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An Army Railroad Howitzer

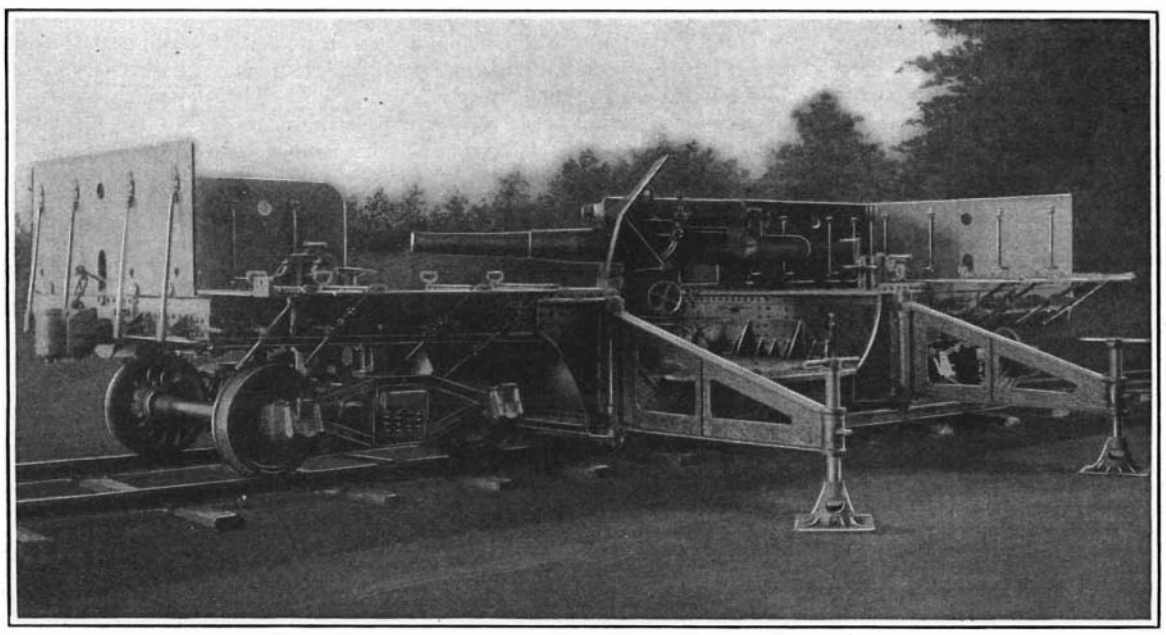
CONSIDERABLE attention has been directed during the past few months to the problem of utilizing our excellent system of railroads paralleling the Atlantic Seaboard as a means of defense for the transportation of heavy artillery to threatened points on the coastline.

Our system of seacoast defenses is not correctly named—rather it should be called our system of harbor defenses. The batteries of heavy guns, set in concrete emplacements, which are to be found at points of vantage guarding the entrances to our important harbors and maritime and naval ports, were excellent for the work they were designed to do; but the radius that is covered by the range of these batteries is limited to about 13,000 yards, and, beyond that distance, the coastline is entirely unprotected by rifle or mortar fire until the next fortified entrance is reached—a stretch in some cases of several hundred miles.

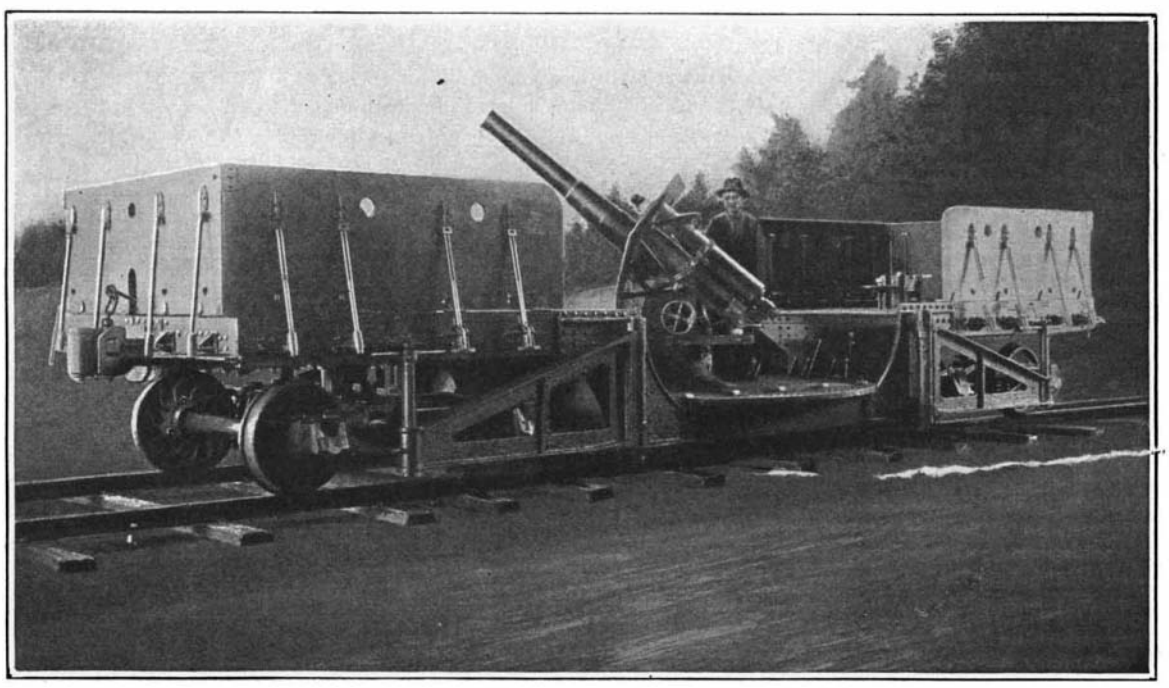
Now, along these unprotected reaches of coastline, there are to be found several locations that are favorable for a hostile landing, and, as matters now stand, there would be nothing in the way of artillery to oppose such landing, except such mobile field guns as it might be possible to gather there.

Experience in the European War, and particularly in France and Flanders, has shown that it is quite possible to mount the heaviest guns, up to 16-inch caliber, upon specially constructed railroad cars, and haul them into position with a celerity of movement which would be impossible upon the ordinary mounting designed for highway travel; and our military men who have made a study of the problem are disposed to favor the construction of suitable railway cars capable of mounting howitzers and rifles of medium and heavy caliber, and building a series of military tracks leading to the coast from our main coastline railway systems, over which this artillery could be quickly hauled to any point at which a landing was threatened.

The two illustrations herewith given are of an army 4.7-inch howitzer, mounted upon a special car, designed by army officers for this class of work. The engravings speak for themselves. The gun is mounted upon a turntable at the midlength of the car, which gives the gun an all-around arc of fire. Four heavy cast-steel brackets are hinged to the car, two on each side, which, when the car is in transit, are folded against the car. To place the installation in condition for firing, the arms are swung out, and, by means of heavy screws and base plates, the load of car and gun is partially transferred from the springs to the supporting arms, which of course, take the whole shock of discharge. The car is provided with lateral shields, pierced with ports for rifle and machine-gun fire, the shields being supported in position by struts leading from near their upper edge to the car floor.



Car, with brackets extended and jacked up, ready for firing



Railroad Howitzer Car with 4.7″ piece, ready for transit

How Refrigerator Insulation is Made

THE cork sheets used for insulation in household refrigerators and also in the large cold-storage plants are to a very large extent a by-product of another industry related to the home, that of making cork stoppers. The bark of the cork oak, a native of the countries bordering upon the Mediterranean, is the raw material first employed. When the tree is 30 years old, the bark is sufficiently thick to be stripped; and, strange to say, the stripping process assists the growth and prolongs the life of the tree instead, as might be expected, of exerting exactly the opposite influence. The bark is first boiled to remove dirt and impurities, this process increasing the volume about 25 per cent. It is then shipped to the manufacturers of cork products, where the best material is used for making cork stoppers and similar articles. The waste is enormous, amounting to between 60 and 70 per cent, and from this, together with the coarser pieces of bark, are made the sheets for insulation and other purposes.

The cork is first sized and freed from dust after which it is placed in steel molds where it is compressed. While under pressure the cork is thoroughly baked and allowed to cool gradually. This baking process drives out the moisture and causes the natural sap to form a glue which binds all the particles into a homogeneous mass. The heat treatment in addition to driving off the moisture and destroying the impurities, causes a more efficient insulator to be produced, due to the formation of more air-cells. The changing of the sap into a glue also increases the waterproof qualities and renders the material a better insulator.

After being removed from the mold, the edges of the cork sheets are trimmed. The final stage in the process is the cutting up into sheets measuring 1 foot wide and 3 feet long. Three standard thicknesses are made, 2, 3, and 4 inches. Another process, employed by a considerable number of concerns engaged in the manufacture of cork products, uses asphalt as the binding material to unite the cork particles in place of the natural sap.

Motor Trucks Used on Primary Triangulation

IN recent surveying work in the Northwest by the United States Coast and Geodetic Survey, automobile trucks were used for the first time on primary triangulation, and they proved so successful that all other surveying parties engaged in such work will use this means of communication. The party representing the survey completed the observing of an arc of primary triangulation which extends 630 miles from northern Utah northwestward to the Columbia River in northeastern Oregon, thence westward down the Columbia River to Portland, Ore. Most of the observations were made at night by the use of acetylene lamps. In spite of the rugged country over which the work was carried, there were no serious accidents to the members of the party in either of the two seasons during which observations were made.

The latitudes and longitudes about 100 stations were accurately determined and, as they have been substantially monumented with concrete blocks which bear inscribed metal tablets, they will be available for generations as starting points of Federal, State boundary and other surveys and engineering works. As soon as the office computations can be made at the Washington headquarters of the Coast and Geodetic survey, the data for this survey will be published in order that they may be more readily available to those needing them.

The motor trucks carried the party and outfit to the base of the peaks on which observations were made with the theodolite. The camp equipage and instruments were carried from the truck to the top of the peak by horses or by the members of the party. Accurate elevations of numerous mountain peaks were determined by this survey. In fact, it is only by such methods that reliable elevations of peaks can be obtained. It is not feasible to run lines of spirit levels up the mountain sides and barometric leveling gives only crude results. The longest distance observed was 134 miles, between peaks in northern Utah and southern Idaho. The lamps were cared for by trained light-keepers.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

We Must Speed Up Naval Construction

ONE of the most encouraging facts in the Naval situation, just now, is the zeal with which Secretary Daniels is applying himself to the problem of getting the steel makers and shipyards to undertake the construction of the large number of warships authorized in the Bill for Naval Extension, recently passed, and put the work through as a rush order. As the Secretary states in his report, it is one thing to make large appropriations for a new Navy, but it is quite another thing to build it.

So far as the Navy Department is concerned, it must be admitted that, from the very moment at which the Navy Bill became law, it bent all its energies to expediting the work of construction, and great credit is due to Rear-Admiral Taylor and the Bureau of Construction and Repair for the celerity with which it got out the plans and specifications for the new battleships, battle-cruisers, scouts, destroyers and submarines, so as to have this material in the hands of the prospective bidders at the earliest possible date. Had the steel makers and private shipyards shown something of the same commendable zeal, the prospects of getting our new Navy built and put in commission at a speed commensurate with the urgency of the situation, would not to-day be so exceedingly disappointing.

It seems that, so long as our contractors have to do with a type of ship which conforms closely to those which they have just launched from their ways, they are willing to put in bids to do the work within the standard time of from three to three and a half years, in which previous ships have been built. But when the Department gets out plans for a new type of ship, the contractors, judging from the experience had in the attempt to secure satisfactory bids for the fast battle-cruisers and scouts, either fight shy of the proposals altogether, or else they demand a length of time for construction which is altogether out of the question.

Take the case of the bids for the new battle-cruisers, which ranged, if we remember rightly (in so far as the time element is concerned), from forty-eight to fifty-two months for completion. Now fifty-two months is just four years and four months, which means that these ships would not be tried, accepted, put into commission and shaken down into thorough working condition until at least five years after the contracts had been let. It is all very well for the contractors to safeguard their own interests. In fact, it is perfectly proper that they should do this. But what about the interests of the country at large? So rapid is the present day development in size, power and speed of warships, that even these fast scouts and battle-cruisers may be outspeeded and outgunned and may be entering upon the first years of their obsolescence, in five or six years from the present writing.

Even if we make allowance for high wages, scarcity of skilled labor, and the difficulty of obtaining materials, this demand of the contractors that they should be given from forty-eight to fifty-two months in which to build a capital ship is simply preposterous, and we can prove it by the following facts:

We know of at least two of the leading shipbuilding yards on the Clyde in which there have recently been completed two superdreadnoughts, sister ships, of approximately the same length (850 feet) as our proposed battle-cruisers, armed with 10 or 12 guns of 16-inch caliber or over, and protected with the heaviest armor, each of which was designed and built in approximately 18 months' time. The SCIENTIFIC AMERICAN publishes these facts on the very best authority and they may be accepted as absolutely correct.

Now, the full significance of this will be appreciated when we remember that there could have been no opportunity to accumulate the material adjacent to the building-ways beforehand, so as to secure a spectacular result in speedy construction; for the plans were not commenced until 18 months before the ship was commissioned. Moreover, the ships were built at a time when the whole of the engineering industries of the country were going under full pressure in the production of military material of every conceivable kind.

This remarkably rapid construction result was made possible by a combination of conditions; conditions which we may, and should, repeat in this country; conditions, which, if we bring them about, will make it possible for us to turn out capital ships just as rapidly as are the British. These conditions are, first, that the government work is given absolute precedence over private work; and, secondly, that the equipment of the yards, both in machinery and men, is worked up to its full capacity. In the case of the British yards, work goes on in two shifts of ten hours each, with four hours' interval for overhaul.

Comparing this with the time actually occupied in construction of our more recent dreadnoughts, we find that the New York (starting, of course, with plans already completed), was launched in fourteen months after the laying of her keel, and the Arizona in sixteen months, and that each ship was completed in thirty-six months. This rate of construction was obtained with only one shift of men, working eight hours per day. It is the opinion of our constructors that with three shifts of eight hours each, the time could be cut down to eighteen months. Both these ships were built at the New York Navy Yard.

It is claimed by the private shipbuilding yards that the impossibility of guaranteeing quick construction is due, in large part, to the difficulty of securing early deliveries of steel, and that, even if these were available there would still remain the difficulty of securing the requisite number of skilled mechanics. Both of these objections could be overcome if the legislation suggested by the Secretary of the Navy were put upon the statute books; and we agree with him that a law should be passed at once, rendering it obligatory upon the steel makers and the shipbuilding yards to give the absolute preference to naval work. If this be done, no hardship will be imposed upon the steel makers; for the sum total of naval and military tonnage would form but an insignificant percentage of the total output of our vast steel making plants.

Thus, the total tonnage required for this year's naval contracts is 383,800 tons; whereas the total output of finished rolled iron and steel in the United States last year was 24,392,924 tons; so that the naval requirements constitute only 1½ per cent of the country's output.

If, with a view to expediting work, the shipbuilding firms were required to put, say, two shifts, upon the more important naval construction, the cost of the ships to the nation would be higher, but the higher cost due to higher pay would be more than compensated for by the rapidity with which the magnificent naval program of 1917 would become available in the country's first line of defense.

A Thirty-mile Railway Tunnel

NOT so very many years have passed since the time when the proposal to build a two-track railway tunnel 30 miles in length beneath one of the great mountain ranges of the world, would have been thought preposterous; but in this day of big engineering achievement, the question of mere physical magnitude is often the least serious element of an undertaking.

During the development of the great railway systems of the world there has been a marked increase in the length, and a relative decrease in the cost and time of construction, of the long tunnels which were necessary to carry the lines across the various continental divides. The most important of these tunnels, at least in respect of their length, are to be found in Europe, more particularly in the Alpine regions, and the following details as to their length and the rate of progress in their construction are illuminating. The first of these, the Mont Cenis, built in 1857-1871, is 7 5 miles in length, and the rate of progress was 7.75 feet per day. Then came the St. Gothard, 1872 to 1881, 9.5 miles in length, in which the rate of progress rose to 18 feet per day. The Arlberg tunnel, 6.5 miles in length, built in 1880 to 1884, was put through at the rate of 27.25 feet per day. The Simplon tunnel, 1893 to 1899, 12.25 miles in length, was built at the rate of 36 feet per day; and the Loetschberg tunnel 1906 to 1911, 9 miles in length, was built at the same rate of 36 feet per day.

It is now proposed by Brig.-Gen. H. M. Chittenden, U. S. A. (retired), to drive a two-track tunnel through the Cascade Range of mountains, which will be 30 miles in length and have a summit elevation not much over 1,000 feet above sea level, the object of this great work being to give a short and easy cut to Puget Sound and the great seaports of the northwest, and avoid the serious interruptions and disastrous accidents, which have occurred of late years on the present high-level railroads across the mountains. The above facts and an elaborate description of the proposed work are presented in an article by Gen. Chittenden in our esteemed contemporary, *Engineering News*, in which the writer goes with sufficient detail into the question of the shortening of the route, the elimination of heavy grades, the methods of construction and the question of cost of construction and reduced cost of operation.

The three tunnels already constructed by the Trunk Lines through the Cascades are the Stampede Tunnel of the Northern Pacific, length 9,824 feet, elevation above sea level 2,837 feet; the Cascade Tunnel of the Great Northern, length, 13.500 feet, elevation, 3,375 feet; and the Snoqualmie Pass Tunnel of the Chicago, Milwaukee & St. Paul, length 11.890 feet, elevation, 2,560 feet. The grades on the approaches to these tunnels range from 1 per cent to 2.2 per cent over distances varying from 10 to 30 miles. The tunnels pierce merely the thin comb of the divide, the approaches for long distances on each side being supported upon precipitous mountain slopes, where they are exposed to slides of rock and avalanches of snow No relief from existing conditions is possible except by building much longer tunnels, and Gen Chittenden suggests a combination by which the railroads concerned might jointly build a low-grade route between Columbia River and the Sound. He suggests, after a careful study of the locality, that the best location would be at the point where the Columbia River, in its great southern swing through the State of Washington on the eastern side of the Cascade Mountains, comes nearest Puget Sound. This point is found at the mouth of the Wenatchee River. The distance between tide water at Everett or Seattle and the Columbia at Wenatchee is barely 90 miles. The valleys of the Wenatchee on the east side of the Cascades and Skykomish on the west side are almost in direct line to each other, and they lead by possible grades not exceeding 0 6 per cent to points on their respective sides of the mountains separated by a distance of only 30 miles.

Regarding the cost and time for construction, the writer bases his estimates on the experience had with the double-track Rogers Pass Tunnel through the Selkirk range on the Canadian Pacific Railway, which is now nearing completion. Progress has been at the rate of about 52 feet per day, which it should be noted is a striking advance on the rate in the Simplon and Loetschberg tunnels through the Alps. To expedite the work, four shafts, from 1100 feet to 2320 feet in depth, would be sunk along the line of the tunnel, and it is estimated that with these four shafts the 30 miles of tunnel could be put through in five and a half years at a total cost of $43,237,000.

As to the operating advantages, the Great Northern Railway would abandon its present railway over the mountains, which has gradients as high as 2.2 per cent and takes three hours for passenger trains and ten hours for freight trains to traverse, and in its place would have a nearly straight and level line, free from risks, and with a passenger time of forty minutes and a freight time of an hour and a half. The Northern Pacific route would be reduced 90 miles in length and 1850 feet in vertical lift, while the average saving of distance for the Union Pacific would be 180 miles by one route and 140 miles by another.

The Nation and Its Oil Reserves

WE are in entire sympathy with the strong appeal which has recently been made by Mr. Frankhn T. Roosevelt for the preservation of certain petroleum reserves for the uses of the Navy. In proof of the vital necessity for an ample supply, now that our future ships are all of them to be oil burners, Mr. Roosevelt points out that the use of oil means more speed; control over smoke conditions, so that advantage may be taken of the "smoke screen"—used so efficaciously by the German Fleet at the battle of Jutland; greater radius of action; reduction of the fire room force; ability to renew fuel at sea, thereby increasing the effectiveness of the fleet by at least 25 per cent; greater safety of vessels against submarine attacks, because of the greater permissible subdivision of the ship. In addition to these are other points well understood by naval experts.

If our oil supply were to run out, or if, for some reason, it should cease to be available, our latest ships and the big fleet which we are about to build would be absolutely useless for the time being, and would remain so for the length of time necessary to make vast changes in their interior construction to render them available as coal burners. Furthermore, the ships as thus changed would be far less efficient.

It is extremely important that we should have a reserve supply in tankage, away from the immediate coastline for reserve in time of war; a supply for current needs, in tankage at fuel ports; and above all a natural underground protected reserve, to insure ample supply for our future oil-burning Navy. Ten years hence the consumption by the Navy may reach 10,000,000 barrels a year, and therefore, it should be one of the first duties of Congress to see to it that the necessary naval oil lands are reserved, whatever the cost. If private individuals have valid claims on these lands, they should be compensated for them, but the oil should be most strictly reserved for naval use only.

