

# SCIENTIFIC AMERICAN



KEEPING A CITY'S STREETS CLEARED OF SNOW: MOTOR PLOW AND SNOW FIGHTERS IN ACTION—[See page 547]

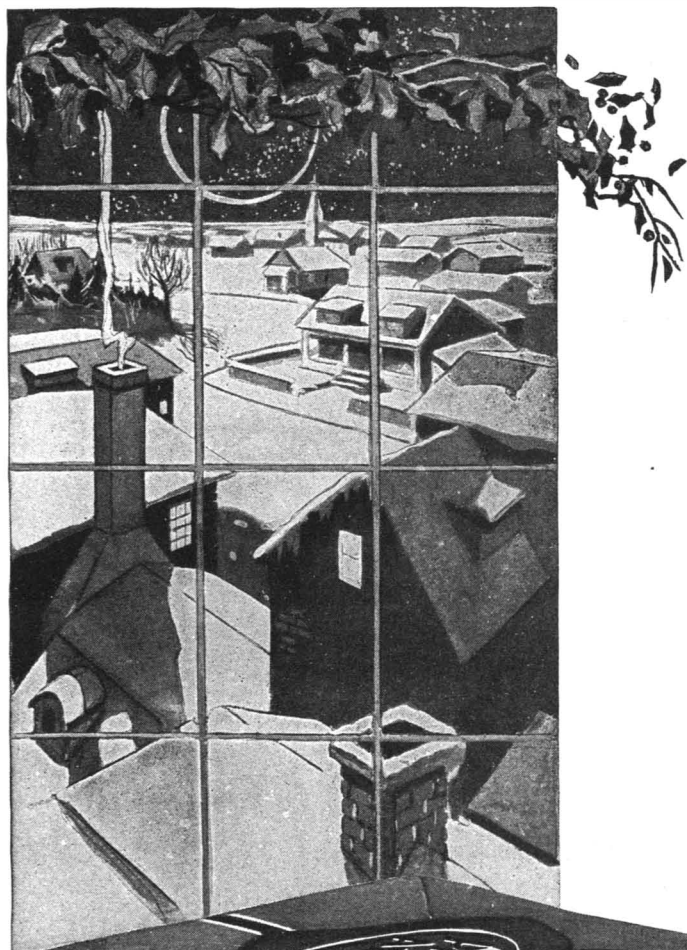
December 16, 1916

Munn & Co., Inc., Publishers  
New York, N. Y.

Price 10 Cents



# This Christmas pound-of-pleasure jams-*quality-joy* into *his* smokes!



Short-circuit the gift-game by passing him the pound crystal-glass humidor with sponge-moistener top filled brimful with Prince Albert pipe and cigarette makin's tobacco! For fine-flavor, for fragrance, for coolness, *for absence of bite* P. A. is the tip-top-all-year-round smoke! *But*, dolled like a thoroughbred in radiant holiday togs, the P. A. pound-package looks as nobby as the tobacco tastes great—and *makes a man chummy with the world early Christmas a. m. quick as he gets a flash at*

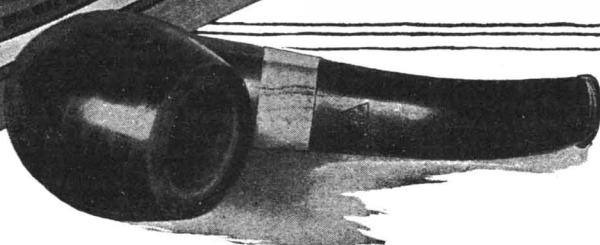
## PRINCE ALBERT

*the national joy smoke*

You hand out Prince Albert with the glad smile of cock sure-certainty that every jimmy-pipe-puff or makin's-puff will ring-up supreme tobacco contentment! For, *get it right here*, he can smoke his fill morning, noon, night *without bite or parch*; without any comeback but delight! Bite and parch are *cut out* by our exclusive patented process!

For your good gift-money Prince Albert offers you *nothing but quality tobacco*. Coupons or premiums have never been given as an inducement to smoke it! *On its quality* Prince Albert has won the favor of the most exacting smokers throughout the civilized world! It has captured the tastes of countless "regulars"; it has put on the road to tobacco-happiness thousands of men who had failed to find a smoke their tongues and throats could stand for! We tell you, P. A. has *everything* any man ever looked for in pipe and makin's tobacco!

**R. J. REYNOLDS TOBACCO COMPANY**  
Winston-Salem, N. C.



*Prince Albert, in its festive garb, equipped with a gift tag ready for you to sign your name, awaits your cheery holiday greeting. This pound package is always in very great demand for holiday remembrances and the quicker you order from your dealer, the surer you are not to be disappointed. Get yours! Prince Albert is also sold in handsome pound and half-pound tin humidors; in tidy red tins, 10c; in toppy red bags, 5c.*



# SCIENTIFIC AMERICAN

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## The Tragedy of the Spawning Ground

By Hamilton M. Laing

OF all the fish tribes that leave the salt water and ascend far inland streams to spawn, none perhaps tell a stranger story than do the salmon of the Pacific coast. Though kin to those of the east coast, they are very different, both in structure and habits of life, and nowhere is this distinction more pronounced than in their habits of spawning. Of the westerners, the Chinook—largest, most valuable commercially, best game and most delicious in the eating—is typical. His spawning habit is essentially different from the eastern species in that though he too pushes up stream to the shallow head-waters as do the easterners, for Chinook there is no down-stream march. He never returns: the riffles of the creeks far inland are his grave as they are his cradle.

Early in the spring (March and April) the run begins up the coast rivers from northern California to far Alaska. The fish entering fresh water first are bound for far inland destinations. Some of them, notably those ascending the mighty Columbia, travel a thousand miles inland; these start early. Others, bound for short coastal streams, come out of the salt water late and constitute an autumn run. None of the fish spawn till late summer or early autumn when the water reaches a certain degree of coldness. Thus the fish far inland spawn first, those in the lower, warmer streams later. In the tributaries of the lower Columbia large numbers of the fish have not spawned by October 1st.

During the spring run the Chinook is a great, clean, solid, game and beautiful fish, heavier than water, bulk for bulk. The giants of his kind occasionally weigh as high as one hundred pounds. On the spawning-ground or near it, he is something else. Wasted in body—he eats nothing after leaving salt water and therefore is weeks and even months without food—changed in color, as a mere relic of himself he arrives. He is bloodless and thin and light, most of his scales and much of his skin are gone, and he exhibits great white patches and blotches, apparently spots of dead and decayed skin. His fins and tail are frayed and wasted or worn off. Males and females are much alike in this respect save that the males are the more hideous and disfigured. In appearance they resemble fishes that might have rotted in the sun for weeks and then come alive again.

Such fish locally are known as dog salmon and the name is not inappropriate. The males—they are larger as a rule—now possess a number of specially grown, long, curved teeth like the canines of the carnivorous animals, and with these weapons the owners fight fiercely. The male apparently is in a savage mood and drives viciously at any other fish that approaches. Doubtless it is in these encounters that



A spawned female, thin and blotched

bits of fins and tails are torn away. Indeed there is little doubt that many of the weaker males are thus prevented from reaching the spawning-grounds. The race is to the strong—nature's inviolable way.

But selfishness or self preservation plays but scant part here. Each fish is possessed of a fierce overwhelming desire to reach the shallows. They rest in the deeper pools and struggle over the shallow riffles, and fight always upward. It is generally agreed that the fish return to spawn in the self-same river in which they were born. Doubtless the compelling instinct in them drives them blindly; but it is nature's provision again that the eggs may be left in the safest spots, least accessible to egg-eating fish. Nature in this respect, as is usual, sacrifices the individual for the good of the species.

No system of reproduction could be more wasteful. The fish do not pair; vast numbers of eggs deposited in the gravel by the females are not fertilized by the males and only a small percentage of the millions of eggs laid ever become adult salmon—to return in their fourth year from the sea to repeat the story. But most wasteful of all is the annual loss of the millions of great fish that make the run. None of them returns. Spawned-out females and torn and tattered males, both alike revolting in their disfigurements, die in the shallow of the upper reaches of the stream after their mission is ended.

## The Breeding of Silver Black Fox on Prince Edward Island

THE domestication of the silver black fox began in a small way on Prince Edward Island about a quarter of a century ago. The one idea of the pioneers was the production and sale of an exceptionally valuable fur as a source of profit. They found it to be a most profitable business after they had evolved the modern fox ranch and solved the many initial difficulties. In some instances, during the year 1910, the breeders were able to dispose of single pelts in London at a price of £500 sterling and upwards.

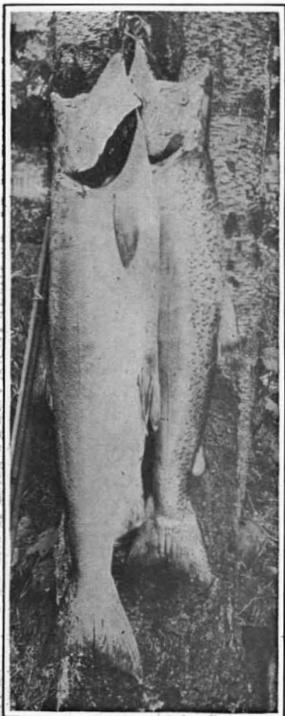
When it became known that the business of fox breeding produced such alluring profits, other persons desired to undertake it and the sale of breeding foxes began, first at moderate prices, which rapidly increased as the demand far exceeded the supply. From 1910 down to the beginning of the great European war few ranch-bred silver black fox pelts were offered for sale, as the sale of breeding foxes was more profitable.

In the meantime, beginning in 1912, companies were formed to carry forward the rapidly expanding enterprises. Fox companies chartered under the laws of Prince Edward Island at the beginning of March last numbered close upon 300, while the number of fox ranches owned and operated by the companies and by partnerships and private individuals, was about 400. These ranches contained some 4,000 silver black foxes and about 2,000 cross and red foxes under domestication. More likely than not these figures have been considerably increased since the time they were compiled.

The war had an important effect upon the fox breeding business. It temporarily closed the large fur markets of Great Britain and the Continent of Europe, greatly checked the sale of furs and diminished the demand for breeding foxes. The fox breeders of Prince Edward Island met the situation by adding to their breeding stock of young foxes they had reared, suspending the payment of dividends, which in 1912-13 had been very large, and carrying forward production upon an enlarged scale.

In the meantime the Silver Fox Breeders' Association of Prince Edward Island was incorporated (in 1915) and has since carried on the work of classifying, registering, and marking the silver black foxes within the Province, thus giving to fox breeding the same status as pure bred live stock. The result has been most gratifying, a much larger proportion of these silver foxes than of any other live stock being already duly registered. A purchaser can now readily obtain breeding foxes with such authenticated pedigree and record as will afford a practical guarantee that their offspring will prove true to type.

The Sales Board of  
(Concluded on page 559)



Fine big fish in the spring



Alike his cradle and his grave, the upper reaches of the streams after spawning time are filled with the dead salmon



After spawning they look like this



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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.

## Trench Chiropody

ONE of the most serious evils with which the men in the trenches of France and Belgium had to contend during the winter of 1915-16 was "frozen" feet, or rather, frost-bitten feet. So many men were disabled by this malady, which was frequently serious enough to make amputation necessary, or even to cause death, that more than one military surgeon devoted special study to the subject.

While the symptoms are similar to those in which there has been actual freezing of the affected part, the condition often occurs when the temperature is considerably above freezing point. Humidity is one strong contributing factor, and another is the poor circulation induced by inactivity and over-tight shoes, stockings, or puttees. Hence some of the earliest recommendations of the surgeons were to keep the feet as warm and dry as possible, and to avoid constriction of the feet and legs.

It now appears from the researches of two French bacteriologists, Raymond and Parisot, that in the worst cases there is another contributing cause. They declare in fact that "trench-foot," to use the popular name, is largely due to the action of parasitic fungi, not unlike those which cause meat, bread, etc., to become covered with mould. In other words the soldiers' feet become mouldy.

Every one who has had even a touch of "frostbite" or "chilblains" knows the discomfort of the first symptoms of swelling and itching, followed by blisters. If the malady is allowed to progress the blister may be followed by a foul ulcer, or the skin will crack and even bleed. If in this state the foot comes in contact with mud containing the tiny fungus mentioned, which bears the formidable name of *Scopulariopsis Koningii*, the latter penetrates the tissues by means of the cracks in the skin, being specially fond of a location around the roots of the nails. Here it proceeds to develop with great rapidity, provided the temperature is suitable. The morbid condition thus set up may not only lead to such degeneration that amputation of one or more toes, or even the whole foot, is necessary, but may result in serious general debility.

