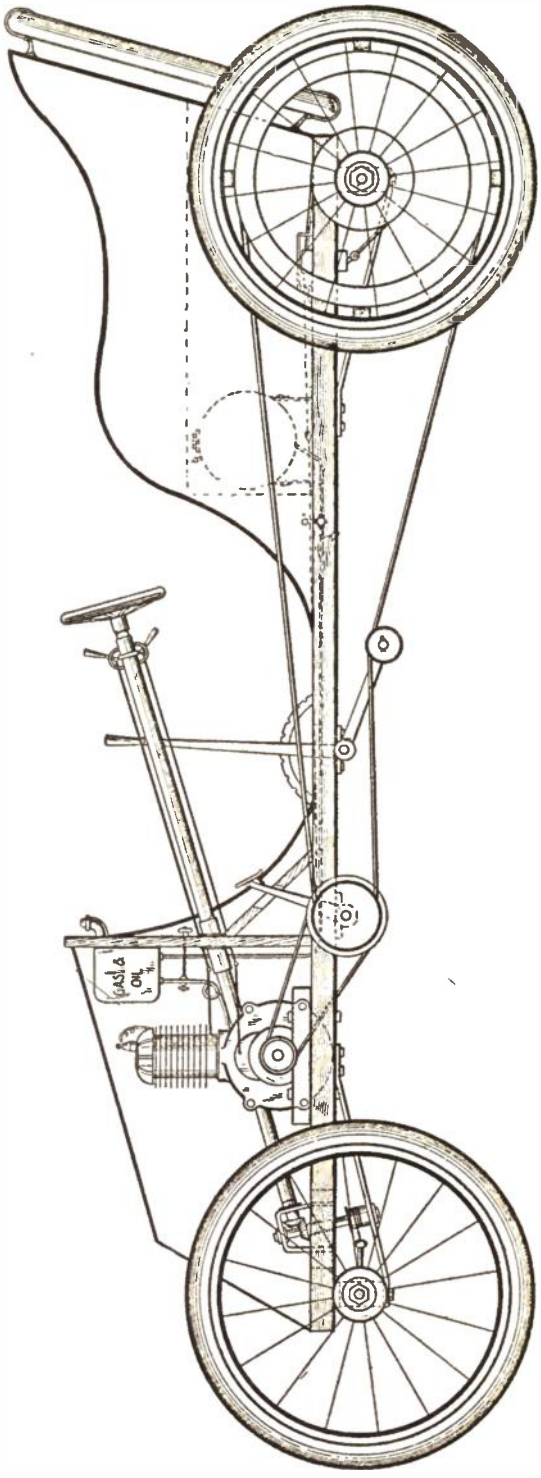
Details of the Chassis

The basis of the chassis is a group of four struts of 2 x 2 inch ash, 96 inches long. These timbers should be very thoroughly seasoned and perfectly straight when they come from the mill, where they should be planed or sanded and cut to the finished size.

The axles upon which the struts are mounted are of maple and cut to size at the mill. The front axle is of 2 x 3 inch stock, 26 inches long. The rear axle is of 2 x 4, 28½ inches long and divided through its center as shown in Plate II, Fig. 2. Through the center is bored a hole to take the axle proper, which is of one-inch wrought iron pipe. This pipe measures slightly more than 1¼ inches on the outside, and, as the reader probably knows, the one-inch applies as a pipe size rather than as a dimension. The inside dimension of the pipe is practically an inch. The rear axle, combining pipe and wood, is secured to the struts by means of bolts passing through strut, wooden piece, and pipe. A brace of half-inch cold rolled steel stiffens the axles, both front and rear, as shown in the side elevation, Plate III.

With reference to Plate VI., Figs. 1

SIDE VIEW



Scale

PLATE III.

PLAN VIEW

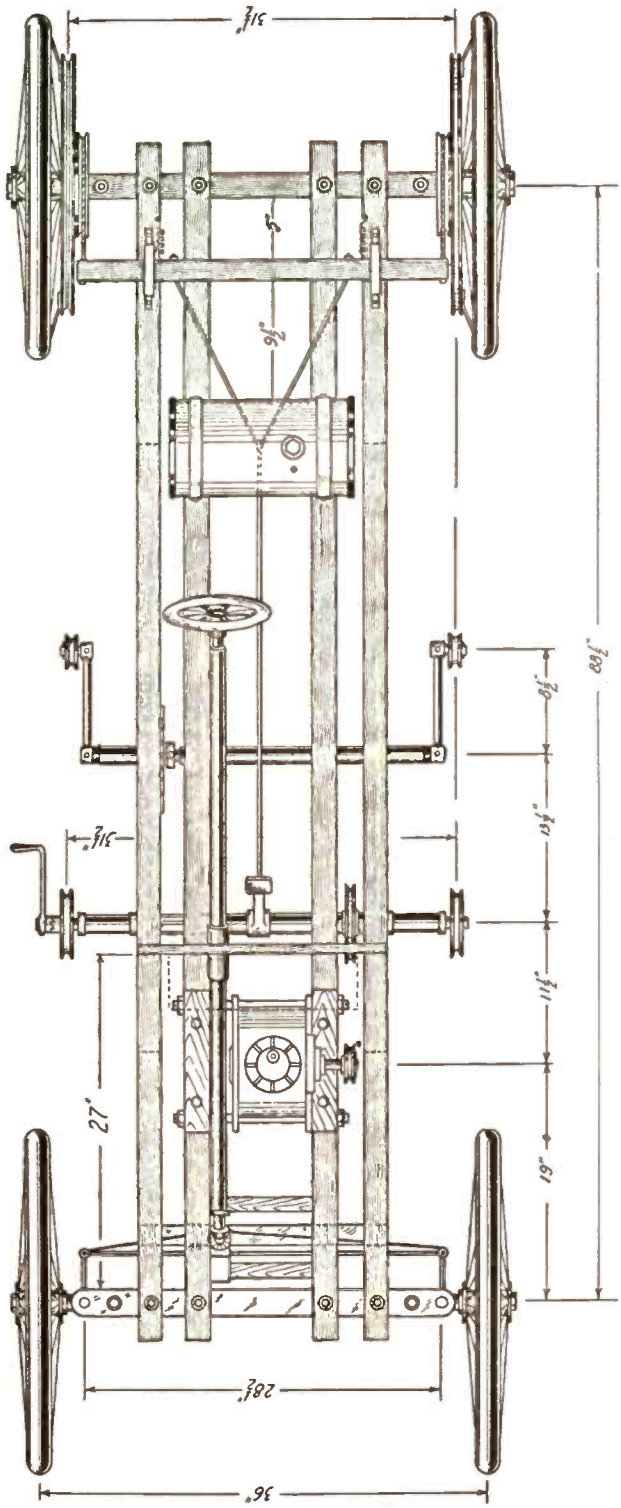


PLATE IV.

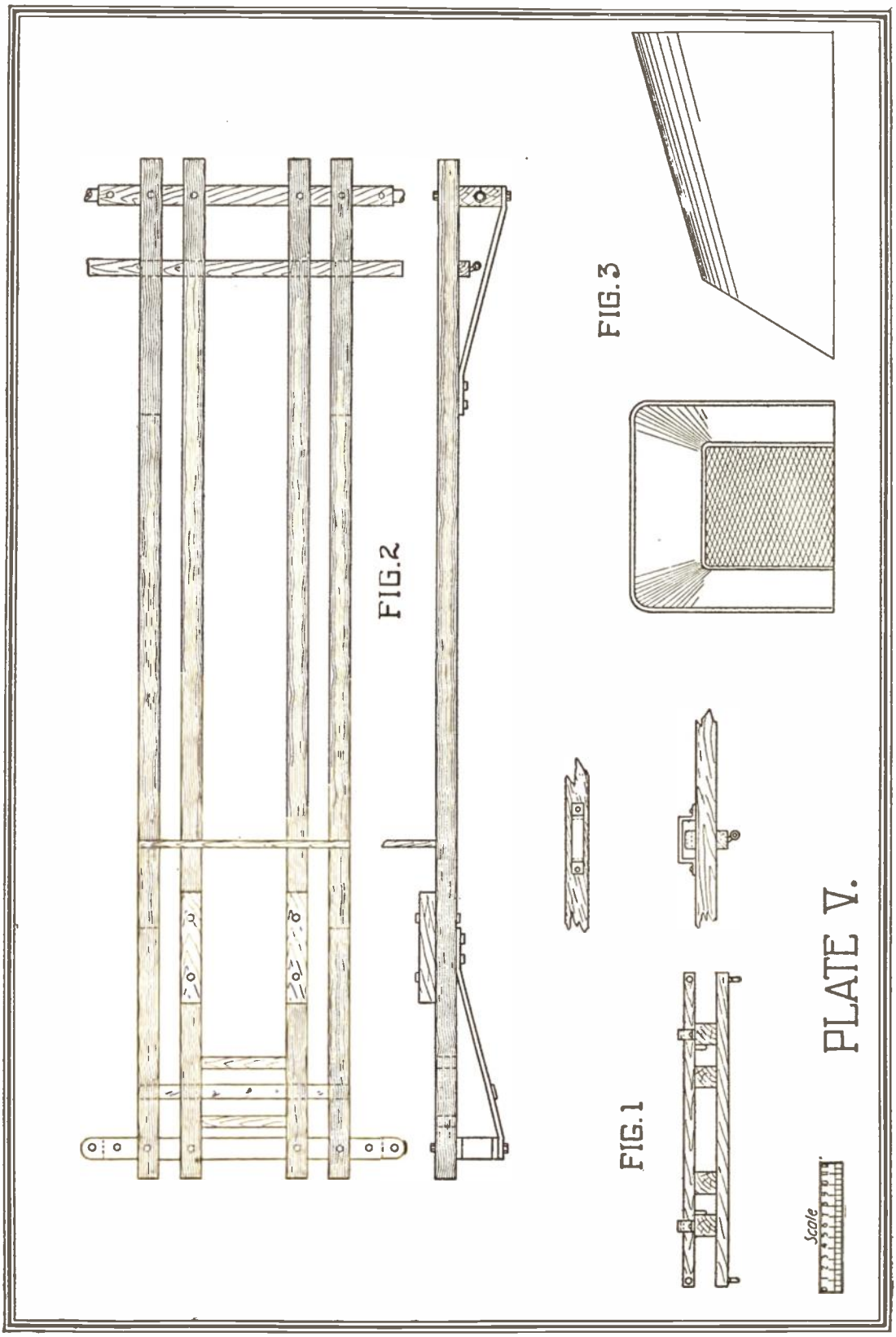


FIG.2
FIG.3
FIG.1
Scale
PLATE V.

and 2 show the details of the steering knuckles. The front axle carries, on its top and bottom, bars of cold rolled steel ½ inch thick, which extend beyond the ends of the wooden piece to form the bearings for the knuckles which carry the wheels. These knuckles are made up of one-inch wrought iron pipe tees, lined with nipples, and fitted with the extensions of the axles of the wheels. The steering gear proper is shown in Fig. 2, which discloses the method by which the steering wheel operates a drum upon which is wound the steel cable connecting with the steering knuckles. The arrangement is similar to that employed with the tiller of a boat. The wheels are maintained parallel through the agency of the distance rod, which links the extensions of the steering knuckles together.

Power Plant and Drive

The use of a standard motorcycle engine of from three to seven horsepower is contemplated. The method of mounting shown is purely suggestive, as there are so many makes of engines on the market that it is difficult to present any one mounting that would serve for all. The plan suggested is merely to run studs through the lugs on the crankcase, bolting down these studs to the central struts of the chassis in the manner shown in the side elevation and plan views, Plates III and IV.

The pulley supplied with the motor will undoubtedly serve the purpose, and upon its size and the power of the engine will depend the diameter of the intermediate or countershaft pulley. The reduction shown in our drawing is about 2:1, this being suitable for the small, single-cylinder motors so commonly used.

The countershaft requires some attention. In Plate IV the reader will notice that this member is carried in a series of bearings made from pieces of pipe, into the ends of which standard annular ball bearings are fitted. These bearings may readily be purchased and it is comparatively a simple matter to fit them to the supporting members. The pipe is secured to the struts by means of strap-irons bolted on. The countershaft carries the central pulley, taking its belt from the engine shaft and, also, at both ends carries the drive pulleys from which the belts pass to the rear wheels. The shaft extends beyond the pulley on one end in order that a starting crank with ratchet may be added if desired. This crank is, of course, removable.

In the center of the countershaft housing will be noticed the brake pedal which pulls the slender rod extending back to the brake bar. This bar is slidably arranged on the struts in order that it may be drawn forward to tighten the steel cables which pass over pulleys on the drive wheels. The other ends of these cables are fastened to the ends of a cross piece which may be seen in Plate III.

Immediately in the rear of the countershaft may be seen the belt idler and its control mechanism. This consists of a shaft carried in two pieces of pipe, which are fastened with strap-irons to the struts, a long lever by means of which the shaft is turned and, at either end of the shaft, an arm carrying at its extremity an idler pulley. The parts of the idler mechanism may be gotten out in castings quite readily, as the pattern work is comparatively simple. The details of the device are very clearly shown in Plate VI, Fig. 5.

To pass now to the rear wheels and their pulleys. If the builder can secure two standard motorcycle wheels with pulleys attached, well and good, but if the substitute must needs be a bicycle wheel, an improvised pulley may need some thought. Perhaps the simplest way out of the difficulty is to build up a pulley from some good, dry, hard wood in three thicknesses, crossing the grain three ways. Instead of glue, heavy varnish may be liberally used between the layers of wood, which should be about ½ inch thick. The final holding with a series of rivets spaced a few inches apart and near the periphery will prepare the pulley for turning. The center is taken out as the pulley is fastened to the rim of the wheel by means of straps of steel. The final treatment of the pulley should be a liberal impregnation with some good

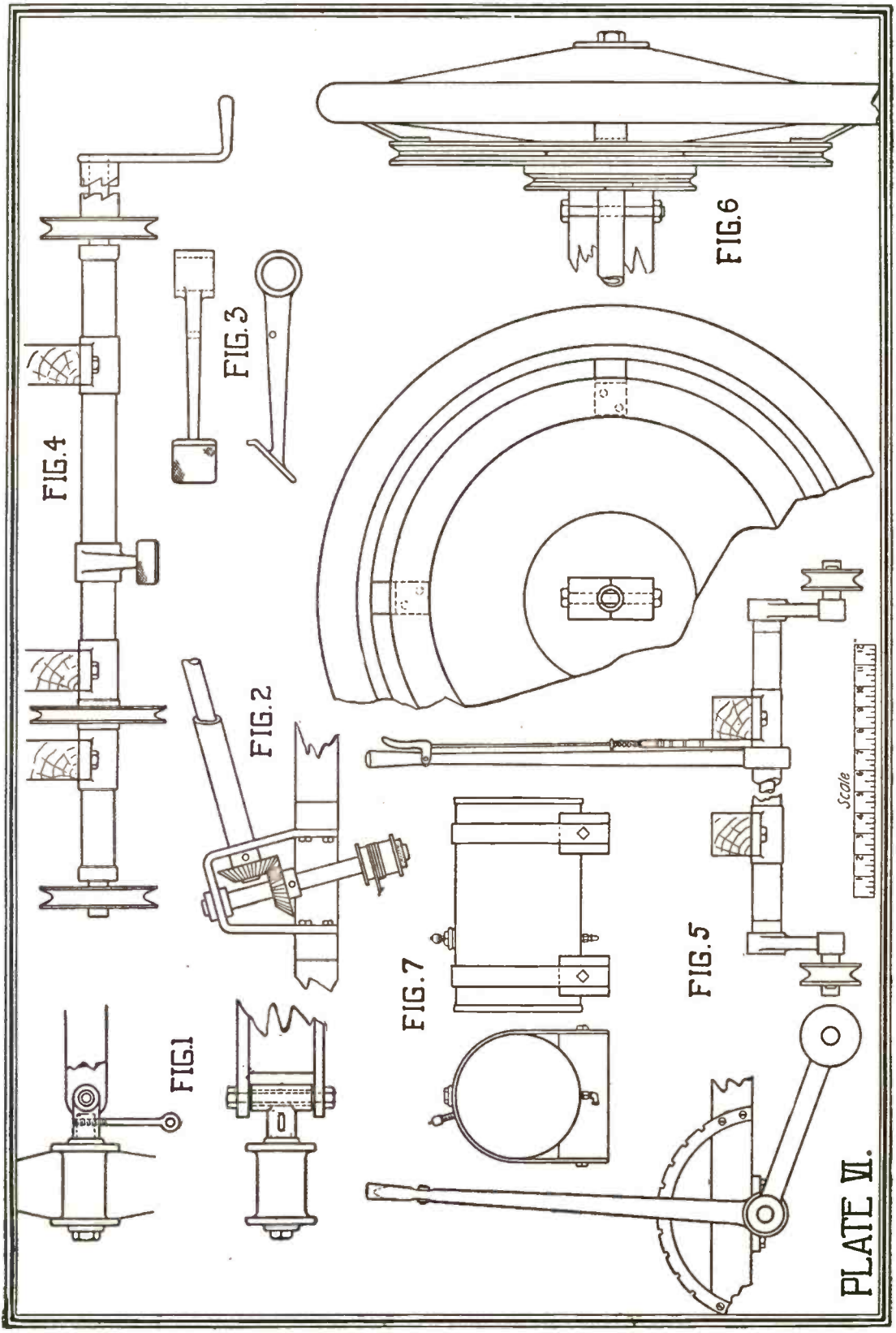


FIG.1
FIG.2
FIG.3
FIG.4
FIG.5
FIG.6
FIG.7
Scale
PLATE VI.

waterproofing compound over which the finishing paint may be applied.

The smaller pulleys serving as brake drums may be made up in the same way, but their rims should be lined with steel ribbon, as the friction of the cable would soon cut the groove too deep. These pulleys are to be fastened to the hubs of the wheels. A secure method to accomplish this is to let the sprockets into depressions cut in the pulleys, thus forming an effective key.

The belting may be heavy, round leather, or it may be standard motorcycle belting which has a V-section to fit the groove in the pulley.

The ratios of the various pulleys as shown in the drawings will make for good hill-climbing qualities rather than speed, and in view of the absence of springs, it is quite likely that the ability to pull under all conditions will prove more desirable than would the greater speed to be obtained through a smaller reduction.

Between the rear axle and the belt idler will be seen the reserve gasoline tank, the function of which is to carry a greater supply of fuel than the main running tank—shown on the dash—is capable of holding. The system of piping and distribution is so clearly shown that it needs no further description. The details of the mounting are given in Fig. 7.

The fitting up of the dash with the control devices, such as the switches for ignition, fuel and oil handles, is best left to the individual builder. A suggestion for the spark advance and throttle levers is given in the side elevation, Plate III. This arrangement is exceedingly simple and it is probably as satisfactory as any within our reach. The termination of the two rods is not shown, as the carburetor and distributor are seldom in the same place on any two makes of engines.

The hood and body of the car are of heavy sheet iron. Plates I and II show the general appearance of the construction. The patterns for the metal should be laid off on heavy paper and cut to shape. In order that the accuracy of the patterns may be tested, they should be bent up and placed on the chassis. The edge of the metal forming the body should be turned over heavy steel wire in order that it may be stiffened and finished.

The hood should be quickly removable as a whole in order that access may be had to the engine. A simple hook fastening will suggest itself to the builder. If difficulty is experienced in keeping the engine sufficiently cool, a second opening may be made in the top of the hood near the dash and fitted with wire netting, as is the front.

The upholstering of the seat is a matter for the builder to decide. A covering of pantasote over a spring seat of the usual type will provide a cushion of good appearance and comfortable riding qualities.

In closing, a few suggestions regarding changes in the design may not be inappropriate. The length of the steering rod, for instance, should be determined by the build of the driver; the distance from the foot board to the rear of the seat is another consideration; the elimination of the hood and body would improve the riding qualities of the car by providing a longer spring in the struts; variable speed could be secured through the addition of a friction disc drive—an appliance not difficult of construction. These and a dozen and one other improvements or alterations will suggest themselves to the prospective builder who applies himself seriously to his task.

As a last word to those who have followed this necessarily brief description to the final paragraph, let the author suggest that standard parts can be obtained in great variety and builders are by all means advised to purchase such parts rather than try to improvise them if a car of durable qualities, capable of long and practical service, is desired. At the best, the car described is scarcely more than a makeshift vehicle intended to furnish amusement in much the same manner as would a bob sled or an ice boat. If, in presenting this design, the author has done nothing more than to offer some suggestions which may prove of assistance to the amateur mechanic who has aspirations toward the building of a real cycle car or light automobile, he shall feel that his efforts have certainly not been in vain.

Electric Lights for the Summer Cottage*

IN planning the system of distribution for the current at the low potential of six volts, we have first of all to consider ways and means for getting the current to the lamps by the shortest possible route in order that the already low voltage may not suffer a serious drop. In this manner we also effect a saving in copper, as a short line does not have to be of as heavy a conductor as would be the case if the transmission were over a long wire. The plan of the cottage under consideration readily adapts itself to a short and simple wiring diagram as the reader will note upon reference to the illustration on the facing page.

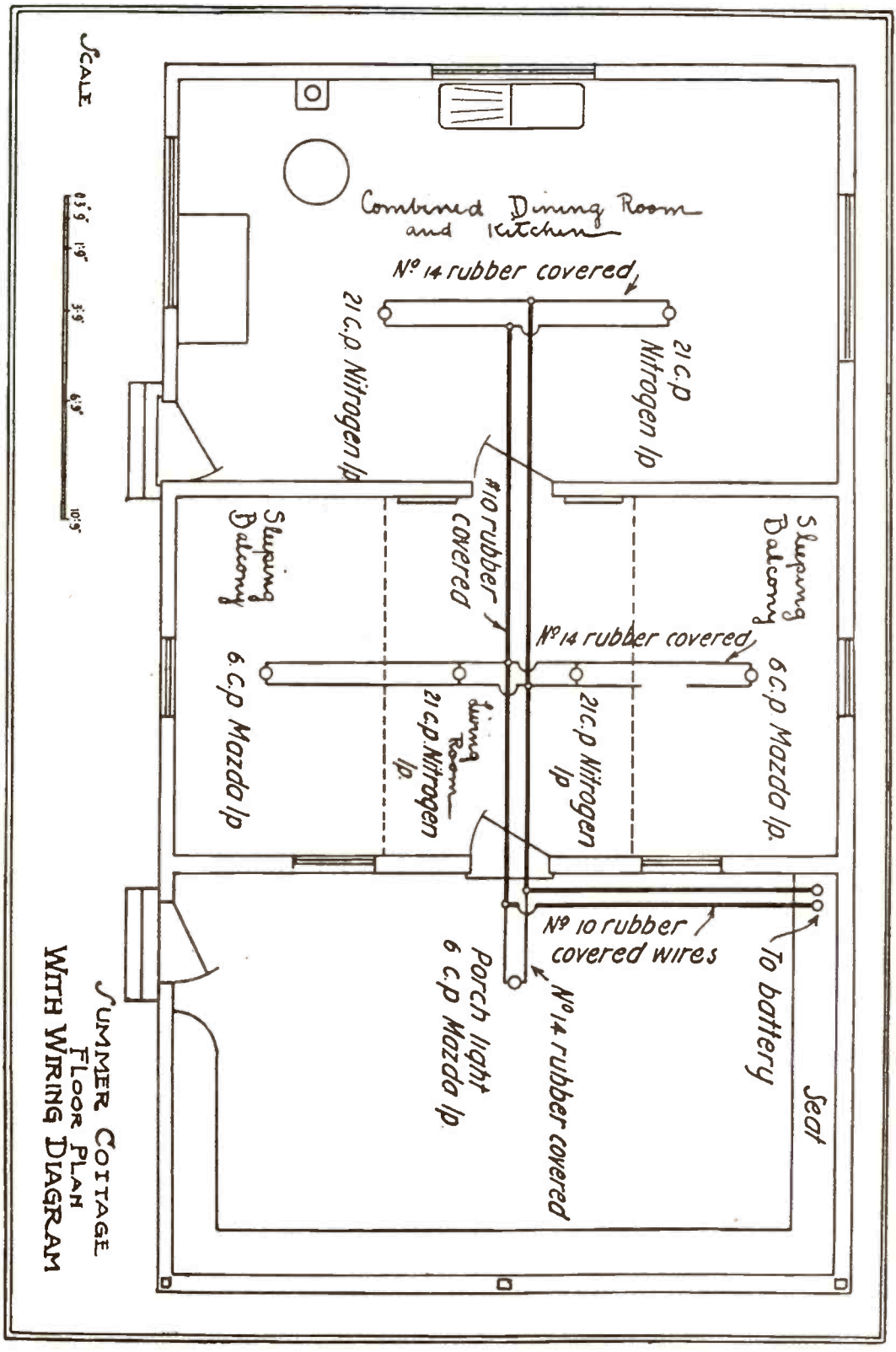
As outlined in the preceding article, the plan is to employ 21-candlepower, nitrogen-filled, six-volt lamps for the living room as well as in the combined dining room and kitchen. The sleeping balconies and the porch are to be lighted with six-candlepower, six-volt mazda lamps. The battery is to be one having a capacity of from 80 to 100 ampere hours and the suggestion is to charge the battery from the generator on the automobile or motor boat during the day. This necessitates the removal of the battery from the house for charging, but the annoyance is slight, and if the user is willing to put up with the trouble, he may save the cost of a generating plant thereby. It is realized, of course, that perhaps some of those who build the cottage will not be the fortunate possessors of either a car or a boat, and in such an event the only recourse is to an isolated plant combining a small generator and gasoline engine. The installation of such a plant, low in cost and simple in operation, will be described in the next article.