Naval and Military Notes

Quick Repairs After Jutland Battle.—According to the leading technical journals, within ten days after the Jutland battle, the most seriously damaged of the British ships was ready to take its place in the line. The great majority of the ships were repaired, had refilled their magazines and replenished their stores, within twenty-four hours after returning to port. This is explained, largely, by the fact that before the ships reached their base, there was full knowledge at the Admiralty as to the extent of damage done and exact details as to plates to be renewed and the new parts of machinery to be replaced.

Channel Tunnel Likely To Be Built.—It has taken this war to bring home to Englishmen the realization of the need for a tunnel under the English Channel—something which the French have long understood. It was announced in Paris last August that France had taken all the necessary steps to enter into negotiations with England for the joint construction of this tunnel, and Premier Asquith, in receiving a deputation favoring the tunnel, has said that the matter would be given full reconsideration either by the War Committee or the Committee on Interior Defense. The tunnel will be about twenty-two miles in length and will cost $80,000,000 to build.

Torpedo Boats as Targets.—The old torpedo boats "Craven," "Stockton," "Stringham" and "Wilkes" are being used as targets in working out torpedo-defense problems. The old boats are anchored and are to be fired upon by vessels steaming at full speed. During recent practice the target boats showed unexpected ability to remain afloat under heavy gun fire. This is due to the fact that their freeboard is so limited that they afford a very small target. These torpedo boats were offered for sale by the Navy Department at the time they were condemned, some three or four years ago, but no bids were received. They are being replaced by destroyers of the same name.

Fate of the "Karlsruhe."—In the earlier part of the war, considerable mystery surrounded the fate of the German cruiser "Karlsruhe," which for several months was engaged in commerce destroying in the West Atlantic. Suddenly, the world ceased to hear anything about the "Karlsruhe" although the British and French Governments made no announcement of her having been sunk. The question has now been settled by the publication of the War Diary of Capt. Lieut. Aust, one of the surviving officers, who states that the "Karlsruhe" was blown up by an internal explosion on the evening of Nov. 4th, 1914, when she was a short distance from the northeastern coast of South America.

Defense of the Panama Canal.—In the event of war one of the very first moves of the enemy would be against the Panama Canal; for the seizure of that waterway would isolate the Pacific coast, so far as any speedy naval coöperation by the Atlantic fleet was concerned. To these facts the War Department, of course, is fully alive, and plans are now under consideration for the reorganization of the government of the Canal Zone. It is proposed to make the military commander also the governor, and organize an army department for the Zone. Eventually there will be 25,500 troops on the Isthmus, and 5,500 civilian employes for the operation of the canal. The troops are now being maintained there at full war strength.

Big Gun versus Dugout.—Among the many amazing developments of this most amazing war is the battle which is taking place between the big gun and deep dugout. Before the war the ordinary six-foot trench with a well-constructed parapet, gave sufficient shelter against shrapnel fire; but with the phenomenal development of heavy howitzer attack, using high explosive shells, the trench became futile for protection and troops were driven underground, particularly when they were thrown on the defensive, as is the case to-day with the German Army in France and Flanders. It is a common experience, when the British sweep over the German position, for them to make captures of troops which are housed from twenty to thirty feet below the surface.

German Submarine Construction.—In the course of an interview with a neutral journalist in Geneva, Prince von Buelow, former German Imperial Chancellor, stated that since the beginning of the war Germany has built two hundred and twenty-five submarines. In this connection we note in "The Army and Navy Journal," that "from an unusually well-informed source," our contemporary is informed that Germany is building seventy-five submarines of the same type as *U*-53, which recently made such a sensational visit to our coast. According to this authority, Germany plans to use twenty-five of these craft against Norwegian ships, twenty-five in general maritime destruction, the balance of the boats being kept in reserve at a submarine base in the North Sea.

Science

Filipiniana.—The Philippine Library at Manila reports that at the end of the year 1915 its collection of Filipiniana amounted to 21,499 volumes. Among the valuable materials recently purchased were the manuscripts of Apolinario Mabini.

Rubber Balloons Wanted by the Weather Bureau.—Before the outbreak of the present war the rubber sounding-balloons used by the U. S. Weather Bureau were imported from Europe. The foreign balloons are now unobtainable and the bureau has been seeking—thus far without success—to obtain balloons of satisfactory quality in this country.

A New Journal of Popular Science.—Plans are on foot to establish under the joint auspices of the National Academy of Sciences and the American Association for the Advancement of Science a monthly journal devoted to the popularization of scientific knowledge. Special emphasis is to be laid upon the authoritative character of the contents and the fine quality of the illustrations.

Hailstorm Insurance is more extensively carried on in Germany than in any other country. During the past 45 years the German hail insurance companies have collected the enormous sum of 1,144,799,000 marks (mark=23.8 cents), in premiums and have paid out 902,426,000 marks in indemnities. During the year 1915 the companies realized a profit of 7,999,975 marks, which was much in excess of their average earnings, and the business of the year showed an increase in insured values of 404,000,000 marks.

Extraordinary Rainfall.—At a "special orchard station" maintained by the U. S. Weather Bureau at Altapass, in the southeastern corner of Mitchell County, N. C., (altitude 2,625 feet above sea-level), 22.22 inches of rain fell during the 24 hours beginning 2 p. m., July 15th 1916. This appears to be by far the heaviest 24-hour rainfall ever recorded in the United States, though heavier falls have occasionally occurred in other parts of the world, the most remarkable being 45.99 inches at Baguio, in the Philippines, between noon, July 14th, and noon, July 15th 1911.

The Extermination of Ground Squirrels from about 209,000 acres of Government land was one of the achievements of the U. S. Biological Survey during the last fiscal year. Of this area about 36,400 acres are on the Fort Totten Indian reservation in North Dakota, and the rest mainly on the Modoc, California, and Sequoia National forests. In North Dakota, where the work has been carried on in coöperation with the State experiment station, no less than five-eighths of a ton of strychnine has been used in the northern part of the state, seven counties having been systematically covered with poison.

Explorations in Central Borneo.—The explorer Carl Lumholtz has recently completed a fruitful expedition to the interior of Borneo, devoted chiefly to the geographical and ethnographical exploration of the upper Mahakam valley. In the course of nine months the expedition covered more than a thousand miles by river in native boats, and nearly half that distance by steamer. Numerous photographs and cinematograph pictures were made of the natives and measurements were secured of 174 individuals, while a number of short vocabularies were collected. Important corrections were made in existing maps of the interior, especially in the watershed region of central Borneo.

Protecting the Elk of Yellowstone Park.—The majority of the elk left in the United States are concentrated in and about Yellowstone National Park. The Biological Survey states that this reservoir for restocking other areas is so important that no pains should be spared to ensure its protection, and a careful investigation of the animals with a view to their future welfare has recently been carried out. A count of the elk made early in the spring of 1916 showed that the southern herd contained about 18,000 animals, which agrees with figures previously published. The northern herd, however, was found to contain only about one-third of the number it had previously been supposed to contain.

The Litchi in the United States.—The Bureau of Plant Industry reports that since its distribution in 1909 of the first inarched plants of the Chinese litchi (*Litchi chinensis*) the question of the hardiness of this tree, the fruit of which is one of the most celebrated products of China, has been under observation. It is now believed that there are areas in Florida and California where the tree may be expected to live and bear if the young plants can be protected or at least escape frost until they become thoroughly established. Excellent fruits have already been grown in this country. The dried litchi "nut," of which there are imported more than $300,000 worth every year, in no way compares in quality to the fresh fruit, which it resembles in appearance.

Radio Communication

Wireless Stations on African Coast.—Military engineers have recently erected a wireless station on Cape Juby on the African coast. In cases of need at sea the service will be available for ships in distress. As the big installation on Teneriffe Island is less than 100 miles from the Cape Juby plant, communication with the Canary Islands is possible and, through them, with the Spanish mainland.

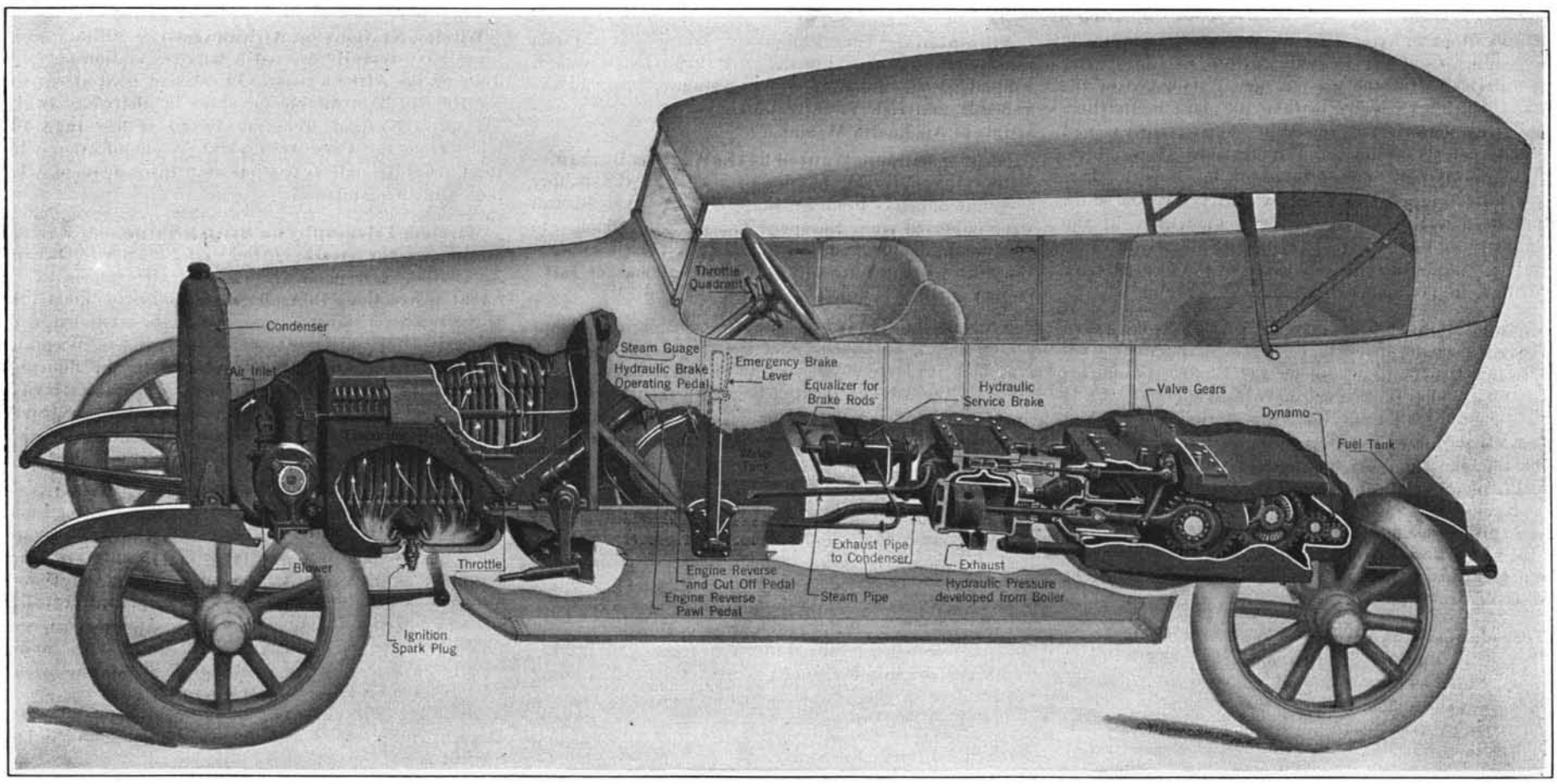
Wireless Telegraphy on British Ships.—At a recent meeting of the North of England Steamship Owners' Association correspondence was read with respect to the recent instructions that all British ships of 3,000 tons gross and over must in the future be installed with apparatus for the transmission of wireless telegraph messages. The Lord Mayor referred to the difficulty likely to be encountered in obtaining operators, and a committee was appointed to consider the possibility of providing a local school of instruction in conjunction with the educational authorities.

Long Range Aeroplane Wireless Apparatus.—One of the wireless sets, employed by our airmen and with which the United States Signal Corps succeeded in communicating over a distance of 119 miles, from an aeroplane, weighs but 60 pounds. The power is furnished by a generator, driven by a two-bladed propeller or fan, and developing 180 watts. Another set, developed at the North Island, San Diego, Cal., flying school makes use of a self-exciting generator, which delivers an alternating current of 110 volts at a frequency of 500. Its total output is about one-quarter kilowatt. The set, complete, weighs about 45 pounds, and it has covered a distance of over 140 miles while flying at an elevation of 7,000 feet. The use of a fan-driven generator permits radio messages to be sent even after the engine has stopped, provided the air speed is maintained.

A Typewriter that Decodes Radio Messages.—There has recently been invented a typewriter which serves to translate and set down on paper wireless messages, so that they may be read by anyone. Briefly, the decoding typewriter is operated by means of two levers, one for the dots and the other for the dashes At the end of the code word the shift key of the typewriter is depressed, actuating all the type which has been locked into place by means of the dot-and-dash levers. Obviously, the user of the new machine is supposed to operate the dot-and-dash levers while the message is being received. While this is quite possible, anyone who has attempted to write down dots and dashes of a wireless message on a sheet of paper will appreciate the degree of skill that would undoubtedly be required in the operation of the new typewriter. In fact, perhaps an equal or very little more practice would result in the mastering of the code, making a decoding typewriter unnecessary.

Hammond's New Radio Boat.—The new wireless-controlled boat built at City Island, N. Y., for John Hays Hammond, Jr., and the United States Government, is 53 feet long and equipped with 400-horse-power gasoline engines. It is named the *H*-4, and is capable of a speed of 24 knots per hour. Recently speaking of his work, Mr. Hammond stated: "A wireless station of special design is located at a point where it will be indestructible or out of range of the fire of the enemy. Then that is connected by land wires to a number of observers situated in concrete turrets along the coast. Each of these observers is enabled through his wire connection to control one torpedo (or vessel). A dozen or more torpedoes may be controlled simultaneously from one station, but each observer will control one. Under the system which we have worked out for some years at Gloucester the accuracy of control is such that we are enabled to strike a bamboo rod one inch in diameter, standing upright, ten out of fifteen times at a distance of three and one-half miles."

List of Radio Stations.—There has just been issued the "Radio Stations of the United States, Edition of July 1, 1916," by the Radio Service of the Bureau of Navigation, Department of Commerce. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at fifteen cents each. The book contains 178 printed pages besides blank pages for additions and presents the following information: Land radio stations, alphabetically by names of stations; ship radio stations, alphabetically by names of vessels; land and ship stations, alphabetically by call signals; special land stations, alphabetically by names; special land stations grouped by districts; amateur stations, grouped by districts, with names of owners, locations, and power, arranged alphabetically by names of owners and also alphabetically by call signals; statement regarding transmission of time signals and hydrographic information by naval radio stations; transmission of weather reports by naval radio stations; international Morse code and conventional signals, and list of abbreviations to be used in radio communication.



New steam car broken away to show details of generator and engine

New Type of Steam Motor Car

Solution of Steam-Car Difficulties by Introduction of Gas-Car Elements

THE Steam Car which forms the subject of these illustrations has attracted the close attention of the automobile engineers of the City of Detroit, in which it was developed and built. The type car, upon which the later models are based, has been three years in operation; and has to its credit a mileage of over 35,000 miles.

The inventor and builder of the car, Mr. Abner Doble, convinced of the inherent advantages of power and flexibility of steam, determined, some five years ago, to apply to a steam car certain elements of quick starting, large radius of action (to borrow a naval term), and ease and certainty of control, which have made the gas car so popular.

He retained the gasoline car radiator with its large condensing surface, thereby securing the condensation of all the steam and raising the capacity on one filling of the water tank to 1500 miles. He retained the carburetor, using a spark plug for ignition, and thereby brought the time of starting down to 1½ minutes with cold water and to less than one minute with warm water. And by introducing the lubricating oil into the water, he at once prevented scale in the boiler and secured a continuous and automatic lubrication of the cylinders.

The following description will show how the mechanical problems involved in securing these results have been solved.

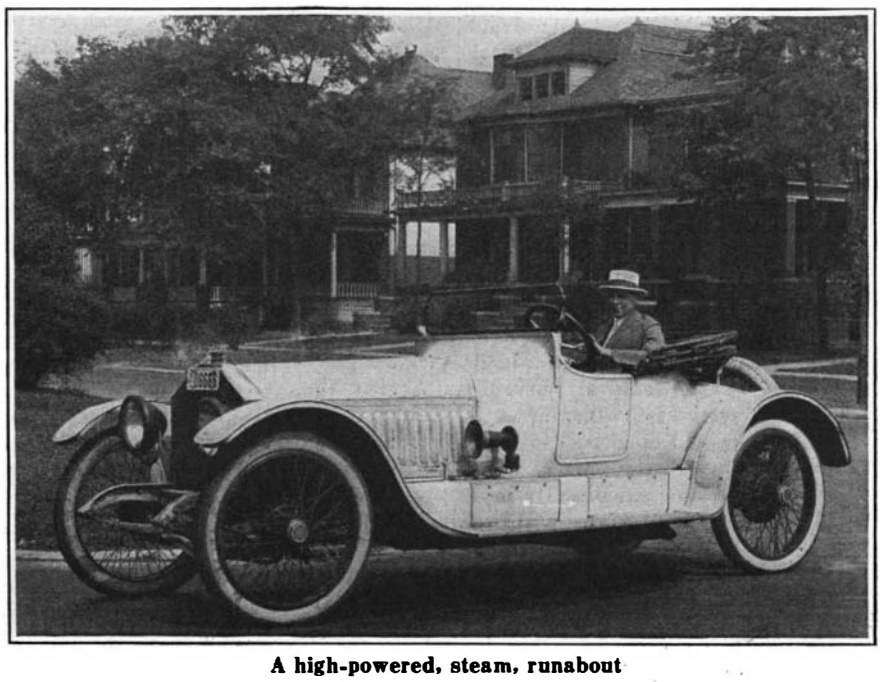
The steam is used in a simple una-flow, double action, two-cylinder, locomotive type steam-engine, with a bore of 5 inches and a stroke of 4 inches. The slide valves are on top of the cylinders, and are actuated by a Joy valve-gear. This gear dispenses with the need for eccentrics, thus making a one-piece crank-shaft possible. Moreover, it gives a superior steam distribution. The gear also reverses the engine without the need of extra devices. The cut-off can be set at any desired point, three being the usual number of cut-offs provided, ¾ cut-off for starting or heavy going, ⅜ for ordinary running and accelerating and ⅛ for high speed and high economy work. The valves are made in two pieces so that they can lift in slow running whenever the compression exceeds the steam-chest pressure. This makes a smooth engine at all speeds and also allows a high compression at all higher speeds and steam-chest pressures.

The piston-rod passes through a special solid cast iron gland, which is made such a perfect fit on the piston rod that no steam can blow by. Due to the long bearing surface there is practically no wear, and never any need for repacking.

The crank-case is an aluminum casting, and contains the entire moving parts of the engine, except the pistons and valves. The differential is also contained in the crank-case, and the taper-tubes of the axle bolt directly to it. Thus the engine and rear axle are one unit.

The main bearings, and the big-end connecting-rod bearings are annular roller, and are of such proportions that no wear should occur during the natural life of the car. All of the other bearings, such as the wrist pins and valve-gear bearings are hardened steel, running in hardened steel bushings. Due to the slow speed of the engine (geared 1 to 1 with the axle) and to the steel bearings, no forced-feed oiling system is necessary or even desirable; and, as the casing is oil-tight, as the oil is kept comparatively cool, and as no carbon, water, or gasoline can contaminate the oil, the oil supply in the crank-case lasts for several seasons. Naturally all parts of the axle are oiled from this same bath.

The efficiency of the engine is due to a combination of several features. Being of the una-flow construction, where the steam travels through the engine in one direction only (*i. e.* from the heads of the cylinder to the center exhaust ports), cylinder condensation is overcome and it is thus thermally efficient. The valves are flat slide valves, accurately fitted, and these in conjunction with a long piston with four perfectly fitted rings, and the fact that there are no exhaust valves should prevent loss of steam due to leakage.



A high-powered, steam, runabout

The power is transmitted to the rear axle by means of two spur gears, a 47-tooth gear on the engine crank-shaft and a 49-tooth gear on the differential gear. There are no change speed gears and no clutch, and the engine has more power than is needed to spin the wheels from rest on a dry pavement.

The water-pumps which keep the boiler supplied are bolted onto the right side of the crank-case and are driven by means of a roller-bearing crank on the end of the engine crank-shaft. In the delivery pipe there is a bypass valve operated by means of a thermostatic tube, which by-passes the water back to the tank when the water-level in the boiler is above normal.

The electric system, to take care of the lights, horn and combustion system, comprises a dynamo and a storage battery. The dynamo is located on the rear of the crank-case and is driven from the main axle drive gear.