For treatment Raymond and Parisot advise thorough washing with borated camphorated soaps. This destroys the fungus growth and the swelling will subside in three or four days, though the neuritic pains may persist for 15 or 20 days. The *Scopulariopsis* and a similar mischief maker, the *Sterigmatocystis*, are both found in straw, manure and stable-bedding, so that dairymen, horsemen and farmers generally should take such precautions as are being urged on the trench-dwellers. The feet should be kept disinfected with the above mentioned soap and in case the blood begins to move sluggishly care should be taken to restore the circulation by suitable means, such as friction, cold plunges, rubbing with snow, etc.

## The Military Man-Power of the United States

DURING the Civil War, when the population of the country, exclusive of the seceding States, was less than one-fourth as great as the present population, estimated at 100,000,000, of the entire United States, the total number of men serving in the Federal Armies at one time and another was approximately 2,500,000, due allowance being made for duplicate enlistments, that is, cases in which men enlisted more than once.

In view of the unexpected favor with which the public (apparently in all sections of the United States) has received the suggestion that the key to a solution of the problem of naval and military preparedness is to be found in some form of universal service, the question arises as to just how many able-bodied citizens of military age there are at the present time in the United States. A partial answer to this question has been made by the Bureau of Census of the Department of Commerce,

which although it is unable to make any estimate of the proportion of our able-bodied men, arrives at the conclusion that the total number of male citizens and prospective citizens (foreign-born persons who have declared their intention to become citizens) 18 to 45 years of age, inclusive, is not far from 21,000,000.

This estimate is based on the assumption that since the census of 1910 there has been an increase of approximately ten per cent in the population of the country. In 1910 the total number of male citizens and prospective citizens, 18 years of age and over, but under 46, was 19,183,000 made up of 14,224,000 native whites, 2,857,000 foreign-born whites, naturalized or having declared their intention, 2,052,000 negroes and 50,000 Indians.

If we include 1,796,000 alien whites and 92,000 Chinese, Japanese and others, together representing about 9 per cent of the total who would be ineligible for military service, the census of 1910 shows the total number of males 18 to 45 years of age inclusive, to be 21,071,076. Taking the country as a whole, the probable increase in population between 1910 and 1916 will, in the opinion of the Census Bureau, approximately counterbalance the number of alien whites, Chinese, Japanese, etc. included in the figures for 1910; so that 21,000,000 may be accepted as roughly representative of the number of male citizens and prospective citizens, 18 to 45 years of age inclusive, in the United States at the present time.

The enumeration by States shows that New York contains 2,223,633; Pennsylvania, 1,842,266; Illinois 1,369,910; and Ohio 1,107,888, making a total of over six and one-half million men of military age from these four States alone, the total for the Northern States alone, being over 13,000,000. The Southern States contribute about 6,000,000 to the total and the Western States about 2,000,000.

If to the total estimated population of the United States today of 100,000,000, we apply the commonly accepted military estimate that 10 per cent of the total population represents the really first-class material available for service at the front, we find that the United States could furnish over 10,000,000 men in this category. This, however, is a conservative estimate, for it is believed that Germany has succeeded in producing 13 per cent of first-class effectives out of a population of about 70,000,000.

## Report of the Secretary of the Navy

IN the opening of his report for the fiscal year 1916, the Secretary of the Navy emphasizes the fact that the great increase in ships and personnel recently authorized by Congress is yet to be carried out. "I feel it my duty," he writes, "to warn as solemnly as I may against the danger that lies in a possible feeling on the part of our people, that the Navy has now been attended to, has been placed where it belongs among the great navies of the world, and that there is nothing further to be done."

The building programme recommended by the Secretary calls for three battleships, one battle-cruiser, three scout-cruisers, fifteen torpedo-boat destroyers, four fleet submarines, fourteen coast submarines, one fleet submarine tender and one destroyer tender, a total of 42 vessels. This, the second installment of the great programme authorized by Congress, is smaller than that called for in the recommendations of the General Board, which includes in addition to the above programme, one additional battleship, an additional battle-cruiser and an increase in the number of smaller and less important craft.

Congress, at its last session, decided that the 156 ships called for by the great naval bill should be built on a three-year programme, and appropriated money for beginning work on sixty-six of these, leaving ninety ships to be commenced during the coming two years. The Secretary's recommendation is, to begin on about half of the remaining ninety ships in the fiscal year 1918, leaving the other half to be appropriated for in the Naval Bill for 1919.

In view of the critical international situation and the fact that the increase of our Navy is as yet upon paper only, it would seem to be the part of prudence for Congress to adopt the larger programme of the General Board; but the Secretary urges against this the "impelling reason" that the private and public yards cannot, unless the building of merchant vessels is abandoned, put through a larger programme than he has recommended.

The obvious answer to this is that if patriotic considerations do not lead our private shipbuilders to give Government work the preference over merchant ships, Congress should have power to make it obligatory upon the private yards to give preference in critical times such as these to Government work.

Looking forward, the report shows what will be the strength of our Navy when the present programme has been completed. It is estimated that by 1921, according to the General Board's estimate of existing vessels of the Navy that will have become obsolete, we shall have 27 battleships in the first line, 25 in the second line, 6 battle-cruisers, 9 armored cruisers, 13 scout-cruisers (of which, by the way, only the ten new 35-knot scouts

can be considered up to date, the three 24-knot scouts of the Birmingham class being too slow for modern work), 108 destroyers, 12 fleet submarines, 130 coast submarines, 18 unprotected cruisers, 15 fuel ships, 5 transports, 6 tenders to torpedo scouts, 2 ammunition ships, and 8 auxiliaries of special type.

A remarkable fact brought out in the report is that the 813,000 tons of new construction, authorized by the 1917 Act, is greater than the total tonnage authorized in the ten preceding appropriations, and that the 377,000 tons of new construction to be begun as soon as possible is five times the average annual output of the preceding ten years.

All of which would be most excellent, were it not for the fact, as mentioned by Secretary Daniels, that the labor and material conditions and the great amount of private work on hand in the shipbuilding yards, will prevent any great speeding-up of this work.

The great Naval Act of 1917 was above all an emergency measure. As we have shown over and over again in these columns, the decline of our Navy from its position of second in strength, which began with the appearance of the dreadnought in 1905, has been due to the failure of Congress during the past decade to make the necessary appropriations. The 1917 Act was an attempt to repair this neglect by a single great programme for new construction; but unless construction is speeded up beyond the point contemplated in the Secretary's report, even this emergency measure will fail of its purpose.

As we showed earlier in the year, it would be possible, by lengthening existing building ways at the public and private shipyards, to lay down at once no less than ten ships. And if construction were quickened to the point now being reached in British yards, it would be possible to have the hulls afloat in less than 12 months and the ships completed within two years of the date of first laying down.

This, of course, would call for an emergency rate of work, such as we have proved capable of in the building, equipment and output of munition factories since the war began. If the answer be made that Great Britain is at war and we are not, and that the call for urgency in the reconstruction of our Navy is less insistent, we can reply that the international situation is so full of dire portent, that no safe prediction can be made as to the peaceful security of the United States during the years through which the present war seems destined to run.

The Secretary states that the new battleships will carry 16-inch guns and that the speed of 35 knots to be attained by the new battle-cruisers will insure that these vessels will retain their advantage of speed, as compared with the heavily armored battleship type, throughout their useful life.

We learn from the report that last year's appropriation will enable the Department to provide ample ammunition reserves. Reference is made to the growing difficulty, due to the flattering wages paid for labor by the manufacturers, of getting the young men of the country to enlist in the Navy. Although the report does not mention the subject, it begins to look as though, if our greater fleet is to be manned, the country will have to resort to some form of universal service.

And just here reference should be made to the fact, as mentioned in the report, that the old and absurd system of promotion of officers by seniority, is to give place to promotion by selection, based upon general fitness.

Finally, the Secretary gives considerable attention to the most critical situation in respect of the conserving of the oil reserves of the country for the use of the Navy. Without oil fuel our new fast battle-cruisers and scouts could not be built; and since all our new ships are to burn oil for fuel, the Navy, when the three-year programme is completed, will require 6,721,000 barrels of oil per year to keep them going.

"It would be a national calamity," writes the Secretary, "for this country to fail to preserve the oil reserves."

Mention is made of the excellent results obtained from the Naval Training Cruise for civilians, of the National Naval Volunteers, and the Naval Reserve Force, which includes all former officers and men of the Navy now in civilian life, officers and men of the merchant marine and civilians who may be capable of affording useful service to the Navy in connection with the defense of the coast.

## A Central Commercial Laboratory for Finland

IN view of the widespread interest created by the war in organized scientific research, there need be no surprise at the announcement of the creation at Helsingfors of a central laboratory for the study of the technical problems encountered by industrial concerns. This undertaking has the financial support of the government on the one hand and of a number of large private enterprises on the other. Besides attacking specific problems it "will pursue systematic researches on various questions relating to manufacturing processes, either on its own initiative or when its assistance is requested."

It will also be a school for highly specialized engineers who will be trained in precise methods for the advancement of applied science.



## Electricity

**Electric Plowing.**—It is reported that electric plowing on an extensive scale has been carried out recently in Sweden, Italy, and France. The results are said to have been extremely favorable, justifying the use of electricity in preference to animal, steam, or oil traction.

**Industrial Electrical Heating Devices in Chicago.**—According to a recent estimate made in the Windy City, there are approximately 33,327 industrial heating devices electrically heated in that metropolis. It is further estimated that these devices represent a value of \$325,145 and a connected load of 23,772 kilowatts.

**Combination Electric Lamp and Stove.**—Norman G. Nicoll of Newark, N. J., has been granted a patent on an electric lamp that may be used as a stove as well. The shade of the lamp contains the heating unit, which may be connected to the socket of the lamp by inverting it, removing a screw top of ornamental design, and screwing the bared attachment plug into the socket of the lamp stand. Liquid may be placed in the bowl of the inverted lamp shade, or a number of utensils contained in the base of the lamp may be employed in cooking the food.

**Electrical Limit Gages.**—In the accurate testing of limit gages electrical methods are being found very helpful. A typical instance is presented in the gages used for testing time-fuse firing pins, where two points are connected in an electric circuit. If the firing pin touches either of the points it completes the circuit and the sounder clicks. The first contact is adjusted to such a height that if the tip of the firing pin touches it, it shows the work is too long; similarly, if the pin does not touch the second contact point, it is too short. In either case the work will be rejected.

**Electric Smelting Proposed in New Zealand.**—The possibility of producing pig iron in New Zealand on a large scale is being thoroughly studied by the authorities as well as by private interests. It is proposed to use electricity for this purpose instead of coal, as indicated in a circular containing the report of the chief electrical engineer of the New Zealand government. There is an ample supply of iron ore in various forms and plenty of water power that may be developed easily to supply electricity at an exceedingly low figure. The report mentioned states that matters are being organized with the idea of entering upon this industry on short notice as soon as the plans are completed.

**Taking the Twist Out of Flexible Cords.**—To overcome the troublesome twisting of flexible cords there has been developed a swivelling attachment that can be readily inserted into any ordinary telephone or other electrical extension cord. It consists of two small composition parts turning on a central spindle, all inclosed in two small brass shells or covers. Between the two rotating parts are two ball races that serve both as frictional bearings and as conducting means. The cord terminals are easily connected to the binding screws on each part, and there is ample room for a strain knot within each shell. The freedom of the swivelling of the two halves of the device eliminates the snarling of the cord.

**New Type of Soldering Irons.**—Possessing many advantages over the usual electric soldering iron, there has of late been introduced a new form of iron in which the generation of heat is at the point of contact and at the spot where the heat is needed for soldering, brazing or annealing purposes. It is said that the iron becomes heated to the required degree the moment it touches the work, so that there is no time lost on the part of the user. Essentially, the new iron consists of two high-resistance heating points or electrodes which become incandescent when current passes through them. The circuit is closed when the points come in contact with the metal to be treated. The iron operates at a low potential, the range being from 6 to 16 volts, and the points are made to carry current according to ratings of 150, 250 and 500 watts.

**Accurate and Rugged Condensers.**—An interesting and highly ingenious method of making paper condensers is covered in a patent recently granted to Edmund B. Wheeler and Morton Sultzer of East Orange, N. J., and New York city, respectively. Whereas the existing practice has been to use tinfoil between the successive layers of insulation, the inventors propose that part of the tinfoil sheets, preferably the last few sheet on each side of the condenser, be replaced by copper or aluminum foil so as to add strength to what has heretofore been the weakest mechanical feature of a condenser. The liability of tinfoil lugs to tear upon the slightest provocation is well known. The same copper or aluminum foil sheets permit of the building of an accurate condenser because the capacity at first can be made a trifle higher than is desired, and the required amount of foil can be withdrawn until the capacity is precisely that which is desired. The latter proceeding is obviously impossible when tinfoil is employed.

## Astronomy

**A New Observatory in the Southwest.**—According to a note in *Science*, an unnamed benefactor has given the University of Arizona \$60,000 for the construction of an observatory, which is to be equipped with a 36-inch telescope.