The wiring diagram discloses the battery beneath the seat on the porch. Where space is at a premium, as in the present instance, the natural closet room afforded by the porch seat offers an opportunity that should be taken advantage of. Furthermore, in view of the fact that this installation is purely a warm weather one, it is just as well for the battery to be placed outside the sleeping and living quarters in order that any possible fumes arising from the acid may be readily carried off. Anticipating the next article a bit, we may add that the porch seat also provides room for the entire charging plant in the event that it is installed. Therefore, the logical starting place for the mains is beneath the seat and near the wall.

Tracing the conductor, which should be of No. 10 rubber covered wire, we follow it up the side of the cottage on cleats until it reaches the ceiling of the porch which it follows to the front door. Here a tap of No. 14 rubber covered wire is taken to provide the branch circuit for the porch light. This outlet may terminate in a standard dome such as is used on the ceiling of a limousine car. The control is preferably through a snap switch just inside the front door of the cottage.

To continue the mains, however, we find that the No. 10 wire is carried in a straight line through the center of the living room to the dining room. At the

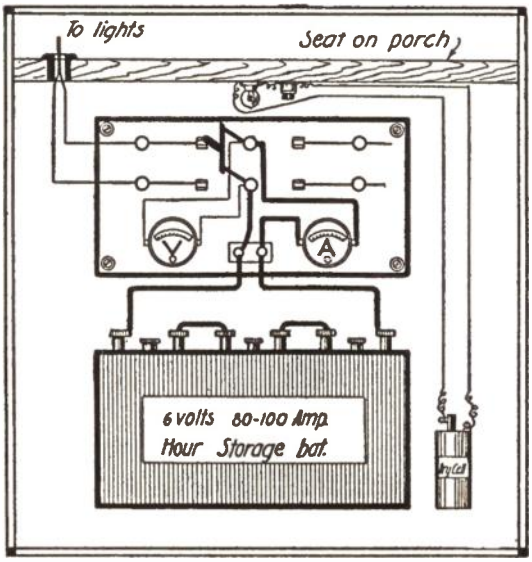
*Continued from the June number.


Combined Dining Room and Kitchen
No 14 rubber covered
21 C.P Nitrogen lp
21 C.P Nitrogen lp
No 10 rubber covered
Sleeping Balcony
6 C.P Mazda lp.
No 14 rubber covered
Sleeping Balcony
6 C.P Mazda lp
Living Room
21 C.P Nitrogen lp.
21 C.P Nitrogen lp
No 10 rubber covered wires
To battery
Seat
Porch light
6 C.P Mazda lp
No 14 rubber covered
Scale
0 1' 2' 3' 4' 5' 10'
Summer Cottage
Floor Plan
With Wiring Diagram

center of the former a branch of No. 14 extends in either direction to provide outlets for the 21-candlepower living room lights and the six candlepower lamps for the sleeping balconies. The former lamps may be carried in fittings suited to the furnishings of the room. For instance, if a library table occupies the center of the floor, a suitable fixture would be a double ceiling pendant with mission lamps. On the other hand, if a broad, practical illumination for the entire room is desired, there is nothing better than the automobile dome light suggested for the porch. The fixtures over the sleeping balconies may be simple receptacles.

For the kitchen and dining room the outlets at the ends of the branch of No. 14 wire may be ordinary droplights with shades. The light here should be serviceable rather than ornamental in order that the camp's chief cook and the associated dishwashers may have plenty of illumination while engaged in the pursuit of their important tasks on the evenings of dark and stormy days.

The wire may be carried either on cleats or in wooden or metal moulding. The wooden moulding is perhaps to be preferred, as it is inexpensive, easy to install, and, what is more, it may readily be stained or painted to harmonize with the decoration of the ceiling. The outlets may come in wooden blocks of standard construction upon which the miniature fixtures are secured. No snap switches have been suggested with the exception of the one for the porch light, as the individual worker will place them where convenience dictates.



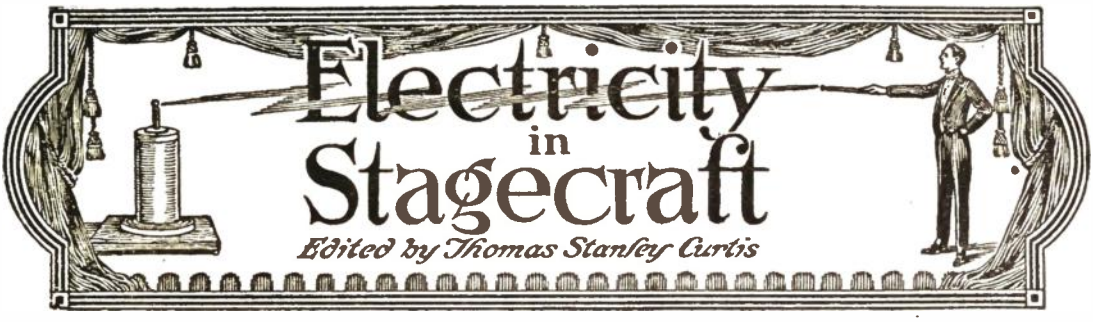
Arrangement of Storage Battery and Switchboard Under Porch Seat.

To return to the battery and its housing. A simple switchboard should be made as depicted in the drawing showing an interior view of the closet beneath the porch seat. The switchboard should carry a double pole, double throw knife switch, a cut-out fused to 10 amperes, and a battery voltmeter and ammeter. Above the board is fitted a miniature lamp which should preferably be operated from a single dry cell placed beside the storage battery. The diagram of connections is shown in the drawing, and a moment's study shows us that the switch, when thrown to the left, places the battery in circuit with the house mains leading to the lamps and, at the same time, permits an examination of the condition of the cells to be made while they are in use. For instance, if the voltage is below six when the ammeter reads two amperes or more, the battery needs recharging. Under good working conditions, the voltage should be slightly over six when the full load is on.

Throwing the switch to the right disconnects the house wires and places the battery in a circuit which may be used for charging through the addition of a generator and engine.

A SPRING WHICH FLOWS GASOLINE

A phenomenon which is so far unexplained has been discovered at Amherst, Ohio, in the nature of a spring which flows gasoline. At first it was supposed that this was caused by the leakage of some gasoline tanks from nearby garages. The tanks have been thoroughly examined, however, and found to be perfectly tight, and the mystery remains. About two or three gallons of pure gasoline flows from the spring every hour, it is estimated, and a lighted match readily ignites the spring's discharge.



The Electrical Entertainer's Program*

SOME of the most startling and spectacular experiments of which the high frequency apparatus is capable are produced in connection with the insulated stool and the charging body of the performer. For most of these experiments, the frequency of the current should be increased by moving the primary clip of the oscillation transformer to a point where fewer turns are included in the circuit. This will reduce the spark length of the coil, but this loss can be tolerated in view of the fact that the current is smoother and the muscular contractive effects are totally missing. It is difficult for the performer to do justice to his experiments if he experiences any degree of shock, which, while not at all dangerous, is still disconcerting.

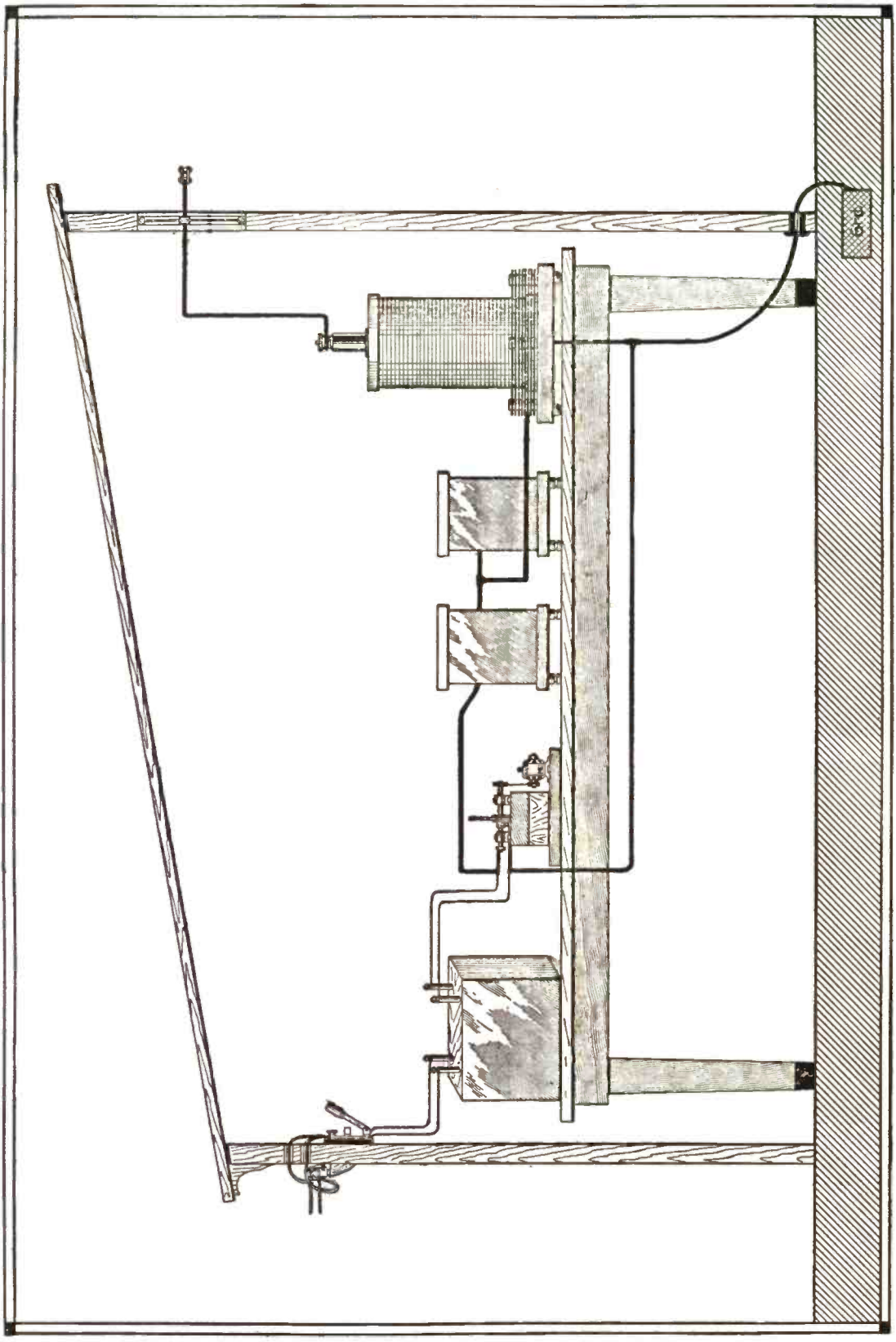
The performer stands on the stool and touches the discharge ball of the coil with his metal wand. When the current is turned on, a strong, snapping spark several inches in length may be drawn from any portion of the body by the assistant. This spark will ignite a piece of cotton dipped in alcohol, light a cigarette, puncture a thin piece of glass, and do many other equally interesting tricks. If the spark is taken from the bare skin for any length of time, a blister will form from the burn which results, and it is therefore advisable to draw the spark from a heavy ring worn on the performer's free hand. An occasional spark taken for a few seconds at a time will not affect the skin and the lighting of the cotton may be accomplished by the assistant bringing the material in close proximity with the performer's ear or chin. *Care should be taken to avoid sparks near the eyes.* If the performer holds a metal spoon in his mouth, a spark may be drawn from the handle and this experiment seldom fails to bring applause.

If the primary clip on the oscillation transformer is carefully adjusted after the performer has been connected with the discharge ball, a point will be found where his body seems literally to exude a luminescent halo of bluish white fire. When the free hand is raised directly over the head, little tongues of fire dart from the finger tips into the air. When a second person approaches to within a foot or so of the performer the space between their bodies is apparently filled with a luminous vapor, and a finger pointed at the performer instantly calls forth an intense, cone-shaped stream of the light. A geissler or other vacuum tube brought to within even six or eight feet of the charged body lights up with its characteristic glow, and, when it approaches to within a foot of the body, the glow is practically as bright as it would be if the current were passing into it through a wire instead of through space.

An entertaining experiment is to bring an incandescent lamp bulb, held by its

(*Continued on page* 116)

*This article is one of a series that has appeared in past issues of *Modern Mechanics* and THE WORLD'S ADVANCE since September, 1914. Previous instalments have covered the construction of the apparatus referred to in this article. The series will be completed in the August issue. The demand for the back numbers has been so great that several issues are now out of print and can no longer be supplied. The author has in preparation, however, a very complete book dealing with this subject in a thorough manner and interested readers may obtain information relative to the work through our Book Department.


Grid

Electricity in Horticulture
Edited by Thomas Stanley Curtis

Plant Culture by High Frequency Current*

Part V. Installation of the Apparatus

IN the four past instalments of this series, the reader has been told how to construct the apparatus necessary for the cultivation of plants and vegetables by means of the high-frequency current. The various instruments described were the transformer, which steps up the commercial lighting current of 110 volts to a pressure of several thousand volts, the condenser, which stores this high voltage current, the spark gap, which permits the stored-up current to discharge, and, finally, the oscillation transformer, which converts the high-frequency current, generated through the discharge of the condenser, from a potential of a few thousand volts to one approaching the 100,000 mark. It is this high potential, high-frequency current that we shall employ in the electrification of our plot of ground, and the object of the present article is to point out how the various instruments of the outfit are connected and combined to produce the current.

The entire outfit should be housed in a perfectly weather-tight shed. The construction of the building may be comparatively crude, if the precaution is taken to carefully seal all cracks and crevices, not only in the walls, but around the door as well. In rainy weather, or even when the humidity of the air is high, the inside of the shed should be kept dry and warm by means of a small oil stove. Dampness is positively fatal to the successful operation of the apparatus if it is permitted to strike in for any length of time.

The shed should contain a substantial wooden table along the rear wall facing the door, and upon this table the apparatus is arranged in the order shown on the facing page. The floor of the shed should be at least one foot above ground and an open air space should be left beneath in order to frustrate dampness so far as is possible. A simple and good construction is to build the shed around four substantial corner posts, starting the walls a foot above ground. The roof should have a generous slant to shed the rain.

With reference to the first drawing, the apparatus is arranged in the following order, left to right: Transformer, spark gap, condenser and oscillation transformer. Upon the wall to the left is secured the main switch, which should incorporate a cut-out fitted with 15 ampere plug fuses. To this switch from the outside of the shed lead the line wires, which are to be supplied with a 110-volt, 60-cycle alternating current, preferably from the local central station. It is recognized that in some outlying districts the current cannot be obtained and for the benefit of experimenters so situated a later series of articles will describe the installation of a suitable isolated generating plant.

Beside the main switch, the switch for the spark gap motor should be located.

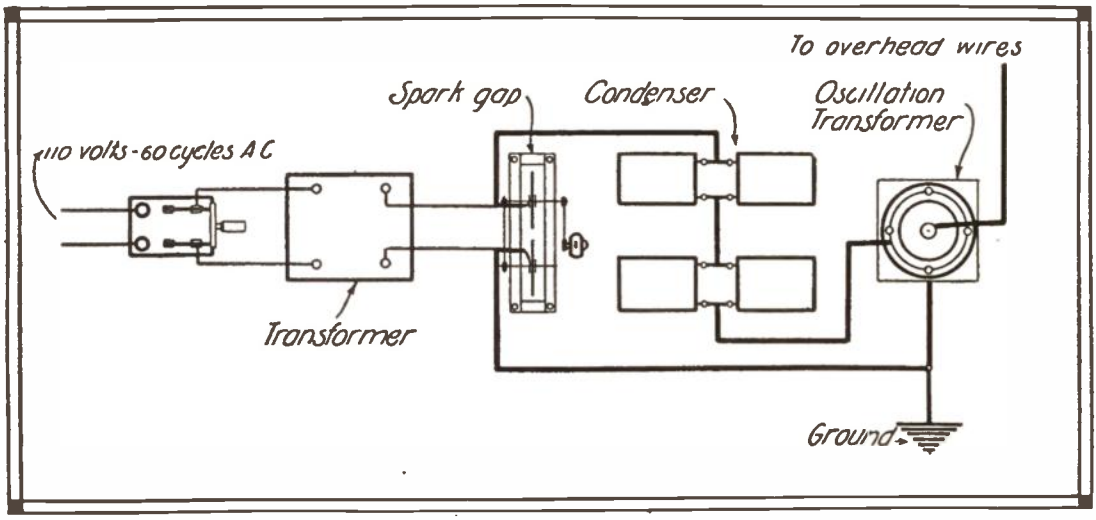
*This article is one of a series dealing with various methods of electrical plant culture that has appeared in this publication since September, 1914. The various instalments have dealt with the different methods of applying electricity to horticulture, as well as described the construction of the apparatus required. Back numbers may be secured at 15 cents each while the supply lasts.

The primary terminals of the transformer are to be connected with the main switch, as shown in the wiring diagram below, which also shows the connections for the remainder of the apparatus. From the secondary terminals of the transformer pieces of No. 14 rubber-covered wire lead to the terminals of the spark gap. From one terminal of the spark gap a piece of stranded cable, composed of 100 strands of about No. 24 insulated magnet wire, runs to one terminal of the condenser. From the other terminal of the condenser, a piece of the stranded cable leads to the movable clip on the primary of the oscillation transformer. The second terminal of the spark gap is connected by cable to the ground connection of the oscillation transformer and this in turn to a series passing through the glass is tipped with a connector to which the overhead wires of the plot are secured.

In the next article, the installation of the overhead wires and the operation of the outfit will be considered.

THE HIGHEST DAM

The United States Reclamation Service is at work on the highest dam in the world, at Arrowrock, Idaho. It will stretch across a narrow cañon of the Boise River, 20 miles above the city of Boise, and will be 351 feet high. That is, perhaps, 23 feet higher than the great Shoshone Dam in Wyoming, and 71 feet higher than the Roosevelt Dam in Arizona. It will be 1,000 feet long and 25



Wiring Diagram for the Connecting of the Various Pieces of Apparatus to be Used in Electrical Plant Culture.

of wires buried in the ground beneath the plot to be cultivated.

The high-potential, high-freqency terminal of the oscillation transformer connects with a piece of light copper rod, which extends upward and out of the side of the building, through a hole cut in the center of a pane of glass. This glass window should be at least 18 inches square and shaded on the outside of the building with a contrivance resembling an awning, in order that the surface of the glass may be kept as nearly dry as possible in wet weather. The copper rod

feet wide at the top, over which will run a roadway protected by a wall on each side. The dam will hold back sufficient water to irrigate 250,000 acres of desert land.

A German electrician claims to have invented an apparatus by which he can measure the ten millionth part of a second. While no details of the invention are available as yet, it is very probable that electricity is employed for the purpose.

Practical Electro Therapy

Edited by Thomas Stanley Curtis

High Frequency Apparatus*

OF all the various currents delivered by the modern high frequency coil designed for medical use, perhaps none is of greater moment than that which is known as

THE D'ARSONVAL CURRENT.

Lower in potential by thousands of volts than the Tesla current it is nevertheless of extremely high pressure. The statistics given by various manufacturers differ, but an average value seems to be in the neighborhood of from twenty to twenty-five thousand volts. At this pressure it sends from one thousand to fifteen hundred milliamperes through the body without the patient feeling the slightest sensation other than one of pleasant warmth.

The physiological effects of this current may be noted as an increase of bodily temperature, of excretion and secretion, of metabolism, and glandular activity. Probably its most important function, however, is the reduction of blood pressure in cases of arteriosclerosis. The reports made by physicians who have used the modality in this connection are unanimously favorable, and in many cases the treatment has succeeded where practically everything else has failed. Last, but not by any means least, the treatment has decidedly a sedative effect upon the nervous system.

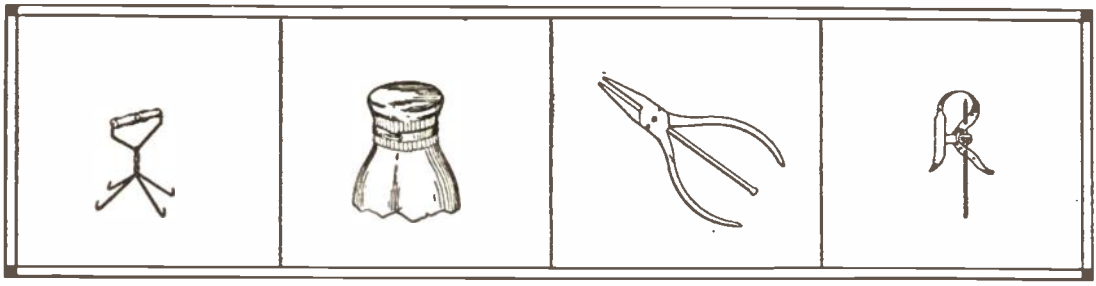
The approved method of application is that known as autocondensation. In this treatment the patient forms one plate or conductor of an electrical condenser while a cushion or other insulator separates the body from the second conductor which is usually a large metallic plate. One terminal of the coil is connected with the patient's body through hand electrodes while the other leads to the plate.

The current passing through the patient's body is measured on a milliammeter which is attached to the case of the coil. While this meter is not essential in case of an emergency, still it affords the only means whereby the physician may determine the dosage being administered, and it is, therefore, necessary if the treatments are to be given intelligently.

The treatment is given either in a special form of chair or else a couch in the upholstering of which the metal plate is incorporated. The chair is preferred by many operators, as in it the patients may recline comfortably without being given the suggestion that they are lying upon an operating table. It is, however, solely a matter of personal opinion with the various physicians whose ideas have been requested. The treatments are equally efficacious in either case.

That motion picture theatres are replacing cheap literature is proven by the fact that English educators have found a decrease in the circulation of this reading matter, following the increase in the number of motion picture theatres. An American bookseller of renown recently closed up shop, stating that the detrimental effect of the motion pictures on the selling of books made the business an unprofitable one.

*This article is the fifth of a series on high frequency apparatus. The first article appeared in the March issue of *Modern Mechanics.*



Recent Novel Patents

A Cuspidor Carrier

Cuspidors are favorite objects for the efforts of inventors, and cuspidor lifters are continually being patented in many different designs. One of the latest of these is shown in the accompanying illustration. It consists of four hook-shaped arms of wire that are joined together and fitted to a common handle. In order to lift a cuspidor it is only necessary to press the device down into the mouth of the container, the arms spreading out and causing the hooks to firmly hold on. The latter can be disengaged by pressing the arms together.

A Milk Bottle Cap

A New York inventor has just secured patent rights on a milk bottle top of original design, which is shown in one of the accompanying illustrations. The top consists simply of a circular piece of paper which has been pressed so as to have a fluted lower portion that fits around the neck of the bottle. A metal band is placed around the fluted portion of the cap and serves to hold it firmly in place.

A Combination Tool

An Ohio inventor has secured patent rights on a design for pliers in which the novel feature is a central piece fitting between the pivoted portion of each plier member and which is fitted with a handle. The inventor does not make clear the reason for providing the extra handle, although he states that the advantage of this design is that each plier handle is independently movable.

A Hat Pin Point Protector

A device for protecting the point of a hat pin has been patented by a Pennsylvania native. It has for its main feature extreme simplicity. This pin point protector is made of one piece of springy metal strip bent in the shape shown and having a short arm soldered or otherwise attached to it. The pin passes through a hole in the strip, thence through a hole in the arm and through another hole in the strip, the spring tension of the latter holding the pin firmly in place. A portion of the strip protects the point of the pin.

A Dresser-Valise

A valise that is made with a drop front and fitted with several trays is the subject of a patent granted to a Kentucky inventor. The valise he has designed may be used as a miniature dresser after the front is dropped down, since the trays may be pulled out like drawers. It is possible to place them at any distance apart. In all other respects the valise is of the conventional type when it is closed, ready for carrying.

A Convenient Screw Driver

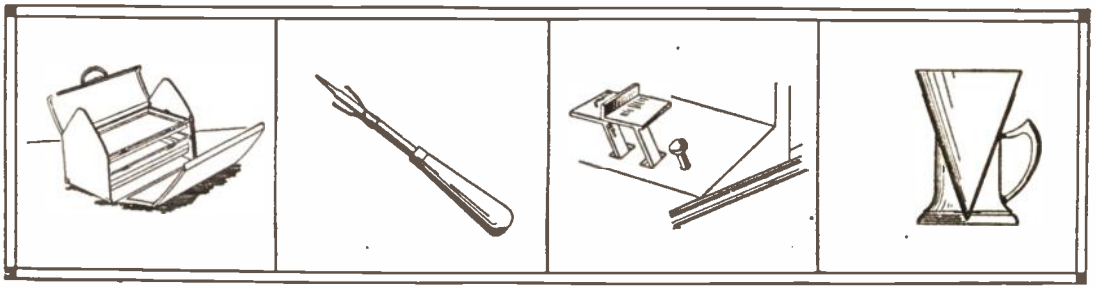
A screw driver fitted with a pair of jaws for holding the screw that is being driven is the subject of a patent granted to an Ohio inventor. The screw driver is fitted with a movable sleeve which mounts the two members that form the jaws. Provision is made for moving the jaws nearer or further apart by simply turning the sleeve, while they may be brought down to hold the screw by sliding the sleeve.