After the steam has done its work in the engine, it is led to the top of the radiator, and in passing down through the passages, gives its heat up to the air passing through the radiator and condenses into water. The water of condensation returns to the water-tank, where it enters near the bottom, so that at nearly all times the opening is below the surface of the water. Hence, in accelerating from a slow speed very rapidly, or in pulling slowly up a steep hill or through heavy mud, at which time the draft through the radiator is not sufficient to condense all of the steam, that which thus finds its way into the tank is at once condensed in bubbling up through the water. This not only saves a lot of water in the course of a day's run, but also a large amount of heat which would otherwise become lost.

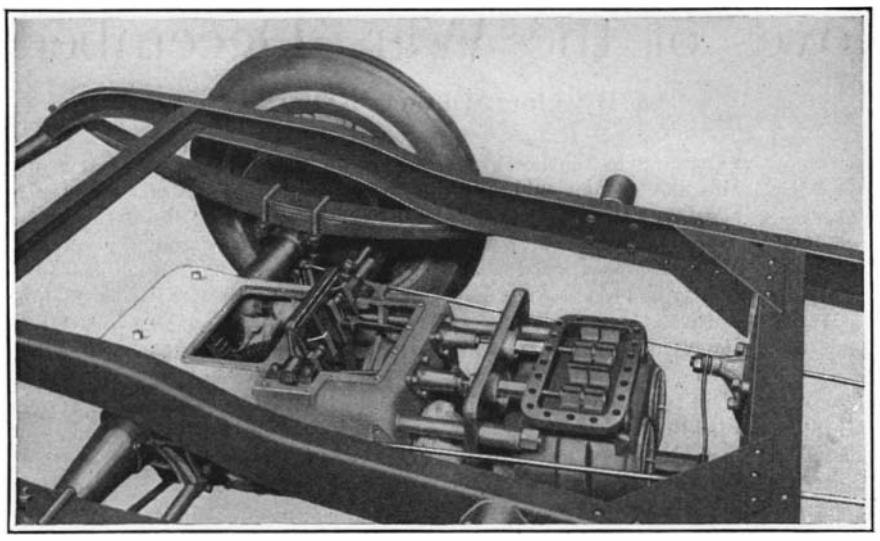
The valves and pistons of the engine, the throttle valve, and the water-pumps are lubricated in an exceedingly simple manner; for a certain amount of oil is put into the water or steam. An easy way is to pour it into the radiator. This forms an emulsion in the water-tank, and it is pumped into the generator along with the water. As the bubbles of steam break through the water surface they take a certain amount of oil with them, thus lubricating the throttle valve, and then the valves and pistons of the engine. The car will travel approximately 8000 miles on one gallon of lubricating oil, due to the entire lack of destructive temperatures, and to the fact that the oil is saved along with the water from the exhaust of the engine. The oil has a remarkable effect on the generator and its operation. It is well known that ordinary waters leave considerable scale in a generator. Of course, since very little new water is used, there is not much scale brought into the system in this way.

The first thing the oil does is to thoroughly coat the entire inner surface of the generator. This coating does not materially obstruct the passage of heat, as it is an exceedingly fine coat, due to the thinness of oil at the generator temperature. This coating of oil prevents scale from sticking to the tubes, so that they remain clean. The scale forms, of course, as the water is evaporated, but

as soon as the scale starts to form it is coated with oil, and, consequently, cannot stick to any other particles of scale, so that the scale remains in suspension in minute particles, which are subsequently taken over with the steam and finally end up in the water tank. The result is that the generator remains clean and preserves a uniform efficiency.

For winter running, enough alcohol is used to prevent freezing at the temperatures encountered. This does not involve much expense, as the car uses very little water in winter, securing as high as 1,500 miles on one supply.

The fuel used is kerosene only. No gasoline is needed for starting. It is stored in a tank at the rear of the chassis, and is made to flow into the venturi tube by a small rotary pump, which is directly connected to the blowers. As the fuel is burned and not exploded, the car starts just as readily in winter as in summer.



Perspective view of the engine and casing with steam chest uncovered

The power plant consists essentially of the steam generating apparatus and the engine, or steam using apparatus. The generator is of the water-tube type, consisting primarily of a number of identical sections placed in an insulated casing. These sections consist of two horizontal headers connected by sixteen vertical tubes. The headers and tubes are made from cold-drawn seamless steel tubing, and the tubes are welded to the headers by the autogenous acetylene process, making the section of one piece of steel.

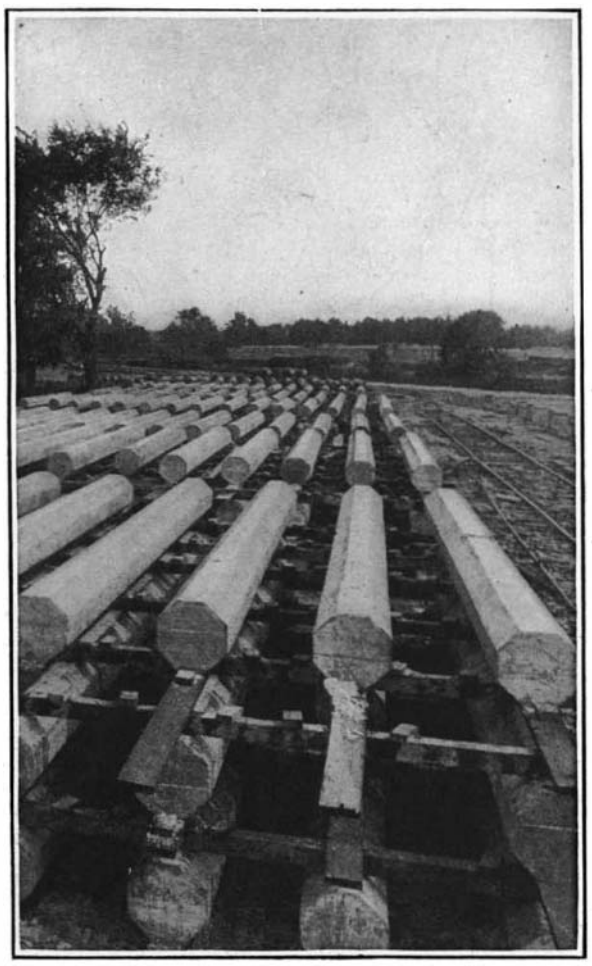
About one-third of the sections are used as the economizer, and the remaining sections form the evaporating part of the generator. The water enters the generator through the lower headers of the economizer and rises through the tubes to the top headers, becoming heated on its way by the gases that have passed through the evaporator portion of the generator. From the top headers of the economizer the water is led through a pipe to the bottom headers of the evaporator sections. The water level is maintained automatically about one-half way up the generator. The steam rises through the upper part of the tubes (becoming superheated on the way) and out through the upper headers into the steam pipe where it is led to the engine. The amount of steam passing being regulated by a throttle valve.

The combustion takes place in a combustion chamber of efficient design, made of a special refractory material, which attains a very high temperature and insures perfect combustion, by heating the gases before they burn, and by its very effective catalytic action. The gases rise past the tubes of the evaporator portion, and are then passed over a bridge wall and down past the tubes of the economizer portion, where the remaining heat units are abstracted by the relatively cool water entering the generator by way of the economizer.

The fuel is burned by means of a system that entirely eliminates any attention or labor on the part of the driver, and reduces the time necessary to start the car from cold by the amount formerly necessary to properly pre-heat the vaporizer. This has been accomplished by taking a few pointers from internal combustion motor design. Thus, the air is made to pass through a device which mixes into it a correct amount of fuel; then this mixture is led into the combustion chamber, where it is ignited by means of an electric spark plug. To cause the air to flow, there is a small blower, driven by an electric motor, such as is used in vacuum cleaners, and this blower forces air through the carburetor into the combustion chamber. All that is necessary in order to start and run the car is to turn the switch to the running position, open the throttle and the car starts off. In case the car has stood inactive for several days, so that everything is cold, it takes about 1½ minutes until the car starts. But after a wait of only a few hours, like over night, the car starts at once. In case the switch is left in the running position, the steam pressure remains at the normal point continuously.

Weather Forecasts by Wireless

THE Weather Bureau reports that forecasts for nine states are now distributed by wireless telegraphy from four points. Those for North Dakota, South Dakota and Minnesota are broadcasted from University (Grand Forks), N. Dak.; for Illinois, from Springfield, Ill.; 1or Ohio, from the Ohio State University at Columbus; and for Iowa, Kansas, Missouri and Wisconsin from the U. S. Naval Training Station at Great Lakes, Ill. These forecast messages are received at about 270 amateur radio stations.



Concrete pile yard at Memphis, Tenn.

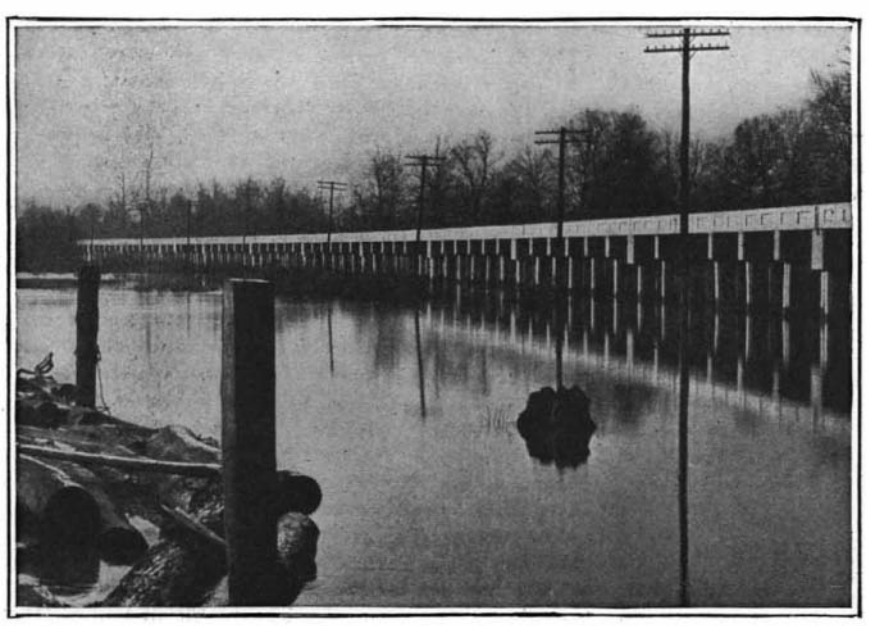
Concrete Piles for Railroad Bridges

MORE and more the utility of conerete piles for all sorts of work is being made clear. The SCIENTIFIC AMERICAN has described several cases of their use, and recent inquiries made by an engineering committee of about a hundred of the leading American railroads, including all those whose lines exceed or approximate 300 miles in extent, have elicited much information showing the extent to which this type of construction has been taken up by the carriers. Not only are concrete piles used as foundations for buildings, bridges and viaducts, retaining walls, conduits, station platforms, docks and wharves, turntables and cinderpits, but the current problem of replacement of the old-fashioned pile and timber bridge is in a fair way toward definite solution by this means. The pile support for trestle bridges of reenforced concrete slabs presents a serviceable and economical substitute for the culvert where the distance to be spanned or the character of the supporting medium is such as to preclude the use of the latter.

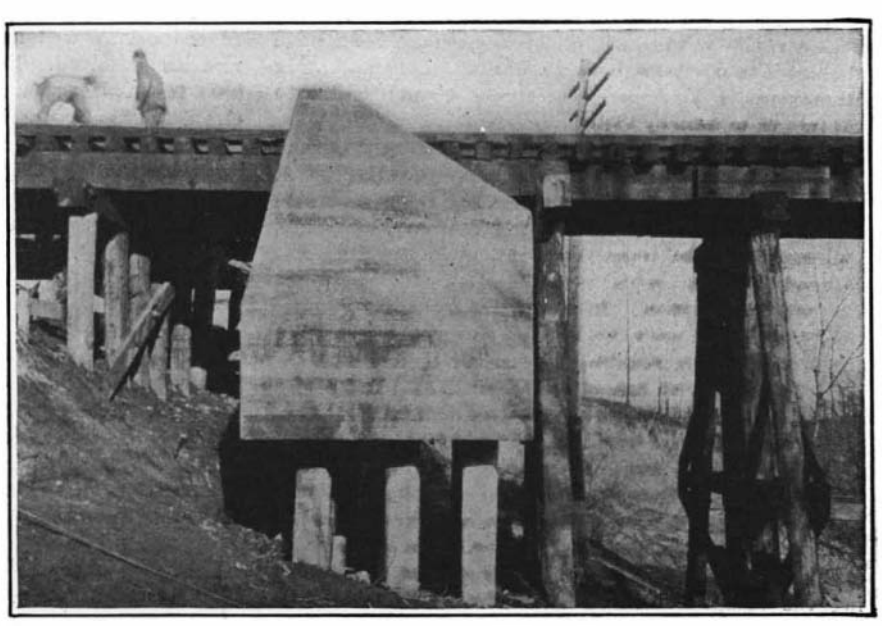
The Burlington road, which was the pioneer with this type of construction, has about 20 miles of concrete pile trestles, some of which have been in service eight years. The St. Paul started manufacturing and using concrete piles for concrete trestles in 1912 and since that time upwards of 30,000 linear feet, have been made and driven. On account of the delay to trains that might be occasioned by driving on main lines of heavy traffic, this company has constructed most of its concrete pile trestles on a second track or on lines where the traffic is not very dense. The Great Northern, the Illinois Central, the Soo line, the Northern Pacific and the Wheeling and Lake Erie are among the roads that make considerable use of concrete piles for trestles. The Great Northern now prefers, however, in place of concrete pile bents, slim reinforced concrete piers extending one to two feet below the surface of the ground, and themselves supported on wholly subterranean piles.

It is the consensus of opinion of the maintenance-of-way engineers of the roads in question that the reinforced concrete pile is eminently suitable for use in trestle bents, that a safe load allowance is from 20 to 35 tons per pile and that the penetration required under ordinary conditions varies from two-fifths to two-thirds the length of the pile, while the maximum projection above the ground recommended varies from 10 feet to 30 feet. Several roads agree on about 20 feet for this maximum projection above ground unsupported while some limit it to about 14 or 16 feet and build slim concrete piers for greater heights.

It is concluded that the pre-moulded type of pile is preferred by the greater number of roads, due partly to the necessity of using this type for trestle work. The octagonal, straight-sided pile about 16 inches in diameter appears to be the most used shape. The steel reinforcement of concrete piles should be designed not only to take a portion of the load that may be placed upon the pile after it is driven, but also to take care of the bending stresses that occur when the pile is lifted either by the middle or by one end, and to withstand the shocks caused in dragging it over rough ground and the jars occasioned in driving.



Bridge of concrete piles on the Illinois Central



Concrete piles supporting abutment of a railroad bridge

Strategic Moves of the War, December 14th, 1916

By Our Military Expert

THERE appears to be more politics than strategy involved in the events of the past week. Germany's offer of peace, coming immediately after France, England and Russia have completed the reconstruction of their respective cabinets with a view to carrying the war in a more vigorous manner, does not seem to be especially well timed. It may be that the German Government is cognizant of conditions within the Allied Nations, not known to the outside world, and that this knowledge convinced the German Chancellor that the present was the most favorable time to offer peace to the world; but it is possible and quite probable that the German mind—without superior, when it comes to make a correct estimate of military situations or strategic requirements, but somewhat uncertain in its judgment of the moral as well as physical strength of Germany's adversaries—has underestimated the sincerity of the Allies' expressed determination to make peace on their own terms. On the other hand, it must be admitted that Germany never has been, and probably never will be, in a better position to "offer peace" than she is at this particular time. Her successful invasion and subsequent occupation of Allied territory have placed in her hands most valuable trading material with which to offset her colonial losses, and until the Allies succeed in reversing the situation, either by regaining lost territory on the western front or by securing such control of the sources of food supplies as to create a condition unbearable to the German people, the physical advantages are clearly on the German side. I am strongly pessimistic on the question of peace in the near future. Without giving too much weight to the comments of inspired or strongly partisan newspapers, I can see many reasons why Germany should desire peace at this time; but I can see just as many equally good reasons why the Allies should want to continue the war in a more vigorous manner than ever before. Be this as it may, it is evident that all these political and diplomatic maneuvers have had a decided influence on the military situation of the past two or three weeks. I have no doubt that when all the facts are published it will be clearly established that the conditions that brought about the changes in the Russian cabinet were directly responsible for the lack of support given to Rumania in her hour of need.

In the meantime, German military strategy, which does not have to wait on the maneuvers of diplomats, moves on relentlessly towards its goal. The Rumanian situation is developing slowly along the lines indicated last week. Such Russian assistance as Rumania may have been led to expect as a result of the cabinet changes that recently took place in the former country has not had time to make itself felt to any appreciable extent. The Rumanian forces made a short and somewhat feeble stand on the left bank of the Jalomitza River, as if to prevent the crossing by the Teutonic forces. This change of attitude did not last very long; the defending army soon withdrew from its position and continued its retreat in the direction of Buzeu. The delay did not affect the Teutonic advance in this sector to any great extent, although it may have been sufficient to enable the Rumanian troops operating to the south and southeast to make their escape from the clutch of the Austro-German army in the north, advancing with a rapidity which, if unchecked, would soon have enabled it to interpose, between Buzeu and the retreating Rumanians, a Teutonic force strong enough either to capture or to destroy them.

The Rumanians having resumed their retreat, the invading armies continued their advance in the northern part of Walachia, where the rivers are fewer and narrower, crossing the Jalomitza River at several points and capturing the important town of Urziceni on the railroad running in a southeasterly direction from Ployesti to Tandarei. Rumania's railroad system has not been of much use to her army in its operations against the invaders or in enabling it to secure a safe and adequate line of retreat east of Bucharest. All the roads of Walachia seem to have been built with a view to assisting the invader from the west and the northwest.

With the timely assistance of Russian troops and the coming of winter, Rumania should be able to prevent the Austro-German armies from crossing the Jalomitza Rivereast of Livedia and taking possession of the railroad east of Slobozia. If in addition they succeed in destroying the bridges at Livedia, Tandarei, Hageteni and Chiora, the Jalomitza River would prove a strong obstacle on which to rest the left of a defensive line extending to the northwest of Buzeu. The success of this movement would depend entirely on the amount of resistance the Rumanians would be able to offer to the Teutonic advance along the Ployesti-Buzeu road. Without strong assistance from Russia, it would be folly to attempt holding any line south of Buzeu.

Up to the present time all Rumanian attempts to stay the march of the invading armies have resulted disastrously for the defenders. Their last stand in the vicinity of Mizil had to be abandoned with the loss of that town, captured by the German forces on the 13th instant, with a large number of prisoners.

In addition to these reverses, disquieting reports are received from the upper Buzeu valley as well as from the Trotus valley, where the Austro-German forces are hammering at the mountain passes with both sides claiming slight advantages. Should the Teutons be able to force their way into these valleys, the Rumanian armies should lose no time in evacuating not alone Walachia, but the southern part of Moldavia as well. I do not now expect that this will be necessary, however, because with the approach of winter there will be very little advance possible through the precipitous defiles of the wooded Carpathian Mountains. In spite of Rumania's heavy losses in men and material, especially in field artillery, her armies should be able to hold the invaders somewhere in the vicinity of the Buzeu River.

We have nothing very definite from the Dobrudja sector, although it was reported some time ago that the Bulgarians had crossed the Danube over the Cernavoda bridge and were operating on Rumanian soil in conjunction with Mackensen's army of the Danube.

The Greek situation, which in addition to its bearing upon the Rumanian situation, controls all operations in Macedonia as well as in Saloniki and to the south, remains unsolved. Desultory fighting is reported to have taken place around Monastir between Italian forces and Bulgarian troops in the western part of this sector, and between Serbians and Bulgars to the north of Monastir. Decisive fighting will not take place in this section until the Allies feel justified in moving away from Saloniki in force, or until the Austro-German-Bulgarian armies to the north of Monastir are sufficiently reinforced by troops from other fronts. This cannot be done for some time, perhaps not before next spring.

Serious clashes are reported to have occurred between French and Greek troops in the vicinity of Katerina, a Greek town recently occupied by the Allies as a precautionary measure. These clashes may hasten the settlement of this question. The necessity of providing for the safety of their base will soon compel the Allies to adopt drastic measures in order to secure compliance with their demands.

The Rumanian Retreat

(1) Urziceni on the railroad runnin to the southeast from Ployesti, reported captured by the Austro-German troops on Dec. 12th.

(2) The valley of the Trotus river where severe fighting for the possession of important hei hts is reported to have taken place recently between Russian and Austro-German troops.

(3) The upper valley of the Buzeu river, where the Teutons are reported to have been checked.

(4) Misil, captured by the Teutonic invaders on Dec. 13th.

The Current Supplement

THE manufacture of munitions for the Allies has been surrounded with much mystery heretofore, probably in many cases because the manufacturers themselves did not know much about what they were undertaking, but gradually the mists are clearing away. In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2138 for December 23d, 1916, there is an excellent series of photographs showing the manufacture of high explosive shells, together with a short article relating to the work. *The Molecular Volumes of Liquids* deals with the characteristics of liquids, depending on their chemical nature, constitution, etc. *The Problem of the X-Rays* is a review and criticism of an important work by an eminent scientist, discussing how an important question of physical science has now been solved. It is illustrated by a number of diagrams. *Psychology and Light* is an interesting discussion of the effects of light on mental functions, a matter of importance both to the engineer and the public. Another paper containing suggestions of wide practical importance is that *On the Natural Method of Learning*. *Power of Growth in Plants* cites some surprising incidents, which have never impressed us, although we may have seen similar cases. Several excellent pictures add greatly to the interest of the note. *A New Bromoil Process* describes an improved method of producing artistic photographic prints, which is particularly applicable to portraiture, as is shown by an accompanying picture. *Road Drainage* is a subject of practical importance to a rapidly increasing proportion of the public, and this article, by a practical engineer, calls attention to the importance of proper road foundations.