**Standard Equinoxes for Star Positions.**—The American Astronomical Society has recommended that in any publication involving star positions no equinoxes should be used intermediate between the years 1900 and 1925. If this plan of widely spaced standard equinoxes is generally adopted it will greatly reduce the amount of labor now involved in the treatment of the star positions given for a multiplicity of equinoxes.

**Solar Corpuscles and the Aurora.**—A recent paper by K. Birkeland takes issue with the well-known hypothesis of Störmer, according to which the aurora is due to the bombardment of the earth's upper atmosphere by positive corpuscles emitted by the sun. The author gives evidence deduced from his experiments on the discharges from a magnetized kathode in a special vacuum chamber, indicating that the corpuscles in question are negative instead of positive.

**Observations of Variable Stars.**—In tracing the history of variable star observations Mr. Leon Campbell has recently recorded some interesting statistics. For some years past the Variable Star Section of the British Astronomical Association has been making observations on a list of 30, and latterly of 50, long-period variables, and has published 20,000 observations, while 16,000 more are in preparation for printing. The Harvard Observatory has published to date some 49,000 and will shortly print about 15,000 more, secured during the past five years by its regular staff and outside coöperators. Lastly, the American Association of Variable Star Observers, founded in 1911, has published about 58,000 observations in the monthly numbers of *Popular Astronomy*. Thus there are available altogether for the discussion of 300 variable stars about 89,000 observations made during the past five years.

**Rotation Period of Venus.**—While some astronomers have not abandoned the old belief that Venus has a rotation period differing little from that of the earth, the bulk of authority has certainly been for many years in favor of a rotation period identical with the planet's period of revolution around the sun; viz., 224.7 days. A modification of the latter view has recently been put forth by Mr. David H. Wilson, who made a long series of observations and drawings of the planet at the Philadelphia and Flower observatories in 1914 and 1915, using special precautions to eliminate personal equation in the delicate task of identifying surface markings. Having established, to his own satisfaction, the identity of certain markings, he found apparently the same markings in the drawings made by other observers during the past forty years. From these studies he deduces a rotation of 223.9 days; i. e., slightly less than the period of revolution, and not identical with it, as has been commonly supposed. He finds the same perpendicular position of the axis heretofore accepted by the believers in a long rotation period.

**A New Process of Stellar Photometry** has been developed by Mr. H. T. Stetson at the Yerkes Observatory. At present the common photographic method of determining the brightness of a star involves measuring the diameter of the image on the photographic plate. One serious difficulty in this process is due to the fact that the images show no well-defined periphery, so that the diameter is more or less uncertain. The difficulty is augmented if the images are elongated or poorly defined. Another method is that of extra-focal images; the plates are placed at a considerable distance from the focus of the telescope, and under these conditions the star disks are all of appreciably the same size, but differ in opacity, and the latter is determined with a calibrated photographic wedge, by means of a Hartmann micro-photometer or other similar device. The principle involved in the new method is to measure the energy absorbed from a beam of light by the silver grains in the stellar image on a photographic plate, and to interpret such absorption in terms of stellar magnitude. A thermopile is so placed as to receive light from a constant source, and in the path of the light is placed the star image, on the photographic plate. The image thus stops an amount of energy depending upon the magnitude of the star. The apparatus is also adapted for measuring opacity of the image in extra-focal photographs, and for measuring relative intensities in plates of stellar spectra. The principal sources of error in this process appear to be variations in atmospheric conditions during exposure at the telescope and irregularities in the photographic plates, but it seems to mark a distinct advance over the method of measuring diameters of star images. As compared with the use of the selenium cell and the photo-electric cell, Stetson's process is applicable to a wider range of star magnitudes. A special thermopile was devised for this apparatus by W. W. Coblentz, of the Bureau of Standards.

## Aeronautical Notes

**The British Expenditures for Aeronautics** is reported to be close to £50,000,000, or \$250,000,000, this year, and that more British money is being spent on American aeroplanes and aeronautic engines than the United States government has so far expended. While this sum seems stupendous at first, when the wealth of Britain is considered, as well as the probable cost of unpreparedness in aerial defences, the investment is well worth while.

**Improvement in German Air Service.**—In a recent interview with a German newspaper representative, Prince Rupprecht of Bavaria said the following concerning the German air service on the Western front: "Our artillery has been strengthened and also our aviators. In the last few days they have again had very fine successes after their hard fight against a great force of enemy aircraft. That our aviators are able to hold their own has given our first line artillery an advantage. It was previously much exposed to observation by the enemy air service."

**French Invent New Type of Captive Balloon.**—Credit is due Captain Caquot of the French Army for a new type of captive balloon which, it is reported, will revolutionize aerial observation work. His balloon appears to have a shape similar to that of a Zeppelin and consequently offers little resistance to the wind. It is stable in the air, and remarkably free from vibration. In comparison, the existing observation balloon or "sausage" is bulky, presents a ready mark to the enemy's guns and aerial attack, and cannot withstand a wind of 30 miles an hour or more without the danger of breaking from its moorings and drifting, in some cases, over the lines of the enemy.

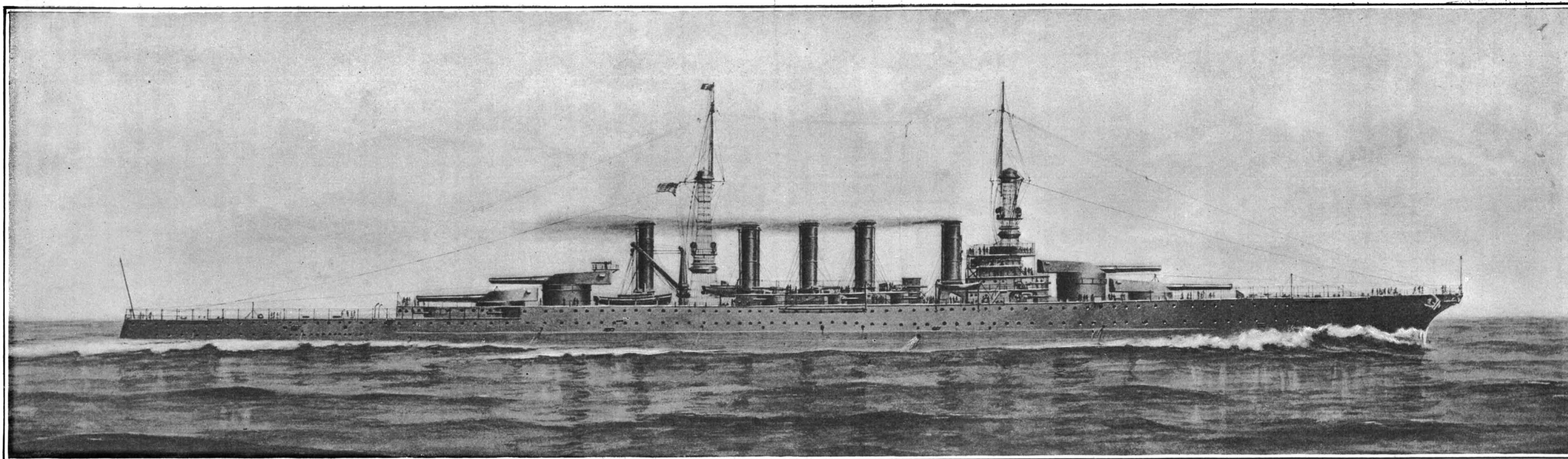
**German Losses in the Air** were recently estimated by *Le Journal*, which obtained its figures from the official *communiqués* and sums up the results obtained by French aviation from July 1st to September 25th of the current year: CHASER PLANES: Enemy machines brought down, July, 38; August, 46; September, 48—total, 132. Aeroplanes put out of action and fallen in German lines, July 13; August, 45; September, 38—total, 96. Kite balloons set on fire, July, 14; August, 8—total 22. BOMBARDMENTS: Number of bombs dropped in territory occupied by the enemy, July, 804; August, 1,035; September, 2,061—total 3,900. In German territory, July, 454; August, 309; September, 764—total, 1,526.

**Is London to be Destroyed?**—From a reliable source it is learned that a fleet of 50 super-Zeppelins is now in course of construction in Germany for the express purpose of destroying London in a daring air raid. Evidently, if this report is authentic, the Germans have not yet come to realize that such a plan is doomed to failure at its inception. The fateful reception of the Zeppelins in recent raids over England has failed to convince the Teutons that an aerial raid on London is daily becoming more difficult and the chances of success more remote. It is obviously their belief that failure has hitherto been attributable to lack of numbers and that a fleet of sufficient magnitude can accomplish this one big aim of Count Zeppelin and the German people during the life of the present war.

**America to be First in Aeronautics.**—According to Alan R. Hawley, President of the Aero Club of America, America is to be first in aeronautics in the near future. This conclusion is reached by those who are close to aeronautic developments, and is not based upon the belief that we shall secure immediately the aeronautic equipment that we lack for our national defences, but upon inside knowledge of the extensive resources that we have, which are being developed at a rapid rate. Mr. Hawley states that we lack, in round numbers, about 2,000 aeroplanes, 25 dirigibles and 150 observation balloons to make this country seventh among the nations in aeronautic equipment for national defence. It would appear that considerable progress has to be made to place our aeronautical defences ahead of those of Great Britain, which is reported to be fast approaching the 10,000 aeroplanes mark.

**Transatlantic Flight Planned by Norwegian.**—Kjell Nyegaard, a Norwegian naval lieutenant, and Hugo Sundstedt, a Swedish naval captain, will sail to New York soon to prepare for a transatlantic aeroplane flight, according to the *Aerial Age Weekly*. They will carry as passenger Lieutenant Nyegaard's wife. The Norwegian aviator expects to purchase a Curtiss machine of larger type than that built for Rodman Wanamaker. He intends it to be a triplane of 131 feet wing spread, equipped with six motors of 160 horsepower each, capable of lifting 5,000 kilograms (55 tons), carrying six persons, with a fuselage constructed like a motor boat, with a water propeller, so if forced to alight on the ocean they can chop away the planes, proceeding as a motor boat. It is understood that the start is to be made from Newfoundland in April or May, when favorable winds prevail, and reach Ireland in 20 hours, continuing to London without stopping, if all is well. The performance would win the Paris *Matin* and London *Daily Mail* prizes of \$50,000 each, besides other cash awards.





Length over all 874 ft. Beam, 91 ft. Displacement, 34,800 tons. Horse-power, 180,000. Speed, 35 Knots. Battery: ten 50-cal. 14-in. guns; twenty 5-in. 50-cal. guns, four 3-in., anti-aircraft guns; eight 21-in. torpedo tubes. Complement, 1,274.

The new United States battle-cruisers—they will be fast as destroyers, powerful as battleships, and big as Atlantic liners

## Our Superb Battle-Cruisers

BY the courtesy of the Secretary of the Navy, we are enabled to publish the above official drawing of the accepted design for our new battle-cruisers, the construction of a division of six of which was authorized last summer. It will be agreed that, without exaggeration, these stupendous war ships, in their combination of size, speed and power, must be considered to be the most novel and sensational (if we may use the word) ships designed for any Navy since the day of the British Dreadnought. They have the length of the largest transatlantic liners, the speed of the fastest destroyers, and the gun power of a modern battleship. On one point only, that of armor protection, is information lacking. The SCIENTIFIC AMERICAN does not know exactly the thickness and distribution of this armor, and if we did we would not tell; for if there is one feature of warship design more than any other upon which the Naval Constructor is silent, it is that of the armor plan of new ships.

To come down to details, the new battle-cruisers are 850 feet between perpendiculars and 874 feet over all; their beam is 91 feet, and their draught is over thirty feet. Now 850 feet between perpendiculars is just 100 feet greater than the length between perpendiculars of the famous "Lusitania," and, if we remember rightly, it is exactly equal to the length between perpendiculars of the Hamburg-American liner "Imperator."

In view of these figures it is surprising and very significant to learn that the displacement of the battle-cruisers will be only 34,800 tons. This is several thousand tons less than the full-load displacement of the "Lusitania" and about 20,000 tons less than the full-load displacement of the "Imperator." The apparent discrepancy is explained by the relatively moderate beam, 91 feet, of the battle-cruisers, and the

remarkable fineness of their model. The "Imperator" has 7 feet more beam and she carries this throughout several hundred feet of her mid-length. The battle-cruisers, on the other hand, fine away rapidly towards bow and stern, the entrance and the run of the vessels being as fine, if not finer, than that of a destroyer. Moreover, the midship section shows a decided dead rise and the round of the bilge is turned in with a large radius, differing in this respect greatly from the cross-section of the typical warship of big displacement.