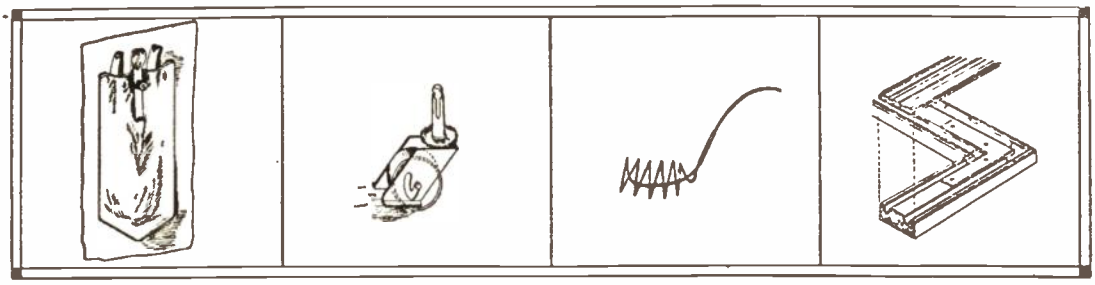
Pedal Controls for Automobiles

In an effort to make the driving of an automobile a simpler task, an inventor of Virginia has patented a form of pedal of the design shown in one of the sketches. The pedal with the overlapping end is that controlling the clutch of the automobile, while the other is the brake pedal. The idea is to couple the clutch and brake pedal in one control, thus requiring but one foot instead of two for operating the clutch and brakes. As the combined pedal is pressed downward, it throws out the clutch, and, when pressed still further, applies the brakes.

A Sanitary Soda Cup

In order to eliminate the usual glass tumblers at soda fountains and replace them with paper cups, a Chicago inventor has patented a holder of peculiar design that takes a conical-shaped paper receptacle. As may be seen in one of the sketches, the holder is very similar in design to some of the holders now in use, with the one exception that it has slanting sides running from the top to the bottom for holding a conical-shaped paper cup. The cup is claimed to be absolutely sanitary, since it is used but once.





Device for Preventing Loss of Tools

An ingenious although very simple device for preventing tools from dropping out of pockets has been invented by a Minnesota native. It consists of a metal strip bent back upon itself so as to form two members, one of which is placed outside and the other inside a pocket. As will be seen in the sketch, the inner one is curved inward so as to hold any tool that may be placed in the pocket. To remove the tool, it is only necessary to push the upper part inward so as to move the inner member out of the way.

An Improvement in Casters

An inventor of West Virginia, has recently been granted patent rights on a simple yet handy type of caster. As may be seen in the accompanying sketch, this caster differs from the conventional ones in that the wheel is not permanently held in one position, but instead may be shifted by means of the slot in which its axle is held. This construction permits the wheel to be raised and the casing member to come in contact with the floor. The advantage of a caster of this kind is immediately apparent; the piece of furniture may be moved about with ease and when it is desired to leave it in one place, the caster may be adjusted so that the furniture stands on rigid feet.

An Improved Egg Beater

A woman inventor has recently patented an egg beater of unique design and which is illustrated in one of the accompanying sketches. The device consists of a single piece of resilient wire bent in the shape shown. The convolutions of wire are made in such a manner that when in use the spiral member bends to conform with the size and shape of the dish or pot.

Electric Light Moulding

A New York inventor has just patented a combination wood and metal moulding which, while possessing the neat appearance and ease of installation of the wooden moulding formerly in use, has practically the same electrical qualities as the present metal moulding required by the Fire Underwriters. By studying the illustration it will be observed that the wooden moulding has a metal facing with grooves for holding the wires. The capping also has a metal surface on the side that faces the wire. Special metal pieces are employed at corners and adjacent sections for making electrical connections between the different lengths of moulding.

Device for Wrapping Paper Rolls

Simplicity and usefulness are the two features of a recent invention of a Wisconsin inventor. His device is intended for use on wrapping paper rolls in order to save time and bother. After a piece of wrapping paper has been torn off a roll, it is usually necessary to spend a few moments in finding the new edge and starting the roll again. This is eliminated by the invention which, as is shown in one of the sketches, consists of a metal arm with a short knife edge at one end, pivoted in a suitable piece which grips on the paper knife. The arm is fitted with a spring which causes the knife edge to press against the paper roll. After a piece of paper has been torn off, it is only necessary to turn the roll in order to start a new piece.

A Tool for Repairing Tires

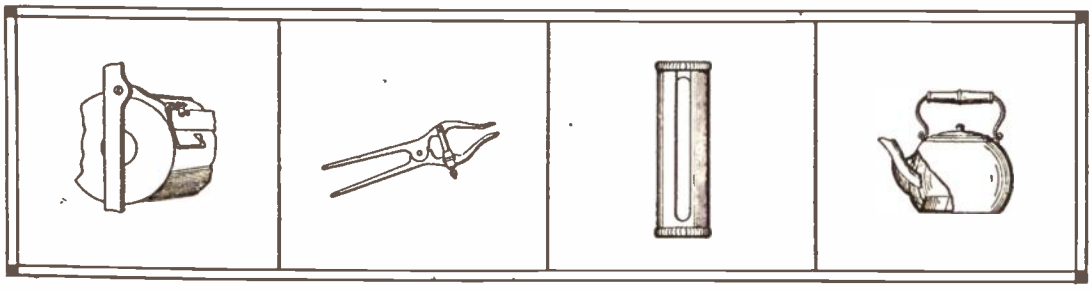
A Canadian has secured an American patent on a tire repair tool of practical design. As will be noticed in the sketch, the tool resembles a pair of pliers, although the pressing of the handles causes the pointed jaws to move apart instead of vice versa. There is also provided a pointed cutting member. The tool is used for making a hole in a rubber tire and then spreading it apart while the scrap rubber is being inserted for making a patch.

A Convenient Match Box

A novelty in the matter of match boxes is presented in the invention of a Connecticut inventor. His device consists of two hollow members which fit one within the other. One end of each tube is closed and finished with a knurled edge, while slots of similar size are cut in the sides of each tube. When a match is desired it is only necessary to turn the tubes around so that the slots coincide, the contents of the match box being then emptied one by one.

Kettle of New Design

A woman inventor of New York has secured patent rights on a tea kettle of new design. Her patent is not limited to tea kettles only, but includes all other spout-provided kettles. The invention is illustrated in one of the accompanying sketches and, as may be seen, consists of a spout of special design as well as a baffle plate at the bottom of the kettle. It is claimed that this style of construction is such that a smooth, controllable stream will issue from the spout.



DIRIGIBLE HEADLIGHTS FOR AUTOMOBILES

An American inventor has recently patented a mounting for headlights which serves to direct the beams of light ahead of the automobile, whether driving straight ahead or around a curve.

The invention comprises pivoted brackets, on which the headlights are mounted in the usual manner. The bracket arms are connected by means of a cross shaft, so that they will turn in unison. Another shaft connects the cross shaft with the steering mechanism of the motor car. Thus, when the steering wheel is turned in order to cause the car to turn a curve, the headlights are also turned to a proportionate degree. The advantage of such an arrangement is immediately obvious; heretofore, when an automobile fitted with the usual headlights turned a curve, the rays of light were cast off the road, leaving the latter in absolute darkness.

COUNTERFEITING U. S. MONEY ON TURKISH TOWELS

The Secret Service Division of the Treasury Department recently received fac-similes of United States paper money, printed on Turkish towels measuring about four feet by two and a half feet. These were sent in as counterfeit money, despite their almost ludicrous size and material, and the Secret Service at once instigated an investigation to discover the whereabouts of the counterfeiters, as the making of spurious American money is a violation of the law. The "towel bills" are in denominations of five and ten dollars, and it is believed that they are manufactured as curios.

GROWING GRAPES ON SAND

A sand dune is about the last place on earth one would expect to see as the base for a vineyard, yet such an extraordinary sight is presented in parts of southwestern France. In the neighborhood of Biarritz there may be seen flourishing vineyards that grow on the dunes of quartz sand cast up by the ocean and driven by the winds.

These vineyards are protected by palisades, and produce great quantities of excellent grapes. They are a modern outgrowth of the ancient Brittany shore vineyards, in which the plants were simply buried in the warm sand, and the grapes were developed almost on the surface of the soil. At that time no means had been devised to protect the vines, and when the wind overwhelmed them with sand the plants were removed to another locality, from which practice arose a local law that treated vineyards as movable property.

A GRIDIRON LAMP

A metal-filament lamp has been produced abroad that is said to afford a more efficient light than the ordinary electric lamp. This is said to be due to the fact that the filaments are arranged in the form of a small square gridiron, fixed horizontally in the center of the globe, and capable of withstanding a considerable amount of vibration. The light is thrown downward, so that illumination is concentrated directly underneath. Tests have been made of the amount of light distributed by this lamp, as compared with the amount given by old-style lamps of equal candlepower. The results are claimed to show that the new-style lamp gives half again as much light.

THE ELECTRICAL ENTERTAINER'S PROGRAM

(*Continued from page* 109)

base in the assistant's hand, close to a rod held in the hand of the performer. The current slowly strikes through the glass wall, and; as the fracture increases, the air is let into the bulb. As the vacuum lowers, the color of the glow in the bulb changes from bluish white to red, then to purple and finally it disappears as the spark punctures the wall and finds its way to the wires inside.

Questions and Answers

This department will appear regularly in THE WORLD'S ADVANCE, subject to following regulations: The questions must be legibly written with typewriter or in ink, on one side of the sheet. Each question must be definite and cover but one point of the subject under consideration, although a letter can contain more than one question. On the 10th of the second month preceding the date of issue of the magazine, all the questions on hand will be considered and those which are put in the most intelligent manner and of widest general interest will be selected for publication in such issue, the number being governed by the space available. All other questions will be returned to the writers with a statement of the price for which they will be answered by letter. Return postage must be enclosed with each letter containing questions, and the letters must be addressed to the Questions and Answers Department and contain nothing relative to other departments of the magazine.

SAYVILLE RADIO STATION.

In reply to the many requests we are receiving from our readers in regard to the operation of the Sayville radio station on Long Island, we will make the following statements, which we hope will clear up the difficulty. Sayville is intended to operate directly with Nauen, Germany, and to send press to the German ships. Since the war has been in progress the German ships have been conspicuous on the high seas only by their absence, so that it would be foolishness to still send press messages out to them. As there is no direct cable communication with Germany, the news has to come by wireless if it is to come direct, so that it has been found more practicable to use the Sayville station only for trans-Atlantic purposes, thus no press messages are being sent as formerly. The call POZ called by Sayville is the Telefunken station at Nauen. There are several wave lengths authorized for the use of the Sayville station, but in general one about 2,800 meters is employed. Sayville's call is WSL.

GENERATOR WINDING.

(1) H. O. P., Elkhart, Ind., asks:

Q. 1.—What should be the winding for a proposed dynamo having an upright bipolar field magnet 6" high, 4" wide, space for winding being 1¼" thick, 2¾" wide, and 3½" long? Bore is 3 1/16" in diameter and 4" long. Armature is H-shaped, 4" long and 3" in diameter. It is desired to get an output of 10 volts, speed being 500 or 1,000 rev. per min.

A. 1.—Although you did not state the material of field magnet, we presume it is of cast iron. It appears to be of good design, differing from most designs submitted to us in that it has more iron. To have the winding space 3" in diameter would be still better. It surprises us, however, to find that you propose to use a Siemens shuttle armature. Even if this is laminated, the operation would be intolerable Sixteen-slot punchings can readily be secured, and from them you can make a first-class drum armature. If you decide to make such modifications in the design of the machine as we suggest, we can then advise you more accurately as to the winding.

WINDING FOR STATOR OF INDUCTION MOTOR.

(2) C. U., Brockport, N. Y., asks:

Q. 1.—What winding should be used on the stator of a certain induction motor of which the principal dimensions are: Outside diameter of stator sheets, 7½"; inside diameter, 4 17/64"; thickness, 1¾"; diameter of rotor, 4 7/32", with 31 copper rods 7/32" in diameter. Stator has 24 slots. It is desired to wind machine for 110 volts and 25 cycles.

A. 1.—For the 4-pole 750-revolution machine No. 18 magnet wire would appear to be about the largest size that will permit the requisite number of turns. You can wind the coils in the manner described in Watson's recent articles on alternating current motor construction. Of course, you are to put on all the turns possible. For a 2-pole 1,500-revolution motor you might use No. 16.

Q. 2.—What is the size of a certain sample of wire sent?

A. 2.—No. 25.

WINDING FOR AN ELECTROMAGNET.

(3) J. E., Ardmore, Okla., asks:

Q. 1.—What would be a suitable winding for an electromagnet having two cores of wrought iron, each 1¾" in diameter and 3¾" long, joined by a wrought iron block having a section 1½" x 2", the current to be taken from ten or twenty dry cells?

A. 1.—You do not state whether the use of the coils is to be continuous or intermittent, yet, from the fact that such batteries are at best adapted for intermittent work, we will propose a winding that will draw a current of only about 2 amperes. If you desire less strength, you can put the cells in two

parallel groups, each consisting of five or ten cells in series. If you desire greater strength, for a few moments only, you can put the two coils in parallel rather than in series with each other. Use No. 18 single cotton covered wire, getting about 70 turns per layer, and 12 layers per spool. Each spool will require slightly over two pounds of wire. Make the flanges of the spools at least ⅝" deep.

FLICKERING OF LIGHTS SUPPLIED BY GENERATOR.

(4) R. R., Humboldt, Kans., asks:

Q. 1.—What is the cause of flickering in the electric lights operated from a certain direct coupled dynamo? Latter is apparently in good shape, and gives 110 volts and 30 amperes.

A. 1.—The causes of flickering may be many, some of them hard to find, and even to remedy. It would be interesting to know the name of the manufacturer of the generator. In a certain case known to the writer, in which there were two large generators in an isolated plant, the causes of flickering were so involved in the design as to be irremediable, and led to the "scrapping" of the machines. Too few commutator segments, irregular spacing of the brushes, unsymmetrical armature winding, unequal spacing of the poles, poor centering of the armature, and poor engine regulation, may be stated as being concerned in the cause. You should certainly seek to remedy the cause, and any progressive manufacturer ought to be anxious to remove all causes of criticism.

PIG ALUMINUM AND INDUCTION MOTOR DATA.

(5) S. McD., Brandon, Manitoba, Can., asks:

Q. 1.—From what firm can he purchase "pig" aluminum?

A. 1.—In the States the principal makers are the Aluminum Company of America, with main offices in Pittsburgh, and works at Niagara Falls. From them you could undoubtedly obtain the address of the nearest Canadian firm with which they are affiliated, and thereby save you the payment of import duties.

Q. 2.—What general dimensions and winding should be followed for making an induction motor of 1/10 horsepower and 3,000 rev. per min.?

A. 2.—As you do not state the voltage and frequency, we are at loss to make any reliable calculations. Possibly you desire a 110-volt machine, and the statement of speed suggests that you have a supply at 50 cycles, for with a 2-pole field that would yield the synchronous speed. With 60 cycles the speed, allowing for "slip," would be about 3,300. It would be worth while to know what range of materials you may have at your disposal, for some accommodation to meet them may be possible. A stator having an outside diameter of 6", inside of 3½", the stack of sheet iron being 1½" thick, would be a good trial size. Have 24 slots, the proportions being about as given in Watson's articles. About No. 20 wire may be used, but arranged for two poles rather than four.

Q. 3.—In making such a motor is it necessary to have any external switches, resistances, reactances, etc.? Such cumbrous adjuncts seem to be omitted from ordinary makes.

A. 3.—While it is true that such starting devices make additional expense, and especially in small sizes of motors are to be omitted if possible, you must face the realization that their omission may mean the retention of certain factors that lessen the regular operating efficiency. Just as in the direct current motors, if you have no starting rheostat, it means that the motor is wound with an inherent high resistance, and has a lower working efficiency than otherwise. Certainly in the case of all large motors, also those used for railway and elevator service, plenty of external devices are involved, and in their design no small engineering skill is shown. You can design a motor poor enough to permit the absence of such devices, or good enough to require them, thereby permitting their losses to be maintained during the starting operations only.

GENERATOR DATA.

(6) W. L., Riverside, N. Y., asks:

Q. 1.—How to wind a laminated field magnet and armature so as to get from 6 to 12 volts. Armature is 1½" in diameter, 2¼" long, with 12 slots 5/16" in diameter.

A. 1.—In consequence of the inability of the laminated structure of the field magnet to hold any "residual" magnetism, you cannot make the machine self-exciting. If it is to be used for charging storage batteries, no difficulty, however, will be experienced, for in that case the electromotive force of the cells may be relied upon to give the initial start. In other cases you would find it necessary to clamp the sheet iron between two cast iron plates, say ⅛" thick, and of the same shape as one of the punchings. You might use No. 22 wire on armature, No. 25 on fields.

QUESTIONS ANSWERED BY MAIL.

For the benefit of those wishing to have their questions answered by mail without the delay involved in answering them in these columns, there is a special service offered to readers only. Questions will be answered by mail within a few days' time if they are accompanied by the fee of fifty cents. If the answers involve extensive calculation and research, the inquirer will be advised as to the fee.

RADIO SECTION

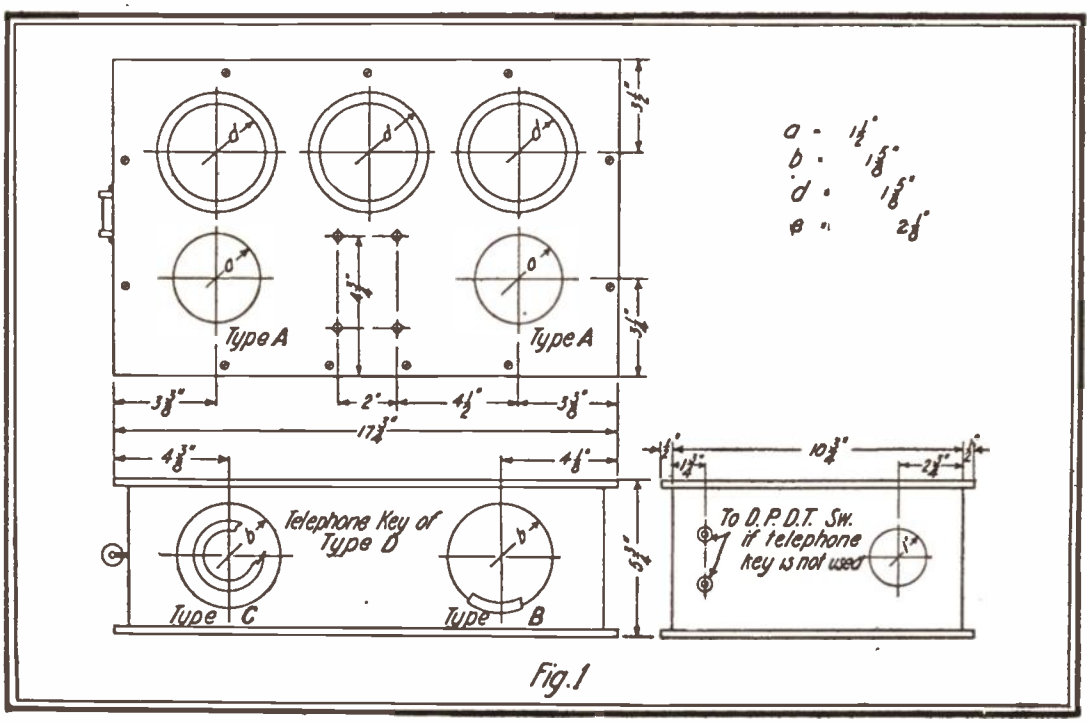
Devoted to the Encouragement of Amateurs and Experimenters in the Field of Radio Communication.

A Multiple Receiving Tuner*

By Chas. P. Seeger

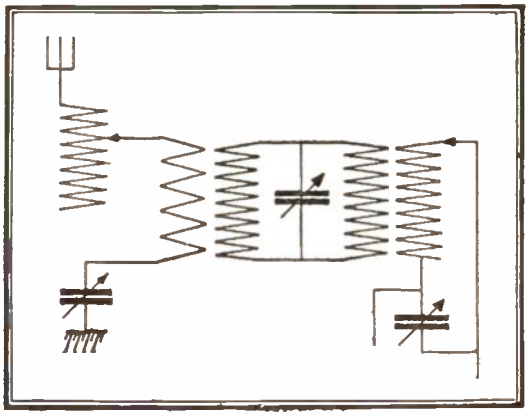
AS a rule, sending outfits are described in greater detail than receptors, primarily because it is necessary to conform to certain rules in setting up a sending outfit. The average receiving outfit described is usually of a simple and common design, no attempt being made to furnish data for a set of apparatus typical of one or the other great systems of radio telegraphy. In the following article the author has endeavored to describe a Marconi type receiving set.

In the Marconi multiple tuner there is an intermediate circuit of low damping interposed between the aerial-earth circuit and the detector circuit. This intermediate circuit has inductive coupling with both the antenna and the detector



Dimensioned Plan of the Cabinet in Which is Placed the Different Apparatus Comprising the Multiple Receiving Tuner.

*This article will be concluded in the August issue of THE WORLD'S ADVANCE.



Wiring Diagram of a Simple Marconi Multiple Tuner, Showing Relation of Different Windings and Condensers.

circuits, and is tuned simply by means of a variable condenser which has a considerable range of capacities. This design of tuner is quite selective, and yet is more quickly and more readily adjusted than the somewhat more selective Fessenden type. Waves impinging upon the aerial, even though highly damped, produce in the low resistance intermediate circuit very feebly damped oscillations, and these can be tuned quite sharply in the detector circuit.

The general diagram of this type of tuner is as follows:

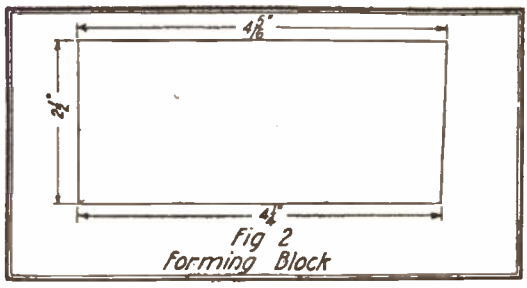
The first circuit—consisting of the loading coil, condenser and primary of the first loose-coupler—is adjusted to respond to the desired wave length. The intermediate circuit is then adjusted, after which the detector circuit is brought to the same period as the rest.

The most important factors in the construction of receiving outfits are the proper proportioning of inductances to capacities in order that the amount of dead-ended wire may be reduced to a minimum, the reduction of distributed capacity, the elimination of sliding contacts, and the use of coils whose natural periods differ considerably from the wave lengths for which they are to be used. Moreover, in inductive tuners the primary and secondary coils must—with the closest coupling—be far enough apart to minimize electrostatic capacity effects between the windings.

The following instructions will enable the construction of an outfit on the order of the multiple tuner, but possessing certain advantages over the above-mentioned tuner in that it is adapted for use with various forms of detectors. The box is to be made of mahogany, preferably, although walnut is also suitable. It is suggested that the box be made with a hinged top in order that the apparatus may be more easily assembled. Retainers are glued to the sides and bottom of the box in order to strengthen the joints.

After assembling, the box should be thoroughly sandpapered in order to remove all traces of glue. It should then be given a coat of mahogany stain, or walnut stain if the latter wood is used. The builder may use a water stain and apply the desired color, after trying various depths of color on a piece of wood.

When dry, the surface should be lightly sandpapered to remove any roughness where the stain may have "raised" the wood. A coat of shellac is then applied and when dry it is sandpapered sufficiently to bring out a smooth surface. This is given a coat of light varnish. When dry, the surface is sandpapered and given a second coat of varnish. When the latter is dry, the builder should obtain a piece of burlap, some "rubbing oil," and the finest powdered pumice stone possible. The burlap is soaked with the oil and sprinkled with the pumice stone to serve in rubbing down the wood. This process requires a couple of hours, but if carefully done it will yield a finish to the box similar to that of a piano. Before sandpapering, it is necessary to make sure that the coats of stain or shellac or varnish are *thoroughly dry*. Great care should be exercised in sandpapering to



Forming Block on Which the Cardboard or Sheet Fibre is Placed.

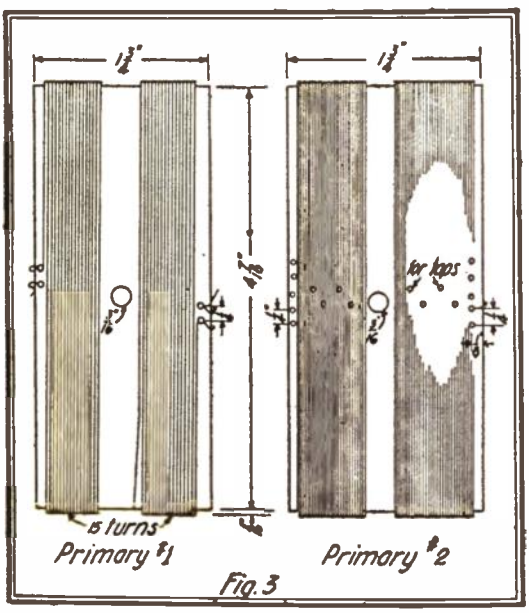
prevent taking off the stain, varnish or shellac. Only No. 00 sandpaper should be used.

While the varnish is drying, work may be started on the inductive tuners, requiring:

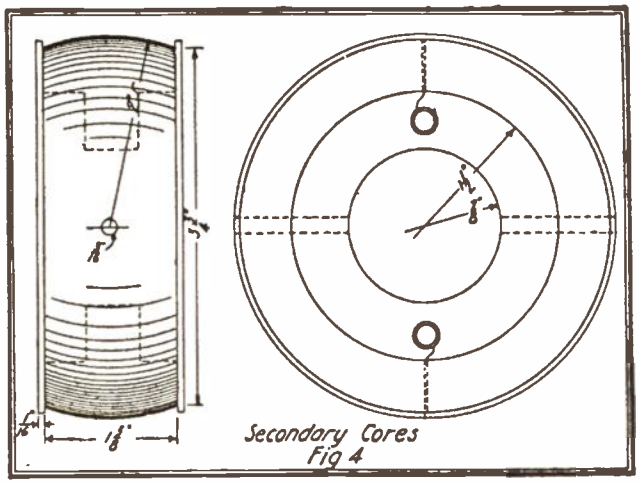
Fiber—about 1 sq. yd. 1/64 inch thick.
Wire—1½ lb. No. 30 s.s.c. and 1 lb. No. 22 s.c.c.