A Substitute for Platinum

JEWELERS who use platinum to make costly and attractive jewelry and chemists who need it for important chemical analyses have been in sore straits since the war started because of the great advance in its cost. They are now offered a substitute which is claimed to be as useful as platinum in every respect, at the same time having advantages over the older metal.

Before the war platinum was about 80 cents per gram; now it is $3.85 per gram or nearly $90 per ounce. It is one of the rarer metals and its greatest source of supply is Russia. Beside its use in fine jewelry, it is essential for crucibles in which chemists melt and fuse various ingredients, since it will stand a high temperature without melting, corrosion or other change.

The new substitute has been very recently offered the commercial world by a Cleveland chemical and mining engineer. It is made of some of the metals similar to platinum which are more easily accessible to this country. These are welded and worked together into an alloy.

While the price is the same as that of platinum, its weight is only about half as much, making a piece of the same size as platinum sell at half the price. Like platinum, it is insoluble in the usual hot or cold strong acids or alkalis, nor will it oxidize or tarnish at any temperature. It is also easily worked into various shapes and can be hammered, drawn or spun. It is nearly 20 per cent stronger than platinum and nearly twice as hard.

It bids fair to become an important commercial product and a boon to industrial and scientific research.

The Value of the X-Ray

THE X-ray is becoming more and more valuable day after day. Recently in Cincinnati, a youth who was arrested for striking and injuring seriously a fellow-workman, stated, when arrested, that he was 19 years of age. Upon learning the seriousness of the charge against him, the defendant and his father asserted that he was but 17 years old, and demanded that the boy be at once turned over to the juvenile authorities, as there is a law in Ohio which prevents a prisoner under 18 years of age being tried in a criminal court.

Thoroughly convinced that the youth was at least 18 years old, the juvenile court physician decided to have X-ray photographs made of the epiphyseal bones of his hand, elbow and hip, and also photos of the same bones of a 17-year old youth. Comparison, it was hoped, would then settle the matter, as it is a known fact in medical circles that when a boy reaches the age of 18 years those bones become hardened.

The photographs developed from the X-ray pictures of the bones of the boys, showed that those of the 17-year old boy had not hardened, but those of the defendant in the case had done so. The physician immediately fixed the age of the prisoner as 18 years or more.

The New President of the American Association for the Advancement of Science

By Marcus Benjamin, Ph.D.

THREE times in the history of the American Association for the Advancement of Science, it has met in New York city. First in 1887, when under the presidency of Samuel P. Langley, the father of modern aeronautics a meeting was held in Columbia College, then on 49th St.; again in 1900 with Robert S. Woodward, now the president and director of the Carnegie Institution of Washington, as its president; and finally in 1906 when William H. Welch, America's foremost pathologist and president of the National Academy of Sciences, was the presiding officer. This week the greatest of all American Scientific associations meets again in our midst, and again also at Columbia University, with Charles R. Van Hise as its president-elect.

Charles Richard Van Hise is the son of Henry and Mary Goodrich Van Hise, and was born in Fulton, Wis., on May 29th, 1857. After the usual preliminary studies at various schools, loyal to his native state he entered the University of Wisconsin, in the educational work of which he has ever since exerted a potent influence. In 1879 he received the degree of B.M.E. and a year later that of B.S., and in 1882 the advanced degree of M.S. Meanwhile his ability and promise gained for him an appointment in 1879 to the teaching staff of the University as instructor in metallurgy, which place he then held until 1883, when he was made an assistant professor, and in 1886 full professor, of metallurgy. Coming under the influence of his gifted colleague Irving, he turned his attention to geology, succeeding in 1888, on Irving's death, to the chair of mineralogy, and two years later became professor of Archean and applied geology. In 1892 he was given full possession of the chair of geology which he then held until 1903. Also from 1892 till 1903 he was non-resident professor of structural geology in the University of Chicago.

As he grew in wisdom his knowledge of his specialty was sought in various fields and in 1883 the U. S. Geological Survey, then under Powell, sought and obtained his services. He was assigned to the Lake Superior Division under Irving, whom he succeeded in this particular work also. In 1900 he was placed in charge of the Pre-Cambrian and Metamorphic deposits on the Survey with the rank of geologist, and so continued until 1909, since when he has maintained a consulting connection only. His services to the Geological and Natural History Survey of Wisconsin have been valuable and have extended over many years. They culminated in his appointment as consulting geologist, a place which he relinquished in 1903.

In 1903 came the most important event of his career. The trustees of his Alma Mater, recognizing him not only as the most distinguished almunus of the University of Wisconsin but also as the most capable, gladly called him to the presidency of the University, a place which he has since held. In his inaugural address he said: "I look forward with confidence to the future, with profound conviction that the breadth of vision, which has enabled this institution to grow from small beginnings to its present magnitude, will continue to guide the state, until a university is built as broad as human endeavor, as high as human aspiration." In this spirit he has carried forward the work of the University and has justified his selection to the high office which he fills so well.

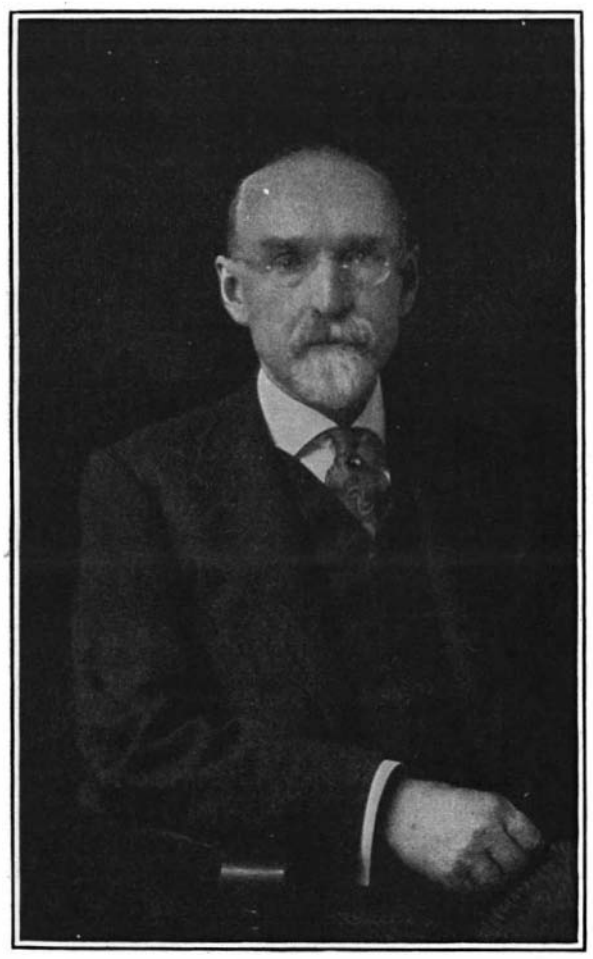
As his vision has broadened he has been invited to act on many important commissions. Among these may be mentioned the following: Wisconsin State Conservation Commission in 1908-15, of which he was chairman, as well as a member of the National Conservation Commission in 1909; also he was chairman of the Board of Arbitration in the controversy between Eastern Railroads and the Brotherhood of Locomotive Engineers in 1912, as well as chairman of the committee appointed in 1915 by the National Academy of Sciences at the request of President Wilson to consider and report upon the possibility of controlling the slides which are seriously interfering with the use of the Panama Canal; and he has been a trustee of the Carnegie Foundation for the Advancement of Teaching since 1909.

He has contributed to the various series of publications of the U. S. Geological Survey many reports and valuable papers on the early geological formations and among these may be mentioned "Archean and Algonkian" (1892); "Principles of North American Pre-Cambrian Geology" (1896); with W. S. Bayley "The Marquette Iron-bearing District of Michigan" (1897); "The Iron Ore Deposits of the Lake Superior Region" (1901); "A Treatise on Metamorphism" (1904), and with C. K. Leith "The Geology of the Lake Superior Region" (1911). For the proceedings of the International Geological Congress of 1893 he prepared a paper on "The Pre-Cambrian Rocks of North America" and in 1900 he published an important paper on "Some Principles Controlling the Deposition of Ores" in the *Journal of Geology*. Since his accession to the presidency of the University of Wisconsin his writings have been confined chiefly to reports on the University, public addresses, and contributions to current literature, notably "The Conservation of the Natural Resources of the United States" (1910) and "Concentration and Control—A Solution of the Trust Problem in the United States" (1912).

In addition to the degrees already mentioned he received in course that of Ph.D. from Wisconsin in 1892, and he has also received the degree of LL.D. from Chicago (1903), Yale (1904), Harvard (1908), Williams (1908), and Dartmouth (1909). President Van Hise is a member of many scientific societies both at home and abroad, among which may be mentioned the Wisconsin Academy of Sciences, Arts and Letters, of which he was president in 1893-6; the Geological Society of America, of which he was president in 1907; the American Philosophical Society; and the National Academy of Sciences, to which he was elected in 1902.

Van Hise's connection with the American Association began in 1888 when he was elected to membership, and two years later he was advanced to the grade of Fellow. In 1901 he presided over the section of Geology and Geography, delivering at the Pittsburgh meeting in 1902 a retiring address on "The Training and Work of a Geologist."

Following the time-honored practice of alternating in the presidential chair a representative of the physical sciences by a representative of the natural sciences, the Association at its last meeting selected a geologist with a reputation second to none in succession to the distinguished astronomer who presided so acceptably at the meetings held in San Francisco and Columbus in 1915. To the honor of association with the immortal names of Dana, Hall, Newberry, Rogers and LeConte there is now added that of Van Hise.



Charles R. Van Hise, President of the American Association for the Advancement of Science

Russian Graphite

THE important graphite mines of Turukhansk were opened up some years ago, and promise to afford a great yield. It may be remarked that the world's annual production of graphite is some 165,000 long tons by recent figures; about one fourth of this comes from Ceylon and one third from Austria, with the remainder from Italy, France and other countries. Russia has two main graphite regions, the first one being situated in Siberia in the Tunkin mountains near Irkutsk, while the second is the one above mentioned. The first region, containing what were called the Aliberoff mines, gave an excellent graphite for lead pencils, but these mines are no longer worked. On the other hand, the Turukhansk mines have scarcely begun working, and are said to be rich enough not only to supply Russia, but also to allow exportation. They were first brought to notice in 1859 and 1862, then commenced to be worked in 1907. Purified graphite from these mines analyzes 98 per cent carbon, showing its high grade, and it comes near the noted Siberian quality, being much better than foreign graphite in general. Geological exploration carried out by the operating company shows a stratum of graphite of no less than 15-foot thickness and covering 450 square yards surface, and the total amount is estimated at 600,000 tons. The depth is about 100 feet. Transportation of the material is cheaply carried out by river route to Krasnoïarsk, then by rail to the leading centers, affording an important source of this substance for crucibles and for metallurgical purposes, as well as for lead pencils.

Indian Mango Plants for United States

A SHIPMENT of forty-five selected grafts of Indian mango plants in eight varieties has recently been made from Madras to a horticulturist in the United States, who will transplant the trees in Florida. The experiment is regarded with special interest by the pomologists of the Department of Agriculture, as mangoes produced in India are considered particularly fine, the ripe fruit of the best varieties being of delicate consistency and agreeable taste, the demand for which is always active.

The horticulturist importing these plants intends to graft them on Florida stock or else to develop a special plantation of East Indian mango trees in the United States in a suitable locality. Mangoes can be grown from seed, but it is the general belief that seedlings rarely produce fruit equal to the parents, and the usual method of propagation is by inarching. The stones are usually sown at the time the fruit is in season and the plants raised from them are potted to be grafted by inarching with desirable plants. This is accomplished in India during the setting in of the rains in the second year of the growth of the seedling. At the close of the rains the union is usually complete. The two principal localities in India where the finest fruits are said to be produced are Mazagon, at Bombay, and Malda, in Bengal.

Diagnosing Auto Troubles

WITH the rapid growth of the service end of the automobile industry the development of specialists has begun to rival the medical profession. In the larger repair stations are men who do nothing but adjust valve tappets; others will be kept busy on carburetor work, and the replacing of gears will be the main duty of a third group.

These lines are all extremely necessary, but the man who can drive a car around the block and tell exactly what is the trouble with it is in a class by himself. He is the examining physician of the repair clinic, and like his more professional brother his work is well spiced with variety.

"I always look for the simplest thing first," said one of these testers the other day. "The average repair man will try all the hard ways he knows to get a machine in shape, and in a large number of cases he will stumble on some simple little thing that is the key to the whole situation."

He went on to say that earlier in his career he had spent half a day on a car trying to find out why it would run well for a quarter of a mile and then stop. It seemed like a stoppage in the gasoline pipe and the line from the tank to the carbureter was removed and thoroughly cleaned. The carbureter was taken off and found to be quite clear of dirt, yet when the machine was again driven it stopped after traveling smoothly for a couple of blocks.

After wasting a half a day the cause of the trouble was discovered in the shape of a stop cock in the pipe line from the gas tank. The handle of the cock was horizontal when in the open position, and the jar of the machine had partially closed it so that gasoline could only flow very slowly. The bowl of the carbureter would fill up while the car was standing, and as soon as the gasoline in the float chamber was exhausted the engine stopped.

Many people have the bad habit of adjusting their brakes without the use of a jack. Without raising a wheel from the ground it is almost impossible to determine whether the brake is set up tightly enough to drag when the pedal or lever is fully released. Frequently this difficulty leads to the taking of the car to a service station with the complaint that the motor will not pull, and refuses to climb ordinary grades on high gear. Sometimes the service people get a car in this condition, and find that the owner has tried to compensate for his brake drag by changing his carbureter to give a richer mixture.

Recently an owner telephoned to a service station for an expert, saying that his car absolutely refused to start after the most patient efforts. The owner had tried priming, and hot water in the radiator, but not a single explosion was forthcoming.. One look, however, was sufficient for the expert. A bright new coat of aluminum paint covered the engine from the tops of the spark plugs to the crank case, and served to short-circuit the ignition apparatus most effectively. "He even painted the porcelain on the plugs," laughed the service man, "and it took me two hours to clear the generator and starting motor. A few experiences of that kind make us realize that it is a pretty broad claim to call a motor car fool proof."

How Waste Paper is Treated to Make New Paper

An Account of Processes and the Difficulties to be Overcome in Removing Printer's Ink

By Thomas J. Keenan, F. C. S., Editor of *Paper*

THE recent extraordinary rise in the price of paper, resulting from abnormal demand and curtailed supply, has again directed attention to the possibilities of reclaiming waste paper by the application of methods for the removal of printer's ink. Processes innumerable have been devised for achieving this result, with and without the use of chemicals. The ideal system of treating all grades of printed paper so as to produce a clean white pulp capable of conversion into new paper of the same quality as the original seems, however, to be as far off as it was when experiments were first undertaken a century ago. It is a problem that has long engaged the attention of investigators, and is now being studied anew as a corollary of the European conflict. For it is the existence of war in the great pulp and paper manufacturing centers of Europe, with the consequent interruption of supplies of both raw and finished materials, that has caused scarcity and increased demand here as well as abroad.

There has never been much difficulty in the treatment of the superior grades of magazine and book papers for the removal of printer's ink and conversion of the pulp into clean paper nearly equal to the original sheet; indeed, many of the trade journals are now printed on converted paper of this sort. Here the original sheet happens to be formed out of cooked woodpulp consisting of nearly pure cellulose, a substance that will stand boiling in alkaline solutions and subsequent bleaching without undergoing further discoloration or material damage to the fibers.

With ordinary newsprint paper the conditions are different. Of course this can always be disintegrated and reduced to pulp for subsequent conversion into an inferior grade of wall paper, or used for the manufacture of paper board and wrapping paper. But the body of newsprint paper is composed of raw, uncooked wood, with merely sufficient chemical fiber or cellulose to hold it together, and enough clay and sizing to fill up the interstices of the fibers and impart a surface to the finished sheet so as to make it capable of taking an impression. In addition to the discoloring action of strong alkaline solvents of printer's ink, this fiber is affected even by the ordinary bleaching agents.

To be sure, the treatment of papers printed chiefly with soluble inks and dyes does not offer much difficulty, as these coloring matters are soluble in water or any stronger chemicals, such as acids and alkalies. In many cases the mere soaking in water is sufficient to remove the ink and to give pulp of a fairly white character. With paper bearing ordinary printer's ink the case is different. This ink consists of a pigment, usually carbon black or animal black, combined with a vehicle in the shape of a rosin varnish with a mineral or a vegetable oil as solvent. The more expensive inks use linseed oil partly oxidized by boiling to a varnishlike consistence.

Copyright, American Press Association

Bales of assorted waste paper near the Brooklyn Bridge ready for shipment to the mills

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Sorting out the various grades of waste paper

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Valuables are sometimes found among the waste

The many patents which have been taken out in the hope of removing printer's ink from waste newspapers have been based mainly on the use of some form of alkali. In the case of varnishes made with vegetable oil vehicles, like linseed, which saponify fairly well on treatment with alkali, the oily constituents of the ink are converted into a soluble soap and the ink is consequently more easily detached from the surface of the paper. If it were then possible to treat the paper superficially and carry away the dissolved and the loosened constituents, there might be some chance of more or less complete removal of the ink. But the pigment constituents of the ink, namely, the minute particles of carbon, are not in any sense attacked, being merely freed from their combination with the varnish, and any attempts to remove this pigment constituent must rely entirely upon mechanical means. Resort is usually had to some form of sieve, such as an ordinary drum washer revolving in the vessel containing the old paper suitably pulped, or by passing the pulped paper treated with the alkali or soap over flat sieves.

There are two defects in any process based on this system of washing; first, a serious loss of weight, owing to the removal of a very large proportion of the clay and small fibrous matter from the original paper, and second, the impossibility of taking out the whole of the carbon. The final result is merely a pulp of grayish color, somewhat stronger than the original newspaper, but with its weight seriously diminished. Hence the cost of treatment is higher than is warranted by the quantity and quality of the product. It need hardly be pointed out that the introduction of mineral oils not easily saponified by alkali has rendered the case still more hopeless, since the oily constituents of the ink are not made soluble by the addition of alkali, and the reduction of the paper to pulp for the purpose of washing does not effect any material change in color.

Notwithstanding the difficulties attending all efforts to repulp waste paper economically, a large tonnage of book paper is produced from this source annually in many mills throughout the country. The bulk of the paper made from old magazines is used in the printing of trade journals and the cheaper illustrated weeklies, but some mills send their entire output to mail order houses for use in the publication of their catalogues. In such a mill the regeneration of the waste paper is accomplished in a simple manner. Care is exercised to exclude from the material all paper made of mechanically ground woodpulp. Suspected sheets are dabbed with a strong solution of nitric acid and if the spots turn brown, rejection follows; or a solution of phloroglucinol in alcohol containing 2 per cent of hydrochloric acid will give a quick indication of the presence of ground wood by turning it pink.

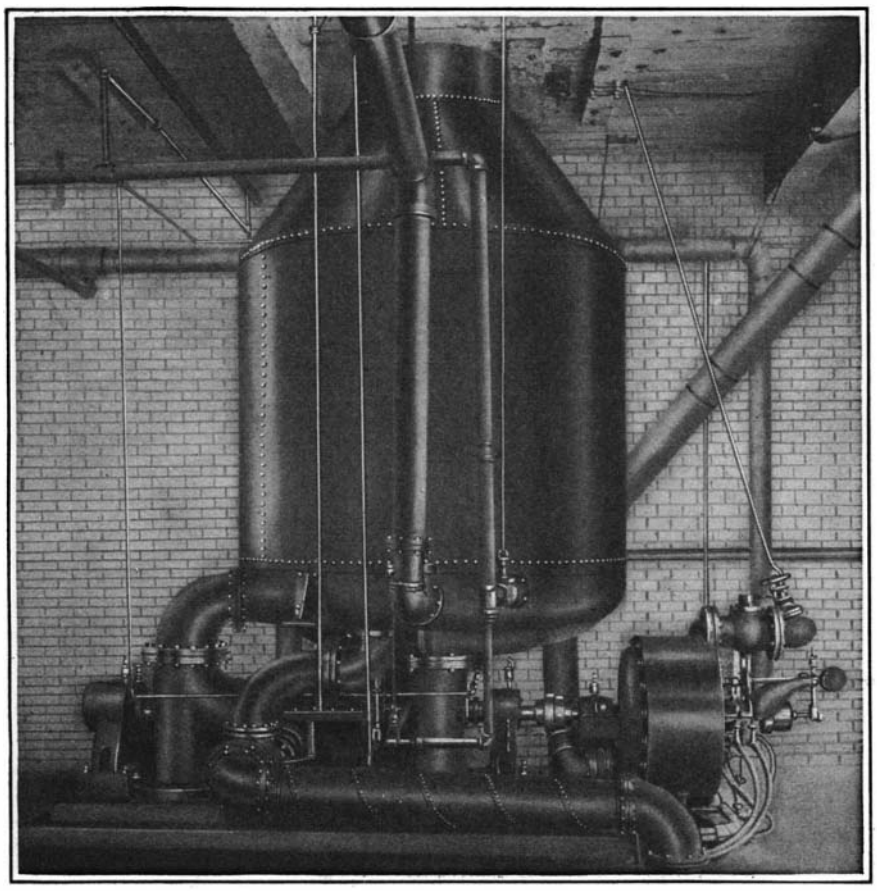
After a rough tearing process followed by a dusting operation, the mass of waste paper is loaded into large steel boilers capable of holding several tons of material. The boiler is then filled with a weak solution of about nine parts of soda ash in 100 parts of water. The contents are then heated by steam to a certain temperature, well under the boiling point; too much heat would disintegrate the fibers and loosen up the sheet more than would be desirable. The object sought is a mere surface loosening of the ink, in order to facilitate the subsequent washing process, before the pulped material is subjected to the ordinary operations of paper-making.