In spite of the extreme refinement of the underwater model, in order to secure a contract speed of 35 knots, which is 5 knots faster than that of any existing British or German battle-cruiser, it has been necessary to install a boiler-and-engine plant of 180,000 horse-power. This is two-and-a-half times larger than the motive power of the "Lusitania," which made 25 knots with 70,000 horse-power, and it is over twice the horse-power of the "Imperator," which made 23 knots with 80,000 horse-power. Now those of our readers who make a study of these big ships, naval and mercantile, will be asking how in the world it is possible to get this amount of motive power inside a ship with such a refined model as these. They will remember that the engines and boilers of the "Lusitania," for instance, took up approximately three-quarters of her floor space, extending from the stern to the bridge.

The solution of the problem is a demonstration of the remarkable advance which has taken place in marine engineering during the past decade. The "Lusitania" used the bulky Scotch boiler. She demanded a width of 18 feet on each side of the ship for her huge coal bunkers, of 7000 tons capacity, and her relatively slow-speed compound turbines demanded a large share of the tank top area for their installation. The battle-cruisers substitute the compact watertube boiler for the Scotch boiler; oil fuel, stored in the double bottom, takes the place of coal and the coal bunkers, thus permitting the whole width of the ship to be given up to the boiler plant;

high-speed turbines direct-connected to generators will furnish current for driving motors placed directly upon the four propeller shafts,

and, lastly, we shall see in these ships the novelty of the boiler-and-engine plant being located upon two decks.

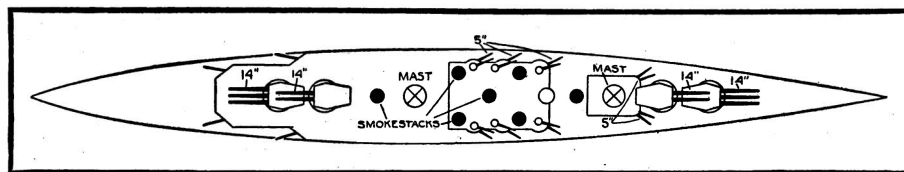
If it were not for the use of oil fuel, watertube boilers, and the turbo-electric drive, it is certain that these wonderful ships could never have been designed, much less, built.

The electric drive has solved the problem of reconciling the demand for high speed of rotation in the steam turbine with the demand for relatively low speed of rotation of the propellers. To get the full efficiency of the turbine it is necessary that the speed of the blades in the turbines be high, but in large ships such as this, to obtain the best

efficiency with the propellers, it is necessary to keep their speed of rotation down within certain limits. In the earlier turbine ships, when turbine and propeller were on the same shaft, the matter was compromised by running the turbine below its best economical speed and the propeller above its best economical speed. The problem has been solved of late years by the introduction of reduction gearing. Westinghouse of this country and Parsons abroad have secured good results with mechanical gearing, and the General Electric Company have obtained excellent results with their turbo-electric drive, as installed on the U. S. Collier "Jupiter." It is their system which will be used on the new battle-cruisers.

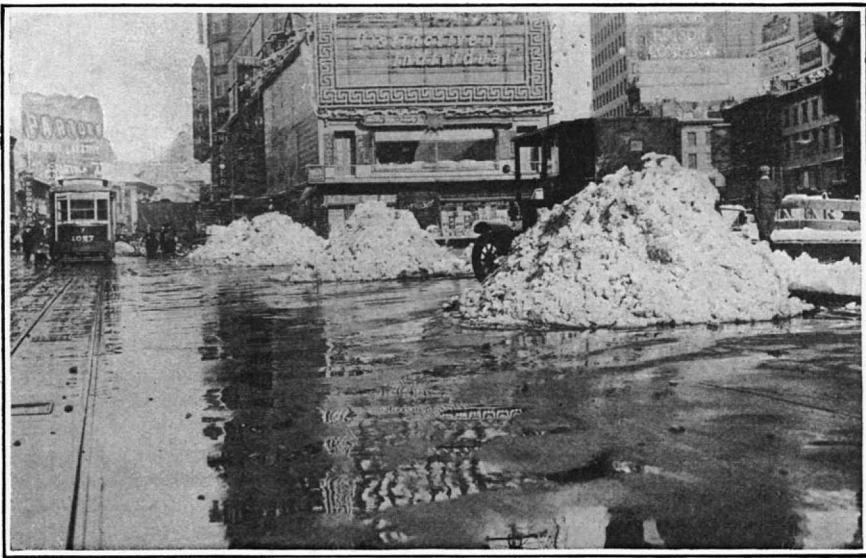
The question of the type of gun (14-inch or 16-inch) to be mounted in the main battery of the new battle-cruisers has been decided in favor of the new 14-inch, 50-calibre gun, and ten of these will be mounted in four turrets, two of them carrying three guns and two of them two guns each, the number of guns and their method of emplacement being similar to that of the battleships "Nevada" and "Oklahoma." The total energy, however, is considerably greater, the 50-calibre gun of the battle-cruisers developing 70,000 foot-tons of muzzle energy as against 65,000 foot-tons for the 45-calibre gun as mounted on the "Nevada." This means that a broadside salvo from the battle-cruisers will have a total muzzle energy of 700,000 foot-tons, or sufficient to lift 1000 tons 700 feet into the air. Defense against torpedoes will be entrusted to a battery of twenty, 50-calibre, 5-inch guns, sixteen of which will be mounted amidships on the upper and superstructure decks. No less than eight torpedo tubes for firing the new 21-inch torpedo with a range

(Concluded on page 560)



Deck plan of the 874-foot, 35-knot battle-cruisers





It is of paramount importance to keep the streets open to traffic, hence the snow is piled up awaiting its removal



After the snow has been largely removed, what remains in the form of small piles is left to melt away

## New York's Army of Snow Fighters

### How the Problems Arising from the Scarcity of Labor are to be Met

By C. L. Edholm

**T**HE problems of snow fighting in New York city are considered long in advance by the Department of Street Cleaning, just as the General Staff of an army develops its strategy and plans campaigns long before war is declared. Among the snow fighters the conditions have more than a fanciful resemblance to military operations; there is the regular organization to be drilled and instructed, and the municipal vehicles and implements that can be counted on; then there is the volunteer army, which must be reckoned afresh every year, and efforts must be made as winter approaches to secure as many enlistments as possible. While the recruits do not require a quartermaster's department to feed and clothe them, yet the paymaster of the snow fighter's army must handle promptly and accurately the pay-roll of thousands of men, and the money must be on hand at the 103 stations at the end of the storm, or as soon thereafter as possible. Then there are the allied forces to consider and plan with—the contractors, the street car companies and the private truck owners, who may be called upon when the snow-fall is unusually heavy.

Among the officers, the strategists of the campaigns, there must be discussion of modern methods of handling the snow in various parts of the city, an alertness to make use of new inventions and a spirit at once imaginative and practical; in a word, the same resourcefulness that should prevail in the General Staff.

Preparedness is the watchword here, for the blizzard begins hostilities without declaration of war, so batteries of snow plows must be always available, fleets of trucks and motor vehicles registered, and the thousands of volunteers must be listed so that they can be mobilized and on the firing line with shovels and scrapers within four hours after the call is sent out.

This year, owing to the general scarcity of labor, there is a dearth of volunteers. Though posters have been displayed, urging men to register at the station nearest their homes, the response has been far below that of 1914 and even less than that of the following year. The organizations that supply labor have been notified, and city employees have been solicited to enroll for clerical work, but in spite of all efforts it appears that the required number of emergency snow fighters, 14,737, will not materialize. Therefore greater dependence than ever must be placed upon machinery to clear the streets.

The class of men desired for this work is not the habitually unemployed, though every man who is fit and willing is welcome. The

best workers are those who are thrown out of a job by the storm, such as builders, concrete workers and laborers, whose work in the open is suspended in severe weather. They are the sort who are used to hard work and will earn their 30 cents an hour, or even exert themselves to earn the bonus of 10 cents an hour above that, paid to the highly efficient. The chronic loafer, however, the bench warmer of the parks, is likely to prove a quitter. His muscles are softened by idleness; and his ambition is satisfied when he has earned a couple of dollars to provide for his immediate needs. Also the man who has a permanent home is desired, for the reason that he can be notified speedily by the patrolman in his neigh-

borhood. Prompt response to emergency calls is essential in snow fighting. The work begins while the snow is still falling, as it is far easier to handle while it is fresh and light than after it has become packed hard or frozen into chunks of ice. Within a few hours after the call goes out, the gangs assemble under direction of a squad leader, a sweeper, and begin clearing the area to which they were assigned in the general plan. It is a scene of intense activity. Efforts are made to open the thoroughfares for traffic at the earliest moment so that business may not be interrupted. This is the essential difference between snow fighting and snow removal, which by the older methods took place after the storm, traffic being blocked meanwhile.

By the modern system a passageway is opened first of all, snow plows working through the street in couples, one in advance of the other, and piling the snow at the sides of the street or in the middle, according to conditions on that thoroughfare. Where motor trucks with plows are not employed, the gangs of emergency men with scrapers do similar work, shoving masses of snow into the sewer openings and piling what the sewers will not take in heaps for subsequent removal.

To illustrate the care with which the officers plan their campaigns this example will serve: At an officers' meeting visited by the writer the question arose how best to handle a snowfall which was followed by rise in temperature. The strategy adopted for such a situation was first of all to clear a passage for vehicles, and then scrape all snow from the gutters allowing a clear passage to the sewer openings, thus permitting a large percentage of the water to drain from the snow and run off in the sewers, while the balance is that much lighter and drier, and proportionately easier to handle. This is just one detail of a big problem, but it indicates how the Department of Street Cleaning is putting thought into the task instead of handling it by mere numbers.

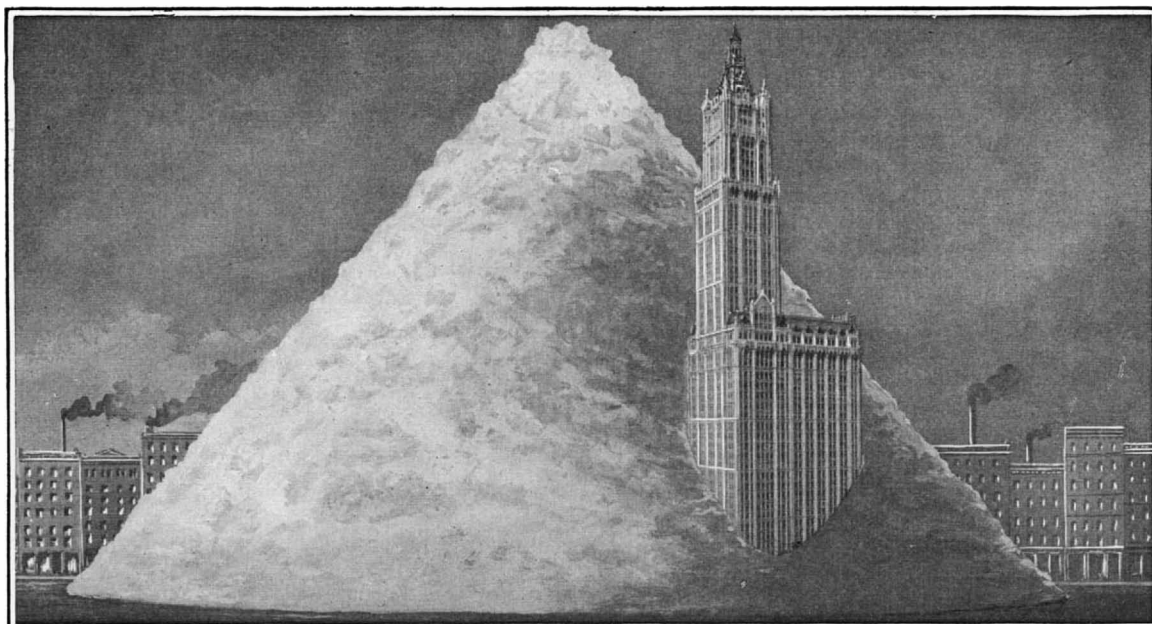
The use of motor-driven snow plows proved so successful in the past that the total was increased to ninety-six for last winter's battle with the drifts. They are attached to the front of five-ton trucks, and last year there was some difficulty in finding enough power vehicles available for this service. There should be less difficulty this year, as the large fleet of tractors employed for garbage removal in the Model District is suitable for this task. The huge trailers are readily detached, leaving an efficient, five-ton tractor available for use with snow plows.

The motor truck is essential for snow fighting, and the big machines with dump

(Concluded on page 560)



A powerful motor truck fitted with an adjustable snow plow. A machine of this kind does the work of many men



The snow removed last year would make a pile 750 feet high and 1300 feet in diameter



# Strategic Moves of the War, December 8th, 1916

By Our Military Expert

INTEREST continues to center on the reports received from the eastern battle fronts. It has been reported that all the Teutonic forces operating against Rumania have been consolidated and placed under the command of Field Marshal Von Mackensen. It is evident that the Rumanian Army is unable to withstand the Austro-German pressure, but the resistance offered and the comparatively small number of prisoners taken by the advancing forces in spite of the enveloping nature of their progress into the Walachian plains, indicate that the Rumanian Army has been well handled in the forced and somewhat rapid retreat from the various sectors and that their failure to make a better showing is probably due more to their lack of war organization and war experience than to demoralization or the lack of fighting spirit.