COUPLER PRIMARY: Turn or plane up a cylinder to the size shown in Fig. 2. Cut the cardboard or 1/64 sheet fiber into strips 2¼" wide, thus forming a tube of the material about 3/32" thick. For adhesive material use shellac, or, better still, hot glue. When the cylinder has been formed, wind a piece of tape around it to hold the layers together, and after allowing it to set for a minute remove from the form. The cylinder should be permitted to stand over night and the superfluous glue then washed off, care being exercised so as not to unloosen the layers. When the cylinder is dry it is trimmed to size on a lathe, or fastened to a disc that can be rotated.

The first primary is wound with thirty turns of No. 22 s.c.c. wire, fifteen turns per side, spaced as indicated. The wire is started through a hole bored in the tube—several turns of the wire being passed through the holes to insure holding—the winding being placed on the cylinder as tightly as possible, fastening the wire as in starting. Two or three coats of thin, transparent shellac are applied when the winding is completed.



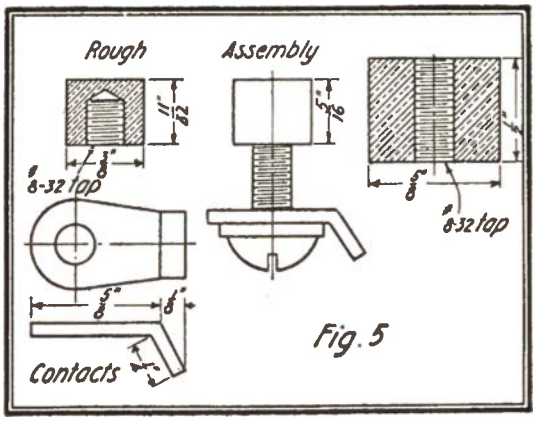
The Two Primary Coils, Showing the Method of Winding.



Wooden Spools Which Are Used for Holding the Secondary Windings of the Coupler.

For the second coupler primary five small holes are bored, using a 1/16" drill, about ¼" apart and ⅛" from edges, as indicated in Fig. 3. One hundred and twenty-five turns of No. 30 s.s.c. wire are wound on, taking taps at 15, 30, 45, 60, 80, 100, 125 turns. In taking these taps, the wire is pushed through a hole in the cylinder, the double wire being then wound as shown, giving it several turns similar to the method of starting, leaving about a foot of doubled wire projecting. The winding is put on as tightly as possible and then given several coats of shellac. When dry, a strip of single thickness empire cloth is wrapped on. On top of this 30 turns of No. 22 s.c.c. wire are wound, starting and wrapping as on the first tuner. Shellac is applied when the winding is completed.

COUPLER SECONDARIES: Turn up the cores of ash or maple to the size indicated in Fig. 4, taking particular care that the radius of curvature of the surface is the distance from the central point on the axis to a point on surface. It is



Details of Switch Points and Connecting Lugs.

also important that the curvature be absolutely regular, for the successful operation of the completed outfit depends largely on the fact that the *secondary cores be exactly alike.* In turning the cores, the builder should make a template of desired radius which can be applied to the surface to determine if the curvature is regular.

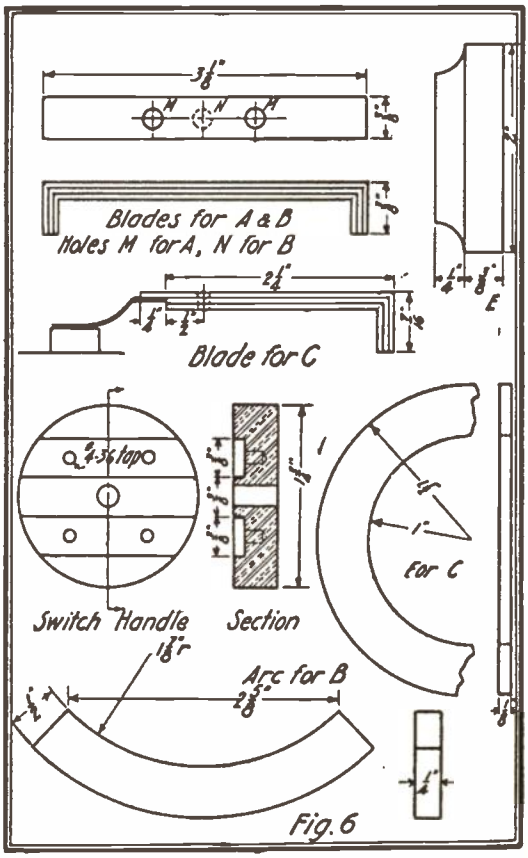
Holes should be bored as indicated with a 1/16" drill, as well as a hole along a diameter with a 3/16" drill. Exactly 31 turns of No. 30 s.s.c. wire should be wound on each side, making the crossover as indicated. The crossover should be 90° on the circumference—one-quarter of the circumference—from the 3/16" hole. It is necessary that these cores hold the same amount of wire, distributed over the same number of turns. The wires should begin and end at small binding posts to facilitate connecting.

LOADING COIL: Obtain a mailing tube 4½" diameter and 7" long, or make one of cardboard or fiber as previously described. It will probably be cheaper to make the tube. Wind on 192 turns of No. 22 s.c.c wire, taking taps at 6, 12, 18 turns, then every eighth turn until 130 turns have been put on. Next tap at 142, 156, 172 turns. Wire is started and taps made in a manner similar to the method used for the coupler, leaving about 8" of wire projecting beyond tube.

CONTACTS: The materials necessary for making the contact points are:

2 ft. ⅜" brass rod.
50 8-32 brass screws—5/16" long.
50 washers or burrs for above screws.

Fifty contact heads should be cut from the ⅜" rod, 11/32" thick. This allows 1/32" for filing. If a bench hack saw, equipped with a vise for cutting bars at right angles is used, these contact heads can be quickly made. Moreover, the cut is smoother than when done by hand and it is at right angles to the sides, thus eliminating a good deal of filing. The pieces should be placed flat on a rather fine file, the contacts being moved and not the file. They are then drilled and tapped for an 8-32 machine screw, with further filing to remove all burrs. The contacts are then assembled on a smooth, level-surfaced piece of wood. A wide fine file is then used to level off the contacts, which are then finished by using the finest sand or emery paper obtainable, the special oo grade, if possible, placing the sandpaper on a block of wood and taking care not to round contact edges, as well as to use sufficient oil. After all traces of oil are removed, the



Details of Switch Arms, Handles and Contact Pieces.

contacts are polished and lacquered.

SWITCHES: The materials for the switches are:

4 ft. spring, brass or copper.
2" x 3/8" x 8" hard rubber.

Type A.—Cut and bend the copper to the size indicated, and solder the strips together at the point *P*. Drill and tap the brass support on top and bottom for 8-32 screws. The slots in the rubber handle should be no deeper than is necessary to make the blades come flush with the under surface. Drill holes in the blades to clear 4-36 screws at points shown, and in the rubber to tap for the 4-36 screws. Before assembling, sandpaper the brass parts to remove all tool marks, using oil with the sandpaper as in making the contacts. Polish and remove *all* traces of oil before lacquering.

Type B.—The construction is similar to Type *A*, save that it is a single arm switch, and that the arm has a 3/16" hole through center. Slot the handle as before. The metal arc can be made by filing from stock or turning a ring to size. (See Fig. 6.)

Type C.—In Type *C* the switch arm is shorter than in Type *B*, as is shown in Fig. 6, and carries a piece of phosphor-bronze spring soldered to it. The metal ring should be made of 1/8" brass, turned or filed to size. It is best to support it with brass pieces (approximately the diameter of the contacts and held to the case in a similar manner), sufficiently thick to bring the ring to the same level as the contacts. This, however, is not necessary, as the ring may be fastened by drilling and tapping for an 8-32 screw, holding it directly to the case. If this is done, the phosphor-bronze spring will have a deeper bend. (See drawing.)

In place of Type *D* a telephone switch may be used, known as a ringing and listening key. This will eliminate the double pole, double throw switch necessary to change from crystal to audion detector, although it adds considerably to the cost of the outfit.

CHICAGO RADIO CLUB

It is announced that the Chicago Radio Club has recently been formed and will hold its meetings every other Thursday night at the clubrooms in Hamlin Park, Wellington and Robey streets, at 8 P. M. The organization charges no dues. The Business Manager of the club states that he will be pleased to have new members join, in and around Chicago. The main object of the club is to decrease unnecessary interference as well as to increase interest in the art of radio communication.

The officers of the Chicago Radio Club at present are: L. J. Healy, President; Harry Lagodzinski, Vice-President; R. T. Strom, Secretary; Fred Fletcher, Sergeant-at-Arms, and Edw. T. Markowski, Business Agent.

THE MANCHESTER RADIO RESEARCH CLUB

There has recently been organized for the purpose of advancing radio science the Manchester Radio Research Club of Connecticut.

The following officers have been elected: C. W. Hollister, President; Wm. McGonigal, Vice-President; Raymond Carrier, Treasurer; E. F. Ball, Secretary, and Edward L. Root, Electrician.

Wireless amateurs in the vicinity of Buckland, Conn., are requested to correspond with the Secretary, E. F. Ball, of that town.

PITTSFIELD RADIO CLUB

At a meeting held Saturday evening, April 17th, at the home of Allan W. Burke, the Pittsfield Radio Club was formed, with an initial membership of twenty-five. The following officers were elected: President, Allan W. Burke; Vice-President and Chief Operator, Vincent St. James; Secretary, John S. Nichols, and Treasurer, F. Hempstead.

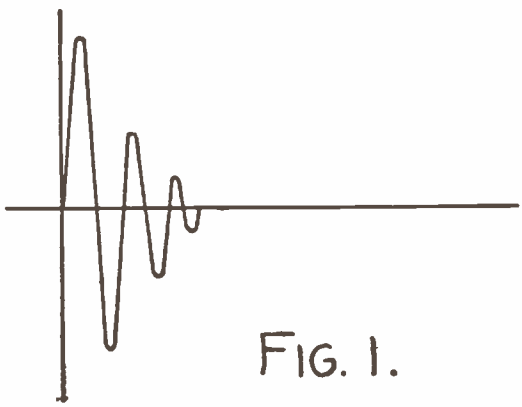
Several of the members of the club have efficient stations and are in communication with other amateurs throughout Massachusetts, Connecticut and New York State.

Spark Gap Efficiency and a New Type Gap

By A. S. Blatterman, B. S.

AS is the case with nearly all of the apparatus used in wireless telegraphy, the spark gap since the first early experiments has undergone a great many changes. In early days the spark gap consisted simply of two brass balls. At that time this arrangement answered the purpose fairly well, though it was realized that blackening and pitting of the surface of the balls, due to the oxidizing and corroding effect of the spark, were detrimental. It was thought at first that the only function of the gap was its action as an automatic switch to suddenly connect the two halves of a capacity circuit charged to opposite potentials, thus suddenly relieving the existing condition of electric strain so that oscillations were produced. This simple property of the gap is indeed a basic requirement, but in modern practice is complementary to another which must now be classed as almost equal in importance for efficient functioning of the apparatus.

With the introduction of higher powers in transmitting it was soon found that the stationary brass ball gap gave rise to a power arc following the first discharge of the condenser, which effectually prevented further oscillations. This was partially overcome by the use of transverse magnetic fields applied at the spark gap to blow out the arc, and with the same purpose a blast of compressed air was often introduced into the gap. Further experience led to the utilization of resonance in the transformer circuits, the inductance in the circuit preventing the heavy rushes of current necessary for maintaining the arc.



Highly Damped Oscillations Produced by a Parallel Plate Quenched Gap.

The spark rate of apparatus using this early spark gap in connection with induction coils, and later with transformers, was very irregular, so that the signal produced in the telephones at receiving stations was of a more or less crackling or sometimes mushy sound, often difficult to separate from the similar sound effects of atmospheric electricity. It was also found by Wien, Austin and others who investigated the subject experimentally that the telephone receiver as well as the human ear is not as sensitive to low pitched sounds as it is to those of higher frequency, in the neighborhood of 900 or so vibrations per second. Accordingly, methods began to be devised for producing regular sparking rates of higher frequency than had heretofore been used.

One method employs a disk carrying a number of metallic studs evenly spaced around its periphery and revolving at high speed between stationary electrodes, the whole device constituting an apparatus which gives a regular sparking rate of high tone when used as a spark gap in the condenser circuit. Another method employs an alternator of relatively high periodicity, viz., 500 or more cycles per second, with a special spark gap so constructed and adjusted as to obtain only one spark per alternation. At 500 cycles the ordinary spark gap falls far short of permitting this condition, because the time of an alternation is so brief that any arcing prevents the desired clearing of the gap before the following alternation. Hence, individualization of the sparks is lost and the tonal quality is impure and mushy.

What is required is a rapid regularly recurring discharge which is damped out after a few oscillations. When a circuit containing the usual form of spark gap is coupled to a second circuit the oscil-

lations in the circuits, even when the two are separately tuned to the same frequency, are not simple damped oscillations, but can be analyzed into a complex vibration of two different frequencies.* These two oscillations have different damping factors and the total energy is distributed, not equally, between the two. When the second of the coupled circuits is an antenna this complex oscillation is undesirable and the usual procedure has been to weaken the coupling between the antenna and the exciting circuit, which has the effect of confining the greater part of the energy transferred to one of the oscillations at the expense of the other. While this results in better definition of the radiation as regards singleness and sharpness of wave, there is a considerable loss in efficiency due to loose coupling. An arrangement whereby tight coupling with high efficiency at the oscillation transformer can be utilized and still maintain single wave radiation is much to be desired.

The success of such an arrangement depends on the use of a suitable spark gap. The parallel plate quenched gap is an excellent example of what can be done in this direction. With such a gap, properly adjusted, oscillations in the closed circuit are highly damped, as shown by Fig. 1, and these induce powerful free oscillations in the antenna of single frequency and the damping of which is determined only by the constants of the antenna. (See Fig. 2.) Very close coupling can be used without the appearance of a complex oscillation, because return of energy from the antenna to the closed circuit is prevented by the automatic opening of the latter circuit after the first four or five oscillations. All of the energy of the exciting circuit is transferred to the antenna during these four or five oscillations.

The requirements for this quenching effect are, first, that there be no arcing at the gap; second, that the gap be very short. It appeared that the rotating gap offered great possibilities as far as the prevention of arcing is concerned, owing to the air cooling fan effect of the moving studs which tends to clear the gap of ionized air or metal vapor after each spark, and to the fact that each spark is of relatively short duration, being interrupted by the separation of moving

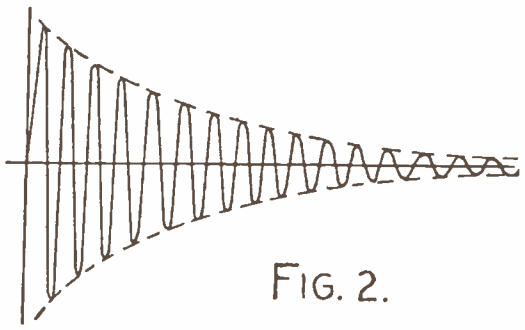


FIG. 2.

Powerful Free Oscillations of Single Frequency Induced in the Aerial by a Highly Damped Oscillation Circuit.

studs from stationary electrodes in rotation, thus preventing temperature rise and the complete formation of arcs. It has not been very usual, however, to truly utilize the principle of short gaps with the rotary discharger, for no matter how closely the stationary spark points are set to the plane of rotation of moving points the discharge always anticipates the exact juxta-position of pairs of these points and take place over a considerably longer gap than that indicated. This is especially noticeable at high voltages.

It has been common practice to use two stationary electrodes for feeding energy to the revolving disk; thus, two sparks occur simultaneously in series at every discharge.

The writer has recently had built a gap in which, instead of only two sparks in series, there are eight. By this arrangement the total discharge voltage is distributed over eight gaps instead of two, so that, while the total gap length through the discharger remains practically unaltered, the length of the individual gaps is reduced approximately fourfold.

There is a certain peculiar advantage in thus dividing the discharge among several series gaps. The possibility of arcing is very greatly reduced. Given n gaps of equal lengths in series, the voltage required to sustain an arc in the gaps is approximately n times as great as would be required for a single gap n

*There is also a possibility of a third oscillation.

times as long as one of these gaps. On the other hand, the voltage required to produce a *spark* through such a series of n short gaps is practically the same (in some cases less than) that required to bridge a single gap n times as long. Thus, subdivisions of the total discharge favors the suppression of an arc, yet requires no additional potential to produce sparking.

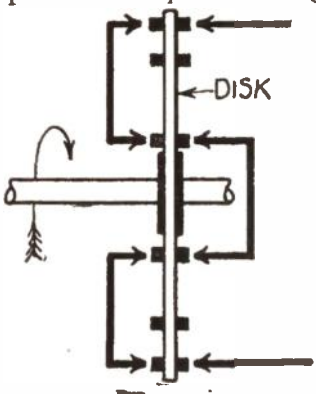


FIG. 4.

Diagrammatic Plan of the New Type of Spark Gap.

The present gap, shown in the illustrations Figs. 3 and 3a, was arranged for non-synchronous operation on 70-cycle supply. The disk is constructed of ⅜" Bakelite and is 12" in diameter. It carries 24 studs, which are threaded into the Bakelite and clamped by lock nuts on each side of the disk. Bakelite is far superior to either fibre or hard rubber in the construction of a disk of this kind, as it can be obtained in sheets of very uniform thickness and does not warp nor absorb moisture.

Some attention was given to procuring a suitable metal to be used for the spark gaps proper. Copper electrodes tend to "bead" in the electric spark; that is, the exposed surfaces become covered with small globules of copper. Zinc, on the other hand, tends to "pit." It has been found that an alloy of copper and zinc, copper predominating, wears down quite evenly, the pitting tendency of the zinc apparently counterbalancing the beading tendency of the copper.

The gap is shown diagrammatically in Fig. 4. It is seen here that eight spark gaps are bridged in passing through the disk. The stationary gaps are arranged as shown in Fig. 5. The electrodes are beveled and set at an angle with the disk, pointing in the direction of rotation. This method effectually prevents mechanical destruction of the gap should stationary and revolving electrodes come into contact. Radiating flanges are provided as shown to aid in dissipating the heat. The electrodes are mounted in Bakelite and those on one side of the disk can be moved as a unit for the purpose of rough adjustments in gap length. For this purpose the disk is also moved along the shaft. The closer adjustments are made by swinging the individual side electrodes themselves in their supports. Considerable care had to be exercised in construction so that all of the eight gaps were in their proper positions for sparking at the same instant. The disk was balanced by mounting on the shaft which was then supported on knife edges. A small 10-24 machine screw was used to obtain exact balance; it was placed about four inches from the center of the disk. The bearings are bronze and no trouble has been experienced from heating.

Experiments to study the behavior of this gap were carried out on a 2 kw. 70-cycle transmitter. The transformer voltage was approximately 20,000 volts (effective), and the spark-frequency used was 700 per second. The gap was found to exhibit properties of pseudo-impact

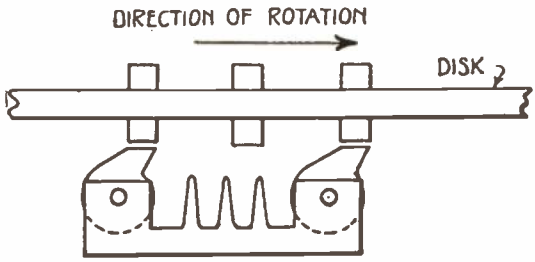


FIG. 5.

Arrangement of Stationary Electrodes of the Spark Gap.

excitation, provided the individual gaps were kept very short. There was also a decided improvement in the power factor measured on the primary of the transformer, readings of 75 per cent. being obtained with eight gaps, as compared with 62 per cent. when only two gaps were used. This is probably due to the decrease in arcing at the gap when the eight gaps were used. An arc at the transformer terminals constitutes a more or less severe condition of short circuit, and a short-circuited secondary is equivalent to an inductive load on the trans-

former; this means (usually) a lower power factor.

A gap constructed on this plan is especially advantageous when high powers are to be used in connection with small antennæ. The production of a given antenna current depends on the equivalent resistance of the antenna, its electrostatic capacity and the potential to which it is charged. A small antenna must be charged to high potential for larger energy storage, and this means high spark potentials. Then, with single wave radiation and high efficiency at the coupling coil, it is necessary to employ a spark gap having impact excitation characteristics. The gap described shows this property, provided that the individual gaps are kept very short, and that minimum voltage required to bridge the whole gap circuit is employed. This voltage must be high enough, of course, to give a smooth spark tone. On low frequency supply the spark voltage varies throughout the cycle and it is not sufficient to use a voltage which breaks down the gaps only near the peak of the wave. It has been found that condenser capacity and spark frequency are important factors in controlling the spark potential, and when the latter is invariable at the transformer, recourse may be successfully had to its automatic adjustment by varying either the capacity of the condenser or the rate of sparking. A certain adjustment can be found at which the manifestations of impact excitation are most pronounced and it is usually found most advanta-

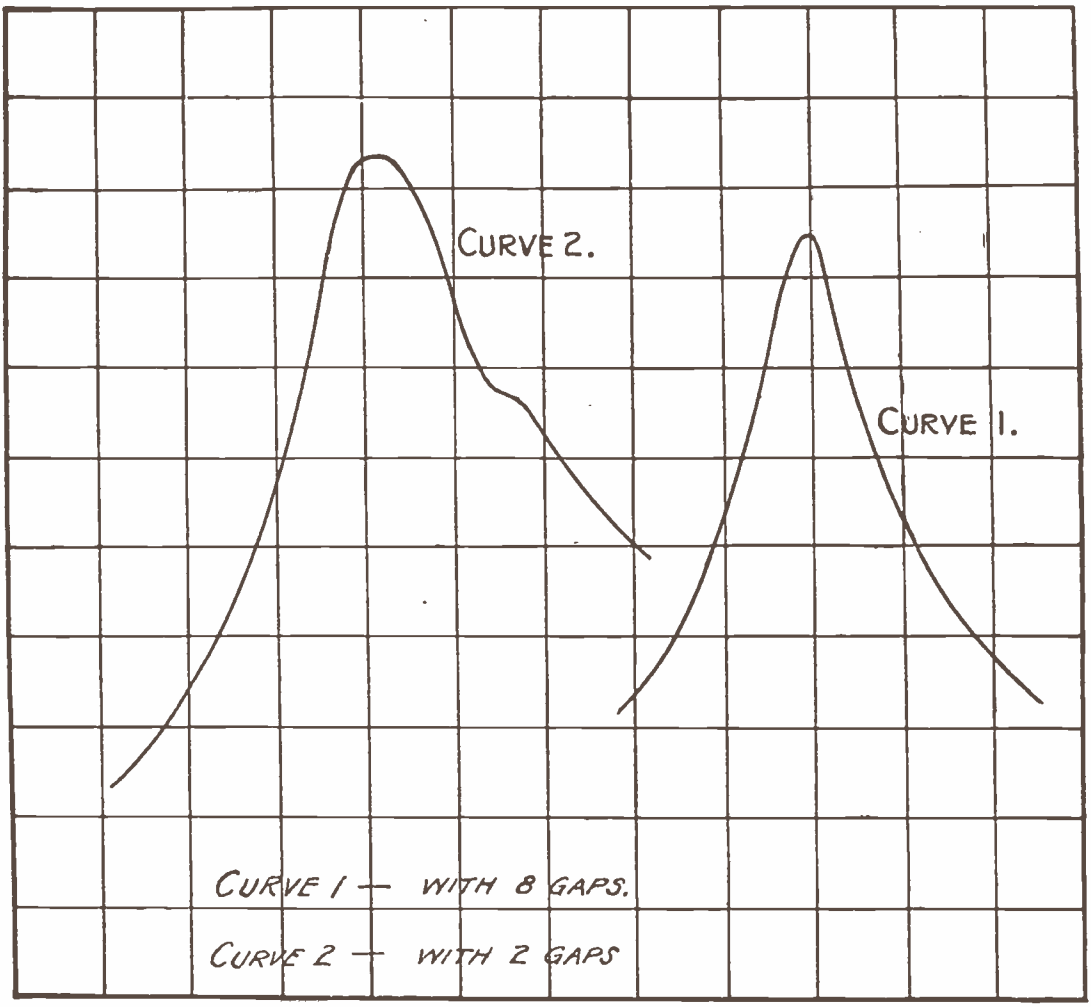


Fig. 6.—Diagrammatic Representation of the Characteristics of the New Spark Gap.

geous to work with this disk speed and condenser.