During recent years the attention of experimenters in the conversion of waste papers into good pulp has been directed to mechanical means of brushing the adherent ink from the paper after it has been loosened by treatment with an alkaline solution. This object has been attained to a greater or less extent by two inventors of machinery for reclaiming old paper, one in Germany and the other in the United States. Under

the German invention the printed or written old paper is thrown, in measured quantities, into a cylindrical screen. This revolves in a vat containing a weak solution of soda ash, bisulphite of soda and another alkali that exerts a bleaching as well as a solvent action. The slightly heated alkaline liquor permeates the paper and saponifies the printer's ink, which is dissolved away. By the revolving motion of the cylindrical screen or drum the paper is gradually reduced to a coarse pulp, some of the larger pieces of paper often resisting the treatment. After 10 or 15 minutes of churning the charge of partly pulped material is transferred to another machine, where the adhering lye is separated from it to be used over again in the first soaking drum. The pulpy mass is then treated with fresh lye and washed with water in a disintegrating machine where the finest particles of color and dirt are removed from the fibers. When this process is completed and the fiber pulp is separated completely from the dark fluid that contains the mineral ingredients (clay, etc.) and the saponified printing ink, the mass of fibers is moved slowly forward on a long, narrow, close-meshed, traveling screen of wire. Here the superfluous water is abstracted. On its way the mass is sprayed vigorously several times by water from sprinkler pipes, being thereby stirred up, washed out and freed from the last traces of dirt and lye. The greater portion of the washing water runs off during the washing process, the remainder being removed by a pressing roll arranged at the end of the traveling screen. From the rolls the now finished pulp is removed by a scraper to be returned to the stuff vat of the paper machine, either directly or after preliminary mixing with clay, size and other substances required in the production of different papers. One of the advantages claimed for this invention is an economy in material, as none of the long cellulose fibers are lost in the washing, conducted as it is over a fine meshed screen.

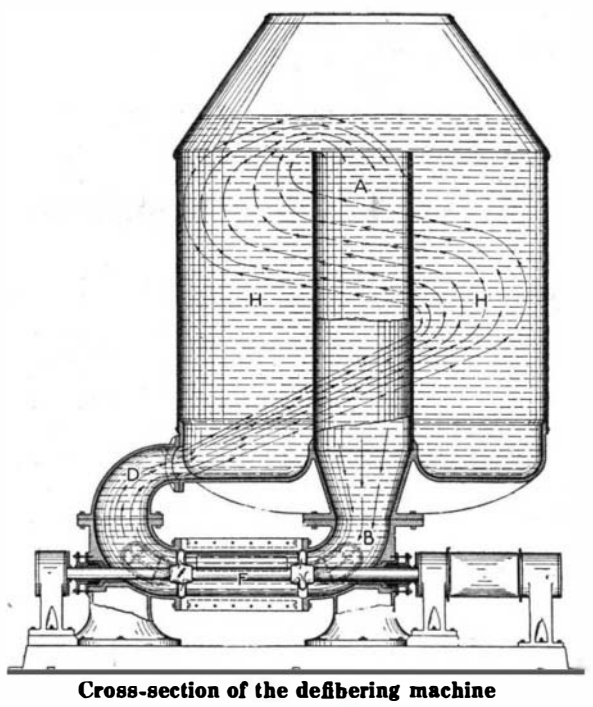
The American invention, known as the Winestock process, is distinguished by several novel features, most important of which is the maintenance of a rapid and steady circulation until all the stock is defibered. The design of the apparatus is shown in the accompanying illustration. It will be seen that circulation is maintained by a pair of propellers situated at the bottom of a tank equipped with a draft tube. These propellers are driven at a high rate of speed, the intent being to have the blades strike the floating particles of paper with such quickness that, embedded as they are in water or a weak alkaline solution, they are unable to take up bodily the rapid motion of the propeller blades, and therefore are pulled out, defibering the paper without materially shortening the fiber, while at the same time loosening the ink. The propeller performs the secondary function of producing rapid circulation of the material without the necessity of using a pump. The blades are overdriven or cavitating screw propellers similar to those used in marine work. The ink removal is effected by a combination of the loosening action due to defibering and the scrubbing action of the blades in the presence of a mild alkaline detergent. The detergent and defibering action of the Winestock process is said to be so efficient that the recovered stock requires no bleaching. This is an advantage of great weight, particularly since small amounts of ground wood are liable to creep in despite careful sorting, and render the color unsatisfactory if bleaching is depended upon.

A technical description of the sequence of operations and machines in the Winestock process may have suggestive value for those interested in the general subject of waste paper recovery. The paper, according to its condition, is first sorted by hand, or dusted in a duster and afterwards sorted, the former procedure applying where the stock is reasonably clean. The paper is then torn and further dusted by a "railroad duster," or its equivalent. The paper is next conveyed by a belt or apron or by an air conveyor up to a soaking tank with agitator, in which it is thoroughly wet in plain water at about 160° Fahrenheit. This tank is so placed that it can quickly charge the Winestock machine, which works in batches. The water in the tank is preferably heated by the exhaust from a steam turbine driving the machine. If this arrangement is employed, the steam from the turbine may be discharged directly into water, since it is not contaminated with oil. The pulp from the Winestock machine requires only washing, or at most, washing and brushing out in a Jordan refining engine to render it suitable for use in the manufacture of new paper.



Machine with which the waste paper is defibered

Although it is possible, without the addition of any new stock, to make a good quality of book paper from pulp recovered by the Winestock process, it has been found desirable to add a small percentage of fresh sulphite pulp to the material in the beating engine.



Cross-section of the defibering machine

Unusually good results have been obtained with the Winestock machine in the cleansing and defibering of waste newsprint paper. After treatment and washing in water, the recovered pulp is found to be of a yellow, natural wood color which can be toned to the tint of ordinary newsprint paper by means of blue and red dye and, to some extent, by the use of clay as a filler. In experimental operations witnessed by the writer the recovered fiber from mixed papers showed good color strength and appearance and it was evident that the material could be worked back into papers nearly identical with those from which the fiber was recovered.

A special soap compound is prescribed for use with the Winestock machine. This consists of tallow saponified by caustic potash in combination with a saturated solution of soda ash containing waterglass (sodium silicate) and aluminum chloride. It is possible, however, to remove certain kinds of ink by the violent mechanical action of the propeller blades in a bath of hot water alone. As will be understood, the effect of the detergent or soapy compound on heavy printing ink is to saponify the fatty material that carries the pigment. This pigment, usually vegetable or animal carbon, upon being set free from the linseed oil or other fatty acid or rosin used as a vehicle, tends to float on the top, from which it can be easily removed.

Although papers produced wholly or largely from previously manufactured material may be made to resemble in appearance the original sheet, they are never of the same quality, and must consequently serve an inferior purpose. This has been pointed out by Cross and Bevan in their *Text-book of Paper Making* in a reference to the damage to fibers caused by a second operation: "In their second

(Concluded on page 579)

Concrete Cottages from a Catalogue

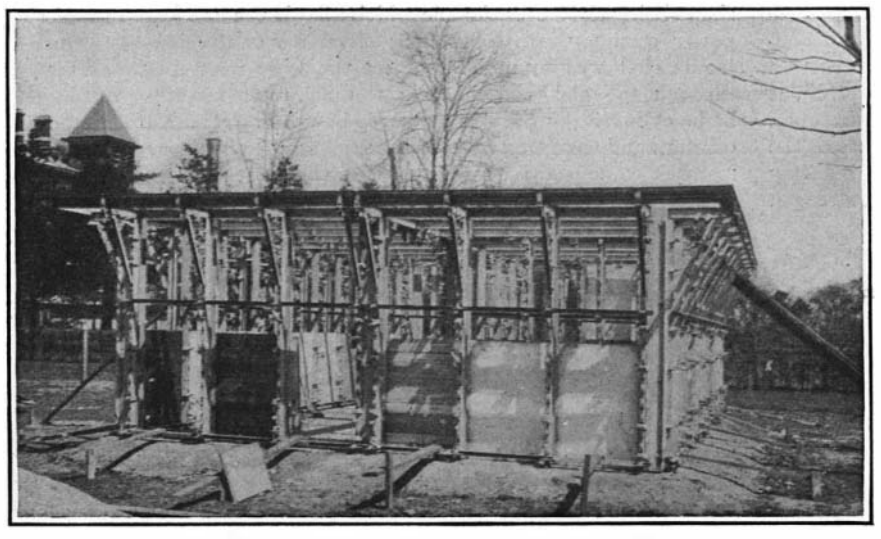
By F. C. Perkins

WE have had the "stock" house, the parts for which are selected from a printed catalogue and ordered by number; and now we are offered a variation upon the same theme in the concrete cottage poured in stock forms of pressed steel. It is claimed that these forms enable concrete houses to be built for much less than the cost of frame cottages with either solid or hollow walls; and their advantages in convenience over these, as well as over the wooden forms cut and nailed up on the premises, are obvious. The forms come in multiple sizes, on a basic unit of 4 inches, and are completely interchangeable; so the prospective builder of a house can modify to suit himself any of the dimensions of his Castle in Spain, subject to the single restriction that all his measurements must be multiples of 4 inches.

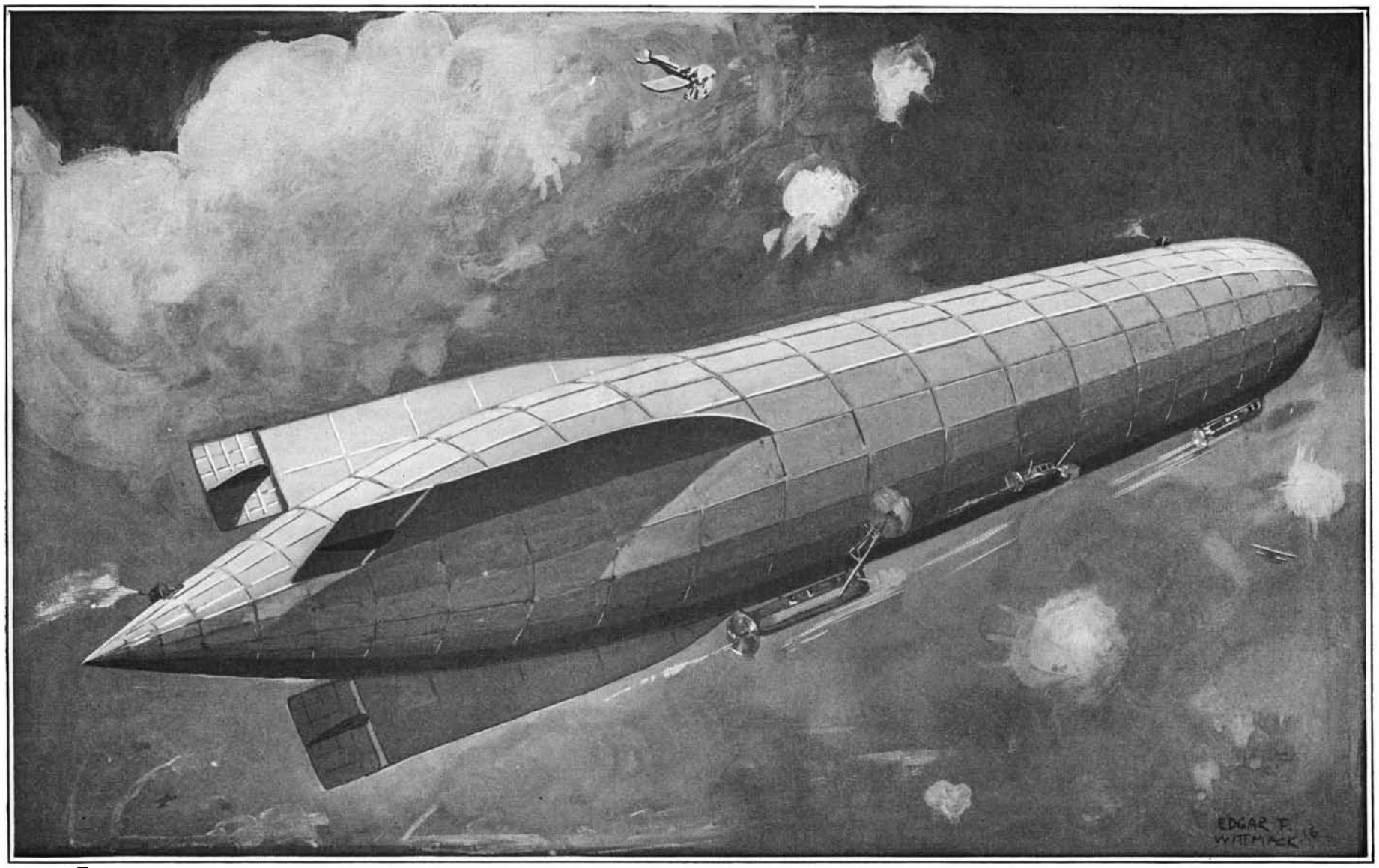
As our illustration makes clear, the forms consist of two essentially distinct portions—the girders which go to make the supporting framework, and the plates which serve actually to mold the concrete. All joints are made with clamps and wedges, and these are securely fastened in their places, so that there are no small loose parts to become detached and get lost. Heating ducts, electric conduits, water pipes and so forth are put in place after the framework has been erected and before the plates have been put on. The steel girders and plates are as light as it is possible to make them while retaining sufficient strength and rigidity to produce straight and accurate walls. A smooth, even finish is obtained, so that plastering and patching are unnecessary; and where time is no consideration it is perfectly feasible for two men to erect and take down all the forms for an entire house.

There is much flexibility in the use of these forms. A single story may be set up and poured at a time, and many of the plates used again for the next story; or the whole structure may be lined up first, and the pouring then done, all at a single operation. In following this course, it is often advisable to avoid dropping the concrete a long distance by temporarily removing single plates to afford a chute for pouring. Another method of procedure is to erect the entire frame, or a large part thereof, and then lay the plates a single row at a time, pouring each layer immediately these are in position.

Not only may forms for cottages be secured, but for barns, garages, ornamental boundary walls, etc. The forms for one story of a house about 24 feet by 32 can be set up by four men in two days; and by using three sets of ribs and one of plates a story can be poured every day in good concrete weather. After the concrete has been in place for 24 hours the plates are removed by simply loosening the wedges and turning the clamps. The uprights can be left in place a day or two longer as a measure of safety to support the wall, and the plates can be moved to another story or another house. The ratio of three times as many ribs as plates is one which experience has shown to lead to the most economical prosecution of the work.



Molds and framework for the catalogue cottage



Three-quarter rear view of a recent type of Zeppelin, 680 feet long and 72 feet in diameter, which is propelled by six motors, developing 1,500 horse-power

Evolution of the Rigid Airship Design

Present Status of Zeppelin Construction

By Baron L. d'Orcy, M. S. A. E.

INDICATIONS are at hand showing that Germany's practical monopoly in Zeppelin construction is being gradually overcome by other nations, for it is common knowledge that at least two Great Powers are at present experimenting with rigid airships; what is more, it is announced that the U. S. Navy Department is now also considering the desirability of laying down such aircraft. It seems fitting in view of these facts to recapitulate here briefly the evolution of the rigid airship from its very inception so that suitable deductions might be drawn from past failures and successes. For the sake of convenience the structural items of the rigid airship, such as the hull, the cars, the propelling apparatus and the control surfaces will be reviewed here separately.

THE HULL.—David Schwartz, the Hungarian engineer actually fathered the rigid airship, for, having built two such craft as far back as 1893 and 1895, he first employed the method of building up the hull frame of longitudinal girders and crossrings. This system has victoriously withstood the test of time; it is not only used up to date in the Zeppelin, but was also employed in the British Vickers and the French Spiess airships, and even the Schuette-Lanz design which originally substituted for the longitudinal girders a spiral cross lattice work of laminated wood, promptly reverted to it in the second airship.

The material used in the frame of the early rigid airships was practically pure aluminum which Schwartz employed in the form of tubes and Count Zeppelin in the form of lattice girders; the great brittleness and consequent unfitness of this metal for airship construction revealed itself when one of Schwartz's airships burst upon being inflated while the other one broke up upon landing, not to speak of the countless collapses the early Zeppelins suffered. Since the aluminum industry has produced zinc-aluminum alloys whose tensile strength approaches that of cold rolled steel for but one-third the latter's weight, rigid airship hulls have become less apt to break up on coming somewhat roughly in contact with the ground; still this danger permanently exists in a lesser degree and it appears that the only way to overcome it would consist in adopting the wire bound wooden trelliswork of Schuette-Lanz pattern whose springiness constitutes its greatest asset, although its unit weight is greater than that of a Zeppelin hull.

One of the most important items of an airship is the shape of its hull for this determines the amount of air resistance that must be overcome, the most favorable

Courtesy of *The Aeroplane*

Triangular aluminum trellis girder of a Zeppelin airship

shape being obviously the one which affords the greatest power economy. In Schwartz's days it was the projectile that was supposed to meet the least resistance through the air; consequently the Schwartz airships had a cylindrical form with a pointed bow, and a rounded off stern and were only four diameters long. Laboratory research work has since revealed that the most efficient airship hull is one six diameters long with the master diameter at about 40 per cent of the length from the nose, the general shape being elliptical and the nose somewhat blunter than the stern. This hull shape is now being used by all airship builders but the Zeppelin Co. which still adheres to the characteristic pencil shape of 9 to 10 diameters length, although some concession to modern ideas may be found on the latest models in the blunt bow and conical stern which have taken the place of the formerly symmetrical arched points. The most plausible explanation for this seemingly uncalled for conservatism seems to be the fact that standardization of parts is infinitely more simple for a hull which is straight sided over three-quartes of its length, where its crossrings are consequently of the same diameter, than for an irregular ellipsoidal shape. And since all the girder rails and web pieces of a Zeppelin are punch pressed the importance of having a small number of sizes becomes self-evident. Another reason why Germany seems unwilling of giving up the classical pencil shape of Zeppelins is found in the size of her airship sheds which were built large enough to take care of future increases in size for a given ratio of length to beam only, so that by suddenly decreasing the fineness ratio of the latest Zeppelins to 6:1 none of Germany's pre-war sheds would afford a berth of sufficient width for these leviathans. In this country where no such conditions prevail, airship designers could well afford to avoid drawing their inspiration exclusively from German sources, for it seems that American ingenuity coupled with a proper training *both* in engineering and aerodynamics should utlimately produce something better than the Zeppelin.