The Austro-German advance has been conducted with characteristic precision and rapidity and while we may not admire the conceit that prompts it, we have to acknowledge the aptness of the often quoted statement contained in Berlin despatches to the effect that, "Our operations are progressing along the lines previously selected and in accordance with our plans!" There is something in this that reminds one of Zola's comment, anent the relentless precision of the German Armies, in "La Débâcle," a novel based on the time and incidents of the Franco-German war of 1870-71, "... these Germans, who make war and win battles by algebraic formulae!" There is food for thought in these few words, for they are as true today as they were forty-five years ago. This short sentence can supply the greater part of the material necessary to frame the proper answers to the many queries of the superficial observers who want to know why Germany is able to carry out successfully so many of her plans while most of those undertaken by the Allies are doomed to failure. On one side, military strategy moves on unhampered and with mathematical precision; on the other, all sorts of obstructions stand in the way. Opportunity presents itself often enough, but by the time politics have been pushed aside, the various national interests and prejudices consolidated, adjusted or placated, and a program of preparation discussed and adopted, it is often too late to carry out the operations decided upon with any reasonable hope of success.

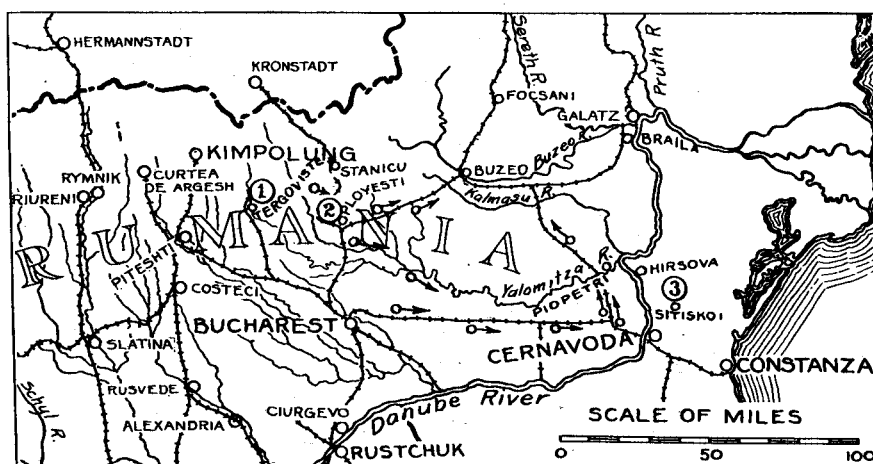
What the Allies have needed from the very beginning of this war, what they need today more than ever, is embodied in a quotation from a speech attributed to Sir Edward Carson and said to have been made a year ago, "It is a terrible error to think one can preserve all the organizations of peace times during a war. The institution of a new order of things is incumbent on the French as on the British and Russian Government." The Allies seem to realize this, but they have not yet succeeded in establishing this new order of things. The Germans were nearer to it at the beginning of the war than the Allies are at this time. All have improved in this respect, but the Germans had the advantage of a good start and have kept it in nearly every department of the game. In order to realize the full import of the difficulties that beset the Allies at every turn of events, one has only to read the history of the Balkans and of Russia's aims and efforts in that direction during the past fifty years. This will enable one to understand the whys and wherefores of many moves which at first glance appear like unpardonable blunders.

The military operations of the past eight or ten days in Rumania seem to support the suggestion made last week with reference to the attack on Campolung. Reports indicate that it fell into the hands of the Germans without much of a struggle just as soon as the forces advancing from the west had reached the vicinity of Ardjish, about twenty-two miles to the southwest of Campolung. Had the Rumanian forces defending the latter place remained in position, it would have been a matter of but a few days before their one line of retreat, the railway to Bucharest, would have been in the hands of the Teutons and the capture or destruction of their entire army a matter of almost absolute certainty. In the absence of reports to the contrary, it is quite probable that this army with the greater part of its impedimenta, was able to effect an orderly retreat in an easterly direction, taking advantage of the railroad lines through Bucharest and Ploesti.

The same strategic principle applied with even greater force to Ploesti with reference to the security of Bucharest; once the former was seriously threatened, the latter had to be evacuated. A glance at the map will

show that the only railway line not actually in danger of capture by the Teutonic forces advancing from the north, west and south, is the line from Bucharest to Futești, the Rumanian terminal of the bridge over the Danube at Cernavoda. It will be noted also that Ploesti is, in reality, on Bucharest's main line of retreat to the northeast into Moldavia, therefore, the rapid march in force, which placed Ploesti in the hands of the Austro-German army, compelled the evacuation of Bucharest. Berlin reports inform us that the capital fell into German hands on the sixth instant, without a struggle. I have not the slightest doubt that the Rumanian main army had its retreat well under way as soon as it became evident that the Teutonic army had made Ploesti the main objective of its operations to the northwest of Bucharest.

Assuming that the Russo-Rumanian main army is retreating in fairly good order to the east and northeast, it must be assumed that a suitable line of resistance has been selected. This will probably be somewhere in the vicinity of the Buzeu (or Buseo) and Kalamasu rivers. I can see no advantage, but much danger, in attempting to hold the Teutonic advance at any point short of that line and I would suggest that no time be lost in reaching and occupying this position, because with Kimpina, Ploesti and Bucharest in German hands, and the possession of the Cernavoda bridge in doubt, the orderly retreat of the Rumanians might easily be turned into a disastrous rout. Unless there should be an opportunity to inflict great losses on the Rumanians, I do not believe that the Austro-German troops will attempt to follow them very far in a northerly direction. Their object, for the present at least, will have been accomplished with



German Operations About Bucharest

The  $\bigcirc \rightarrow \bigcirc$  indicate the Rumanian probable lines of retreat following the evacuation of Bucharest and Ploesti.

- (1) Tergovist from which point the Teutonic troops under Delmingsen are reported to be marching and closing in on
- (2) Ploesti (Ploesci) at the junction of the railroad from Kronstadt to Bucharest and Bucharest to Buseo (Buzeu) and the northeast. The key to Bucharest.
- (3) Sitiskoi where, according to reports from Sofia, a strong Russian attack was repulsed with great losses inflicted on the attacking forces.

the occupation of Walachia. In the meantime it would be very interesting to know the true cause of Russia's inactivity on behalf of Rumania. There appear to be several opportunities for decisive action on the Danube by river gun boats, and in Transylvania, but beyond the report of the capture of a hill or line in the Trotus and Putna valleys, on Rumanian territory, near the western frontier of Moldavia, all of which operations are too remote to have any direct effect on the Walachian operations, there appears to be an ominous quiet on all the northeastern lines.

Violent fighting is reported from the Monastir front. I notice that little or no mention is made of the participation of French troops in these later operations. The gains made do not appear to be of great importance to either side.

The Greek situation (political), which controls the operations originating at or from Saloniki, continues to be very unfavorable to the Allies' plans. After taking a turn for the better in the early part of the week and giving every indication of an early adjustment of the differences between the King's Government and the Allies, the situation suddenly took a turn for the worse and, at date of writing, seems to be as far as ever from settlement. Without entering into the question of the ethics of the case and speaking only from the viewpoint of the Allies' aims and intentions, what seems to be needed just now in that particular section is what the Spaniards call, "La mano fuerte"—the strong hand.

With the exception of the capture of Hill 304, on the west bank of the Meuse, Verdun front, which is announced in Berlin reports of December 7th, and admitted in part in dispatches from Paris, there appears to have been no serious operations in that sector. Violent

artillery fire, by both sides, is reported to have taken place on the Somme front, also trench raids and hand grenade attacks with slight successes claimed by both sides; no important gain of territory has been reported and the local advantages, where any are claimed, seem to be about equally divided.

## Gunpowder, the Modern Chimney Sweep

MOST people would not at first thought associate the sooty chimney sweep of former days with gunpowder. It is, however, true that both are somewhat related especially as gunpowder is now employed to free large smokestacks or kiln chimneys from the soot that has accumulated in them and is choking the draft. All that is required is a stack gun and some blasting powder. This gun can be used in cleaning either lined or unlined brick or steel stacks without injuring either the stack or the lining.

An old piece of shafting about 4 inches in diameter and from 14 to 16 inches long is the gun, which can be mounted on a pedestal about 6 inches in diameter so that it will stand in an upright position. A hole  $1\frac{3}{4}$  inches in diameter and 10 inches long is bored in the center of the shaft, with another  $\frac{3}{4}$  inches in diameter at right angles to it. The second hole, which extends to the bottom of the central hole, serves as a touch hole for inserting the fuse.

To clean the stack blasting powder is poured into the mouth of the gun to about 2 inches from the top and covered with dry clay. A short piece of fuse is inserted in the touch hole in contact with the main powder charge. The flue door at the bottom of the stack is opened and the cannon placed on the floor in the center of the stack. After lighting the fuse, the flue door is closed and the resulting explosion shakes and loosens the soot adhering to the sides, causing it to fall to the bottom where it is readily removed through the flue door.

A charge of 8 inches of powder,  $1\frac{3}{4}$  inches in diameter, is sufficient for a stack 4 feet or more in diameter and 100 feet high. The number of shots required to clean the stack thoroughly, of course, depends upon its condition, but ordinarily three or four shots will be enough unless there is a large accumulation of soot. The size of the charge and the length of the cannon can be regulated to suit the height and diameter of the stack, at the pleasure of the operator.

## "Shellitis": a New Malady

THE next editions of the French dictionaries will doubtless contain the new word *obusite*, which has been accepted by the French Academy of Medicine and which is used in their reports to signify those physical and mental disturbances consequent on the explosion of a large calibre shell in the vicinity of the patient, though no fragment has actually struck him. Dr. Ranjard recently submitted to the Academy a study of one of the most characteristic forms of *obusite*, or shellitis, as it might be rendered in English, the deafness which is a frequent result. This deafness is of two distinct varieties. In the first there are actual organic lesions in the auditory apparatus due to a sudden excess of pressure on the tympanum. In the second the troubles are functional and have their origin in simple disturbances of the nervous system. It is exceedingly important that there should be a correct diagnosis, since the last form of injury is very often curable by appropriate general treatment. For the purpose of this diagnosis, Dr. Ranjard has devised a special apparatus of mathematical precision.

## Improved Occulting Blinds for Range Lights

THE satisfactory operation of new occulting mechanism which has been tried in this country is reported by the United States Bureau of Lighthouses. The outfits were manufactured at the general lighthouse depot, Tompkinsville, N. Y., and were installed on two four-order range lights in the fourth district. They were designed to replace the old-style "pile driver" occulting mechanisms. Each consists of a frame placed in front of the lens, carrying multiple vertical metal vanes or shutters pivoted on their vertical axes and arranged to be rotated through an angle of 90 degrees by means of connecting rods. Movement is imparted to the connecting rods through links connected to a bell crank, which in turn is operated by a cam on the operating clock. The mechanism is arranged to give an instantaneous opening and closing of the shutters.



## Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

### A Few Questions Concerning the Steam Automobile

To the Editor of the SCIENTIFIC AMERICAN:

I have been very interested in the letters on the steam car in your issues of September 9, 1916, October 28th, and especially one on November 25th by Mr. J. D. Nies, and as they have all been on the same subject—the steam car—I would like to ask a few questions concerning it, and to say a few words in behalf of the gasoline car.

I notice that Mr. Nies says that the steamer uses cheaper fuel. Yes, kerosene is cheaper than gasoline but how about the quantity consumed? One hundred — cars all over the United States were tested as to their gasoline consumption a year ago, and it was found that the average of all the cars taken together was 32.8 miles per gallon, and in the new — cars this year the gasoline consumption has been decreased 17 per cent. How much does the steam car average to the gallon of kerosene and do the prices of the two fuels differ to such an extent that in the end it costs the man with the gasoline car more for fuel than a man with a steam car?

In regard to the pick-up ability of the steamer I do not deny the fact that it is far better than the gasoline car, but what good does the ability of a car to pick up extremely quickly do the average man who drives his car for the pleasure in it, with a view to preserving his health and the convenience derived therefrom? It doesn't matter to him whether he can pick up quite as quickly as some other car or not, or whether he can go fast for a short spurt. His main thought in buying a car is the pleasure he is going to derive from riding in it, and not how quickly he can pick up so that he can beat anybody on the road. As a matter of fact the gasoline car can defeat the steam car with ease in regard to speed for any length of time, as the steamer cannot make steam fast enough to average 106 miles per hour for over three hundred miles—a record made not long ago by a gasoline car. If the steam car can go so much faster than a gasoline car why do not its makers enter it in some of the automobile races, where it has a chance to go as fast as it wants to, to prove to the gasoline car makers that the gas car is to the steam car as a snail to a rabbit.