The first indication that impact excitation is taking place is the tight coupling required for maximum antenna current and also the large drop in this maximum which accompanies the slightest change in coupling from this critical position. The conditions can be more accurately analyzed by loosely coupling a wavemeter circuit to the antenna. The resonance curve (1) of Fig. 6 was taken on an antenna of 0.002 mf. capacity at a wave length of 850 meters with the eight gaps in series. The curve (2) of Fig. 6 was taken under exactly similar conditions, except that only two gaps were used. The wavemeter circuit contained a rotary variable condenser of maximum capacity about 0.004 mf. and an inductance of about 100,000 cms. The self-damping of the wavemeter circuit at the wavelength employed was 0.02. The coupling of the condenser circuit to the antenna was adjusted, in each case, for maximum aerial current. The maximum readings of the ammeter in the wavemeter circuit are not to be compared among themselves as a measure of the energy in the antenna, because the coupling between the wavemeter and the antenna was varied from time to time. As far as the aerial current alone is concerned, the use of the eight gaps gave readings from 20 per cent. to 30 per cent. higher than those obtained with two gaps.

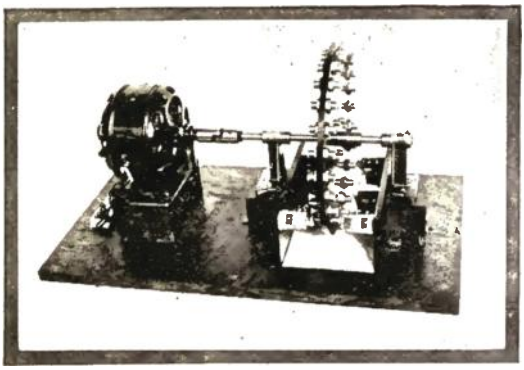
In conclusion, it has been found that this series gap exhibits properties approaching those of impact excitation. This is due, at least in part, to the inherent cooling properties of the rotary gap and to the favorable relation of arc voltage to spark voltage in series gaps. The proper selection of a spark gap alloy is of importance. In this connection zinc is one of the so-called non-arcing metals, and in general its addition to an alloy renders the alloy non-arcing. It has been found, however, that zinc becomes pitted in the electric spark, and hence it is of advantage to alloy it with copper whose tendency to "bead" counteracts the pitting tendency of the zinc, and results in an even wearing of the gap surfaces. The series rotary gap, in the present case, gives an improved power factor on the transformer and an increased overall efficiency into the antenna with lower aerial decrement. The motor speed was invariable in these experiments; it is believed that a higher speed than that used will magnify the advantages of the gap, and experiments to verify this are contemplated for the near future.

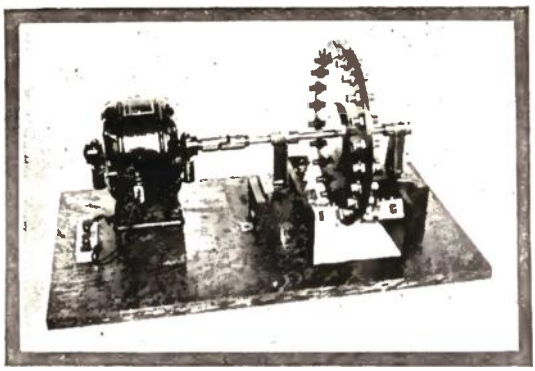
CENTRAL RADIO ASSOCIATION BLUE BOOK

The Blue Book published by the Central Radio Association is now ready for distribution. Not only does this book contain a list of stations of all the members of the association, which covers nearly thirty states, but it also contains numerous wireless facts. The sending power, make of coil or transformer, transmitting distance and other interesting data of every station listed, is also included. In addition to the list of members the call letters of several hundred amateurs who hold a Government license, but who have not yet joined the association, are given.

The Blue Book contains a full explanation of the Government time signals and weather forecast code, an illustrated article on the construction and operation of the audion detector and amplifier, a list of all the principal land and naval stations and their call letters, the abbreviations authorized by the International Radio Telegraphic Convention, as well as a list of abbreviations in general use. A page has been devoted to a key to the call stations of the world, enabling an operator to locate the origin of any unknown official call. In addition to these features there are a number of articles of general interest to the members of the association.

A copy of the Blue Book will be mailed to any one upon the receipt of fifty cents. Correspondence should be





Figs. 3 and 3a.—Two Views of the New Rotary Spark Gap Which Has a Total of Eight Separate Gaps Connected in Series.

addressed to H. B. Williams, Secretary of the Central Radio Association, Chanute, Kansas.

A TRANSMITTING RECORD DUE TO FREAK CONDITIONS

A few days ago the writer received a letter from H. Danner, a wireless amateur in Wilkes-Barre, Pa., who claims he and several others heard my transmitting set in Boston. Any radio expert will certainly state that it is impossible to cover that distance with the power employed except by freak conditions. That the distance covered was remarkable is evident from the fact that under normal conditions my set will not carry more than ten miles.

The feat mentioned will probably not be repeated again, yet it indicates the remarkable carrying powers of even a small transmitting set under abnormal conditions. Although the writer has spent more than two years on board ship where freak conditions have not been uncommon, yet this was his first encounter with an amateur station record.—FRANCIS C. JUSTICE.

MEETING OF RADIO CLUB

The last meeting of The Radio Club of America before the summer holidays was held on Saturday evening, May 29th, 1915, in Room 301, Fayerweather Hall, Columbia University.

Dr. Alfred N. Goldsmith, of the College of the City of New York, presented a most interesting and instructive paper on "Foreign Radio Apparatus." The paper was plentifully illustrated by lantern slides. The Telefunken, Goldschmidt, Lorenz and Poulsen, Berliner Poulsen, and Compagnie Generale Radiotelegraphique systems' apparatus were shown and discussed. Mr. R. H. Marriott, Dr. Zenneck, Dr. Wheeler of the Crocker-Wheeler Co., Dr. Goldhorn, Mr. P. F. Godley, and others participated in the discussion regarding the paper.

A SUGGESTION FOR INCREASING RECEIVING RADIUS

In talking with an old operator recently, the writer was told that if a variable inductance is shunted across the primary of a transformer, the incoming signals are increased about 25 per cent. On putting this suggestion to a test it was found to work extremely well, bringing in signals that were formerly barely audible to a readable loudness.

Almost any sized single-slide tuner may be used as the inductance; in the instance of the writer a 130-meter tuner was employed. The tuner is an excellent substitute for a variable condenser, and the suggestion will therefore be of particular interest to amateurs who are not so fortunate as to possess those instruments.—HOWARD S. PYLE, L. R. O.

A Memorial Fountain to Wireless Operators

By J. Andrew White

A MEMORIAL fountain to the wireless operators lost at sea now rears its noble column where the tip end of New York looks out toward the remorseless ocean. Standing at the lower end of Battery Park, in the shadow of the Barge Office walls, against a background of stately poplars, this simple and beautiful testimonial to those who have gone to death in the sanctified cause of manliness and self-sacrifice stirs the imagination of the passer-by as no other memorial of uncompromising granite could. It is an eloquent reminder of a tradition that has grown out of the brand of courage which seeks no precedent, which, founded on the heroic action of a mere boy, has been written in the indelible annals of the men who go down to the sea in ships.

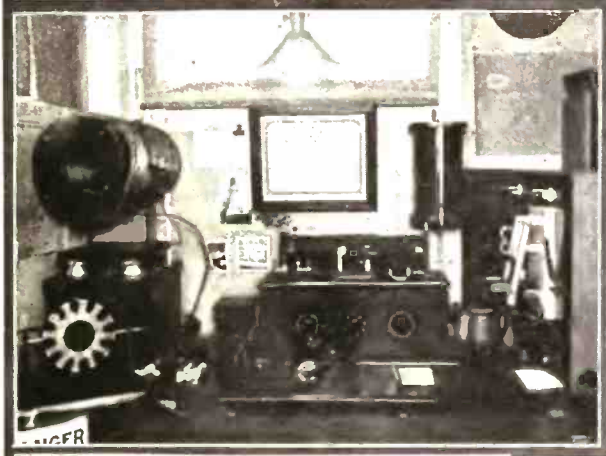
"Most of us are creatures of the land, and the dangers of the sea have in our minds the added terror that attaches to things unknown and mysterious," said Acting Mayor McAneny at the unveiling on May 12th. "So it is that the picture we form of a man on a sinking vessel, sitting calmly at his post and ticking off the calls for help—calls which may or may not be answered—stirs our deepest admiration. Could any sort of courage and sacrifice be more impressive than that of Jack Philips and the coolness with which he stuck to his post on the *Titanic* on that awful Spring morning in mid-Atlantic, three years ago? It was a story that went around the world, and won the respect and gratitude of millions."

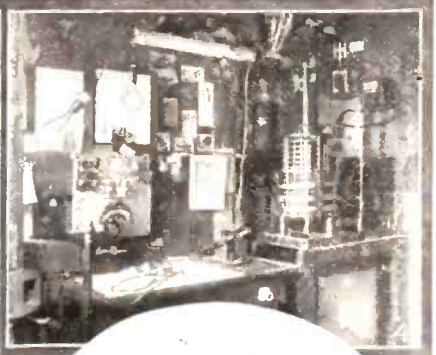
It was remarked that, as in the case of Captains, these young men quit their posts only when their ships have gone down, that they have accepted the tradition of their class or rank. And that is the most beautiful thought of the records of the wireless men. There was no such tradition five years ago, no such unwritten obligation. It remained for a little fellow whose name appears inconspicuously on the shaft, Stephen S. Sczpanck, to blaze the trail which so many have unselfishly followed. Sczpanck was lost on *Car Ferry No.* 18 on September 9, 1910, on Lake Michigan. A long train filled with passengers was being ferried from Ludington, Mich., to Milwaukee, and two-thirds of the distance of a little over one hundred miles had been covered when the boat received her death blow, filling rapidly and settling in the waters with scarcely a ripple. On order from the captain Sczpanck sent out a call for help while the crew summoned to the deck the passengers, who were still comfortably seated in the railroad coaches. The decks were awash before the human freight had sought the safety of the lifeboats. Great excitement reigned. In the midst of the confusion the cool and collected wireless operator appeared, making his way slowly through the aisles and stopping at each seat to reassure the passengers. Help was coming, his wireless appeal had been answered and a sister ship was speeding to the rescue. When the boats had been lowered away in good order and his assistance was no longer needed on deck, Sczpanck returned to the wireless room. There he remained by his crackling key, directing the speeding rescue ships until the still waters closed relentlessly over the vessel he had served so well.

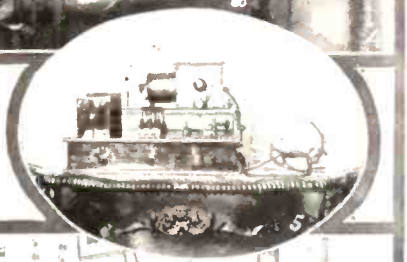
With this noble example of quiet devotion to duty before him, George Eccles, whose name appears among the nine inscribed on the memorial, stood steadfastly by his wireless instruments while his ship, the *Ohio,* pounded to pieces on an Alaskan reef on August 26, 1911. In thirty minutes from the time she struck, the great vessel, which had been carrying two hundred passengers, had slipped from the reef and sunk in the hungry maw of the sea. From the first it had been known that the ship was doomed and the crew worked frantically to get the passengers off in the lifeboats. Ec-

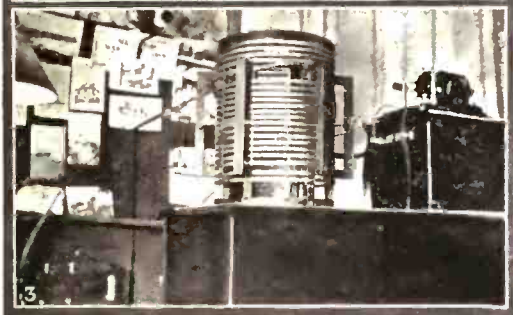
(*Continued over leaf.*)

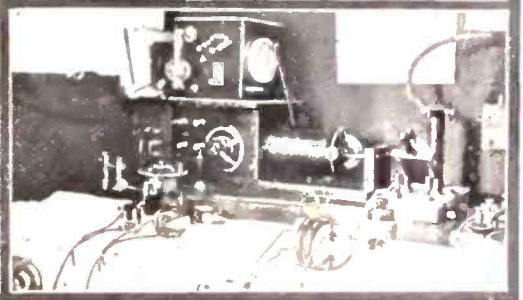
AMATEUR WIRELESS STATIONS











The Wireless Stations Appearing in the Above Views Are: (1) Receiving and Transmitting Apparatus of Milton Baylies, of New Bedford, Mass.; the Greater Part of the Station Has Been Made by Its Owner. (2) Wireless Station of Edward H. Lewis, New York City; the Apparatus Is Mounted in a Neat Cabinet. (3) and (7) Transmitting and Receiving Apparatus of John J. Grossman, Tiffin, Ohio; the One KW. Transmitter Recently Made a Record by Sending a Message Over 920 Miles. (4) Wireless Station of Edmund H. Bremer, of Detroit, Mich.; the Transmitter Has a Capacity of 3 KW., Although but One KW. Is Normally Used. (5) Receiving Set of Jos. L. Turre, Denver, Colo.; It Has a Range of 3,000 Miles. (6) Receiving and Transmitting Apparatus of Orton S. Barnes, of Binghamton, N. Y.

cles' wild, despairing calls crashed out again and again over the angry waters. Not a ship answered. Then, far across the great land and water wastes, came the cheery call of an Alaskan station. It had his message but could not send him direct aid; the voice of its powerful spark, however, would be lifted in an added appeal for succor. The minutes passed, the time was growing short. Tense, straining every faculty for a sound in his head telephones, the faithful operator scorned the death that crept toward him in the rising sea. Suddenly the far-away land station called again; it had picked up two vessels near by, the *Humboldt* and the *Rupert City*, and they were then headed for the *Ohio*. Eccles told the captain, and then turned to the task of sending messages to the approaching ships, directing them to his exact position.

Twenty minutes after the ill-starred vessel struck, the waters flooded the engine room and silenced his instruments. He arose then and stood out on the deck, watching the last of the departing lifeboats. One of the relief vessels hove into view and a great cry of exultation came from the throats of harassed passengers. It seemed certain that all would be saved. Just at that moment a vicious comber swept down on the staggering *Ohio*, lifted her high off her precarious position and crashed her down on the cruel rocks. In an instant she was gone, and with her the man who had saved her helpless humans in the face of tremendous odds.

Conspicuous on the face of the shaft is the name of Jack Philips, the martyr to duty in the great *Titanic* disaster of April 15, 1912. His bravery, coolness and skill in time of immortal stress bring uplifting memories to a still shuddering public. To the very magnitude of that great ocean tragedy in which he figured is due the recognition of the wireless operating fraternity for which the monument stands—the one lasting memorial this country has raised to them. It was the shock of horror which then reverberated around the world that awakened a grateful humanity to a sense of obligation and started the flow of contributions which soon afterward assumed proportions sufficient to defray the expense of erecting the memorial. William Lawrence Bottomley, of the firm of Hewitt & Bottomley, architects, voluntarily offered his services and furnished gratuitously the design which was selected after a competition; the Marconi Company contributed five hundred dollars as a nucleus and passengers on coastwise vessels willingly subscribed the balance of the fund in smaller amounts. No intensive solicitation was made, no propaganda prepared to aid the raising of the desired sum; as the principal speaker at the unveiling remarked, it was a direct refutation of the contention that "in the rush of our affairs we are all too prone to forget great deeds."

To the Philips brand of courage, then, must be attributed this monument from the people. A more noble example of the heights young men can rise to in meeting an emergency will never be known. On the night of the disaster he was tired out after a long vigil in the wireless room. He had worked uninterruptedly for seven hours the preceding day, effecting some needed repairs. Under the regular routine he was not due off watch until midnight, but his assistant, Harold Bride, appreciating the strain of the overtime labor, had insisted upon relieving him earlier in the evening. Thus it was that Bride was standing beside when the ship hit the iceberg. Refusing to give up his post, Philips continued at the key from the time the first SOS call was sent until his instruments no longer would work. He had established communication with the *Carpathia* and other vessels, had given them the ship's position and received assurance of speedy rescue; his captain had told him: "You have done your duty. You are free now; every man for himself in a time like this!" But Philips stayed. Refusing even to stop for an instant to adjust a life preserver, he bent resolutely over the little rubber knob that spelled salvation to the helpless passengers and continued sending out reports that would aid in picking up the laden lifeboats.

Only when the last flickering sputter had come from his key did he give a thought to himself. The lifeboats had long since gone, and, fearless and calm,

he stood on deck until the great leviathan took her final plunge into the icy waters.

When dawn arrived, and with it the *Carpathia* on her mission of rescue, his lifeless body was tenderly lifted from a crowded life raft.

Among the six heroes whose gallant deaths are commemorated as occurring on the Pacific Ocean, the first name is that of Lawrence A. Prudhunt, who perished in the wreck of the *Rosecrans* on January 7, 1913. Little is known of Prudhunt's faithfulness to trust, for his was not a great passenger ship, laden with important people. Only thirty-six members of the crew were aboard and but three were saved. The vessel struck a rock and sunk soon afterward. He was offered a chance in the boats which the crew were putting over the side, but went instead to the wireless room and continued directing the rescuers until the ship broke up beneath him. When assistance came it was found that he had been pinned under the wreckage and washed overboard when the wireless house was swept into the hungry waves.

The Memorial Fountain to Wireless Operators, and an Impressive Moment in the Dedication Exercises.

In the wireless room also, with all avenues of escape cut off by wreckage, Donald Campbell Perkins perished on August 18, 1913. His ship was the *State of California,* which sank in Gambier Bay, Alaska, three minutes after she had ripped her bottom off on an uncharted rock. But even in the short time before the mountainous deluge swept through her, Perkins had rushed from his cabin in his pajamas, taken charge of the wireless apparatus, and given his distress call and position to the Alaskan steamship *Jefferson.* That vessel chanced to be near by and arrived on the scene a few hours later; it was broad daylight and no difficulty was experienced in picking up the many passengers whom the crew had succeeded in placing in the lifeboats. Thirty-one were missing, trapped in their staterooms, and among them was the faithful operator. His assistant was saved, and it was he who told how Perkins had ordered him to go on deck and assist in the launching of the small boats. There was one lifeboat immediately in front of the wireless cabin which they were unable to launch. As the vessel took a sudden list to port this boat broke adrift and jammed fast in the door, making Perkins a prisoner. Realizing fully that every second counted if he was to make his escape, the young man elected to stand by his key and give further directions to the summoned rescue vessel.

Just twenty years old was Ferdinand J. Kuehn when he gave up his life for another, when, on January 30, 1914, the *Monroe* sank off the Virginia coast. This heavily laden passenger vessel met in collision with a freighter as she was feeling her way through a dense fog. It was known instantly that the vessel had received her death blow and Kuehn's assistant brought a life preserver to the wireless room, adjusting it as the wireless instruments again and again crashed forth the SOS. Only twelve minutes elapsed between the time the vessel was struck and when she sank. The crew had succeeded in getting three boats away when the wireless operator appeared on deck, his work done. Just then one

of the women passengers passed; she had no life preserver. Kuehn insisted that she take his. He adjusted it for her and helped her into a lifeboat. This boat was among the last ones to get away, and a few minutes later the survivors it carried saw the young operator slip on the tilted deck and fall into the water. With the life preserver to keep him afloat he would have been saved. Willingly, he had sacrificed his life that another might live.

Kuehn was a popular boy in New York and a graduate of the Bronx High School. Many of his former companions looked on as the sailors blew "taps" over the shaft which bears his name. In the silent crowd, too, were a number of his later friends of the sea; for in deference to the occasion the Marconi offices closed at noon, enabling all Kuehn's fellow workers to be present at the unveiling.

Chiseled on the shaft of honor close beside this record of a brief career is the name of Walter E. Reker, another twenty-year-old boy, lost in the wreck of the *Admiral Sampson* off Seattle, Wash., on April 25, 1914. These two disasters, occurring less than three months apart, had several similar features. The *Sampson* received her death blow in a collision and sank in fog-bound waters soon after. An added horror in this case was brought on by the cargo of oil igniting and enveloping the ship in a sheet of flame. Reker sent out his appeal for aid and stood by his post of duty until the vessel which had dealt the fatal blow advised him by wireless that she was sending for assistance and there was no need for him to operate his instruments any longer. The time was growing short, but the wireless operator refused to abandon the ship, taking his place instead beside the crew and assisting the passengers into the boats. Ignoring repeated appeals to save himself, he waited until the last boat had left and all but two of the fifty-four passengers had gone to safety. Then he reported to the bridge and sank with the ship to his death, standing beside his captain.

Two names complete the record on the fountain shaft. Side by side in life, Clifton J. Fleming and Harry F. Otto are immortally paired in the inscription which relates their heroism when the steam schooner *Francis H. Leggett* filled and sank in the Pacific, sixty miles south of the mouth of the Columbia River. This was on September 19, 1914. For two days she had been pounded unmercifully by the heavy seas and finally a particularly vicious wave tore loose a hatch and a torrent of water poured into the hold. Fleming sent out the distress call as the vessel began to list and two steamships started to the rescue. Efforts to launch the lifeboats proved futile; as soon as they struck the water they capsized. Suddenly the vessel lurched as her lumber cargo shifted, and she disappeared beneath the waves. Otto, the junior operator, was carried down by the suction. Fleming clung to a piece of wreckage and gave aid to those struggling in the water about him. One of the survivors later told how this seventeen-year-old boy pulled him to safety and then grasped a floating railroad tie for his own preservation. Just then a woman lost hold of the wreckage which was keeping her afloat and was washed against Fleming. He reached out for her and helped her to the tie which he was gripping, and then, realizing that it would not support the weight of both, let go and sank.

Simple and supreme courage in time of peril, faithful devotion to duty in the face of tremendous odds and a brave unselfishness that causes all men to experience a thrill of pride and an elevation of spirit, is the story the nine inscriptions on this newest monument tell to humanity. New York and the country at large will specially reverence this beautiful memorial, erected at a time of strife and combat so at variance with the spirit of its conception. For it typifies those qualities so essential to the world in the great period of reconstruction which is to follow the dawn of peace, the qualities which, by the strange coincidence of words, make possible—shall we say it? —THE WORLD'S ADVANCE.

The August issue will contain many feature articles in the Radio Section. Don't fail to read them.

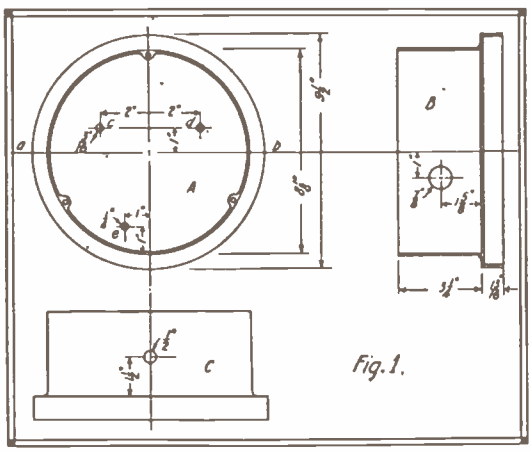
A Hot Wire Meter of Simple Design

By C. L. Sears

IN the construction of the average hot wire meter there are some parts which could be simplified. For instance, the device used to bring the pointer back to zero is usually in the nature of an arrangement whereby the wire is tightened or loosened, as the case may be. This construction usually involves a special casting which in itself sounds formidable to the amateur.

The meter to be described is provided with an adjusting member which is easily made and which gives a wide range of adjustment. The case of the meter made by the writer was taken from a damaged voltmeter of the switchboard type and of the size indicated in the dimensioned drawing, Fig. 1. While these meter cases are not difficult to obtain, the movement of the hot wire meter could just as well be mounted in a neat wooden case.

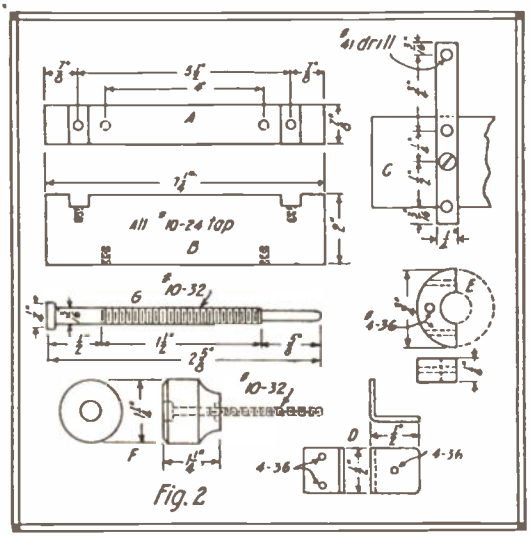
In laying out the case prior to drilling the holes, the builder will facilitate his work if he scribes two diametrical lines at right angles to each other across the back of the case on the inside. With reference to Fig. 1, scribe a second line



The Details of the Case for the Hot Wire Meter.

one inch above the center line and drill two 3-16-inch holes on this line 4 inches apart or, in other words, 2 inches on either side of the vertical center line. This layout is indicated at *C D* in Fig. 1. These holes are to hold the fibre support for the wire.