It is interesting to note that on the latest known type of these airships the gangway which formerly was

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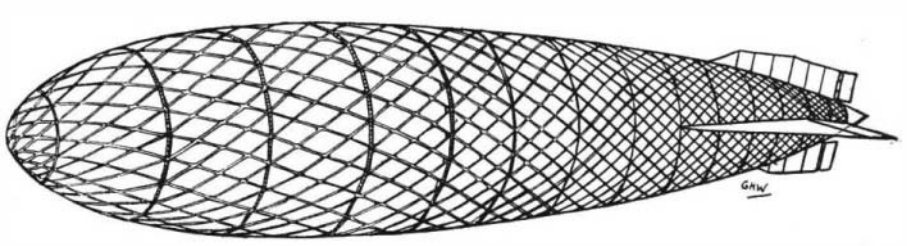
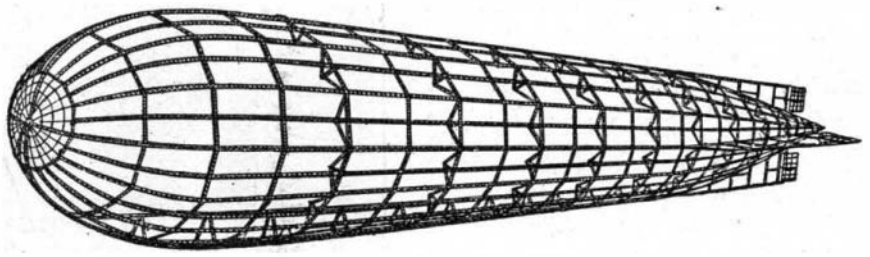
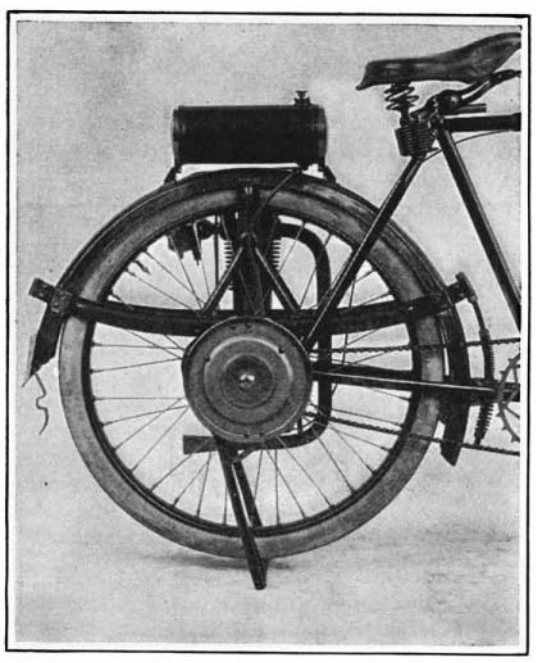


Hull frame of a Schuette-Lanz airship, made of laminated wood trelliswork and kept under tension by wire bracing



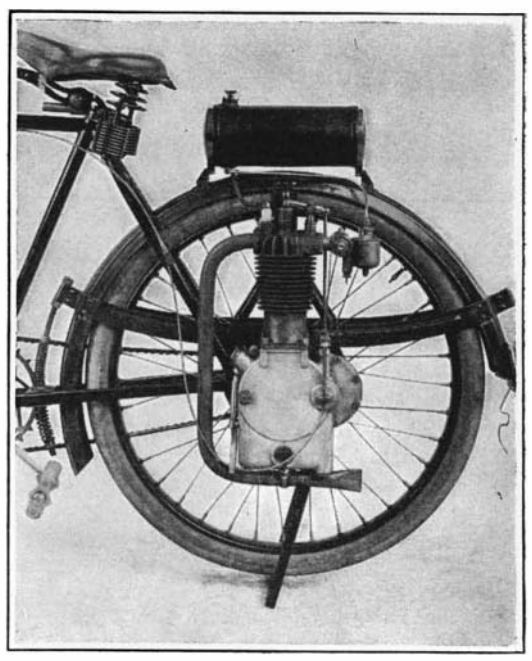
Courtesy of *The Aeroplane*

Hull frame of a modern Zeppelin airship, made of aluminum-alloy trellis girders. Note king post bracing on polygonal girders



Right side of motor wheel, showing flywheel

Bicycle motor wheel attached to a bicycle, as it appears in use



Left side of wheel, showing engine and attachment

A Power Plant for a Bicycle

THE lure of the open road is daily becoming stronger with the public, for everyone appreciates a pleasant run or a picnic in the country, which constitute most attractive forms of popular relaxation. The automobile is of course the most efficient means for enabling people to enjoy these pleasures, and noting the ease with which this vehicle fills its purpose bicycle riders have long wished for some method of applying power to their light and convenient mount that would relieve them of someof the labor of travel, as well as enabling them to extend the radius of their travels without increasing the exertion.

To meet this demand many schemes have been devised for adapting a gasoline motor to the bicycle, but in most of these there have been objectionable features and although more bicycles are in use to-day than ever before, the number fitted with power is very small. If the power plant is attached to the frame of the bicycle it usually develops that the machine is not strong enough to carry the added weight and withstand the vibration of a fast-running engine, which moreover is not entirely comfortable; and if the power is applied as an auxiliary attachment, the outfit becomes somewhat cumbersome and loses some of the desired traction. At the recent motorcycle show at Madison Square Garden a new power plant that can be applied to any bicycle was disclosed, which appears to meet the requirements of the bicyclist in a very satisfactory manner.

As will be seen from the accompanying illustrations the power plant is incorporated as a unit with the rear wheel. It is not an attachment to be placed on the ordinary wheel of the bicycle, but a specially built wheel, complete with all necessary mechanism that is substituted in a few minutes for the regular wheel. This is a very desirable feature, for this special wheel is very strongly built, with special rim and heavy spokes, thoroughly adapted to carry the weight of the motor, and to stand up under the application of power, which an ordinary bicycle wheel is unfitted for.

The engine is an unusually neat little four-cycle gasoline motor of two horse-power, which will drive the outfit as fast as is safe for a bicycle on ordinary roads, with an ample reserve of power for hills. To meet any question of balance, from the engine being located on one side of the wheel, the main shaft of the engine is extended right through the hub of the wheel, and the flywheel is mounted on the right side of the rear wheel. This has the additional advantage that it permits of substantial and well arranged bearings for the main shaft. An ingenious ignition magneto is built into the flywheel; and the drive to the road wheel is through spiral cut, nickel steel gears. There are two connections between the bicycle frame and the power unit. The rear fork ends are attached by bolts to a pair of collars that support the power plant, which pivots on these bolts. A pair of pressed steel arms, which also support the mudguards and gasoline tank, bridge the road wheel on each side and are attached to the collars of the power unit. At the forward end of this yoke is a curved rod that passes through a clamp fixed to the forward part of the rear forks of the bicycle frame, just behind the crank bracket; and threaded on this rod are two helical springs, one above and the other below the clamp. This arrangement of yoke arms and springs permits the power unit to rock on the pivots formed by the rear connecting bolts, which not only cushions all shocks of the drive when starting, but also acts as a spring frame that softens the road shocks to the rider.

The control of the motor is through a single Bowden wire connecting with a small finger lever on the handlebar. The outfit weighs only 57 pounds, all of which is available for traction, and the half-gallon tank carries enough fuel for a trip of 50 miles. All moving parts are carefully protected from dirt and particular attention has been given to simplicity in removing the cylinder for cleaning, etc. It may be noted that the designer of this outfit is one of the oldest and best known motorcycle engineers in the country, who thoroughly knows the requirements of two-wheeled vehicles.

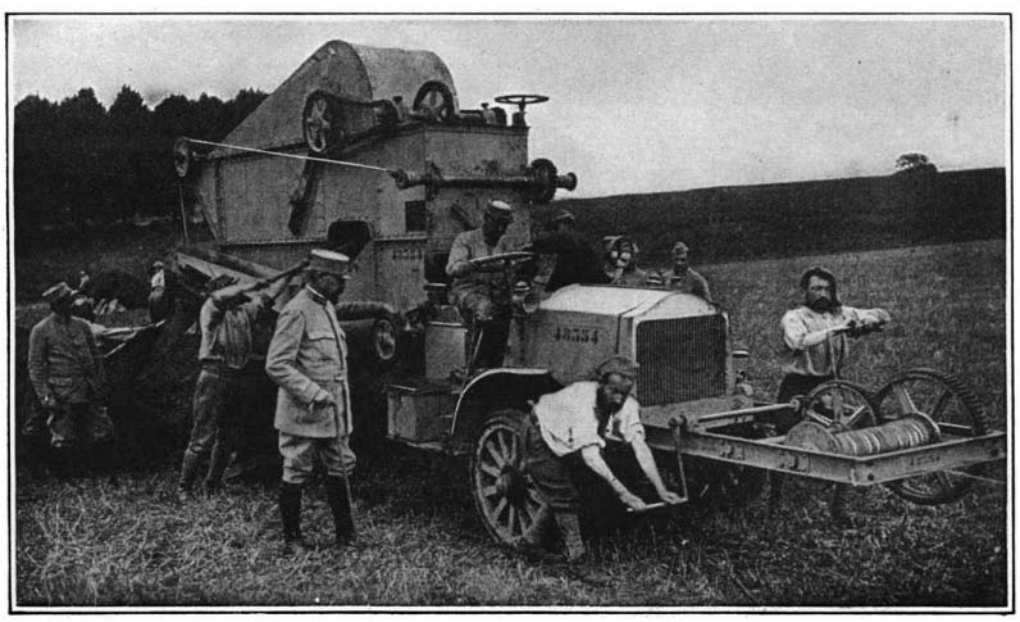
Digging Trenches and Erecting Breastworks by Gasoline Power

THE vast amount of labor that is required in preparing the field fortifications or trenches that extend for hundreds of miles on the Western fighting front of Europe has caused the belligerents to devote no small share of their inventive genius toward the development of a military trench-digger. Reports have it that considerable success has been achieved in this direction; but the accompanying illustrations are perhaps the first pictorial evidence of the use of gasoline trench-diggers, to reach this country.

The trench-digger here shown is now being employed by the French army for the purpose of digging trenches and throwing up breastworks, in one operation. It appears to be a powerful truck mounting a bucket excavator of conventional design, and fitted with a projecting framework and windlass in front of the radiator. While moving from point to point the power of the engine is applied to the rear, broad-tired wheels of the motor truck in the usual manner, but in actual excavating service the power plant is called upon solely to operate the excavator. In the absence of definite facts it is safe to assume that, owing to the slow progress of the trench work, it would not be possible to apply the engine power to the propulsion of the machine without greatly complicating the transmission system; and even then, the advantages gained would be negligible since the heavy work is centered about the operation of the bucket belt. Consequently, the propulsion of the excavator over the ground is accomplished by the hand-operated windlass at the front of the truck, winding up a heavy cable which is fastened to some substantial object, such as a tree, at the farther end. The two men, operating the windlass through reduction gearing, have no difficulty in pulling the excavator along at a slow but sufficient rate of speed.

One cannot form even a modest conception of the extent of modern trench systems as exemplified by the Western front of Europe, without actually visiting the battlefields. The recent drive of the Anglo-French armies on the Somme has disclosed tier after tier of German trenches, deep, properly drained, and often cemented. It is to render unnecessary the taking of many fighting men from actual duty on the firing line that the trench-digger is being introduced.

The trench-digger, rumbling at a leisurely but steady gait over a field, leaves behind it a deep, clean-cut trench, provided with high breastworks. The latter result from the throwing out of the excavated material on both sides of the gasoline digger. With a trench of the proper depth and suitable breastworks in the rough, the military engineers consider the remaining work of converting these into first-class field fortifications, a simple matter.



Leaving in its wake a clean-cut trench with high breastworks, this French trench-digger greatly simplifies the work of the military engineers

Rear view of the trench-digger, showing the excavator buckets and the trench and breastworks

Inventions New and Interesting

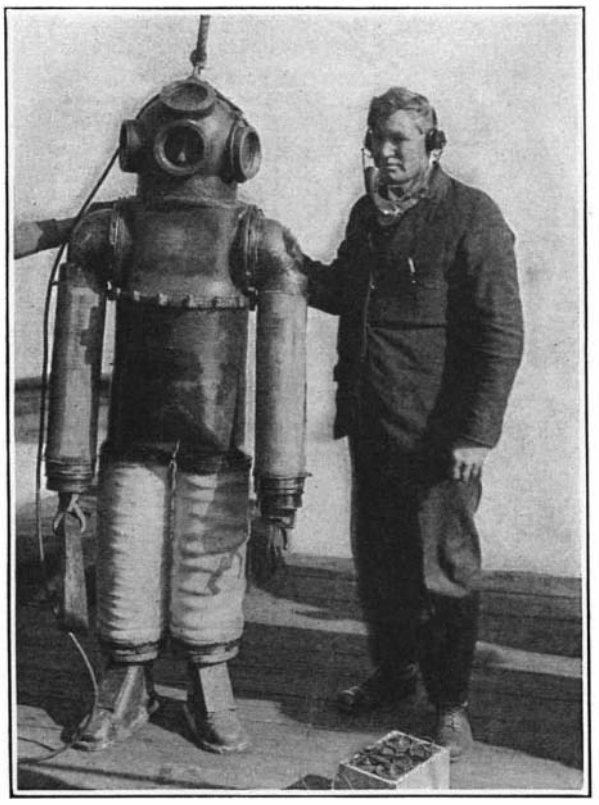
Simple Patent Law; Patent Office News; Notes and Trademarks

A Flexible Armored Diving Suit for Descending to Great Depths

THE Steamer "Mary Ethel" recently put out from Toledo, Ohio, having on board a group of prominent people from that city. Among them was B. F. Leavitt, an inventor of Toledo, who, wearing his new patented diving armor, descended 361 feet in the waters of Grand Traverse Bay. This establishes a new world's record for deep-sea diving.

The Leavitt invention is unlike the conventional diving dress in that it is heavily armored throughout and considerably more bulky. It is entirely self-contained, carrying its own air supply; and by means of a telephone instrument mounted in the helmet the diver is in constant communication with the crew on the surface. The armor consists of a manganese-bronze body and feet, and legs of flexible construction. Instead of using his hands for the actual work below the surface, the diver manipulates a pair of iron claws from the inside of the suit.

At a depth of 361 feet it is said that Mr. Leavitt experienced no discomfort, and was able to remain on the bottom for a considerable length of time, meanwhile speaking to various persons on board the ship. All of which indicates that the new diving suit should prove most satisfactory in deep sea salvaging operations.



In this self-contained diving armor its inventor descended to a record depth of 361 feet

Electro-Magnetic Removal of Steel and Iron Particles from Liquids

ONE of the present needs of the industrial world is a device for removing iron and steel particles from liquids. The principal requirements of such a device are that it be quick, simple and cheap in operation. The demand for such apparatus becomes most urgent in large machine shops operating a great number of automatic screw-cutting machines, for machinery of this class uses a jet of oil on the cutting tool for lubrication and reduction of temperature. After being used once this oil may be collected and used again if properly renovated, and it is with the object of serving to this end that the following electro-magnetic device has been evolved.

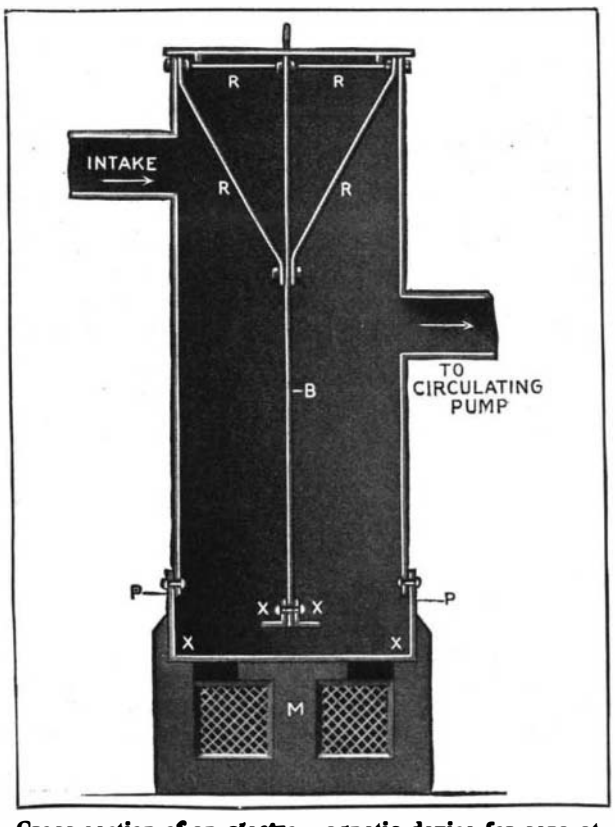
Filtering methods are notoriously slow but also highly efficient in removing all foreign material from oil. Settling or gravitational methods, when operated quickly enough to be of commercial value, remove the coarser chips and turnings; but the finer material remains in suspension and is thus kept in circulation. This fine material is injurious to the pumping machinery used in circulating the oil, as well as to the screw-cutting machine parts.

An efficient method of removing all fine magnetic material from oil is depicted in the accompanying illustration. Into the oil pumping line is inserted a cleaning tank of such size as to reduce the flow of oil to approximately 30 feet per minute under the shoe on the baffle plate *B*. The bottom and sides of the tank up to point *P* are made of non-magnetic material, while the baffle plate, shoe and upper portion of the tank sides are made of iron. The baffle plate is supported and braced by rods *R*. The tank has an electro-magnet *M* fitted to the bottom of it.

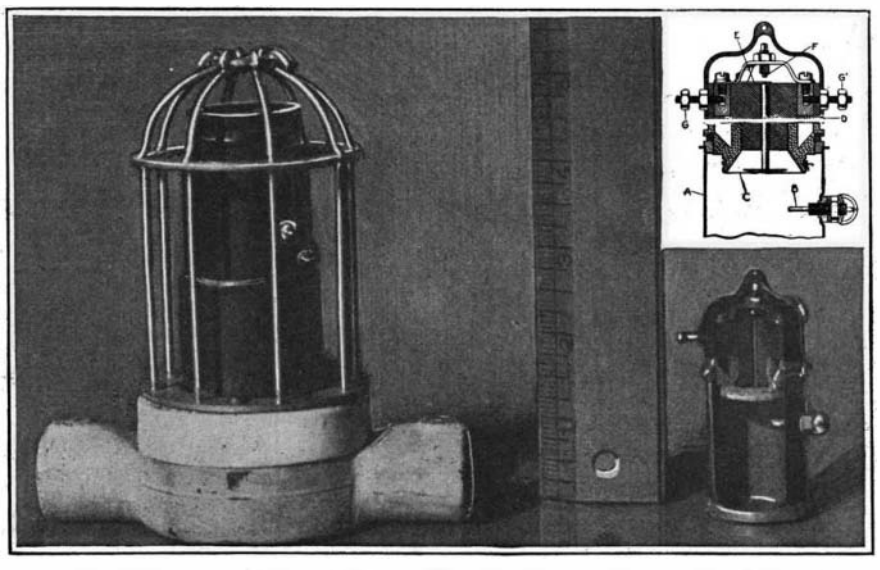
The oil flows from the automatic machines through the pipe line to the cleaning tank; thence between the baffle plate shoe and the magnet, following which it passes the circulating pump and back to the automatic machinery. The cleaning action occurs while the oil is passing the magnet. A strong magnetic field is produced by means of a current flowing in the wire winding of the magnet. When an iron particle enters this field it is attracted toward the magnet and its movement in the direction of flow of the oil is retarded. It is thus caused to be deposited upon the bottom of the cleaning tank and held there by magnetic attraction.

This arrangement results in the fine iron particles accumulating in pockets, *X*, where the magnetic field is strongest and the oil the least velocity.

Cleaning tanks of this kind can be installed in batteries, in order that one set of tanks may be cleaned while others are being operated. The chief disadvantage of this system of separation is that it removes only magnetic material. On the other hand its principal advantages are the simplicity of the mechanism and the quickness of its operation.



Cross-section of an electro-magnetic device for separating iron particles from oil and other liquids



Two forms of a recently invented fire detector. The insert is a sectional view of the detector mechanism.

Artificial Feet Made Out of Paper

ACCORDING to *Berlingske Tidende* the Danish physician Svindt, who formerly manufactured artificial legs out of papier maché, now makes artificial feet out of paper pulp. A model of the foot is made of wire gauze and upon this is poured the specially prepared pulp, the latter entirely filling the interstices of the wire gauze. These paper feet are said to be strong enough for general use; they have, moreover, the advantage of being very cheap. Physicians report that these artificial feet are very popular with crippled soldiers.

A Fire Detector That is Based Upon the Expansion of Imprisoned Air

NOT much larger than a shot-gun cartridge is the fire detector recently invented by Chas. H. Kayser of Newark, N. J., yet numerous tests conducted with it under service conditions have disclosed the fact that this is an infallible means of detecting conflagrations at their very inception.

The new fire detector is the electrical contact-making member of a fire-detecting system, and as many detectors as may be necessary to cover a given premises are employed in one or more circuits. Not unlike the familiar tubular fire-alarm systems, calling for several hundred or even thousands of feet of small diameter copper tubing mounted on the ceiling of the various rooms to be protected, the new fire detector depends for its operation upon the expansion of a small quantity of imprisoned air. It is an independent contact device, however; and this feature, together with the fact that it contains a greater quantity of air than that of the tubular system which would ordinarily be employed to cover the same area, is claimed to bring it many advantages over the latter device.

Briefly, the new fire detector may be considered as consisting of two main members: a copper cylinder, designated as *A* in the accompanying sectional view, 1¾ inches long, 1⅛ inches outside diameter, and .012-inch walls, closed at one end and containing about 1.25 cubic inches of air; and the contact-making mechanism, consisting of elements *C*, *D*, *E*, and *F*, which is operated by the expansion of the air in the copper cylinder. On the open or top end of the copper cylinder is soldered a threaded brass ring to receive the diaphragm holder—a die casting made of type metal. Over the lower end of the diaphragm holder is fastened a specially-treated gold beater's skin diaphragm, *C*, on which rests the button or head of the rod member *D*, sliding in the hole of an insulating block. Over the hole is a silver contact strip, *E*, which is normally flat; but upon the expansion of the imprisoned air in the copper cylinder the skin diaphragm bulges upward, raising the rod member which in turn presses the contact strip against the contact stop *F*. The latter, it will be noted, is adjustable and carries a silver contact point. Thus an electric current can be passed from binding post *G* to binding post *G'*, and any circuit in which the fire detector happens to be is closed by the action mentioned.