The steam car is undoubtedly the best hill climber, but that doesn't say that the gasoline car is not a good enough one. Why is there any use in having a lot more power than is necessary? The — car will go up any hill that any sane man would want to go up, but the majority of the hills that one usually has to climb year in and year out are not awfully steep. When comparing the hill climbing powers of a steam car with a gasoline car one should make comparison with the ability of the gas car on low gear. When one compares the steam car with the ability of the gas car on high gear he does not make a fair comparison, because it must be remembered that the gas car is many times as powerful on low gear as it is on high gear. I notice that Mr. Nies says: "If great power is the supreme motor luxury, then that luxury is only to be had through the use of steam." This is not the case, however, for great power is not supreme motor luxury. Supreme motor luxury consists in freedom from excessive vibration, easy riding, and minimum of trouble in taking care of the car.

The steam car demands a great deal more attention than the gas car. On the — car there is nothing to do except to turn a few grease cups once a week, fill with gasoline, and oil several parts once a month. In the steam car it is necessary to keep the pilot light going all the time, therefore requiring that the gasoline tank be filled every two days and that a consistent watch be kept, especially in winter time, to see that the pilot light does not go out. Also that the kerosene burners be cleaned very frequently, besides turning some grease cups, repacking the various pumps, and filling with water. When a man is very busy all the time he does not want to have to tend to his car every two days, and so this is a constant cause of annoyance. The modern motorist does not want to have to bother with fixing his car except at week-ends. His idea of a car is one that requires an hour's attention perhaps once a week, and the rest of the week nothing to do but just to go to the garage and get the car out. He also wants to throw a switch and have the car start, and not to have to attend to anything else except to drive, rather than have to pump several pumps, be sure that the steam pressure is high enough, and that there is plenty of water in the boiler. Where water is expensive, as in some places, there is an added expense for fuel.

It is true that there is no way to make a steam car miss fire, but it is also true that there are thousands of ways that a steam pipe can leak. This is usually the case when you are in a hurry to go anywhere in a steam car. Either the superheater tube is split, or one of the

pipes is stopped up with sediment, or one of the pumps needs packing. An ordinary gas car, with slight care, will very seldom miss, and the engine will always perform consistently if it is cared for at all properly. Our — car has been driven over fourteen thousand miles. It has only missed twice during that time, which was due to the fact that the magneto points had worn out, a matter of a short time to replace.

If the steam car's transmission of power is so uniform why are strut rods used? The — car can boast of not using a single strut rod to the back axle. The back axle hangs alone on the rear springs. This is one of the reasons that the tire economy is so great. — owners all over the country average from eight to fourteen thousand miles on their tires. This is due to the fact that the traction power is not too great as on the steam car.

I have stated above that easy riding is one of the supreme motor luxuries. In this respect the — car is better than the steam car, because how can a car with full elliptic springs front and back, set on an angle so as to offset road shocks, and with a wooden frame that absorbs the road shocks, ride harder than a car with a steel frame and *without* full elliptic springs?

I will be very much obliged if Mr. Nies will answer some of my questions as I would very much like to get some data on the steam car and to know something of its capabilities and troubles. I am not at all prejudiced against it, and if it can be shown to be better than the high class gasoline car for the average man, I should like to uphold it to the best of my ability.

F. VAUX WILSON, JR.

Grande Mere, P. Q.

### The Armament of Our New 7000-ton Scouts

To the Editor of the SCIENTIFIC AMERICAN:

I am not familiar with the mental processes of the gentlemen who have decided on an armament of eight six-inch guns for the new scout cruisers; neither am I a "naval expert," but to a mere observer it would seem that there had been a miscalculation somewhere.

True, the ships will possess advantages, which will go far, but to my mind they cannot remedy this fatal defect of armament.

When Great Britain laid down the Chatham class of cruisers there was some outcry against their lack of armament. These were five thousand-ton cruisers. If eight six-inch guns are not enough for them, what shall be said of increasing the displacement two thousand tons without increasing the armament at all?

Two seven and a half or eight-inch guns mounted fore and aft could do vastly more damage than the whole battery of six-inch, and would make the cruisers really formidable to any possible enemy.

If, however, eight six-inch guns is a sufficiently heavy battery for a ship whose duties are mainly those of a scout why not reduce the displacement to a reasonable limit, and build more of the ships.

Therefore, by all means, let us have more guns. A battery of two seven-and-a-half-inch, and six six-inch is by far the most reasonable for such large, fast ships as our new cruisers will be.

M. FLETCHER PRATT.

149 North Pearl St., Buffalo, N. Y.

[Our New Scouts would be used against foreign fast Scouts and Destroyers. These carry nothing heavier than the six-inch gun.—Ed.]

### Is the Moon a Dead World?

To the Editor of the SCIENTIFIC AMERICAN:

"So far as can be ascertained by the most careful examination, not the slightest change ever takes place on its surface."

Thus wrote one of the world's greatest astronomers, Simon Newcomb, in "Astronomy for Everybody," page 128, published in 1910.

This appears to be the consensus of opinion among astronomers, notwithstanding the evidence that the crater Linne was, prior to the year 1866, a six-mile crater, very deep, visible under all illuminations, and that in that year it became invisible for some months, seemingly concealed by a fog or haze that hung over it, and upon clearing up, a much smaller crater was in its place, and surrounding it a white spot like a drop of whitewash on the dark sea floor, occupying the space of the original crater.

Since the above date this region has been scrutinized frequently by many observers, and the results of their observations have conflicted greatly. At times a crater would be reported and at other times a mountain or small elevation. The last report on this subject by a well-known astronomer, so far as the writer is informed, is that found in "The Moon," by Prof. W. H. Pickering, published in 1904, in which it is stated that there is now a  $\frac{3}{4}$ -mile crater in the white spot.

The writer has been interested in this region for many years, but was unable to see anything in the white spot until the evening of March 7, 1911, when at the moment of sunrise he observed a spark of light, such as is pro-

duced by the first rays of the rising sun striking an elevation. In the course of a few minutes this resolved itself into a crescent-shaped elevation, having the appearance of the western half of a very small crater wall. This was drowned out in a few minutes when the surrounding sea floor began to be lighted up well.

Conditions were not found favorable for the observation to be repeated until March, 1912. The elevation was there, bigger than before, but no longer crescent shaped. The mountain was not again observed until May 8th, July 6th and November 1, 1916, when it was plainly seen with a power of 105 on a 7-inch refractor. The elevation and its shadow were held for three hours, and then clouds interfered. The mountain is much larger than in 1914. It appears now that the white spot varies in size, being larger at the time of sunrise than when the sun has been shining on it for ten days or two weeks. This indicates that it is of the nature of frost deposited from vapor that issues from some small orifice, and that is partly evaporated by the sun. It is possible that our little mountain is formed of ice, and may disappear as rapidly as it has appeared.

The observation is easy of verification, if made at sunrise, and of considerable interest as it goes far toward answering the above question.

JOHN A. COOK.

Macon, Mo.

### Making the X-Rays More Efficient in Surgery by Wearing a Special Monocle

PROF. Guido Holzkecht announced that a method of removing foreign substances from the human body with the direct aid of Roentgen rays has been devised. The method is described in the Vienna papers, which state that at the last meeting of the Medical Society of Vienna, Prof. Holzkecht demonstrated the process by means of stereopticon pictures. He explained the primitive beginnings of the attempts at removing foreign bodies by such means, stating that many years ago the complaint was first heard that in the removal of needles, steel splinters, etc., the exact location of the particles could not be determined in spite of their general localization by means of the X-ray pictures. It was almost imperative, he said, to find some method of shortening the operation and of leading the surgeon to the exact location of the foreign body by the shortest possible route, without destroying more tissue than was absolutely necessary, or incurring unnecessary danger of infection.

Dr. Holzkecht is quoted in the press as giving the details of the method that has been devised for accomplishing the desired improvement. He said that the problem could not be solved until more perfect machines had been produced. It had now been possible to construct an X-ray machine which overcame all difficulties, and this machine had been set up in the clinic of Prof. Eiselsberg. The explanation given is as follows:

The new method permits the surgeon to see the field of the operation with one eye, under ordinary conditions, while the other eye sees the same field under Roentgen-ray illumination. This method of double vision is made possible by the so-called "Grashey monocle," constructed by Dr. Grashey. The Roentgen machine itself is situated below the floor, in a room under the operating room, if necessary in a cellar, and is connected by means of a speaking tube with the operating room. The surgeon is enabled to see on the picture in the Roentgen machine how far his probe is removed from the object.

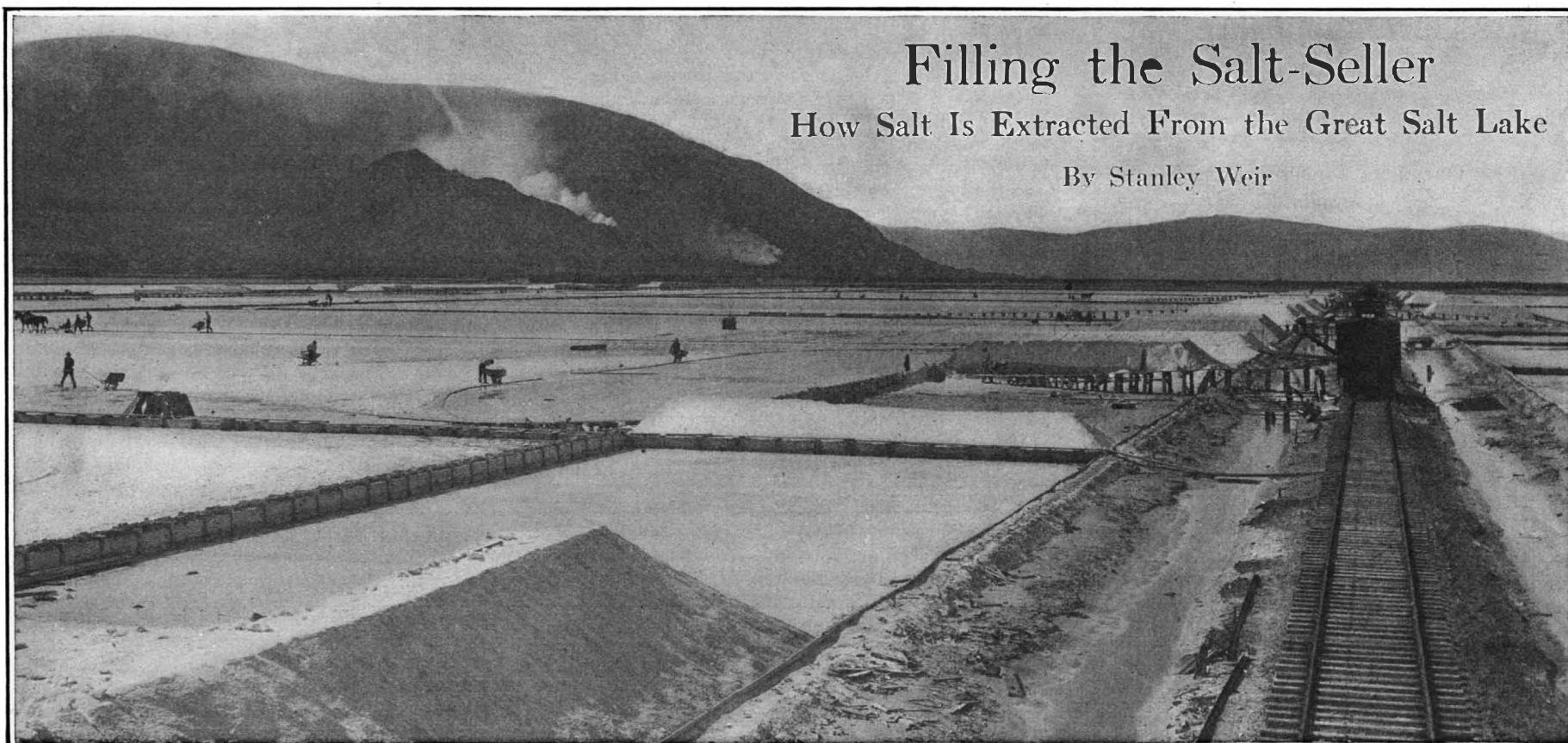
Prof. Eiselsberg spoke of practical experience with the machine. He said there were undoubtedly many cases in which foreign bodies could be removed without the new apparatus, but the new method enabled the surgeon continually to keep the body sought in the field of vision while conducting the operation himself. The result was less manipulation of the probe and the finding of foreign bodies which formerly could not be located.