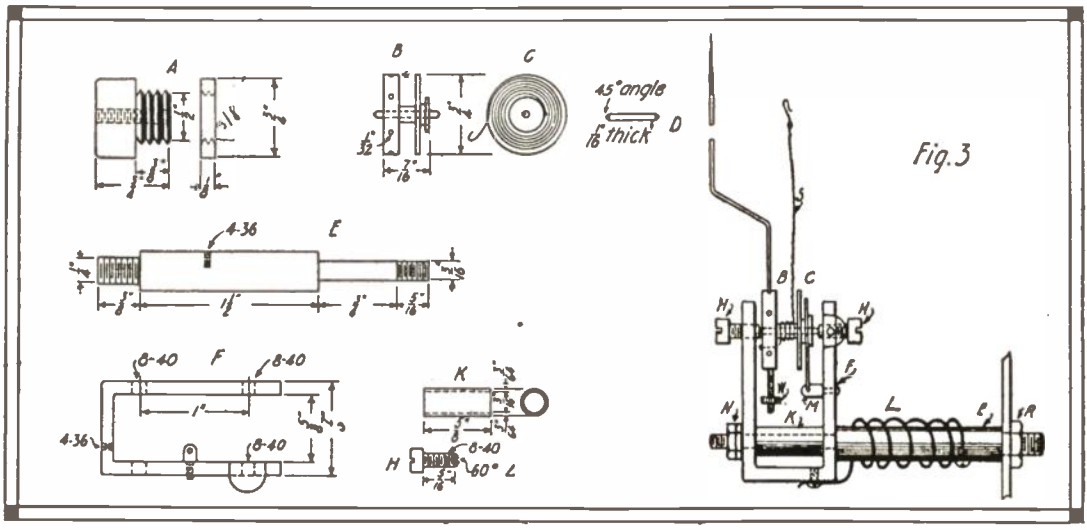
Measuring one inch from the inside



Various Parts of the Hot Wire Meter.

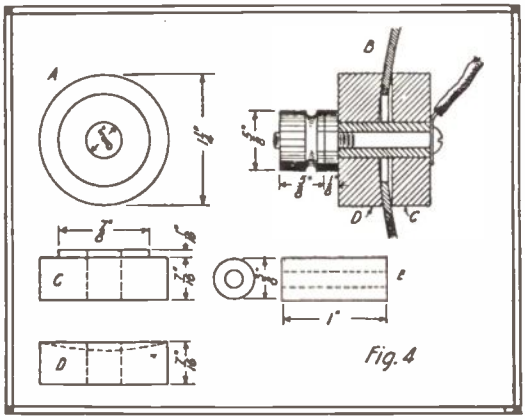
of the case and one inch to the left of the vertical line, drill a ¼-inch hole, *E*, Fig. 1. In the sides of the case drill two ⅞-inch holes for the insulating bushings and also a ½-inch hole for the brass adjusting screw bushing as shown at *C* Fig. 1. The insulating support for the wire holders is made from a piece of black fibre ⅞x2x7¼ inches and is drilled and tapped as shown at *A* and *B*, Fig. 2. As shown in the drawing, it is slotted ⅛ inch deep and ¼ inch wide. At *C* are shown the two wire supports which are made from ¼-inch square brass stock 1⅞ inches long. The three small holes ¾ inch apart on centers are drilled and tapped 4-36 and the large 3/16-inch hole is drilled to clear a 10-24 round head machine screw to fasten the supports to the fibre crosspiece. The small holes should each be supplied with screws and small washers.

At *D* and *E* are shown the dial supports for a case of this type. Two of



Different Members of the Hot Wire Ammeter Movement, as Well as a Side View of the Movement When Assembled.

the styles shown at *D* and one similar to that shown at *E* are required. The two *D* pieces are made from ½x1/16-inch brass strip drilled and tapped as shown, while the piece *E* is made from a ¼-inch piece of ¾-inch diameter round brass rod. The details of the fibre knob for the adjusting screw are



Details of the Binding Posts and Insulated Bushings.

shown at *F*, while the adjusting screw is illustrated at *G*.

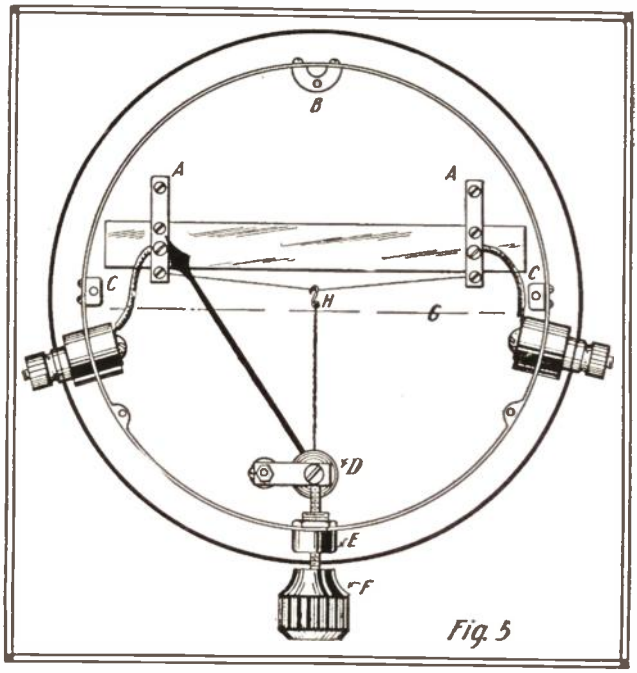
In Fig. 3 the reader will find the details of the movement. The part *B*, which holds the pointer, is made from a piece of ¾-inch rod which is turned to the shape indicated in the drawing. The pointer is fitted into a radial hole on one side while a small counter weight *W* is fitted in the opposite side. The spiral hair spring which carries the pointer across the scale is made from a piece of thin phosphor bronze sheet, or, if the builder happens to have one handy, he may employ the steel hair spring from an old alarm clock. The spring should be very light and it should be put on counter clock-wise. The steel center or pivot *D* is made from a piece of 1/16-inch drill rod or a phonograph needle pointed on each end and hardened.

The main support shown at *E* is made from a piece of ⅜-inch round brass turned-down and threaded as shown. The small hole is to take a screw which fastens the end of a spring used to rotate the entire movement clock-wise. The piece which holds the movement *F* is made from a piece of brass bar, drilled and bent as shown in the illustration. On the lower arm of this piece there should be fastened a small piece of brass upon which the adjusting screw may bear. The addition of a small projection *M* to which the end of the spiral spring is attached completes the holder for the movement. The assembly of the movement is shown in Fig. 3 in the completed view. After the movement has been assembled, the balancing weight *W* should be adjusted until the pointer will rest at a given point regardless of the position of the meter case.

The hot wire for an instrument to be used in connection with a 1 K. W. outfit

should be a No. 30 bare copper wire, as this will give a full scale reading at 7.5 amperes. The extra holes in each wire holder are to permit of the connection of shunts. The shunt, if it is found necessary, is to consist of single wires of the same size, resistance and length as the wire measured. Connections may be made from a short piece of flexible lamp cord with terminals or from a piece of copper strip.

For calibration of this meter, it is advisable to use a direct current supplied by a storage battery or a number of dry cells connected in multiple. The hot wire meter should be connected in series with a standard direct current instrument and a rheostat capable of being adjusted in steps of ¼ ampere at a time. In marking the scale, the greatest care should be taken to avoid drafts, as even one's breath on the heated wire will cool it sufficiently to falsify the results.



Front View of the Working Parts of the Hot Wire Meter as It Appears When Finished.

This meter will read with equal accuracy on either alternating or direct current, and its reading on high frequency current will be the same. The only precaution in connection with its use is to make sure that the meter is not overloaded, as in such an event the wire would quite likely stretch seriously or else burn in two. This would, of course, necessitate replacing the wire and recalibrating the instrument, involving a great deal of extra work.

A GOOD STRAIN INSULATOR

Owners of wireless stations always have to make use of insulators in their aerials. Porcelain cleats are generally employed for this purpose, but are found to be useless when they are subjected to any strain such as guy-wires impose upon them. The writer has found that a block of wood with an outer coating of paraffine is an excellent insulator and, moreover, possesses a high tensile strength. The block is dipped in the melted wax and thoroughly impregnated. Wood is naturally a good insulator but has the disadvantage of partially conducting an electric current when it is wet, and thus allows considerable leakage in the case of wireless. The paraffine renders the block waterproof, and therefore makes a good strain insulator.—H. C. Loomis.

ELIMINATION OF TEST BUZZER NOISE

The noise made by the test buzzer may be reduced to a minimum by suspending the buzzer from the table edge by means of rubber bands. Furthermore, the connecting wires running from the table to the buzzer are curled. When the instrument is screwed directly to the table, as is usually the case, the table top acts as a sounding board, greatly augmenting the actual sound produced by the buzzer. The same is the case when the buzzer is screwed to a wall.—Royal Bergvall.

Long Distance Wireless Telegraphy*

By J. B. Woolsey

THE casual "listener-in" on a long distance radio set at the present date is apt to be impressed with the fact that the use of undamped oscillations for long distance radio telegraphy may soon become more or less universal. While it is true that no definite decision has been arrived at as to the relative merits or demerits of the damped and undamped systems, still, the general trend of practice seems to be toward the latter. This is probably augmented by the fact that there has been developed of late a certain type of receiving apparatus peculiarly suited to the reception of undamped oscillations, giving at the same time extreme sensitivity.

There are a number of long distance radio telegraphic circuits used more or less commercially, but largely experimentally, concerning which the general amateur field is not at all informed. One of the most successful of these is that of the Marconi Company between Glace Bay, Nova Scotia (WSS), and Clifden, Ireland (MFT). These stations work twenty-four hours per day with practically no interruptions, handling an enormous volume of commercial and war traffic. The dispatch of traffic at these stations is facilitated by the fact that the circuit is duplex, allowing the operators to interrupt each other during the transmission of a message, permitting the immediate correction of an error. These stations, although fitted with spark gaps of the rotary type, produce oscillations of feeble damping which possess characteristics similar to the stations employing genuine undamped oscillations.

There are five methods in use to-day for the generation of undamped oscillations, viz. (1) the Poulsen arc; (2) the Goldschmidt high-frequency alternator; (3) the high-speed, high-frequency alternator; (4) the Count Arco step-up transformer system for the generation of undamped oscillations; (5) the General Electric Kenotron.

The Poulsen arc does not, as is generally supposed, generate pure undamped oscillations; as a matter of fact these oscillations are produced in a series of groups, the groups taking place at a rate above the limits of audibility. Due to slight irregularities in the action of the arc, this type of transmitter possesses slightly damped characteristics, so much so, in fact, that the signals may often be read on the ordinary crystalline detector at a distance of 10 to 50 miles from the station.

The arc system is employed exclusively by the Federal Telegraph Company of San Francisco, Cal. The company operates a few long distance stations at various points. The arcs at these stations are employed in a simple manner; one of the electrodes being connected direct to the earth and the other to the aerial system. The wave length of the antenna system is then increased or decreased as desired by the simple addition or subtraction of the turns of a tuning inductance connected in series with the aerial circuit. Signalling is accomplished by short-circuiting a few turns of this inductance with an ordinary transmitting key.

Thus, the aerial system is rapidly changed from one wave length to another, and if the distant transmitting station is tuned to the wave emitted when the wave is depressed, the wave emitted when the key is raised will be inaudible. The arc at these stations is enclosed in a chamber and supplied with either hydrogen or ordinary illuminating gas or perhaps alcoholic vapor. It is likewise burned in a strong magnetic field at right angles, which increases the steadiness of the arc and its effectiveness as a whole.

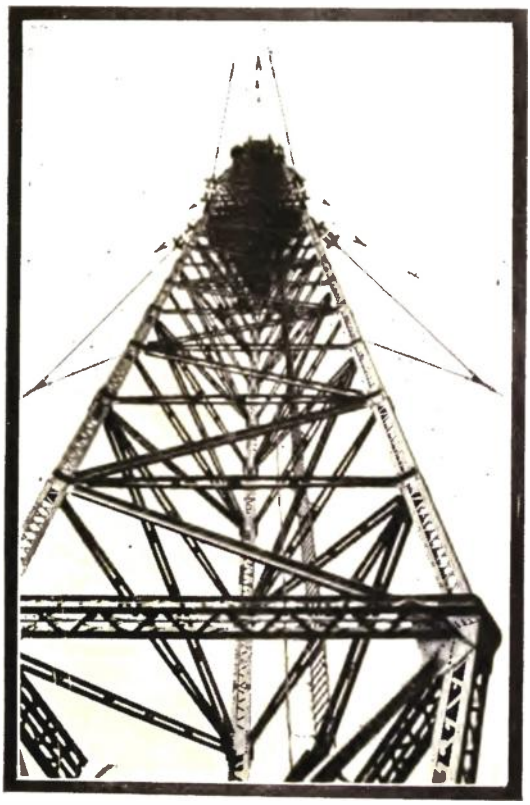
The receiving apparatus at these arc stations generally consists of a sliding wire tikker which comprises a simple piece of flexible wire in loose contact with a rotating wheel. It is connected in

*Owing to the inordinate length of this article, it has been found necessary to publish it in two parts. The second and concluding part will appear in the August issue. (Photos. International News Service.)

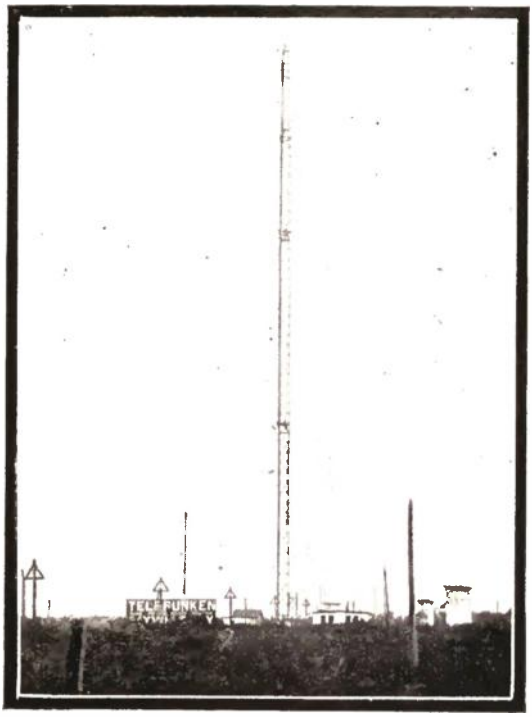
the circuit in a manner similar to the ordinary detector.

The Federal Company operates several commercial stations on the Pacific coast, the most prominent one being the "KSS," South San Francisco, Cal., station, and a similar station located at Heeia Point, Honolulu, Hawaii. The San Francisco station operates on a wave length of 7000 meters and actually consumes from 50 to 60 K. W. of direct current energy. The corresponding station at Honolulu often operates on a longer wave length—sometimes at 11,000 meters—and is particularly effective. Commercial correspondence is carried on between these two stations with a fair degree of accuracy. An interesting feature in connection with the South San Francisco station is that the use of a fan aerial has been abandoned and a large single cable substituted for it.

Another long distance radio circuit in daily use is that employing the Goldschmidt system between Tuckerton, N. J. (WGG) and Eilvese, Germany (OUT).



Looking Toward the Top of the Steel Tower at the Tuckerton Wireless Station.



The Steel Mast of the Sayville Wireless Station on Long Island.

These stations employ the Goldschmidt high-frequency alternator, which is a generator giving a very high frequency at a low initial speed. The alternator at Tuckerton is of about 70 K. W. capacity and operates at a frequency of about 50,000 cycles. The station at Eilvese is said to employ an alternator of 150 K. W. capacity at a similar frequency.

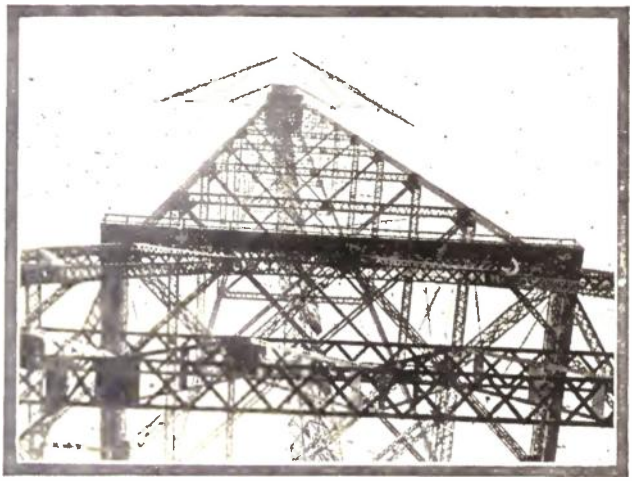
Immediately after the outbreak of the European war the Tuckerton station was taken over by the United States Government and operated on a commercial basis in connection with the corresponding station at Eilvese. The staff at the station at present consists of ten operators, in charge of a naval lieutenant. Commercial business is accepted for points in Germany, subject to a delay, at a rate of 50 cents per word. Since the opening of this service the Tuckerton station has been congested with traffic and, owing to its limited facilities for handling the same, has often fallen several days behind.

During the most favorable months of the year, these two stations were able to carry on correspondence throughout the twenty-four hours of the day, but only

with fair degree of accuracy during specified hours. In fact, at the present time, these two stations are only in communication between 5 p. m., Eastern Standard Time, and 2:30 a. m., Eastern Standard Time, which are, of course, the more favorable hours during the day for long-distance radio telegraphic communication in this portion of the universe.

The traffic from the Tuckerton station is sent in series of groups of messages which are acknowledged at the Eilvese station at the end of each group. The Eilvese station then replies, requesting repetitions of lost words, which is followed by the dispatch of traffic that has meanwhile accumulated at Eilvese.

The service between these two stations is handled in an accurate manner, but at a slow speed, consequently only a limited amount of business can be handled.



Looking Toward the Top of the Tallest Steel Mast of the Arlington Station.

As mentioned before, the Goldschmidt high-frequency alternator is unique in that a very high frequency is obtained from a low initial generator speed of about 3,000 revolutions per minute. The generator itself comprises a stator and rotor, the stator being magnetized by a direct current source of supply. The number of field poles and the design of the rotor are such that the initial frequency of the machine is 15,000 cycles per second. The rotor is then shunted by coils of inductance and a condenser constituting an oscillatory circuit, which has a natural frequency of 15,000 cycles per second. Due to the rotating magnetic field produced, the rotor induces currents in the stator having a frequency of just double the value, viz., 30,000 cycles per second. The rotation of the rotor in the magnetic field produced by the 30,000 cycles in the stator induces in it (the rotor) currents at a frequency of 45,000 cycles per second. A second circuit is now joined across the rotor, which has a natural frequency of 45,000 cycles and the reaction of this magnetic field on the stator produces in it a frequency of 60,000 cycles per second. The terminals of the stator are in turn connected to the aerial and earth connections, the aerial being so adjusted by tuning inductances to give it a natural frequency of 60,000 cycles. In other words, the antenna and earth connections are joined across the original direct current field magnets, which also have alternating currents of high frequency flowing through them. The antenna is in turn attuned to the high-frequency energy.

Signalling is accomplished by the insertion of a telegraph key in the direct current circuit to the field coils, the field windings being thus magnetized and demagnetized to produce the dots and dashes of the telegraph code. The high-frequency alternating current super-imposed upon the direct current circuit is prevented from flowing back into that circuit by specially designed choke coils.

It is extremely important that the speed of a high-frequency alternator be maintained constant in order to keep the aerial in resonance. Arrangements are therefore made whereby the field of the motor driving the generator is weakened just previous to the pressing of the key. Thus the speed of the generator is kept fairly constant.

A transmitting station of this type is indeed novel, since the customary high potential condensers, noisy spark gap and oscillation transformer are absent. It is rather awesome to see this machine in

operation, because the observer is conscious "that something is doing" in the ether, but there is not the accompanying crash one expects from the ordinary set.

The receiving apparatus in use at Tuckerton comprises the Goldschmidt tone-wheel, which is nothing more than a circuit interrupter breaking the circuit many thousands of times per second. In this manner beats are produced in the local receiving circuits giving a musical note depending upon the rate of interruptions taking place. The signals thus made audible by the tone-wheel are increased in intensity by means of a triple audion amplifier.

It was a master stroke of the Germans to put this Eilvese-Tuckerton route into operation, for they are thus enabled to carry on communication with the outside world while the cables are in charge of the Allies.

RADIO CLUB OF AMERICA'S COMMENDABLE WORK

During the recent visit of the Atlantic Squadron in New York a temporary radio station was maintained at the Hotel Ansonia, the headquarters of Admiral Fletcher and many of his officers, for their use in communicating with the vessels of the fleet. The station was established in Room 168, the headquarters of the United States Navy League, through the courtesy of the Radio Club of America which made the installation and operated the station.

The installation was of a composite non-synchronous 1 K.W. type, power being supplied from a special motor-driven alternator. The station was operated under a special temporary license and was tuned to an unusual degree of sharpness, the decrement being .05. Amplifying apparatus of the audion type rendered received signals audible throughout the operating room, as well as in the adjoining rooms and corridors. The installation and operation of the station was undertaken by the Radio Club under the supervision of Mr. Paul F. Godley, one of the club directors. Mr. Godley was recently in charge of work on Brazilian government stations and is a man of wide experience in radio work. Two operators were in constant attendance. Mr. Godley, together with Messrs. Sadenwater, Lemmon, Grinan and Faraon, handled most of the work.

All communication was with the vessels of the fleet. The station was much used and proved a great convenience to Admiral Fletcher, his officers and families, and the members of the Navy League.

THE ATLANTA RADIO CLUB IS FORMED

It is announced that a wireless society has been formed at Atlanta, Ga., for the purpose of advancing the interests of the wireless amateurs and known as the Atlanta Radio Club.

The following officers have been elected: A. S. Guimaeraes, President; F. Merriam, Vice-President; B. R. Magee, Treasurer, and M. A. Herzog, Secretary.

Communications from amateurs within 100 miles from Atlanta are solicited by the club. Amateurs living beyond that range are also requested to interchange ideas with the members of this society. All correspondence should be addressed to the Secretary, 16 Faith St., Atlanta, Ga.

There has been recently placed in operation at Seattle, Wash., a wireless station for the use of the port warden. The station has been assigned the call letters K P E, after being tested and passed upon by Radio Inspector V. Ford Greaves.

What the World is Doing

MANUAL labor is being seriously threatened by the ever-increasing competition of labor-saving machinery. There is probably no single trade which machinery has not invaded, with the result that work previously accomplished by hand has been dispensed with to a greater or lesser extent, depending largely on how skilled that labor was. Elsewhere in this issue there appears an article entitled "Reducing the Human Element in Modern Printing," in which the work of the linotype and monotype machines is described. Here we have a striking instance of the capabilities of modern machinery. No one will deny that the task of typesetting or composing is one requiring skilled labor. Years past, hand compositors or typesetters were paid fair wages for their work, and many of them employed, because of the necessarily time-consuming nature of their task. Yet today in place of these bright, industrious men will be found intricate machines directed by men or even women operatives. One linotype machine with its operator can easily replace five men, hence four men have been eliminated from typesetting work by the introduction of machinery. And it must not be forgotten that printing is but one of many trades in which similar conditions already exist. Truly, the days of the man who works with his hands only are numbered. At no distant date he must give way to gears, cogs and levers made of steel, brass and other inanimate substances, assembled together in marvelous machines through man's ingenuity. Brains only cannot be replaced by machinery.

TIME was when the wireless operator was considered a nuisance. In the old days he caused more than one commercial and Government operator to employ profane language in voicing his opinion of some one particular amateur, and all of them in general, especially when endeavoring to read a long distance message with a nearby amateur indulging in a friendly conversation with another amateur, or, worse still, holding down his key in order to adjust the spark gap. Conditions are entirely different today. The amateurs, thanks largely to the Government regulations now enforced, have developed into serious experimenters, with their hobby and the interests of others at heart. On more than one recent occasion the amateurs have come to the rescue of Government and commercial wireless operators when both the latter required assistance. A most typical instance of this fraternal co-operation was witnessed a few weeks ago during the visit of the Atlantic Squadron to New York City. The Radio Club of America installed a model radio station in the Hotel Ansonia, the headquarters of Admiral Fletcher and his officers, enabling the visiting Admiral and his staff to communicate with the vessels of the fleet. But the installation of the apparatus did not complete the commendable undertaking. Club members operated the instruments during the entire period of the naval visit and handled no little amount of wireless traffic for the naval officers. The station proved a great convenience to Admiral Fletcher and his officers, and this deed on the part of the Radio Club of America will no doubt serve to bind still closer the tie of friendship between the amateurs and the Government and commercial operators.

WITH a view to properly preparing the United States for any military eventualities, there has been formed the National Security League with headquarters at 31 Pine St., New York City. While the United States of America is undeniably the leading exponent of peace and arbitration, still, according to the spokesmen of the League, so long as other powers of the world decide that international questions had best be settled by recourse to arms it is obviously imperative that we Americans should be prepared not only to defend our coasts against hostile invasion but also to enforce our authority abroad should occasion demand it. It is the purpose of the League to take such steps as will eventually result in placing the United States in a better state of preparedness and with fair assurance always to be able to defend our institutions and principles. Americans desirous of joining in this patriotic work are asked to communicate with the headquarters of the League.

"What do you want with all those hammocks and phonograph records and fancy groceries?" asked the storekeeper. "Going to have summer boarders?"

"No," replied Farmer Corntossel. "I wouldn't waste all them on summer boarders. I'm tryin' to make the place attractive enough to persuade a few farmhands to linger around an' help me out with the wheat crop."—*Kansas City Journal.*

♣

Paying Teller (to woman with check)—"I'm sorry, madam, but you'll have to be identified by some one I know."

"Oh, very well; I have a friend waiting outside in the machine. I'll bring her in and introduce you to her."—*Life.*

♣

He—Yes, the governor cut off my allowance, so I've had to cash my brains for a living.

She—I wondered why you were looking so thin.—*Boston Transcript.*

♣

"You've made a mistake in your paper," said an indignant man, entering the editorial sanctum of a daily paper. "I was one of the competitors at that athletic match yesterday, and you have called me 'the well-known lightweight champion.'"

"Well, aren't you?" inquired the editor?"

"No, I'm nothing of the kind, and it's confoundedly awkward, because I'm a coal merchant!"—*National Monthly.*

"How's business?" inquired the life insurance agent.