The fire detector is only operated by a sudden rise in temperature such as would accompany a conflagration. Temperature changes of the natural order, at the most about one degree per minute, are taken care of by a small vent or valve, *B*, which is soldered in the copper cylinder wall. It consists of a minute copper or phosphor-bronze tube ½ inch long which is soldered in a brass socket, and whose end terminating inside the copper cylinder is flattened to diminish the flow of air and permit only a small portion of the otherwise imprisoned air to pass out or in, as the temperature rises or falls. On the end of the brass socket is screwed a small brass screen or basket, containing a piece of cotton which acts as a filter in preventing dust from being sucked into the minute tube. While the vent or valve allows for natural changes of temperature, the sudden expansion of the imprisoned air under a sudden rise in temperature must still exert itself on the skin diaphragm, since the rate of flow through the vent is much too slow.

The wiring for the new fire detector is much the same as that of an annunciator circuit, with the detectors taking the place of the push buttons. It is claimed that the detector will work equally well in ice houses, boiler rooms, or other places where abnormal temperatures are maintained for commercial purposes.

How Waste Paper is Treated to Make New Paper

(*Concluded from page 576*)

cycle of utilization the fibers must suffer to a large extent from over treatment, since it is to be inferred that the first treatment was calculated to develop their maximum paper-making possibilities." This statement is plainly a rational one. So it is that papers made from old printed material never show up so well as first-hand stock; they are more opaque, flabbier to the touch and weaker in tearing strength than papers formed of new material. But in these days of paper scarcity, the supply of book paper manufactured out of old material is inadequate to the demand even at three times the price paid prior to the outbreak of war in Europe.

Evolution of the Rigid Airship Design

(*Continued from page 576*)

contained in a V-shaped keel protruding from the hull has now been placed within the latter and is in the form of an inverted V with a flat bottom; obviously a corresponding sector of the drum-shaped gas cells is cut away. Gas leakage is taken care of by ventilating shafts leading to the roof. The gangway runs through the greater length of the bottom and connects the cars as well as a gun emplacement on the stern above the elevators; the frontal gun emplacement on the roof is reached through a stairway shaft.

The skin of the hull is, as on all modern airships, a specially treated fabric whose elasticity coefficient makes it more desirable than the aluminum sheeting the late Schwartz used on his vessels. This metal skin which Schwartz believed would prove more impervious to gas than a fabric envelope proved very leaky because the torsion of the hull—all airships sag to a certain extent—caused the plates to spring.

CARS AND PROPELLING APPARATUS.—The difficulty of connecting the propelling apparatus to the hull can be said to increase with the airship's size. Generally speaking, the necessity of evenly distributing the masses carried makes airship designers split up the power plant into several units mounted on several cars, an arrangement which advantageously limits the size of propellers and also reduces the chance that an engine breakdown will put the whole power plant out of commission. This explains why the characteristic two-car side-drive of the Zeppelin has given way on the latest models to four cars arranged crosswise, a system which had previously been tried on the Schuette-Lanz airships. In this case only the bow and stern cars are mounted co-axially, the two other cars being hung side by side from the middle of the hull. Each car houses one engine which drives through a clutch transmission a propeller mounted aft of the car; the stern car, however, is fitted with two more engines driving in the old-fashioned way two-side propellers through bevel gears. Thanks to this clever arrangement all the propellers work in "pure air" for the only two which are co-axial are so far apart that no interference can result therefrom. The cars are streamlined and, on account of the cold met at great altitudes, totally enclosed; they are built up of lattice girders similar to those used in the framework and are covered with corrugated sheet metal.

CONTROL SURFACES.—It is remarkable how closely the design of airship control surfaces has followed the evolution of the corresponding organs of aeroplanes. The complicated multiplane rudders and elevators which were an outstanding feature of early Zeppelins have now been displaced by symmetrical monoplane surfaces arranged crosswise, the advantage derived thereby consisting in that one large control surface is not only much more effective, but can also be made infinitely stronger than several small ones. The symmetry of the control organs is of self-evident reason if one keeps in mind the symmetrical cross-section of the hull which is a 25-sided polygon, the gangway-keel with its corresponding side resistance having been discarded. No swivelling or fixed propellers for direct lift appear to be used on the latest Zeppelins whieh several reports

(*Concluded on page 581*)

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel

DRESS SHIELD.—CLARA D. BENNETT, Cresskill, N. J. This invention provides a shield with means for concealing or disguising the same; provides means, unattached to the body of the wearer, for holding the arm portion of the shield in service position; facilitates the adjustment of the shield in service; and maintains the shield snugly in service position.

BRASSIERE.—JEANNE LEEMAN, 1771 Sutter St., San Francisco, Cal. This invention is an improvement in brassieres, and the object is to provide a device which while affording an effective support will be easily adjusted, comfortable in use, and easily removed, and will avoid pressure upon the vital organs of the body.

COLLAR FASTENING.—R. M. REID, Box 505, Colorado Springs, Colo. The present invention relates generally to collars of the turned down type and is particularly effective in connection with collars close fitting at the front, the fastening of which is attended by considerable difficulty with the use of the collar buttons now generally utilized for the purpose.

Electrical Devices

KNOCKDOWN ELECTRIC SIGN.—C. H. LUSH, East Merrick Road, Freeport, L. I., N. Y. This invention provides an all-metal double-faced reflector sign which is comparatively simple and inexpensive construction of durable design and capable of being readily taken apart or knocked down for convenience in storing or shipping, and in which the panel is easily removed or interchanged.

Of Interest to Farmers

GRAIN THRESHER ELEVATOR BOOT.—D. D. COTTRELL, Newkirk, Okla. The improvement is designed to provide ample room at the juncture of the discharge and the elevator, whereby the grain enters the boot and passes freely in front of the cups or buckets, so as to be taken up thereby without tendency to bank or choke.

CALF MUZZLE.—W. E. BUFFAT, Greenville, Tenn. In feeding the calf lowers its head as in picking grass, and the rings having free motion among themselves fold up, allowing the calf to get its mouth to the ground. When the calf raises its head to attempt to suck, the muzzle automatically resumes its extended position about and below the mouth of the calf.

Of General Interest

METHOD OF EVAPORATION.—O. SÖDERLUND and T. BOBERG, Fairlawn, Clarence Road, Clapham Park, London, S. W., England. The invention relates to evaporating, distilling and similar operations. The process evaporates solutions in a plurality of stages in which each stage of the evaporation is effected by a separate heating element, said heating elements operating at progressively increasing temperatures imparted thereto by vapor which for each successive element has been heated to a higher degree of compression.

MEANS FOR ATTACHING AN ARTIFICIAL TOOTH TO A BRIDGE PLATE.—H. D. MORGAN, care of David G. Jenkins, 304 Madison Bank Bldg., Youngstown, Ohio. This improvement provides a pin holder mounted to slide longitudinally in a receiver which is rotatably disposed in an undercut hole in a bridge. The tapering sides of the hole at the undercut prevent the removal of the receiver under normal conditions, while permitting the adjustment of the pin holder by a movement thereof longitudinally of the receiver in connection with the rotation of the receiver.

ACCOUNT BOOK HOLDER.—C. T. FARNELL, Bayboro, N. C. This invention provides a lever having connections whereby to move the frame forwardly and upwardly to an inclined position from its normal horizontal position, which lever is movable with respect to its connections, under control of a spring catch, whereby it may be moved to a position permitting its inclosure within the frame by the hinged portions of the cover.

PIN CARRIER.—C. P. VOGEL, care of Wm. Wicke Ribbon Co., Woodhaven Ave., Glendale, L. I., N. Y. This invention provides a pin carrier which will present the heads of the pins so that the same can be easily picked up. It provides a pin carrier comprising a receptacle adapted to accommodate a large quantity of pins and from which the pins are fed to the holder proper of the carrier.

PURSE.—W. B. URMSTON, 25 Bucker Bldg., El Paso, Tex. The present invention bas reference to purses of the general style shown in Mr. Urmston's application for patent filed January 14th, 1916, Serial No. 72,061. More particularly the present invention relates to a means for strapping the purse to the hand When, however, it is desired to remove the purse from the hand, the strap may be readily detached from the fastener stud.

PARCEL POST MAP AND ZONE FINDER.—MARY A. REILLY and N. A. LYBECK. Address the former 189 Joralemon St., Brooklyn, N. Y., N. Y. This invention provides a map with pivot members to definitely hold the zone finder; designates by said members the characteristic of the location; provides means for attaching a map and finder therefor when inactively disposed; provides a finder having members and holders for a zone marker; and provides a finder having the characteristics enumerated, said finder having graduate marking denoting miles or units of space.

MULTIPLE MACHINE TABLE.—ROBERT S. ARRANTS, Bluff City, Tenn. (Inventor, C. McK. Arrants, deceased). This invention provides a means whereby a job may be clamped in the rough to a table or platform and moved thereon from one place to another, or from one machine to another, for the operation thereon of various processes, without necessitating the loosening of the job and re-attaching it to another suport.

SMOKING PIPE CLEANER AND AGITATOR.—E. E. TAYLOR, 1126 S. 4th St., St. Louis, Mo. This improvement relates particularly to an attachment for smoking pipes whereby to loosen the tobacco to cause the pipe to draw freely, and to provide for cleaning the interior of the bowl at the bottom and sides as well as the forward end of the stem when necessary.

CIGARETTE HOLDER.—I. WALLENSTEIN, care of Presto Cigarette Case Corporation, 1328 Broadway, New York, N. Y. This invention relates to cigarette holders such as shown and described in the Letters Patent of the United States, No. 1,164,434, granted to Ralph Wallenstein. The purpose of the present invention is to provide a new and improved cigarette holder arranged to properly accommodate and securely hold cigarettes which may be round or oblong in cross section.

PROCESS OF MANUFACTURING YEAST.—LUCIEN LAVEDAN, 2522 Beclin St., New Orleans, La. This process produces a yeast in such manner that the highest possible yield is effected from a given amount of clear sugared liquid, thereby greatly decreasing the cost of manufacture and making use of certain portions of the raw material formerly wasted.

PROCESS OF EXTRACTING MILK SUGAR FROM WHEY.—J. G. DIETRICH, Chehalis, Wash. This invention relates to a new product of manufacture which is particularly useful as an ingredient in the manufacture of a substitute for human milk. This product is intended to be used where milk sugar is a necessary or advantageous ingredient.

FLOATING MINE.—P. L. E. DEL FUNGO GIERA, Box 1200, New York, N. Y. The invention relates more particularly to the type anchored in a submerged or partially submerged position at the entrances to and within harbors and the like, and provides such mines which may be safely handled in transportation to the points of use and which are immune from accidental explosion when anchored or if they should escape from their anchoring means for any cause.

HEARSE ATTACHMENT.—L. M. AMMEN, 607 S. Elm St., Greensboro, N. C. This invention relates more particularly to casket stops, the object being to provide means whereby to automatically set the casket stops when the hearse doors are closed, in order to obviate all danger of shifting of the casket and displacement thereof during travel over rough or hilly country.

PICTURE FRAME.—J. L. MURRAY, 185 Willetts Ave., New London, Conn. This improvement provides separable edge-covering and corner-covering members for holding a picture or similar object when disposed in service; provides a frame, the members whereof are dissociated when the picture held in said frame is removed from its exposed position; and provides means for mounting the frame and picture contained therein in service or viewed position.

AIR PURIFIER.—E. L. GOLDBERG, care of Y. M. C. A., Perth Amboy, N. J. This improvement comprises a casing adapted to be carried upon a person or in some other convenient position, the casing containing air purifying devices or chemicals, depending upon the character of the poisons or dangerous atmospheric conditions, and tubular connections being provided between the casing and the man's mouth and nostrils.

GRATING.—A. DARROCH.—368 9th St., Brooklyn, New York, N. Y. This invention provides an improved grating for use in the roofs of subways, pavements, buildings and other structures, and arranged to readily take care of rain water, debris and the like, passing into the space below the grating and to illuminate and ventilate such space. It permits of removing the sections of the grating from the top to gain access to the space below in case of an accident or for any other cause requiring opening of the grating.

TRAP.—E. E. KLUIN, 609 Montgomery Ave., Elizabeth, N. J. This invention has reference to traps and particularly to an improved sewer trap which is normally maintained closed but which will readily open when a predetermined quality of liquid has been deposited therein. A valve member is utilized for closing the trap until a certain quantity of liquid has accumulated.

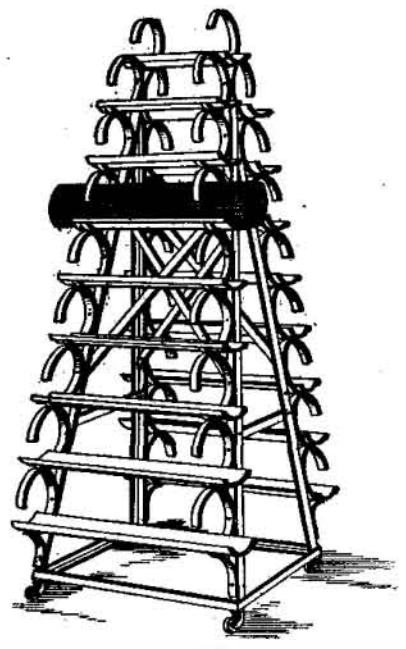
Hardware and Tools

PRIER.—T. M. FORINGER, 31 Cortland Place. Cliffside Park, N. J. The invention relates to repair tools for tires, hose and other similar articles, and provides a prier arranged for convenient insertion into a cut or opening and for automatically forcing the latter open and holding it open under a desired tension to facilitate the process of repairing.

MEASURING INSTRUMENT.—J. VERHEY and D. A. L. JANSZ, Pella, Iowa. This invention provides for use of carpenters, cabinet-makers, and other artisans, an instrument for measuring the length and end angle or inclination of a baseboard, shelf, stair-tread, stair-riser, chair-railing, and the like, so that the same may be fitted quickly and accurately in place.

SAFETY RAZOR STROPPER.—B. TROSKY, 57 W. Houston St., New York, N. Y. This invention has for its general objects to improve the construction of devices of this character so as to be reliable and efficient in use, and is so designed that the blade is automatically clamped or unclamped in closing or opening the case.

WIRE HOLDING STAND.—J. W. PETER, 241 E. South St., Fostoria, Ohio. In a former invention of this type by Mr. Peter the rings tended to scratch and mark the wire and it is to obviate this disadvantage that the present



WIRE HOLDING STAND

improvements have been made, the object the reof being to provide a pan or tray upon which the wire rolls may in each case rest, said tray having an overturned portion forming a smoothedge across which the wire may be drawn in unrolling the same.

Heating and Lighting

THERMOSTATIC HEAT REGULATOR.—H. W. SOUDER and R. H. SOUDER, Tamaqua, Pa. Among the objects of the invention is to provide a heat regulating system in which is employed a plurality of thermostats adapted respectively to provide for different standard temperatures at different hours of the day or night, and time controlled mechanism to bring the several thermostats selectively into operative relation to the system automatically.

MOVABLE CHARGING DEVICE FOR A FURNACE.—J. M. WETCKE, 14 Kölnerstrasse. Duisburg, Germany. This invention places articles or materials, such as bar iron, pipes, sheet metal, ingots, and the like to be heated and roasted into the furnace or oven and allows removal of the charging device from the interior of the furnace during the roasting of the material so that the charging device is not unduly subjected to the heat and hence a long life is assured.

HEAT RADIATING UNIT.—J. McE. BOWMAN, Hotel Biltmore, New York, N. Y. The improvement prevents the freezing of water employed as the heating medium in the radiator; provides means for maintaining continuously a circulation of the heating medium in the vicinity of the radiator for maintaining the temperature of the air surrounding the radiator above the freezing point; and continuously maintains a limited circulation of the heating medium in the supply and delivery radials immediately connected with the radiators in the heating system.

Household Utilities

DOUGH PRESS.—J. J. CAVAGNARO, Harrison, N. J. This invention relates to a press for operating on dough and other plastic material, and has to deal more particularly with a change speed driving gear for the rotary knife which severs the material intermittently as it is forced out of the die of the press, whereby products of different length can be obtained at will.

HEATING AND COOKING APPARATUS.—W. W. ROBERTS. This invention pertains to apparatus on the fireless cooking principle, and provides a device arranged to permit of carrying on a number of cooking operations at the same time and with the use of but a single heating element, or to carry on such operations at the time the heating element is not in use.

Machines and Mechanical Devices

SAUSAGE CANNING MACHINE.—A. M. AUGENSEN, 515 N. 4th Ave., Maywood, Ill. This invention relates to machines for placing sausage and the like in cans, bottles, jars or other receptacles and has for an object to provide an improved machine of this character which will place the correct amount in receptacles in comparatively quick succession and automatically.

ICE CUTTING MACHINE.—H. A. MASON, 183 Weir St., Taunton, Mass. This invention has for its object the provision of an ice cutting machine which is adapted to cut a pack or brick of ice cream as may be desired, the thickness of the cut portions of ice cream being uniform and being regulated by means provided.

FIRE ARM.—W. E. ROSEBUSH, Appleton, Wis. This hand firearm is formed of comparatively few parts which can be readily assembled or disassembled and are not liable to easily get out of order, the firearm being arranged to provide simplicity of action, to prevent firing in case a cartridge is not properly seated in the breech of the barrel or a shell is not properly ejected.

VALVE FOR GAS AND LIQUID MEASURING DEVICES.—E. A. APPELL, 522 W. 148th St., New York, N. Y. This invention provides a valve to attain better results over the present reciprocating sliding valves generally used in gas and liquid meters. For this purpose use is made of a valve seat and a valve body, provided with inlets and outlets for the fluid and adapted to be connected to actuating and measuring devices.

DREDGE.—J. A. MILLER. Address Chas. S. Wallace, P. O. Box 129, Bellingham, Wash. This device is adapted to be lowered from a barge or the like, above the surface of the water, the device sinking atomatically to the bottom of the body of water and when the bottom is reached, the material at the bottom on which the device comes to rest will be altomatically drawn into the receptacle, means furthermore being provided to prevent the escape of such dredged material from the receptacle.

WATER CLOSET SEAT.—C. W. BAIRD, 160 Lefferts Ave., Brooklyn, N. Y. The object here is to provide a new and improved water closet seat arranged to enable the user to render the seat sanitary by providing sheets of paper or similar material for cleaning the seat. Use is made of a seat forming a magazine for containing a pile of sheets of paper or similar material.

STENOTYPE MACHINE.—J. ELEIZEGUI, 6 Apodaca St., Havana, Cuba. This inventor provides an inexpensive machine which is ribbonless and substantially noiseless. He provides a machine the impression of which can be understood by any one having the key or a knowledge of the relative combinations of the impressions.

MOWER.—G. P. HELFRICH, 976 Fox St., Bronx, N. Y. The invention relates particularly to a mower in which the cutting member is given a circular motion together with a forward motion. It provides a construction wherein there are provided a plurality of traction members and a single centrally arranged driving gear for operating the cutting member.

WATER METER ADJUSTER.—A. S. FLENNER. Address F. B. Reynolds, 201 State Bank Block, Billings, Mont. This invention relates to the resetting of water meters back to zero when this is desired for any reason, particularly when the meter is undergoing repair, and the main object is to provide means for accomplishing this result to supplant the present time consuming manual method.

ADJUSTABLE TAPE FRAME.—M. B. DISKIN, 149 Wooster St., New York, N. Y The invention pertains to adjustable tape frames for winding tapes, particularly those which are used in connection with the manufacture of paper boxes. An object is to provide an adjustable frame whereby tape sections of any predetermined length may be obtained.

HEMP BREAKING MACHINE.—W. P. ELKIN, care of Elkin Power Hemp Break Co., Winchester, Ky. The present invention relates generally to hemp breaking machines, and more particularly to a portable machine of this character, including a simple, compact and durable arrangement, as well as one requiring but minimum attention and skill during action. It comprises a series of spaced alternating knives, movable toward and away from one another, each knife having a bearing adjacent its upper end, and a conecting member extending through the bearings of each series and rigidly connecting the knives.

ADDING MACHINE.—A. W. LAWRENCE, Times Bldg., New York, N. Y. This improvement relates more particularly to machines of a simple inexpensive nature and of that type operated by hand through the use of a stylus of suitable nature, the object being to provide improvements in connection with devices of this nature whereby to facilitate their operation in use, prevent undesirable and accidental displacement of the parts, and otherwise increase efficiency.

FILTER.—R. L. Y. GUIJARRO, care of Theodore Brooks, R. 2167, Hotel MacAlpin, Broadway and 33rd St., New York, N. Y. This invention provides a filter of the rotary type which is characterized by the provision of a filtering drum with which a vacuum pump is associated to draw the filtered liquid to the axial part of the drum, while the solid particles are driven off the filtering drum by the centrifugal force thereof and scraped and discharged by a suitable conveyer coöperating with the filtering drum.

MACHINE FOR AFFIXING AND CANCELING STAMPS.—F. SMITH, Box 702, Douglas, Ariz. The invention provides a machine comprising a series of units separably operable to affix stamps of a particular denomination and cancel the same after having been affixed; provides for automatically feeding the stamps from a roll and severing the same as the stamp is applied and canceled; and provides a machine in which the units are adjustable in unison, to various heights, to suit packages of varying sizes.