Dr. Holzkecht in speaking of his method, said:

The removal of foreign bodies, even with the aid of X-rays, often has met with great difficulties. The surgeon, although he sees the object in the Roentgen picture, has difficulty in finding it in the actual operation. To examine this problem, the course of an ordinary operation of this kind was followed by means of a small chryscope without disturbing the operation in itself.

It was of the greatest interest to see the number of movements of instruments, and the destruction of tissues necessary in the course of the usual operation, before the foreign body could be definitely located. It was shown, therefore, to be necessary for a method to be devised by means of which the relation of the foreign body to the instruments of the surgeon could be ascertained at all times and the position of the foreign body always kept in the field of vision. It was found that the change in tension of the tissues, occasioned by the incision, caused the foreign body to move even while the operation was in progress. The new method makes it impossible for the surgeon at any time to lose sight of his object.





Harvesting time in the salt gardens on the shores of Great Salt Lake

**A**LTHOUGH salt is a commodity used in every household throughout the length and breadth of the land, the process it passes through to make it available for human consumption is not common knowledge. Usually thought of as the product of mines and salt springs, it is perhaps not generally known that 60,000 tons of this necessary substance are literally plowed each year from the waters of the great Salt Lake in Utah. But such is a fact. The cause of the excess of salt in this body of water is a mooted question. It can only be said with certainty that the lake water contains seventeen per cent of salt, as against approximately two per cent in sea water, thus ranking in density second only to the Dead Sea.

For the purpose of this article, therefore, it will be considered that the sack of salt that the housewife buys at the corner grocery originates in a small building, foundationed on the bottom of the lake, and located some four or five thousand feet from the shore line. This houses a pump with capacity of 6,000 gallons per minute, which raises the water into a trough elevated on trestles fifteen or sixteen feet above the surface of the lake. Transported in this to dry land, the water is discharged into a flume which, in turn, carries it two miles inland by gravity to a canal feeding what is known as a settling pond; and here it is that the first

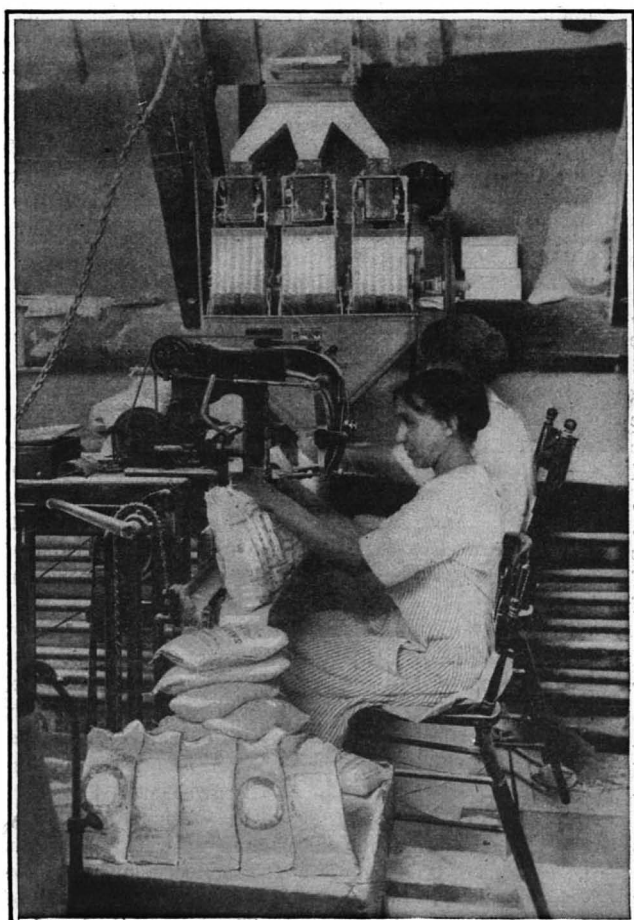
step in the actual salt-extracting process takes place.

This settling pond is simply an immense reservoir confining the water by means of banks constructed of timbers and mud. Adjoining, and connected by a sluice gate, is another large enclosure of similar construction called a stock pond. This leads, through another sluice gate, into eighteen smaller ponds of varying sizes, called salt gardens or harvesting ponds. Each of these salt gardens is provided with two sluice-gate outlets, one giving exit to the next garden in line, the other to a continuous open drain running the entire length of all the gardens and paralleled by a railroad track, which will later transport the salt to the refinery. These open drains, each about a mile long, discharge into what is known as a potash spill. All the ponds have hard clay bottoms to prevent the absorption of the water and to provide a firm foundation for the harvesting process. The entire system covers an area of 500 acres.

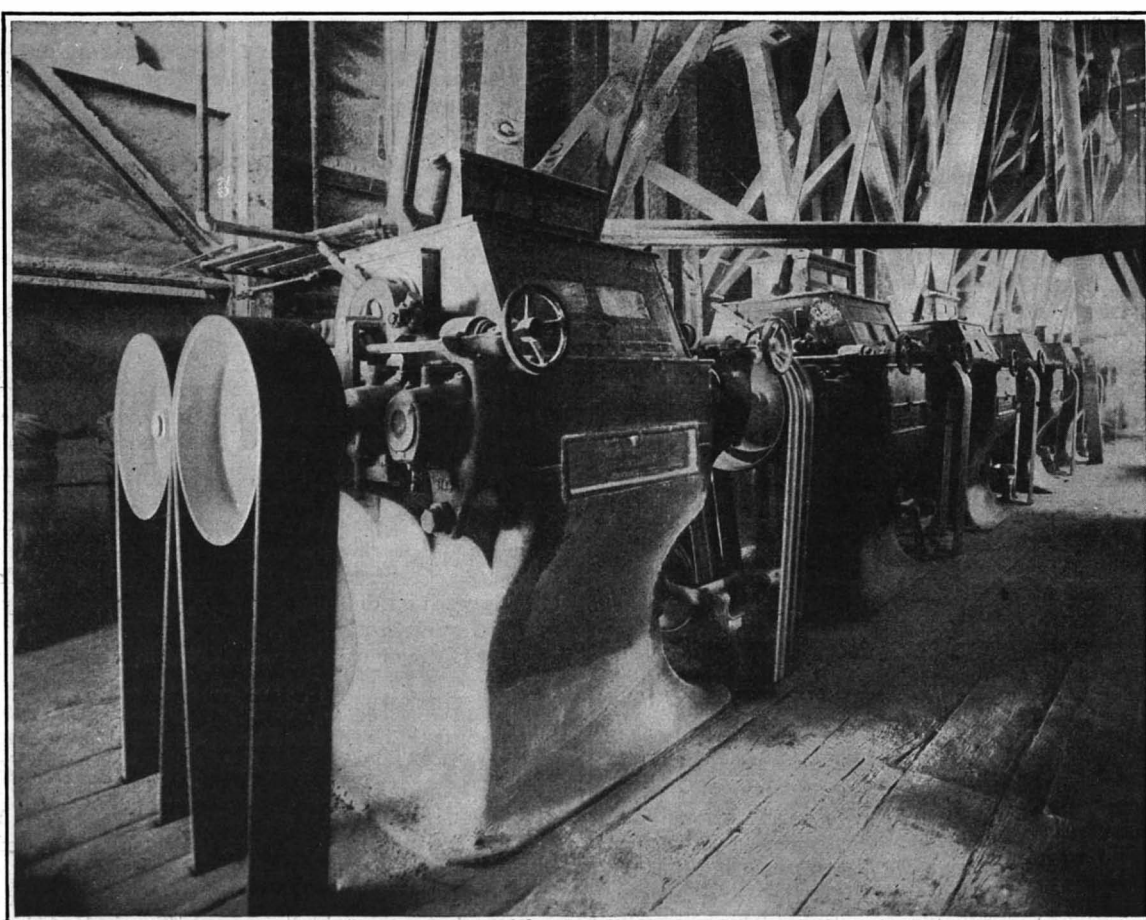
The lake water, with its seventeen per cent salt content, is pumped through the trough, flume and feed canal into the settling pond. Exposure to the sun and air cause evaporation to commence immediately, with the result that the water registers approximately twenty per cent salt by the time it reaches the sluice gate and passes through into the stock pond. Here it is held until it tests twenty-five per cent salt, the extreme

density at which it will flow without precipitating its salt content. The settling pond, so called because all foreign floating substances there settle to the bottom, is in reality a sort of preliminary cleansing bath. An average of eight inches of water is kept in the settling and stock ponds. The pump in the lake is started in April and, ordinarily, is kept running every day until September, when the water ceases to evaporate and harvesting begins. During July and August the pump is operated day and night.

Throughout the entire summer the water is almost continuously admitted from the stock pond to the small harvesting ponds. As salt falls to the bottom at twenty-six per cent, it will be seen that the water in its passage precipitates a cumulative deposit in the salt gardens. By September this averages three to four inches deep. Twice a year the water is drawn off from all harvesting ponds to get rid of the potash which, though a valuable by-product, would constitute an impurity in salt. The water so drawn off is discharged through the continuous open drains already mentioned into the potash spill. Here it is used by a chemical company, or, if not so needed, an outlet is provided to conduct it back to the lake. The removal of excess brine from the surface of the harvesting ponds, called skimming, is practically continuous and automatic, the



Weighing the salt out and packing it in bags at one operation



The machine that grinds the salt to six different sizes



water constantly being admitted from the stock pond, floating over the top of the deposited salt, and finally reaching the potash spill. Water is never let in or out of the settling or stock ponds during storms, the addition of rain water naturally reducing the percentage of salt.

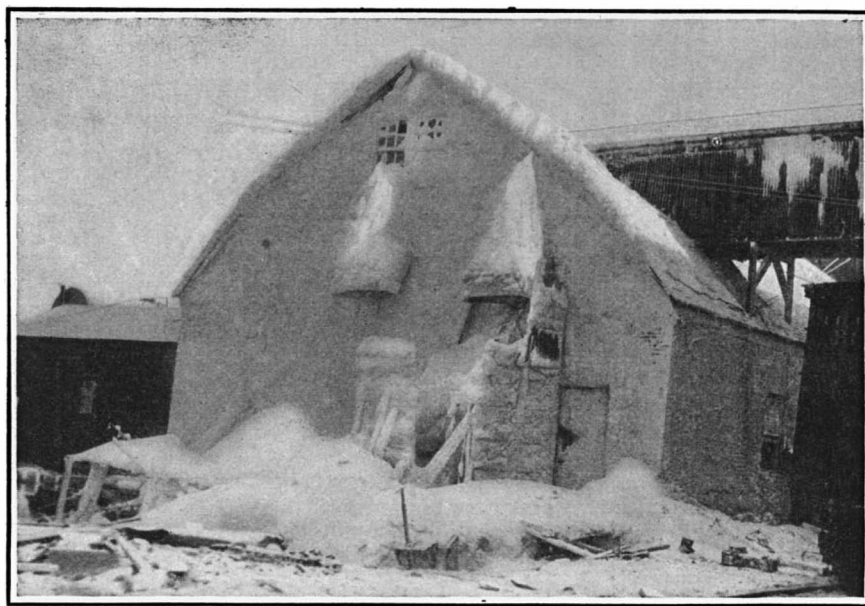
Harvesting commences about September 15th and continues for three months, more or less. When ready to harvest, the pump in the lake is stopped for the season and the water in the salt gardens allowed to run off into the drainage ditches; this can be accomplished over night. The salt is then plowed up with ordinary tractor plows. Men follow the plows and shovel the loosened granulated salt into wheelbarrows, stacking it beside the ponds and railroad tracks in piles of from 700 to 1700 tons each. All salt is exposed to the air for a year, so that one season's harvest is not taken to the refinery until the following year. The salt loses about ten per cent in bulk by this exposure. It is then loaded into cars in a semi-moist condition and hauled to the mill. It will thus be seen that the securing of the proper amount of salt deposits and the subsequent outdoor exposure require sixteen months or more. The loaded cars are switched opposite a bin situated at one end of the mill building and the crude salt is transferred, with a power shovel, directly into a bucket elevator or hopper which conveys it upward into the bin, which has a capacity of three carloads, about sixty tons.

A worm-gear conveyor then takes the salt from the bin and carries it to the dryers. These, of which there are three, are drums six feet in diameter and thirty-two feet long, equipped with heating coils at one end and a large fan at the other. A series of flights or ledges set at an angle revolve inside each of these drums. The salt enters the dryer at the heating-coil end and is at once carried to the top of the machine by the flights. Then it falls in a shower to the bottom, only to be immediately picked up again by the flights, the process being repeated throughout the entire length of the dryer. The effect of the fan is to draw hot air under high pressure through the dryer, thereby extracting most of the moisture from the moving salt. The exhaust from the dryer fans passes through a flue to the outside of the building, covering everything in the immediate vicinity with a heavy deposit of salt that looks like the aftermath of a blizzard.