"Haven't turned a trick this week," said the book agent.

"Same here. I'll tell you what I'll do."

"What?"

"I'll buy a set of books if you'll take out some insurance."—*Pittsburgh Post.*

♣

Passenger—I'd give you a tip, only I've nothing but a $10 bill.

Porter—Oh, that'll be enough, sir.—*Boston Transcript.*

♣

Motorist—Yes, I advertised for a chauffeur and I have no doubt you are a good one, but I am sorry to say the position is filled.

Applicant—Then, sir, would you mind giving me a reference saying I'm a good chauffeur and you were sorry to lose me?—*Washington Star.*

♣

"I had a dreadful fall last night."

"Tell me of it, Egbert."

"My wife was talking; I hung on every word, and then, and then——"

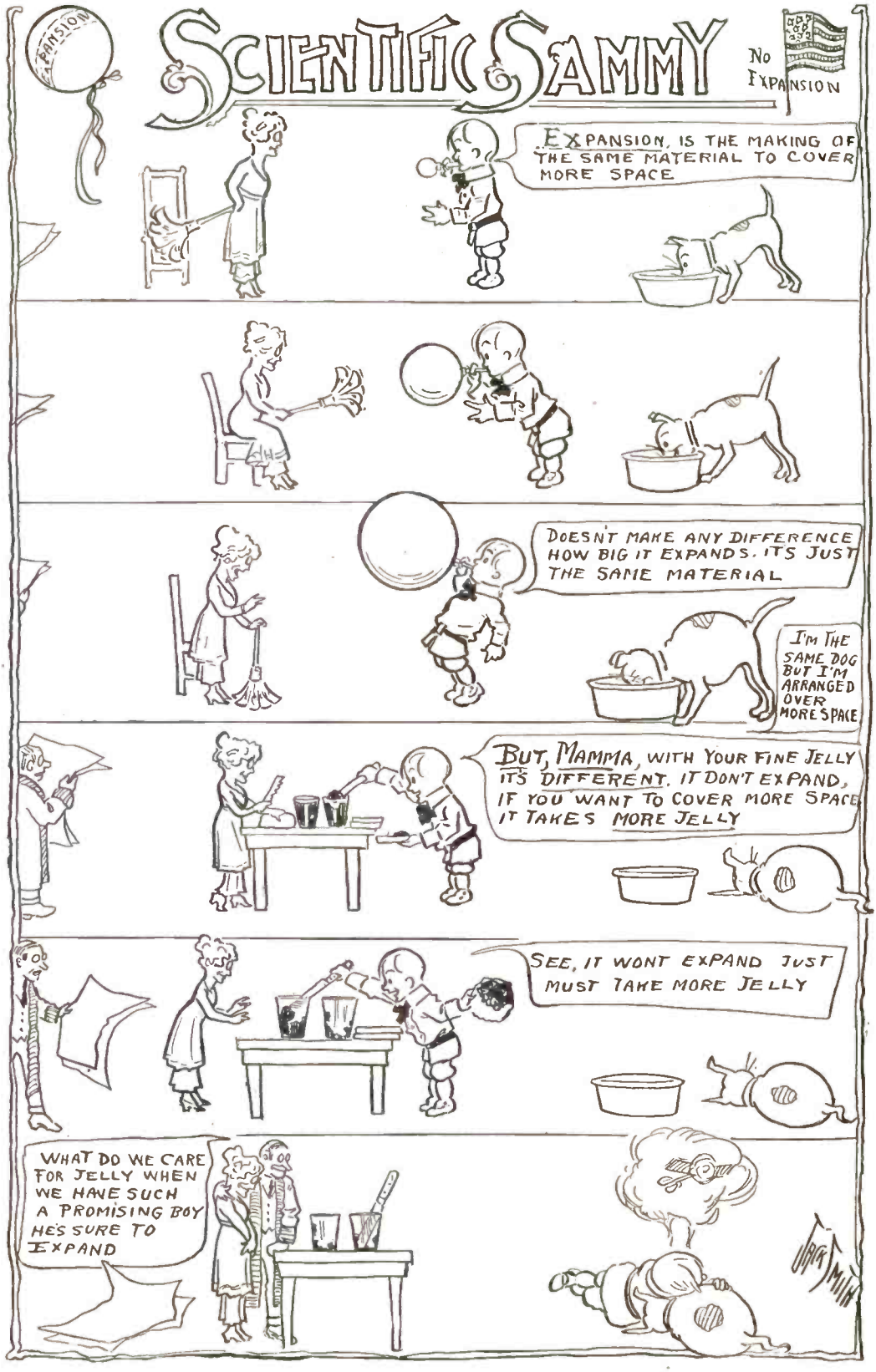
"Yes, yes, and then?"

"Her voice broke!"—*Harvard Lampoon.*

♣

Bix—You should have taken time by the forelock.

Dix—I tried to; but the other fellow got hold of it first.—*Boston Transcript.*


SCIENTIFIC SAMMY
No Expansion
EXPANSION
EXPANSION, IS THE MAKING OF THE SAME MATERIAL TO COVER MORE SPACE
DOESN'T MAKE ANY DIFFERENCE HOW BIG IT EXPANDS. IT'S JUST THE SAME MATERIAL
I'M THE SAME DOG BUT I'M ARRANGED OVER MORE SPACE
BUT, MAMMA, WITH YOUR FINE JELLY IT'S DIFFERENT. IT DON'T EXPAND, IF YOU WANT TO COVER MORE SPACE IT TAKES MORE JELLY
SEE, IT WONT EXPAND JUST MUST TAKE MORE JELLY
WHAT DO WE CARE FOR JELLY WHEN WE HAVE SUCH A PROMISING BOY HE'S SURE TO EXPAND
JAS. SMITH

THE WORLD'S ADVANCE MAGAZINE

FORMERLY

POPULAR ELECTRICITY AND MODERN MECHANICS

Classified Advertisements

Advertisements accepted in these columns at the rate of 10 CENTS PER WORD NET. Remittance, in the form of currency, check, money order or stamps, MUST ACCOMPANY THE COPY. Advertisements for the August issue must reach us not later than July 1st in order to insure their appearance under the headings desired. In counting words, name and address must be included.

Through the consolidation of the three leading publications—"Popular Electricity and the World's Advance," "Modern Electrics and Mechanics" and "Electrician and Mechanic"—a most excellent and inexpensive advertising medium is presented in these columns. Over 750,000 readers may be appealed to by classified advertisements appearing in THE WORLD'S ADVANCE, at the very moderate cost of 10 cents per word—undoubtedly the most economical, high grade, result-producing medium to-day. Why not try it?

THE WORLD'S ADVANCE MAGAZINE, 239 Fourth Ave., New York.

AUTOMOBILES AND ACCESSORIES

GENERATORS, Batteries, Vulcanizers, Compressors, Engines, Lathes, Dies, Cheap. Effel Dynamo Works, Chicago.

SHOP Vulcanizer. Bargain. Tires at cut prices. Vanderpools, Springfield, Ohio.

TIRES!—Prolonged life! Get more mileage; $1.00 brings successful method. A. Scott, Route No. 1, box 26, Cudahy, Wisc.

AGENTS—To demonstrate, sell and install automobile specialties. Men with automobile preferred. Salesmanager, 650 Woodward Ave., Detroit, Mich.

USE AN AIR-FRICTION CARBURETOR 1915 Improved Model C or D. Increases power and economy of motor one-half. Absolutely impossible to load or choke. Starts easy warm or cold weather. Uses either high or low grade fuels with finest results. We fit all motors and guarantee definite results or refund money if returned within thirty days. Liberal exchange allowance on other carburetors or old model Air-Frictions. We also make and absolutely guarantee the Air-Friction Spark Plug. Sold in sets of five only at $3.00 per set. THE AIR-FRICTION CARBURETOR CO., DAYTON, OHIO.

AUTOMOBILE SCHOOLS

AUTOMOBILE INSTRUCTION — Four weeks' course; best equipped school in the country; men enrolled from all parts of the United States; booklet "MM" on request. West Side Y. M. C. A., 318 West 57th st., New York.

WELDING

WELDING PLANTS, $25 to $250. Liberal terms. Write A. J. Bermo Co., Omaha, Nebr.

AGENTS WANTED

WINDOW Lettering Business. We start you free. Stalbrite Co., Dept. F, Long Island City, N. Y.

AGENTS WANTED—To advertise our goods by distributing free sample to consumer; 90 cents an hour; write for full particulars. The Favori Co., 1061 West St., Dayton, Ohio.

WE WANT a general representative; excellent opportunity and big money for ambitious men; those meaning business apply at once, giving references. Central New York Nurseries, Geneva, N. Y.

AGENTS—There will be a great deal of money made within the next few years selling the "JULES FOLDING PORTABLE ELECTRIC LAMP," containing ten feet of concealed extension cord that can be automatically lengthened or shortened. Also many other new features. A few minutes' demonstration insures sales in every Home, Office, Factory, Hospital and to students. Enormous profits. Address for full particulars: Rose-Strauss Co., 213 West 48th St., New York.

AGENTS WANTED

AGENTS—Novel selling plan, novel article; a business that is growing bigger every day. The HANDY LIGHT, a free salesman's course, a general agency, a business of your own. Sells every place electricity is used. Big profits. Send for proposition. The Handy Light Co., 233 Handy Light Block, Cincinnati, O.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent. profit; one agent's sales, $620 in six days; another $32 in two hours. Monroe Mfg. Co., X38, LaCrosse, Wis.

FREE samples to agents. Fireproof wash-powder for fireproofing children's clothing and lace curtains is the biggest seller. Make money, no capital required. Fireproof Chemical Co., 1158 Summit avenue, Jersey City, N. J.

AGENTS: 500% Profit, Free Sample Gold and Silver Sign Letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 400 N. Clark St., Chicago, U. S. A.

AGENTS—Here's a winner. The Midget Vest Pocket Garment Hanger—sells on sight. The most attractive proposition ever offered. 150% profit. No competition, as article is fully protected by U. S. and foreign patents. Address Dept. "W-A," The Silvex Company, 171 Madison Ave., New York.

AGENTS: $1,000 to $3,000 yearly selling over eighty every-day articles to farmers. Pleasant, permanent business. Full instructions. Big chance. Write quick. Dept. 49, Duoform Company, North Java, N. Y.

AGENTS: Great opportunity to be permanent representative largest manufacturers high-grade soaps and toilet goods. $25-$75 weekly. Write for immediate appointment. E. M. Davis Co., B-51 Davis Bldg., Chicago.

MAKE AND SELL YOUR OWN GOODS. Formulas by expert chemists. Manufacturing processes and trade secrets. Formula catalog for stamp. E. Mystic Company, Washington, D. C.

AGENTS—THE BIGGEST SELLER OUT. Concentrated Beer Tablets. A good glass of Lager Beer for everybody—everywhere. Show it—sell them all. Strictly legitimate. Makes real beer just by adding water. Carry right in your pocket. Enormous demand—immense profits. Full particulars free. The Ambrew Co., Dept. 2151, Cincinnati, O.

AGENTS—NEW, MIGHTY MONEY-MAKING marvel; world startled; new, marvelous clothes washing crystal; clothes washing ideas revolutionized, positively abolishes rubbing, washboards, washing machines; women astounded, wild over it, absolutely harmless; $1,000 guarantee goes with it; make $50 to $100 weekly easy. Marshall, of Pennsylvania, amazed, telegraphs: "Rush 5,000 packages." Exclusive territory; no experience necessary; credit granted; own a business; supply customers; pocket big profits; nature's mighty elements do work; hurry! write today; get overwhelming proof, all free. Equitable Corporation, Dept. 303, 215 West Superior, Chicago.

AGENTS WANTED

ARE YOU FROM MISSOURI? Big money in Mail Order business. I'll show you. Write Herb Lavers, 551 Dudley St., Roxbury, Mass.

400% PROFIT selling our high grade goods. Samples free. Gordon Co., Northwestern Bldg., Chicago.

AGENTS: Sell rich looking 36 x 68 imported rugs, $1.00 each; Carter, Tenn., sold 115 in 4 days, profit $57; you can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid 98c. P. Condon, Importer, Stonington, Me.

$250 for reliable man or woman; distribute 2,000 free packages borax powder with soaps, etc., in your town.; no money or experience needed. S. Ward Co., 214 Institute, Chicago.

AGENTS! ATTENTION! — Guaranteed gas mantles, pay 100 per cent. Write Brilliant Mantle Co., 1731 9th st., N. W., Washington, D. C.

AGENTS—RED HOT SUMMER SELLERS, concentrated soft drinks; just add water; delicious, sparkling soft drinks in a minute; anywhere, anytime; always ready for the family, picnics, parties, socials, etc.; guaranteed under U. S. Pure Food Laws; enormous demand, 100 per cent. profit; $6 to $12 a day easy; big line, over 250 popular priced household necessities; all lightweight packages; agents getting rich, your chance; OUTFIT FURNISHED FREE; don't wait—secure territory now; act quick; just a postal, today. American Products Co., 2235 Third St., Cincinnati, Ohio.

$1,000 PER Man per County: Strange invention startles world—agents amazed. Ten inexperienced men divide $40,000. Korstad, a farmer, did $2,200 in 14 days. Schleicher, a minister, $195 first 12 hours. $1,200 cold cash, made, paid, banked by Stoneman in 30 days; $15,000 to date. A hot or cold running water bath equipment for any home at only $6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 4111 Allen Bldg., Toledo, Ohio.

SPECIALTY SALESMEN

SPECIALTY SALESMEN — Something new, latest electrical wonder, substitute for medicine, high frequency violet ray machine; relieves chronic disorders due to faulty nutrition or poor circulation; sells every home, massage or beauty parlors, doctors, dentists; no competition; big money; machine and results guaranteed; good territory open. Eastern Electric Co., Cleveland, Ohio.

VACATION OCCUPATION

WE have some uncommonly good opportunities for mechanically inclined young men to demonstrate and introduce our tools, designs and outfits in a large way to department stores, hardware stores, toy stores and boards of education. W. R. Price, 127 Fifth ave., New York City.

VACATION BOOKS

I have a fine book proposition for ladies and gentlemen during vacation. Write for particulars (no charge). Geo. W. Somers, Publishers' Representative, D2, St. Augustine, Fla.

MR. ELECTRICIAN: Let our book "Electricians' Wiring Manual" be your helper. It contains hundreds of kinks for the practical wireman, the contractor, or the helper; a clear explanation of the National Electrical Code; and other features of great value to the electrician. Price, $1.50. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

BOOKS AND PERIODICALS

THINK! Forty pages for writers, printers, advertisers, salesmen, mechanics, 25c. William L. Blocher, Publisher, Dayton, O.

WONDER book on Hypnotism, personal magnetism, magnetic healing and occult science sent free to any one. Send your address today. M. D. Betts, Sta. 129, Jackson, Mich.

NEW Book Catalog containing titles and synopsis of hundreds of electrical and mechanical books will be sent free on request. Your name on a postal will do. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

BUSINESS OPPORTUNITIES

A NEW WAY TO PAINT SIGNS—Our patterns do the work; samples 10 cents. Butts, 15 West 10th St., Kansas City, Mo.

WANT BIG PROFITS? Learn Tartaric Mirror Silvering. New Process. Open enormously profitable business. Particulars free. C. Barstow, 514 23rd Street, Oakland, Cal.

LOOK INTO IT. Into what? Why, the mail order business. Big money. Our guarantee protects you. Reed Supply Co., Box 323, LaCrosse, Wis.

"MAKING MONEY in the MAIL ORDER MINT," written by ten Mail Order experts; handsome edition; just published; large profits selling this book; folders free. Rollins, publisher, Dept. 27, Boston.

WRITE Motion Picture Plays; $50 each. Correspondence course unnecessary. Details free. Atlas Publishing Co., 3066, Cincinnati, Ohio.

MAIL ORDER BUSINESS. We start you right. Furnish everything. Ideal Novelty Co., Desk 5, Palmyra, Pa.

I MADE $50,000 in five years with a small mail order business; began with $5; send for free booklet; tells how. Heacock, Box 605, Lockport, N. Y.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. Victor J. Evans & Co., 152 Ninth St., Washington, D. C.

WE START YOU IN BUSINESS, furnishing everything; men and women, $30.00 to $200.00 weekly, operating our "New System Specialty Candy Factories," home or small room, anywhere; no canvassing; opportunity lifetime; booklet free. H. Ragsdale Co., East Orange, N. J.

BUSINESS OPPORTUNITIES

WE pay 25c each for farmers' names. Send dime for contract. "C-Sun," Leroy, Mich.

SONG POEMS WANTED—Big demand for song poems; send us your verses or melodies today or write for instructive booklet—it's free. Marks Goldsmith Co., Dept. 74, Washington, D. C.

MANUFACTURE TOYS AT HOME—Big demand; war has cut off supply; big profits; tools, directions and drawings from $1.00 up. W. R. Price, 127 Fifth ave., New York, N. Y.

ARTIFICIAL MARBLE, sanitary flooring, ornamental casting, concrete, plaster, papier-mache, interior decorations, garden furniture, statuary, life casting, elastic moulds, electro metalizing casts particulars, 200 illustrations FREE. Mahler, C-117 Russell St., Brooklyn, N. Y.

LET the Parcels Post help you. Add ($15 to $25 weekly) to your present salary or income. Start during spare time and build up a permanent mail order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parcels Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write to-day. Address Pease Mfg. Co., Inc., Dept. B, 70 Broadway, Buffalo, N. Y.

FREE for Six Months—My special offer to introduce my magazine. "Investing for Profit." It is worth $10 a copy to any one who has been getting poorer while the rich richer. It demonstrates the REAL earning power of money, and shows how any one no matter how poor, CAN acquire riches. "Investing for Profit" is the only progressive financial journal published. It shows how $100 grows to $2,200. Write NOW and I'll send it six months free. H. L. Barber 423, 20 W. Jackson Blvd., Chicago.

REAL ESTATE—FARM LANDS—California

VISIT San Joaquin Valley, California, THIS YEAR. See the Expositions, too! Low fares for great World's Expositions at San Francisco-San Diego enable you to see wondrously fertile San Joaquin Valley as well, via "Santa Fe." Look into this Promised Land of the Homeseeker NOW. Combine education, enjoyment and exploration. For free literature write C. L. Seagraves, Gen. Colonization Agent, A. T. & S. F. Ry., 1854 Ry. Exchange, Chicago.

REAL ESTATE—FOR SALE—TEXAS

LOTS IN NEW seaport, Texas city, on Galveston Bay, land locked harbor; fastest growing city in Southwest; millions spent by government and private interests on harbor improvements, docks, factories, mills; proposed $10,000,000.00 steel plant; fourth seaport in United States in cotton exports; realty values increasing enormously; lots splendid investment; terms only $1 per lot cash, $2 monthly; price low as $100; closing out; write for maps and illustrated literature. A. C. Bryan & Co., owners, 351 First National Bank Building, Houston, Texas.

FOREIGN INVESTMENTS

CAPITAL introduced for sound enterprises of all kinds, 5 per cent commission; bond and stock issues placed; underwriting procured; references exchanged. Address Cooke & Byrne, Harcourt Street, Dublin, Ireland.

CAMERAS, PHOTOGRAPHY & SUPPLIES

GREAT BARGAINS in Kodaks, Cameras, Photo Supplies, Balopticons, Watches, Jewelry, etc. Many at half price; send for list B. Photo Novelty Co., Ellwood City, Penna.

WILL you buy a practical guaranteed moving picture camera for $35.00? No larger than a kodak, easily operated by any one; daplight loading; 50 ft. capacity; standard film. Address F. E. Slocum, 406 Main St., Peoria, Ill.

INSTRUCTIONS and Formulas for Phosphorescent Photos, Disappearing Photos, Photos on apples, cloth, chinaware, etc. Simple enlarger, trick pictures; 25 in all for 25c. Disappearing photo free with each order. Money back basis. A. E. Benson, Stewartville, Minn.

KODAKS, Graflex, Cameras, Lenses—Everything photographic; get bargain list; you can save money by sending your order to Willoughby, Broadway and 11th St., New York.

HAVE you a camera? Write for samples of my magazines, American Photography and Popular Photography, which tell you how to make better pictures and earn money. F. R. Fraprie, 134 Pope Bldg., Boston.

AMATEUR Photographer's Weekly, $1.00 yearly, weekly competitions, criticisms, illustrated, for beginners. Three months' subscription 25c. Amateur Photographer's Weekly, Cleveland, O.

THIS is just the time to place an advertisement for your cameras, supplies, developing, etc.; our August issue will be on sale in July in plenty of time for the vacation season; mail your order at once to the Classified Department, The World's Advance, 239 Fourth ave., New York City.

KODAK FILM DEVELOPING

FILMS DEVELOPED, 5c roll; prints, 4c. The better kind. S. Chestnut, 2102 East Susquehanna Avenue, Philadelphia.

OPTICAL GOODS, MICROSCOPES, ETC.

WE BUY, sell and exchange bargains in microscopes, telescopes, binoculars, cameras, etc.; bargain list sent. Kahn & Son, Opticians, No. 54 John St., New York. Established 63 years.

OLD COINS BOUGHT

$2 to $600 paid for hundreds of old coins dated before 1895. Send 10 cents at once for new illustrated coin value book, size 4x7. It may mean your fortune. Clarke & Co., Coin Dealers, Box 76, Le Roy, N. Y.

COINS AND STAMPS

FOREIGN Stamps Free; 52 different foreign, including China and Venezuela, to all who apply for our high grade approval selections. Send two cent stamp for return postage. Edgewood Stamp Co., Dept. M., Milford, Conn.

FREE packet to applicants for stamps on approval. Leon Cass, Quakertown, Pa.

FREE. Choose one. 205 foreign, 101 United States, 50 Sweden, 50 Asiatic, 50 Norway-Denmark, all different, with McKeil's Stamp Weekly, Boston, Mass., six months. Remit 25c.

STAMPS—100 (all different) free; postage, 2c; mention paper. Quaker Stamp Co., Toledo, Ohio.

"RUSSIAN Postage Stamps," Red Cross issue, complete, unused, 16 cents. A. Roessler, East Orange, N. J.

DOGS, POULTRY AND PETS

HOUNDS—All kinds. Catalog 5 cents. Rookwood Kennels, Lexington, Ky.

ELECTRICAL

DYNAMOS for Picture Shows, $80. Dynamos for charging batteries, $70, in payments of $10 per month. Hobart Bros Co., Troy, Ohio.

FOR SALE—Cheap, eight 2-volt, 30-ampere-hour, storage cells fully charged, per cell $1.50; one dynamo motor, $4.50. O. C. Frey, R. D. No. 4, Canton, Ohio.

MR. AMATEUR: Do you want to know how to make dynamos, motors, electric heating apparatus, wireless instruments, and hundreds of other pieces of electrical apparatus? Our book, "How to Make Things Electrical," at $1.50, will tell you how. Book Dept., "The World's Advance," 239 Fourth Ave.; New York.

NEW Book Catalog containing titles and synopses of hundreds of electrical and mechanical books will be sent free on request. Your name on a postal will do. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

MR. ELECTRICIAN; Are you puzzled at times to know how to connect a circuit to accomplish certain results? Our handy 300 page book, "Modern Wiring Diagrams and Descriptions" at $1.50 will help you with the right diagram at a moment's notice. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

DO you want this book, which tells you how to test and operate all different kinds of electrical apparatus, from generators and motors to lamps and bells? Only $1.50 postpaid. "Electricians' Operating and Testing Manual," by Henry C. Horstmann and Victor H. Tousley. 16mo., full leather, and chuck full of the right kind of information, which can be readily mastered by the layman as well as the experienced man. Modern Publishing Co., 239 Fourth Ave., New York City.

FOR THE HOME

FREE to any woman. Beautiful 42-piece Dinner Set for distributing only 3 dozen cakes of Complexion Soap Free. No money or experience needed. S. Tyrrell Ward, 214 Institute Place, Chicago.

BLUEPRINTS

BLUEPRINT PLANS for two-story, stucco, twin dwelling, six rooms to each side, size 38 by 42 feet, $2.00 postpaid. C. E. Kent, Martinsburg, W. Va.

FIRE ARMS WANTED

FIREARMS — Old - Time and Modern. Buy, sell, exchange all sorts. Stephen Van Rensselaer, West Orange, N. J.

FOR MEN

Beaded moccasins, novelty vests, ties, pouches, fobs, etc. Price lists free. Indian Beadwork Co., Poplar, Mont.

"SEXUAL PHILOSOPHY," 12c. Clear, specific, authoritative, complete, best, satisfies. Fred B. Kaessmann, Lawrence, Mass.

PERSONAL

YOGHURT conquers nine-tenths of all maladies by destroying intestinal self-poisoning, caused by harmful bacilli; particulars. Yoghurt Co., (8) Blaine, Wash.

YOUR FUTURE FORECASTED, according to planetary aspects. Accurate information concerning Business, Love, Marriage, Health, Travels, etc. Thousands have testified to my reliability. Send 10c and birthdate for trial reading. A. P. Frank, Department 18, Kansas City, Mo.

FOR SALE

FOUNTAIN PEN guaranteed, $1.00. Your money back if not entirely satisfied. Honest offer. Economy Co., Charlotte, N. C.

TEMPERED COPPER? No. Something still better. Send 10c for wonderful 80 per cent. Cast COPPER Chisel which cannot be annealed and is GUARANTEED to cut iron and steel; also instructive and interesting information. Address: Peter J. Weber, 3019 Lisbon Ave., Milwaukee, Wis.