LIQUID DISPENSING APPARATUS.—R. C. BRADLEY, 709 Louisiana St., Houston, Tex. This apparatus is for use in connection with delivery wagons for dispensing oils or other

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Evolution of the Rigid Airship Design

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credited them with; still this feature which is no novelty since it has successfully been used on various French and British airships seems well worth closer investigation.

ACCOMMODATIONS AND ARMAMENT.—The "brains" of a modern Zeppelin are centered in the bow-car. This has three compartments, the foremost one being fitted as the navigation room and commander's cabin, next to which comes a small wireless room, the rear compartment being the engine-room. The commander's cabin is fitted, in addition to the customary navigation instruments, gas pressure gages, engine revolution counters and engine room telegraphs, with a switchboard which controls the electro-magnetic bomb release devices. The bombs are carried amidships, so as not to upset the longitudinal equilibrium when they are released, and are hooked to two parallel girders, each of which carries 30 bombs, on either side of the gangway. The release of the bombs is effected by a series of levers which are set working by an electric current but can also be operated by hand.

The defensive armament of the Super-Zeppelins consist of nine machine guns, some of which are said to be of larger caliber than the ordinary small arms ammunition. Three of these are mounted on the roof, two near the bow, side by side and one on the stern; the remainder are distributed among the cars, firing broadsides.

DIMENSIONS.—It has been variously reported that the latest Zeppelins are from 230 to 240 meters (755 to 787 feet) long and are fitted with seven or even eight engines developing a total of 1,500 to 2,000 horsepower. If true, this must be a very recent type, for the largest Zeppelin that was shot down in England, last October, measured only 207 meters (679 feet) in length and 22 meters (72 feet) in width.[1]

OBSERVATION CAR.—The existence of an observation car which could be lowered from the airship by means of a winch has now definitely been ascertained, for one such car has been found in East Anglia after a Zeppelin raid. The car is of streamline shape, about 14 feet long and 5 feet high and is fitted with a cruciform tail which serves to keep it head-on to the relative wind. Owing to its very small size the car could be lowered a few thousand feet without fear of detection from the ground while the airship remains hidden in the clouds; the observer is thus given excellent opportunity for reconnoitering things below and transmitting the result by telephone to the chart room.

[1]See also SCIENTIFIC AMERICAN, July 8th, 1916, page 39.

Diamond Cutting Industry in England

ONE effect of the war, apparently, has been to establish the diamond-cutting industry on a permanent footing in Birmingham, England. Attempts made from time to time to start the industry there were, in the main, failures because of a lack of the necessary skilled labor; but now the war has driven to England as refugees practically all the Belgian diamond workers.

Birmingham is probably the leading center of the jewelry industry in Great Britain. Diamond cutting is a most important essential of the industry, and the advent of the Belgian workers was at once seized on by the jewelry manufacturers to establish the business in Birmingham. Six months ago a start was made with about fifty skilled Belgian workers. It was a success from the beginning. The staff and plant were soon increased, and there are now over eighty employed. In the meantime British boys are being trained, and it has been demonstrated that they are quite capable of acquiring the necessary skill. It is said that in London half a dozen diamond cutting factories have been made possible by the presence of refugee Belgian skilled workers.

Experienced jewelry men believe the industry in Birmingham is there to stay, and that while many of the Belgian craftsmen after the war may return to their native land they will have remained long enough to establish the business permanently in England.

(Concluded from page 580)

liquids or at service stations, and in which a locking device is provided which must be manipulated with a key to obtain access to the liquids, means being provided for recording the number of the key, thereby indicating the person who bas drawn off the liquid.

DISPENSING APPARATUS.—R. C. BRADLEY, 709 Louisiana St., Houston, Tex. The invention pertains to improvements in devices for dispensing articles both of a liquid and a solid nature. It provides a device which may be stationed at any convenient place as for instance at a prominent corner or at the intersection of cross roads for dispensing liquids and containers for the same.

APPARATUS FOR RAISING SUBMERGED OBJECTS.—R. O'NEAL, 908 Cleveland St., Tampa, Fla. In carrying out this invention, a pontoon is provided adapted to revolve on its axis. Means is provided at the periphery of the pontoon, whereby the mass may be varied at predetermined places at the periphery to create a torque for turning the pontoon on its axis, together with means controlled by the turning of the pontoon for raising the submerged object when connected with the latter. Means provide for varying the mass.

MACHINE FOR CASTING AND COMPOSING SEPARATE TYPE.—F. SCHIMMEL, 4 Rue Messier, Nancy, Meurthe et Moselle, France. This machine is for use in casting and composing movable characters, in which the keyboard acts directly on the casting mechanism without the interposition of a perforated paper band, which permits the dispensing of one assistant. By a novel and particular construction of the melting pot, composing mechanism and other parts, a machine is provided all parts of which are readily accessible and which permits of the employment of a large number of different characters in one line without it being necessary to make modifications in the construction of the machine.

REFRIGERATING MACHINE.—J. D. ROSS, Supt. of Lighting, Seattle, Wash. An object here is to provide an extremely simple, durable and efficient refrigerating system which automatically maintains a substantially uniform temperature and which does not require the care of an attendant except only occasionally for the purpose of inspection to see that the apparatus is operating at its best efficiency.

FABRIC FRAME FOR EMBROIDERY MACHINES.—125-127 Rector St., Union Course, L. I., N. Y. This invention provides a frame for holding the goods on embroidery machines in position to be worked, the construction being such that the frame may be conveniently attached to the machine, and pieces of the goods to be embroidered may be quickly attached to the frame, and after the embroidery has been finished may be quickly removed therefrom. As the frame is constructed, a number of pieces may be worked at the same time.

ADDING MACHINE.—J. F. KEY, care of Key Adding Machine Co., 942 Santee St., Los Angeles, Cal. An object here is to provide a device which is simple in operation, and which can be manufactured at small cost for permitting operations that are ordinarily accomplished by machines of much greater complexity, and which are comparatively expensive.

FLUID VENDING MACHINE.—J. MCG. CHANDLER, Mexia, Tex. This machine may be regulated to dispense more or less gasoline or other liqnids as desired upon the insertion in a coin slot of a coin of a predetermined denomination. In this way, the quantity of gasoline dispensed on the operation of the machine may be changed to agree with the current price of gasoline.

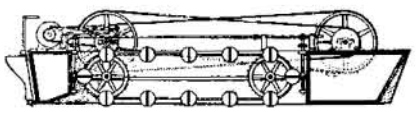
PRINTING DEVICE.—A. G. OGDEN, 109 S. Charles St., Baltimore, Md. This invention relates to printing devices for reproducing a multiplicity of prints arranged in symmetrical relation from a single negative. It provides a means for more accurately adjusting the step by step device by means of which a sensitized plate is shifted from one position to another, with respect to a stationary negative.

MACHINE FOR SPLITTING CANE OR OTHER LONGITUDINALLY FIBROUS SUBSTANCES.—J. KING, 139 Springbank road, Hither Green, London, S. E., England. This invention comprises the combination with a splitting knife of a centralizing device formed or arranged in conjunction with levers, each lever being pivoted at one end at a fixed point and at the other end to a rotatable plate, and a controlling spring acting on the plate.

POCKET INDEX.—W. B. URMSTON, 25 Bucker Bldg., El Paso, Tex. The invention provides a pocket index having generally the form of a card-case or booklet and provided with means whereby the various parts of the device though movable relatively toward one another, are quickly and accurately restored to their respective normal positions by mechanism which is practically automatic.

MOLDING MACHINE.—E. STICHELBAULT, 822 E. 56th St., Chicago, Ill. The machine is used for rockover molding, stripping plate and plain pattern plate molding, and comprises a supporting frame having an adjustable swinging tube mounted on the opposite sides of which are pattern plates to permit the plates to be used alternately as the table is swung from side to side of the frame, the table, the pattern plates and the mold being counterbalanced by an adjustable counterweight to swing the table.

CURRENT MOTOR.—G. M. SHEFFER, Emlenton, Pa. The device is mounted on a float and raised or lowered with respect to the float to provide for variation in water conditions, and wherein the support for the motor is provided with mechanism for operating the motor in a direction to propel the boat or scow, the mechanism being releasable from the current



CURRENT MOTOR

motor, and wherein a speeding up connection is provided between the current motor and the mechanism to be driven, the mechanism being arranged to be connected to and disconnected from the current motor, and wherein guiding mechanism is provided for the motor support to guide the same during its movement from place to place.

FLEXIBLE SHAFT.—A. MONAR, 9039 Snedeker Ave., Woodhaven, Brooklyn, N. Y., N. Y. The invention has reference to flexible shafts consisting of a plurality of interconnecting links, and the object thereof is to provide a simple and efficient shaft of comparatively light weight and great flexibility and in which the connections between the links are in the shape of spherical joints.

PUMP.—W. M. FRASER, Sewaren, N. J. This invention relates to a combination pump and tank adapted to contain and dispense liquids, and is more particularly adapted for containing and dispensing viscous liquids at high temperature. It provides improvements in the manner of handling liquids contained in the tank and overcomes some of the difficulties now experienced, more especially when viscous liquids are to be pumped.

DEVICE FOR MAKING PUBLIC ANNOUNCEMENTS AND EXHIBITING ADVERTISEMENTS.—H. K. HARRIS, 96 Victoria street, Westminster, London, England. This invention relates to devices for making public announcements, exhibiting advertisements and for other purposes of a like nature, and refers to an improved device of this class in question by means of which any required letters, signs, numerals or the like can be formed in a simple and effective manner for the purpose of producing the desired announcement or the like.

PUMP.—L. J. COOLEY, 227 Ave. 60, West Los Angeles, Cal. This invention provides a pump having means for raising the water and adapted to be operated by power or in any other suitable manner and having means in connection with the water raising means, for aerating the water, that is, for thoroughly impregnating the water with air to assist in raising the water.

ELEVATOR-DOOR HANGER.—C. O. MARX, Care of Elevator Efficiency Appliance Co., 51 Maiden Lane, New York, N. Y. This invention provides an anti-friction door hanger including a casing, a sectional anti-frictional member within the casing, and a smooth supporting member, said member constituting not only a support, but also a spindle around which any or all of the bearing parts may turn.

PROPELLER.—F. C. GOETTERT, Care of Seville Hotel, Westwood, Cal. This device is for use in water craft of every character, and wherein the propelling mechanism is arranged to bore into the water, instead of pounding against the water, thus reducing slippage and increasing the speed in accordance with power, saving fuel and reducing vibration of the boat and slippage of the propeller, and facilitating reversing, and eliminating swell and dead water.

TREE BOARD.—J. SAMUELSON, care of J. Turner, Eureka, Utah. The prime objects here are to produce a tree-felling board that may be quickly applied to the tree without the necessity of cutting notches in the latter; and to provide for the quick adjustment of the board to move the same to an angle to differently position the board for cutting at different sides of the tree.

Prime Movers and Their Accessories

COOLING MEANS FOR INTERNAL COMBUSTION ENGINES.—H. C. MAGNE, Garces, Ariz. The improvement provides a hollow piston which is provided with ports in the periphery of the annular head, and in the piston which is open at its ends are deflectors, which cause currents of air to be directed against the internal surface of the cylinder while the piston reciprocates, whereby air cools the piston and cylinder, which latter may, if desired, be externally air- or water-cooled.

ENGINE CRANK MOVEMENT.—G. P. B. HOYT, 1 Clinton Place, Jamaica, L. I., N. Y. The inventor provides a crank movement more especially designed for use on internal combustion engines of the two-or four-cycle type, and arranged to insure a proper transmission of the developed power without jar or vibration to balance the engine and thus provide an easy running thereof.

VALVE OPERATING MECHANISM FOR INTERNAL COMBUSTION ENGINES.—H. C. WELL, 1175 Wyatt St., Bronx, N. Y. This engine has two or more cylinders with a valve sleeve in each cylinder, spindles being journaled between the cylinders in bearings disposed at right angles to the axes of the cylinders, so that one sleeve will serve in connection with a spindle and gearing connecting the valve sleeves with the spindles to rotate the adjacent valve sleeves.

FLOW METER.—F. H. ROSENCRANTS, Care of Oregon Agricultural College, Corvallis, Ore. The invention is primarily intended for use in indicating the rate of flow of oil to burners of oil burning boilers, although it may be used in a variety of places, such as in the feed-water lines of individual boilers, in the cooling water lines to transformers, gas engines, and almost any place where a small rate of flow is to be indicated.

Railways and Their Accessories

AUTOMATIC AIR COUPLING.—R. A. MCCURRY, General Delivery, Portland, Ore. This invention has relation to train pipe couplings, which are automatic in action, both in coupling and uncoupling without requiring any attention on the part of a brakeman or other train attendant, or necessitating such attendant going between the cars to couple or to loosen the coupling.

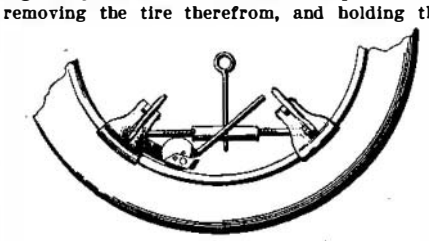
DIRGIBLE HEADLIGHT FOR LOCOMOTIVES.—H. E. BEASLEY and W. BYRD, 943 St. Charles St., Victoria, B. C., Canada. This improvement has reference to headlights for locomotives and relates more particularly to means for automatically focusing the headlight upon the track at all times, whereby curves as well as straight portions of the track will be effectively illuminated.

Pertaining to Recreation

TOY SHIP.—C. A. LEWIS, 6214 Penn Ave., E. Liberty, P. O., Pittsburgh, Pa. The general object here is to provide a toy ship having a weight therein, adapted to be shifted to tilt the ship to a partially submerged condition in simulation of the sinking of a ship. Weight-restraining means, movable to positions to present movement of the weight or to permit movement thereof is provided.

Pertaining to Vehicles

TIRE RIM TOOL.—J. B. STROUD, Pass Christian, Miss. The invention relates to improvements in tools designed for use in breaking the joint of demountable rims previous to removing the tire therefrom, and holding the



TIRE RIM TOOL.

same in position while the tire is removed and replaced. In removing a clencher tire from the rim it is often difficult to part the rim at the joint, and after the same has been parted it is equally as difficult to lock the same together. The device overcomes this difficulty.

TIRE PROTECTOR.—W. J. HARMON, 1422 N. Garrison Ave., St. Louis, Mo. This invention relates to tire protectors in which an armor in the form of an annular band is disposed about the tire. The object is to provide a protector and retaining means therefor, of simple form and adapted to be retainined in its position by the expansion of the tire.

ENGINE STARTER.—E. IBACH. Address SAMUEL E. MURRAY, care of Matthews, 116 W. Washington Place, New York, N. Y. This inventor improves and simplifies the construction and operation of mechanisms especially designed for use on automobiles, whereby the engine can be started from the driver's seat, and so designed as to be automatically disconnected from the engine shaft as soon as the engine is started, or in case of back fire.

DEVICE FOR CONTROLLING SHOCK.—C. B. BILLINGHURST, 303 Dakota Ave., Pierre, S. D. The invention provides mechanism for use in motor vehicles of every character for absorbing the shock and jar resulting from the movement of the vehicle over the road, wherein pneumatic cushions are arranged between the body and the frame of the vehicle in such manner that they will absorb and cushion the movement of the body and the frame with respect to each other.

ROUTE INDICATOR FOR AUTOMOBILES.—C. M. STODDARD, Phoenix, Ariz. This invention relates to means whereby the driver of an automobile may have the benefit of a complete log of a particular route, the readings of which will be changed as the route is traversed to show the road and certain directions in connection therewith for some distance in advance, say approximately 50 yards.

AUTOMOBILE SPRING.—T. A. TOMASINI, Cayucos, Cal. The invention relates particularly to a spring for automobiles in the nature of a shock absorber, and provides a construction capable of resisting and modifying the shocks usually following relative movements of the frame aud axle of an automobile when a rock or other obstruction in the roadway is encountered.

STORM SHIELD.—C. DILLING, 93 Menahan St., Brooklyn, N. Y., N. Y. The invention relates to a storm shield for baby carriages, which shield is in the shape of a supplementary, foldable hood which can be easily attached or detached from the permanent hood and which, when folded against the permanent hood, occupies little space and in no way interferes with the permanent hood.

COUPLING FOR AUTOMOBILES.—E. L. COLQUITT and H. P. SPENCER, Shelbyville, Tenn. The object of this invention is to provide a coupling for permitting a relief automobile to be coupled to a dead car for instance, in such manner that the dead car will follow the relief car, and will be turned or guided in the proper manner and without undue strain on either car.

CARRIAGE CURTAIN WINDOW.—C. G. FISHER, 217 N. Main St., Piqua, Ohio. This inventor provides a curtain frame that will permit the pane to be readily slid into or out of place in the frame; provides an inner glass-receiving frame member at the inside of the curtain and an outer frame member having fastening tongues which penetrate the curtain and extend at the inner side thereof, the tongues being flexible and adapted to be bent over the inner frame.

CAPSTAN.—C. M. HAHN and A. B. GREEN, Care of the latter, Valentine, Neb. This improvement provides a portable device which may be readily set up in operative position in front of a vehicle, and attached thereto by a flexible connection whereby, upon the operation of said device, said connection will be wound upon a drum or sleeve, thus drawing the vehicle forward.

FENDER FOR AUTOMOBILES.—J. P. GERAGHTY, care of Pennsylvania R. R., 5th and Hudson Sts., Jersey City, N. J. This invention arranges to normally hold the fender a considerable distance above the roadway to allow the fender to pass over ordinary obstacles, and to automatically drop, on a person or similar obstacle being struck by the fender, to safely pick up such obstacles and prevent the same from being run over and injured by the vehicle.

ROBE HOLDER.—D. C. RUSSELL, 703 E. 2nd St., The Dalles, Ore. This invention relates to the robe rail of an automobile or other vehicle, which in practice is secured to the dash-board or to the back of a seat to receive the robe, when the latter is not in use. It relates particularly to a robe rail in connection with which clamping means is employed, to prevent the accidental displacement of the robe or the removal thereof by unauthorized persons.

VEHICLE SEARCHLIGHT.—E. VON SZUPPINY, 287 Pennsylvania Ave., Paterson, N. J. This improvement relates to headlights or searchlights adapted especially for automobiles or other vehicles where it is desirable to vary the effect of the light with respect to distance ahead. It provides a searchlight having movable or adjustable lens devices.

MOTOR VEHICLE.—Z. L. BEDFORD, M. F. HIGGINS, JR., and C. C. HIGGINS. Address Henderson & Durbin, Suite 607, Savings Bldg., Lima, Ohio. An object of the invention is to dispense with the use of gasoline and substitute natural or artificial gas therefor, and to this end there is provided a supply tank or tanks mounted upon the vehicle and connected to the intake manifold of the engine by a suitable supply pipe.

MOTORCYCLE CAR.—G. MORROW and MARIE J. R. MORROW, 16 South Hazell St., Danville, Ill. This invention pertains to motorcycle cars—that is, to light vehicles to be connected with a motorcycle and disposed alongside thereof, and adapted to carry one or more persons. It comprehends various parts used for connecting the motorcycle in such manner as to secure safety and promote flexibility as between the various parts.

FOLDING ROOF AND REMOVABLE PANELS FOR MOTORS AND OTHER VEHICLE BODIES.—H. MOZEYKO, No. 17 Rue de Cormeilles, Levallois, Seine, France. This invention relates to a folding roof combined with a device for filling glazed sides applicable to motor or other vehicles. The glazed frames forming the sides inclosing the body are jointed on each side relatively to each other in such manner that they are able to open with the doors, and also, after having been folded one upon the other, they are able to enter housings or wells provided for this purpose in the interior of the vehicle body.

DOUBLE OR SINGLE HITCH TRUCK.—J. A. DAUGHTERY, Goldsboro, N. C. Axles are provided at the ends connected to the body to swing on vertical axes with respect to the body, each axle having an outwardly extending draft bar provided with a hook for engagement by draft apparatus, and wherein mechanism is provided in connection with each draft bar for preventing disengagement of the draft apparatus from the adjacent hook when the latch is in one position, and for engaging the body to prevent swinging movement of the adjacent axle when the latch is in another position.

Designs

DESIGN FOR A CANE.—E. C. RIEGEL, 550 W. 172d St., New York, N. Y. The skeleton handle of the cane has an oval form, the broader portion being uppermost, and the sides curving therefrom inward toward each other, thus forming the symmetrical crotch, whence the straight, smooth, and tapered stock of the body extends downward.

DESIGN FOR A CABINET.—J. VIRZI, 622 Cortlandt St., Bronx, N. Y. The cabinet body is square with a beveled top and bottom placed on a stand with four curved legs. The ornamental and line features are charming in their grace and simplicity.

DESIGN FOR A HAM MOLD.—H. ADELMANN, 530 Westchester Ave., Bronx, N. Y. This design for a ham mold is in two parts, the upper nestled snugly on the lower. The form is oblong and the whole mold is designed in round corrugated circles of comparatively broad effect.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.