FORMULAS

10,000 RECIPES, Formulas, etc., in our "Twentieth Century Book of Recipes, Formulas and Processes." For $3.00 it gives you information that represents the collection of years and the expenditure of thousands of dollars. Covers everything from the making of simple glues and adhesives to the tanning of leather, the making of photographic materials, working of metals, etc. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

GUMMED LABELS—ADVERTISING STICKERS

GUMMED LABELS, 3,000, $1.00. 40 pp. Catalogue, 2 cts. MacTaggart, 1235 Arch, Philadelphia, Pa.

INSTRUCTION

MATHEMATICS, including trigonometry, geometry, mechanical drawing and plotting problems—worked by ARCASCOPE triangle. Fifty Cents. Leishman Arcascope Company, Ogden, Utah.

DEVELOP your memory—memorize everything. You learn—we teach you. 12 lessons—first lesson, 25c. Write today. Vogelmann Memory System, 76 Cooper St., Brooklyn, N. Y.

THE GILSON slide rule will solve any mathematical problem with rapidity and accuracy. Anyone can learn to use this slide rule in a few minutes. Price with complete instructions, 50c. The Gilson Slide Rule Co., Niles, Mich.

LEARN TO WRITE SHORTHAND—Our complete course prepaid, 25 cents, coin. Gibson Agency, Harbor Springs, Mich.

ELECTRICAL and mechanical engineering taught by mail, 15 cents a lesson; write for catalogue. The Easy School of Engineering, room 402, 5531 Lakewood Ave., Chicago, Ill.

EIGHTEEN Ways to Make Money! Interesting, isn't it? If you are mechanically or electrically inclined don't fail to write for our free book. Efficiency Company, 104-C East 16th St., New York.

MR. EXPERIMENTER: Have you read the new edition of "Construction of Induction Coils and Transformers" by T. S. Curtis? It's the biggest 25 cents' worth in the field of electrical literature. Tells how to design and build magnetic leakage transformers, low voltage transformers, high frequency apparatus, induction coils, condensers, gaps, etc., and gives dozens of valuable hints. Send for your copy today. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

MAGIC, GAMES AND AMUSEMENTS

360 POPULAR TOASTS—Selection suitable for all occasions. 10c. Wedge Mfg. Co., "L," Binghamton, N. Y.

NEW pocket trick, including professional catalog, 6c. Magic, 249 West 38th St., New York.

LEARN to hypnotize and make fun and money. Send for free book to M. D. Betts, Sta. 129, Jackson, Mich.

LEARN MIND READING! IT'S EASY. No special gift required; anyone can do it if they have the "know how"; mystify, amuse, entertain friends or the public; make money exhibiting; become leader at social gatherings; full private instructions in typewritten form sent for $1.00; descriptive circular free. The Banner Mailing Bureau, box 33, Nevada City, Cal.

MOTION PICTURE PLAYS

WRITE MOVING PICTURE PLAYS: $50 each. Correspondence course unnecessary. Details free. Atlas Publishing Co., 306, Cincinnati.

LEARN TO WRITE MOVING PICTURE PLAYS—Details free. Gibson Publishing Co., 611, Harbor Springs, Mich.

HERE'S ONE GRAND CHANCE!—Our new Advance System teaches you photoplay writing complete, all for $1.00 prepaid; "do it now." Advance System, Hastings, Neb.

MOTION PICTURE PLAYS

Write moving picture plays; constant demand, $50 each; devote all or spare time; past experience or literary ability unnecessary. Details free. Giese Co., 225 Whiteman Street, Cincinnati, Ohio.

WE ACCEPT manuscripts in any form; criticise free; sell on commission. Big prices paid. Don't waste money on "instructions." Write us. Story Revision Co., 200 Main, Smethport, Penna.

MOTION PICTURE BUSINESS

$35 PROFIT Nightly. Small Capital starts you. No experience needed. We teach you and furnish everything. Reliable Film Exchange, Dept. 5, 525 South Dearborn St., Chicago, Ill.

MOTORCYCLES

SUPPLIES—Write for big catalog with prices lower than you now pay. Meco, Hammondsport, N. Y.

CONVERT your bicycle into a motorcycle at small cost by using Shaw Motor Attachment. Catalog free. Shaw Mfg. Co., Dept. 68, Galesburg, Kans.

NEW and Rebuilt Motorcycles, Hendersons, Pierces, Kultures, Yales, Indians, Harleys, Excelsiors, Readings, Thors, $25 to $100. Singles and Twins. Second-hand Bicycles, $5; tandems, $10. New bicycles at Factory prices. Send for catalogue. Deninger Cycle Co., Rochester, N. Y.

MUSIC AND SONGS.

LOOK! Wonderful invention; phonograph records on post cards, guaranteed to play, only 15 cents. Adolphus W. Noon, Nogales, Ariz.

WANT YOUR SONGS PUBLISHED FREE? Send them in; we'll write the music and advertise them for sale to reliable music publishers. National Manuscript Sales Co., 303 Theatrical Exchange Building, Broadway and 40th St., New York.

SONG POEMS WANTED—For publication. Past experience unnecesary. Our proposition positively unequalled. Send us your song poems or melodies today or write for instructive booklet—it's free. Marks-Goldsmith Co., Dept. 21, Washington, D. C.

MACHINERY MODELS, TOOLS AND SUPPLIES

MODELS made for inventor; general machine work; designing and perfecting; developing automatic devices and machinery; in a position to do all kinds of light tool and machine work; prices reasonable; estimates cheerfully given. Ideal Machine Works, 61 Ann St., New York City.

MACHINERY, TOOLS AND SUPPLIES

FOR SALE—All sizes new and second-hand pulleys, belting, shafting, hangers, couplings, pillow blocks, collars, etc. Passman Bros., 28 and 30 S. Green St., Chicago, Ill.

MOTORS, ENGINES AND GENERATORS

SPECIAL SALE SMALL DYNAMOS—All 110 volts D. C., 10 lamps, $12.50; 20 lamps, $28.50; 40 lamps, $35.00; other sizes, all voltages. Johnston, Evans Ave., Ingram, Pa.

ALTERNATING CURRENT, single-phase motors, $7 to $95. Direct current and three-phase bargains. Motors bought, sold, repaired. Satisfaction guaranteed or money refunded. Fan bargains. Send for electrical supply bargain list. Hyre Electric Co., 609-V So. Dearborn St., Chicago.

SMALL A. C. MOTORS—110 volts, 60-cycle, all new, automatic start, with sliding base, ¼ H.P., $12.50; ¾ H.P., $18.50; ½ H.P., $35.00. Johnston, Evans Ave., Ingram, Pa.

PENNANTS, PICTURES & POSTCARDS

PHOTOS (postcards) of pretty girls. Very attractive poses. Splendid samples, 25c. Circular free. G. Olive, Willmar, Minn.

POSTCARDS—25 beautiful postcards, 10c, 100 for 30c; liberal samples for 2c stamp. Mador Print, Box 1429C, Boston, Mass.

PENNANTS, PICTURES AND POSTCARDS

REAL PHOTOS of pretty girls in bewitching poses. Samples, 10c. K. A. Rex Co., Harrison, Mich.

REAL ART STUDIES—Samples and prices, 10 cents. Box 878, Proctor, Vt.

SEPTEMBER MORN and two real photos, feminine beauty, posed by living models that are better than September Morn; the three plates for 25 cents. Mack & Co., 609 Seventh Ave., South, Minneapolis, Minn.

PRINTING AND ENGRAVING

GOOD Printing at low prices; 1,000 good letter heads, envelopes, cards, billheads, labels, circulars, $2.50; samples free; catalogues, booklets and circulars our specialty. Ernest L. Fantus Co., 523 S. Dearborn St., Chicago, Ill.

PRINTING SPECIAL—Fine calling cards, 25c., 100 business cards, 500, $1.00; 1,000, $1.90; sent prepaid. University Press, 433 Falls Ave., Youngstown, Ohio.

50 cases NEW TYPE, 12 to 36 point, 25c. per pound; send for proof. J. L. Lucas & Son, 10 Fox St., Bridgeport, Conn.

NEAT printed letterheads and envelopes, 125 each, prepaid, $1.00; samples. Maxwell, printer, Henniker, N. H.

AMERICAN PATENTS

I CANNOT AFFORD to give my services for nothing. Neither can any other Patent Lawyer. But I will, for a reasonable fee, secure the best patent protection obtainable for you. Try me. F. V. Winters, Registered Attorney, 125 East 23rd St., New York City; also Washington.

PATENTS

C. L. PARKER, Patent Attorney, 8 McGill Bldg., Washington, D. C. Inventors' hand book, "Protecting, Exploiting and Selling Inventions" sent free upon request.

PATENTS secured or fee returned. Send sketch for Free search. Latest and most complete patent book ever published for free distribution. George P. Kimmel, Attorney, 214 Barrister Building, Washington, D. C.

PATENTS without advance attorney's fees. Free report and books. Frank Fuller, Washington, D. C.

PATENTS secured. See index for our display ad. Books sent free. John S. Duffie & Co., Patent Attorneys, Washington, D. C.

PATENTS—Trade-Marks. Send for my free book, "How to Get Them." It's full of information you should know. Joshua R. H. Potts, 8 S. Dearborn St., Chicago; 929 Chestnut St., Philadelphia; 805 G St., Washington.

IDEAS wanted—Manufacturers are writing for patents procured through me. Three books with list 200 inventions wanted sent free. Advice free. I get patent or no fee. R. B. Owen, 44 Owen Bldg., Washington, D. C.

THE PATENTOME is free; an education in obtaining patents; established 1865. Anderson & Son, attorneys, 712 Seventh St., Washington, D. C.

"PATENTS AND PATENT POSSIBILITIES" is a 72-page treatise which tells all about patents, what to invent and where to sell it; it gives honest advice to inventors, and is full of valuable and interesting information; write for it today! It is FREE. H. S. Hill, 929 McLachlen Building, Washington, D. C.

SEND FOR FREE BOOKLET. All About Patents and Their Cost. Shepherd & Campbell, Patent Attorneys. 500 B Victor Bldg., Washington, D. C.

PATENTS FOR SALE

Patents and patentable ideas sold on commission. Best location and facilities. Fuller Co., 500 Fifth Ave., New York.

WOULD like to sell my patent on a Dirigible Air Dreadnought. Will fly longer, higher and quicker than others. Patented June 6, 1911, Serial No. 567468. Inventor G. Scheel, 418 E. 9th St., New York City.

MODEL BUILDERS

PRODUCERS OF RESULTS—Inventions developed, light mfg., models, experimental work, tools, dies and stampings. John's Machine & Stamping Works, Middle Bldg., Dept. F, Cleveland, Ohio.

CONSULTING ENGINEERS

DRAWINGS made for inventors. Consulting Engineer, WA-3240 Seminary ave., Chicago.

CONSULTING Engineer—A. M. American Institute Electrical Engineers. Practical advice; ideas, inventions perfected. Maximilian E. Weil, 2 Rector, New York.

INVENTORS—INVENTIONS

INVENTORS—My patent made a fortune; particulars free; let me sell yours. Eugene Pearl, W23 Union Sq., New York.

PATENT ATTORNEYS

PATENT specification and drawing prepared $10.00. Free particulars. Seyer Company, 1100 New York Ave., Washington.

NO ATTORNEY fees until patent allowed. Send sketch for free report. Books free. Frank Fuller, Washington, D. C.

A PATENT—Can you tell me how to secure a patent? What will it cost? M. F. C., Brooklyn.

If you wish to file an application for a patent, it is advisable to employ the service of a reliable patent attorney, as the value of patents depends largely on the skillful preparation of the specifications and claims. The cost is $65.00 or more, according to the case. If you write to Allen & Daggett, Patent Attorneys, 950 Old South Building, Boston, Mass., they will send you full particulars.

PATENTS—Herbert Jenner, patent attorney and mechanical expert, 606 F St., Washington, D. C. I report free of charge if a patent can be had and its exact cost. Send for circular.

PATENT—Advice and Books free; highest references; best results. I procure patents that protect. Watson E. Coleman, Patent Lawyer, 622 F St., N. W., Washington, D. C.

BUSINESS goes where invited and stays where well treated. My 27 years of personal attention has procured patents for successful inventors and manufacturers. Grasp this opportunity to get the same service. Write and send sketch. Vernon E. Hodges, 631 Barrister Bldg., Washington, D. C.

WANTED New Ideas. Write for List of Inventions Wanted. $1,000,000 in prizes offered for inventions. Our Four Books sent free upon request. Victor J. Evans & Co., 155 Ninth St., Washington, D. C.

PATENTS—Edward Bruce Moore, former commissioner of patents; patents trademarks and copyrights. Sole offices Barrister Building, Washington, D. C. See advertisement page 139, this issue.

RAZOR-BLADES SHARPENED.

SAFETY razor blades resharpened "keen as new," 2½c. up; satisfaction guaranteed. American Tool Co., Dept. G, Springfield, Ohio.

GRIND, hone any blade, 2c. Keenedge, Oshkosh, Wis.

TELEGRAPHY

TELEGRAPHY—Wire and wireless, taught at home. Spare time. $75.00 to $150.00 month. Big demand. Graduates assisted. Money back guarantee. Booklet free. Southern Institute of Telegraphy, Dept 29, LaVergne, Tenn.

TELEGRAPHY—Morse and Wireless—Also Station Agency taught. R. R. and Western Union Wires and complete Marconi Wireless Station in school. Graduates assisted. Marconi Co. employs our wireless graduates. Low living expenses—easily earned. Largest school—established 40 years. Investment, $25,000.00. Correspondence courses also. Catalog Free. Dodge's Institute, 16th St., Valparaiso, Ind.

TYPEWRITERS AND SUPPLIES

GOOD, SERVICEABLE typewriters, $7.50 and up. Postcard brings list. First class ribbon, any machine, 25c. Hub Typewriter Co., 286 Devonshire St., Boston.

CORRESPONDENCE SCHOOLS

OPTOMETRY—Profitable profession; new and uncrowded; fitting glasses by scientific methods; men or women quickly prepared for practice by our "Home Study" course; diploma granted; liberal payment plans; send for free catalog and full particulars. Chicago School of Refraction, 512 Journal Building, Chicago, Ill.

TRADE SCHOOLS

ELECTRICITY, plumbing, bricklaying mechanical and architectural drafting taught by practical instruction. This is largest and best equipped practical school in America; short time required and small expense; positions secured; earn expenses while learning; write for big illustrated book; it's free. Coyne Trade School, Dept. 840-Y, Chicago.

WIRELESS

AERIAL MASTS — "Superfect" type. J-230, Stuyvesant Ave., Brooklyn, N. Y.

FOR SALE—Clapp-Eastman one kilowatt, type "C," high tone, sending set complete, practically new, includes everything necessary for high-grade station. Price reasonable. Write L. R. Stanley, Swampscott, Mass.

BARGAIN!—One kilowatt transformer, rotary gap. A. W. Gavett, South Portland, Me.

ONE-QUARTER kilowatt Peerless set, very good condition, $17.50; one-half kilowatt Blitzen transformer, in case, good as new, $18.00. Lester Jenkins, New Bedford, Mass.

BLITZEN Receiving Set; phones, other wireless instruments; perfect condition; half price. E. F. Rybolt, Dayton, Ohio.

FOR SALE—Blitzen receiving set without receivers. Fine condition. $13.00 takes it. Walter S. Leigh, Clinton, N. J.

WE make loose couplers, 2,500 meter, $5.00; tuning coils, 350 meter, $2.00. Cliff Mfg. Co., box 130, Brookfield, Mass.

"WIRELESS HOOK-UPS," containing 96 pages and 100 hook-ups, is full of diagrams fully illustrating every possible wireless connection. This book will enable wireless men to get excellent results. Sent postpaid for $0.25. Modern Publishing Co., Book Dept. 239 Fourth Ave., New York City.

NEW Book Catalog containing titles and synopses of hundreds of electrical and mechanical books will be sent free on request. Your name on a postal will do. Book Dept., "The World's Advance," 239 Fourth Ave., New York.

HELP WANTED

YOUNG MEN to qualify for demonstrating and selling our tools and outfits through the big trade. W. R. Price, 127 Fifth ave., New York, N. Y.

20c each paid for tobacco users' names. Contract, blanks, etc., 10c; returned if dissatisfied. Superba Co., K2, Baltimore, Md.

WANTED — AMBITIOUS WORKMEN. Your work on actual jobs pays for teaching trade of Automobiles, Plumbing, Bricklaying. Only few months required. 700 students last four years. Write for information. Bruns Contracting Trade School, 234 Aliso, Los Angeles.

LOCAL REPRESENTATIVE WANTED—Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. All or spare time only. This is an exceptional opportunity for a man in your section to get into a big paying business without capital and become independent for life. Write at once for full particulars. National Co-Operative Realty Company, L-604 Marden Building, Washington, D. C.

Advertisements for the August issue must reach us not later than July 1st in order to insure their

HELP WANTED

LADY OR GENTLEMAN, fair education, to travel for old established firm; no canvassing; salary $936 per year, payable weekly, pursuant to contract; expenses advanced. G. M. Nichols, Pepper Building, Philadelphia, Pa.

MEN to refinish lighting fixtures, brass beds, etc. All or spare time. No capital or canvassing. Experience unnecessary. Write for particulars. Gunmetal Co., Dept. F., Decatur, Ill.

WRITE Motion Picture Plays: $50 each. Correspondence course unnecessary. Details free. Atlas Publishing Co., 3065, Cincinnati, Ohio.

ANY intelligent person may earn steady income corresponding for newspapers. Experience unnecessary. Address Press Correspondence Bureau, Washington, D. C.

GOVERNMENT Civil Service Positions pay Big Money. Examinations everywhere soon. Get prepared by former Government Examiner. Booklet free. Write today. Paterson Civil Service School, Box 3019, Rochester, N. Y.

GET CASH FOR NAMES, INFORMATION, IDEAS, FORMULAS—Turn what you see, hear and know into money. Instructive booklet for stamp. INFORMATION SYSTEM, 411, Marietta, Ohio.

USE YOUR SPARE TIME to build up a mail order business of your own; we help you start for a share in profits; 27 opportunities; particulars free. Dept. W, Opportunities Exchange, Buffalo, N. Y.

THOUSANDS JOBS OPEN TO MEN, WOMEN—$75 month, vacations, short hours, steady work; common education sufficient; write immediately for list U. S. government positions now obtainable. Franklin Institute, Dept. W50, Rochester, N. Y.

APPARATUS EXCHANGE DEPARTMENT

Advertisements appearing under this heading will be inserted at the rate of 2½ cents per word. This department is for the use of subscribers of record only, to enable them to exchange technical articles for which they have no further need, for other articles or apparatus which they prefer. Remittances must accompany copy—no advertisements will be published free of charge.

The right is reserved to rewrite or reject any advertisements which will not be for the best interests of our readers.

Advertisements of articles intended for sale cannot be accepted, as a regular classified department is conducted for advertising of this character at 10 cents per word.

All advertisements for this department should be addressed to "Apparatus Exchange Department," THE WORLD'S ADVANCE, 239 Fourth Avenue, New York.

HAVE general stamp collections; value about $20 each; will exchange for typewriter, camera, magic lantern, or bicycle; also have some books and magazines that I will exchange for other books and magazines. Edmund Beck, Whittier, N. C.

WANTED—A complete headset of standard make in exchange for receiving set that receives up to 1,000 miles. Make me an offer. Clarence D. Miner, 412 Cedar St., Niles, Ohio.

WANTED—Several good eight-day clock works, A. C. wattmeters and fan motors. Address J. Nordstrom, Gallitzin, Pa.

WANT—Smith motor wheel; have complete receiving set, including Blitzen variable condenser, 'phones, commercial loose coupler, etc. Edward French, Peekskill, N. Y.

WHAT do you offer me for ¼ kilowatt transformer and condenser? Also have oscillation transformer and series condenser. Arthur Haake, Closter, N. J.

WANTED—Lathe set, electric fan, xylophone, orchestra bells; all copies Electrician & Mechanic before 1908; also January, 1908; April, 1909; August, 1912; have accordeon, books, ocarina, electric articles; $5 hypnotism course. Emil Hoers, 241 West Hickory St., Kankakee, Ill.

APPARATUS EXCHANGE

FOR EXCHANGE—Two single 3,600 ohm head phones, two kodaks, one-inch coil, five condensers, audion, four detectors, brand new motor generator, 6 volts, 6 ampere, oscillation transformer, $10.00 key and a lot of other experimental goods; all the above is in excellent condition. What have you? All correspondence answered. Don I. Shepherd, St. John, Kan.

FOR EXCHANGE—Typewriter, want motorcycle. J. Bufka, R2, Denmark, Wis.

WILL EXCHANGE—Rotary condenser, pair of 2,000 ohm receivers, for good camera or offers. H. V. Butterworth, 15 Kosciusko St., Brooklyn, N. Y.

WANTED—Audion detector, flexible transformer any size, line protector for 110 volt circuit, large spark coil and other wireless goods in exchange for large loose coupler; wound for 3,000 meters; one-half KW. sending transformer and a new $25.00 mandolin. H. A. Thorndike, Fitchburg, Mass.

HAVE for exchange lantern slides, negatives, films, Tribune tandem, Seneca camera, flint lock pistol, English make; want large lantern slides or views of historical places, Indian relics, curios and electric fan. Brodstone, Superior, Neb.

FOR EXCHANGE—One-half KW. transformer coils, three-slide tuner and loader style "C" one, and two KW. gaps; 30-30 Stevens repeater rifle (new), detectors, electrolytic interrupters, old violin, marine engine, Detroit make; 2½ H.P., two cycle, 20-22 diamond auto engine, complete to run. Want rotary converter 110 D.C. to 110 Volt, 60 cycle A.C.; rotary spark gap of standard make or transformer of standard make. G. L. LaPlant, St. Anthony, Iowa.

HAVE for exchange the following articles, value $56.50: One loose coupler, $9.00; fixed condenser, $3.00; crystaloi detector, value $3.00; variable condenser, $5.00; detector, $3.00; loading coil, rewound, $5.00; two S. S. tuning coils, $5.00 each; 2,000 ohm phones, complete, $10.00; buzzer test with key, $2.50; 1-lb. tested galena, $1.00; one D. P. D. T. switch, $2.50, and one D. P. D. T. switch, $1.50. Will exchange for motorcycle or what have you? All the above articles are in first-class condition. G. O. Fackrell, agent Sierra Railway, Cooperstown, Cal.

HAVE Blitzen receiving set, 2,000 ohm phones; many other wireless instruments; X-ray outfit, two-inch spark coil; write for list. What have you in exchange? E. F. Rybolt, Dayton, Ohio.

WILL EXCHANGE high-grade 2-inch wireless spark coil, eight-point adjustable condenser, spark gap, brass key and helix for Audion detector or what have you? J. Miller, 33 Windsor Place, Brooklyn, N. Y.

HAVE De Forest audion with stand, mounted on hardwood case, with rheostat, switches, etc. Want good coaster brake bicycle. Edward French, Peekskill, N. Y.

FOR EXCHANGE—An auto sparker or dynamo; cost, $28; weight, 23 lbs.; was used on an automobile to develop current for a spark coil. Will take wireless or electrical things for it. Also have a ½ KW. transformer, $5; fixed condensers, gas engine coil, sensitive galvanometer, electric bell, electric thriller, shocking coil without vibrator, and "Fun with electricity outfit" (St. John's); besides magazines, etc. All things in good condition. Would like especially such articles as 100 ampere ground switch, Murdock 43-plate rotary variable condenser, "Electro" loading coil and a good spark gap; act quick. Donald M. Terry, Scott, Ohio.

FOR EXCHANGE — Quantities of tested galena; if you have wireless goods to exchange, write. George T. Hunter, 203 Miami St., Urbana, Ohio.

FOR EXCHANGE—A complete wireless receiving set, consisting of $12.00 loose coupler, $10.00 phones, $3.00 variable condenser and $1.00 fixed condenser, mounted on mahogany base, unpacked but not used. Will sell separately or complete. Also sending instruments and desk; make offer. Well. Van Slyck, 836 Main St., Lake Geneva, Wis.

FOR EXCHANGE—Wireless set costing $150.00. What have you to offer? A. H. Morris, 919 West Eighth St., Wilmington, Del.

WILL give Fox typewriter, in good condition, for six-inch spark coil, or what have you? Eliot Sarasohn, 696 West End Ave., New York City.

DO YOU REALIZE the mechanical process this magazine goes through in its manufacture? Read the interesting article beginning on page 27, this issue.

RUSSIAN RED CROSS POSTAGE STAMPS

Russian Red Cross postage stamps have recently been issued by the Red Cross Society under permission of the Postal Department. These stamps are of four denominations, 1, 3, 7 and 10 kopecks. (A kopeck is, roughly, one-half cent in U. S. Currency.) Each stamp sells at post offices in Russia for one kopeck over its face value and this small one-half cent tax or surplus goes to the Red Cross fund. The first issue was printed on tinted paper; while the second was printed on white paper. Not many of the first issue came to America because of the poor transportation facilities, and for that reason the sets of these stamps are scarce. A complete set sells for ten times the face value represented. The second set is more easily obtained and is selling at 16 cents or three and one-half cents over post office cost.

ANOTHER "SMALLEST ELECTRIC MOTOR"

Another claimant to the smallest electric motor in the world title is a machine built by H. F. Keeler, a student in the Highland Park College of Engineering at Des Moines, Iowa. The armature is less than one-quarter inch in diameter, while the wire of the winding is no larger than a fine thread. It is said that a jeweler's microscope must be employed in order to see the different parts. The entire machine weighs only 20 grains, or as much as a third of a teaspoonful of water. The motor operates on one dry cell.