After passing through the dryers, the salt is diverted to a series of six grinding machines and the same number of automatic sieves. These twelve machines are arranged in pairs on two floors—a sieve on the upper floor immediately above a grinding machine on the lower level. By a system of connecting conveyors, the salt passes from the first grinding machine up to the first sifting machine, then down to the second grinding machine and up to the second sifting machine, and so on through the entire series of six. As the rollers in each grinding machine have finer corrugations and the sieves in each sifting machine have finer meshes than the one preceding, the sieves act as automatic size graders. The salt of a size to pass through the first sieve is immediately conveyed to a stock bin in the packing-room two floors below, while the salt too large for this sieve moves to the next grinding machine for reduction to a still smaller size and so on. The salt in this way is automatically reduced to and sorted in six different sizes—pickling, rock, ice, meat, dairy and table salt. The corrugated rolls in the grinding machines range from eight to twenty-four corrugations to the inch. The latter is so fine as to feel like a smooth surface.

Large magnets in each grinding machine rid the salt of any particles of iron, steel or other metal that may have found entrance, and fans winnow out all dirt. One of the novel features of the sifting machines is the automatic trip hammers with which each is equipped. These help to keep the sieves in a constant state of vibration. The noise, however, from twelve to eighteen of these hammers operating at one time is almost deafening.

In the packing-room, the salt comes out of the bins pure, absolutely clean, sparkling and white as snow. The mouths of the various stock bins are immediately over a combination weighing and sewing machine, the bin-opening closing automa-



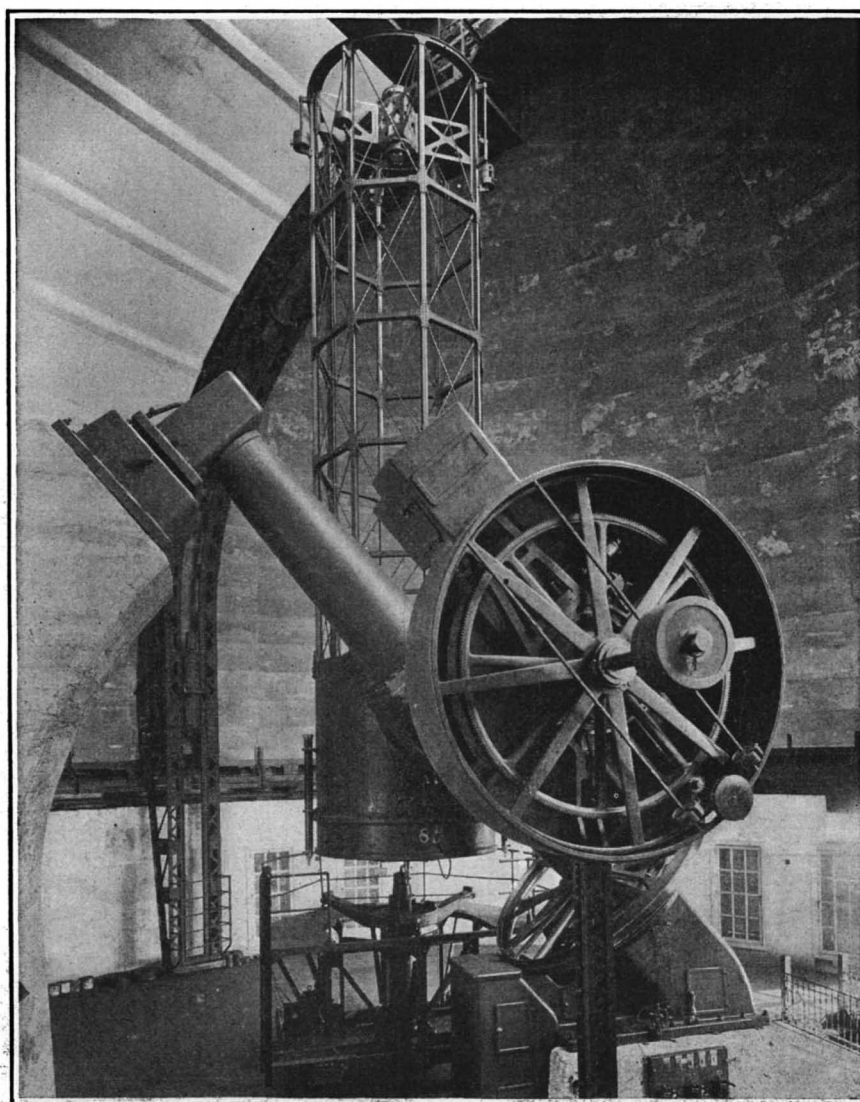
A salt storm from the exhaust pipes

tically when the proper weight of salt has fallen into the bags held on the scale. With the aid of two girls sitting side by side, the machine will fill and stitch from 7,000 to 12,000 bags a day. When the bags are filled and stitched, they pass down a chute to a second packing-room where the small bags of table salt are baled for shipment to market. The coarser grades are put up in bags in sizes up to 150 pounds each.

In conclusion, it will be interesting to note two things: first, that one of the peculiarities of Salt Lake salt is that it remains cubical in form no matter how finely it may be crushed, even to pass through a 120-mesh sieve; and, second, that the salt is never touched by human hands during its travels from the lake to the housewife.

#### The Current Supplement

THE paper on *A Few Astronomical Events of the Past Fifty Years*, in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2137, for December 16, is a review of the work of American astronomers that will be of value to the general reader, as well as to those associated with this branch of science. *The Manufacture of Big Chains* gives some facts in regard to a manufacture that, in spite of the great modern improvements in machinery, is still conducted by hand labor. Several excellent photographs add to the interest of the article. *Where the Motor Truck Has Displaced the Horse* describes the use of power vehicles in heavy logging operations in the Northwest, which are illustrated by a number of photographic scenes. The paper on *Bergson's Theory of*



72-inch reflecting telescope at the Dominion Observatory, the largest in the world

*Intellect and Reality* is concluded in this issue. *The Conifer Leaf Oil Industry* tells of a little known industry that is of importance in some sections of this country, and gives many pertinent facts. *The Problem of Life* is an important paper dealing with the economic waste of sickness and premature death that should be read by everyone. *The Intermittent Annual Growth of Woody Plants* is a most interesting article, and deals with geographic and climatic variations as affecting the phenomena. An excellent illustration accompanies the article. *Measuring Wind Forces* describes and illustrates an ingenious apparatus that makes possible the separate determination of all the components of wind pressure, and consequently the direction and point of application of the wind force upon the surface under discussion. A new type of accumulator describes a type of storage battery for which remarkable efficiency and economy is claimed, together with decreased size and weight for equal capacity.

#### What Is a Guatemalan Marimba and How Is It Played?

THE people of Guatemala are very fond of music. Their most popular programs are those in which classical selections predominate. Band, orchestral, and marimba music constitute an indispensable feature of all public festivals and entertainments.

The most highly prized music in Guatemala is that of the marimba, a sweet-toned musical instrument said to have been invented by the "Tecomate," a tribe of Indians of the State of Chiapas, Mexico. The original form of the instrument, crude in structure, was brought to Guatemala, where it has been greatly improved. It resembles the xylophone in structure and manner of playing. The keys, strips of wood graduated in length to the musical scale, are made of two kinds of wood called "hormigo," not unlike cedar, and "aguacate." The keys are held together by means of a cord drawn through them. There are 45 tones and 30 half tones. The bass tones are given by the long, thick slats, the high tones by the short, thin slats. The keys are struck with two small rubber hammers called "baquetas."

The marimba is about 8 feet long, and varies from 1 to 2 feet in width. The sounding board beneath the keys is constructed of two kinds of wood, "taxiscob" and "guachipilin," and the keys are made of mahogany. The cost of a marimba is from \$60 to \$125 gold.

The finest marimbas are manufactured in Quezaltenango, and the most skilled operators also come from this city, which is the second in size in Guatemala. Eight operators are required to play a marimba, and the addition of a bass viol, a recent innovation, gives strength and volume to the music.

#### The Big Telescope at Little Saanich

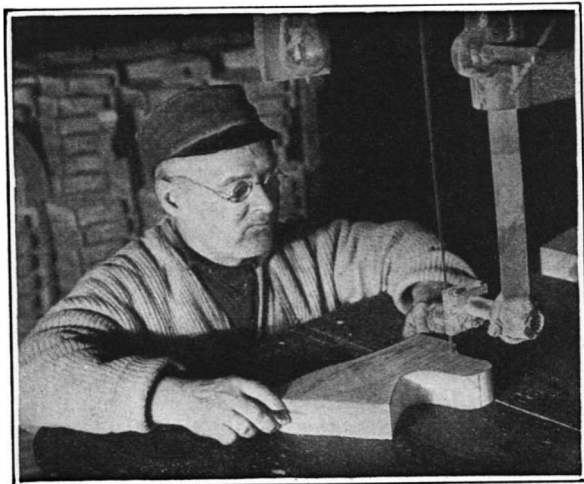
FOR the present, and until the completion of the 100-inch reflector now being built for the Mt. Wilson observatory, the telescope which we illustrate on this page has the fleeting honor of being the largest in the world.

This optical giant is located in the Dominion Observatory at Little Saanich Mountain, Vancouver Island. Our readers will recall that in our issue of November 4th we gave a view of the unfinished dome which will house it. Like all the largest telescopes of recent years, this one is of the reflector type. Seventy-two inches in aperture and 31 feet long, it weighs 12 tons dismounted and 55 tons with all its fittings.

In spite of the firm foundation of concrete piers necessitated by this great mass, the tube is so delicately mounted that it responds instantly to the smallest push. In fact, the excess of the current required to move the telescope at its top speed, over that necessary to run the motors light, is barely sufficient to feed a sixteen-candle-power lamp.

The enormous mirror which, in the reflecting telescope, takes the place of the lens in concentrating the rays of light, weighs 2½ tons, measures 73 inches from edge to edge, is 12 inches thick at its outer rim, and is pierced by a hole 10½ inches in diameter. The silvered upper surface acts a parabolic mirror to bring the reflected light to a focus 30 feet above the mirror. Made in Belgium, it was shipped just two days before the declaration of war.

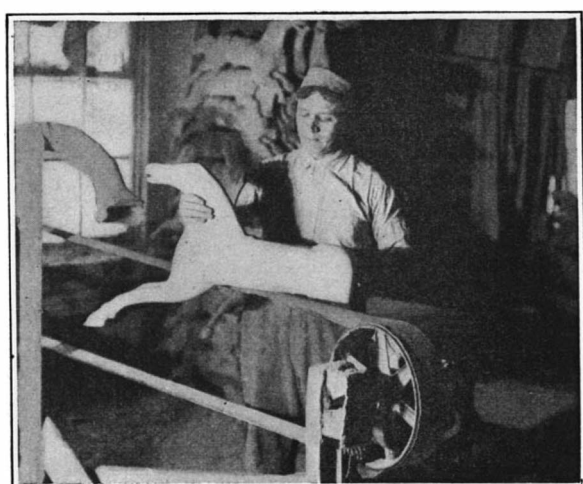




This workingman is sawing out the head of a horse on a band-saw table



Using an air brush for the purpose, this girl puts the spots on the horse heads



By means of an endless belt of sandpaper, the wooden horses are finished smooth

## America's Toy Town

### Meeting the Toy Shortage Due to the European War

AMONG other things the European war found the United States quite unprepared to meet the domestic demand for toys; indeed, serious doubts were entertained concerning the ability of the toy dealers to meet the Christmas trade of 1914. Fortunately, however, a sufficient stock of German and other foreign toys had accumulated in the store rooms of the dealers so that the burden imposed on American manufacturers was materially lightened. And with characteristic initiative and skill the American toy-makers set to work to meet not only the demands of 1914, but those of years to come, fully assured that foreign-made toys will not be plentiful in our markets for at least a half a decade.

In Massachusetts, not far from the New Hampshire border, is the town of Winchendon, thriving in the shadow of Mount Monadnock. Winchendon is America's Toy Town, and occupies the same relative position in American industry as Nuremberg does in Germany. In fact, the New Englanders often refer to it as "The American Nuremberg," which is, after all, the best proof of the similarity. And if the youngsters of America have experienced no disappointment on Christmas morning of each of the past two years, if they have had all the toys they have asked for, then credit in large measure is due to the artisans of this little town of Winchendon.

It is not only because toys are made in Winchendon that it has earned its title as the Toy Town, for the very atmosphere of the community is filled with the spirit of Toyland. As the train pulls into the station the visitor is surprised to find a huge rocking horse standing in the green near the depot, fittingly serving as a symbol of the activities of the town.

Unlike other manufacturing towns, Winchendon has none of the characteristics that usually mark a highly-developed industrial center. There are no closely

grouped and ugly workingmen's homes; no tall, dirty, smoke-belching chimneys, nor grim factories with barren, cheerless walls bounded by dark, narrow streets. Instead, the visitor is surprised to find gay, clean cottages that house the happy workers. Pleasing is the effect of the neat and extensive lawns that surround the little

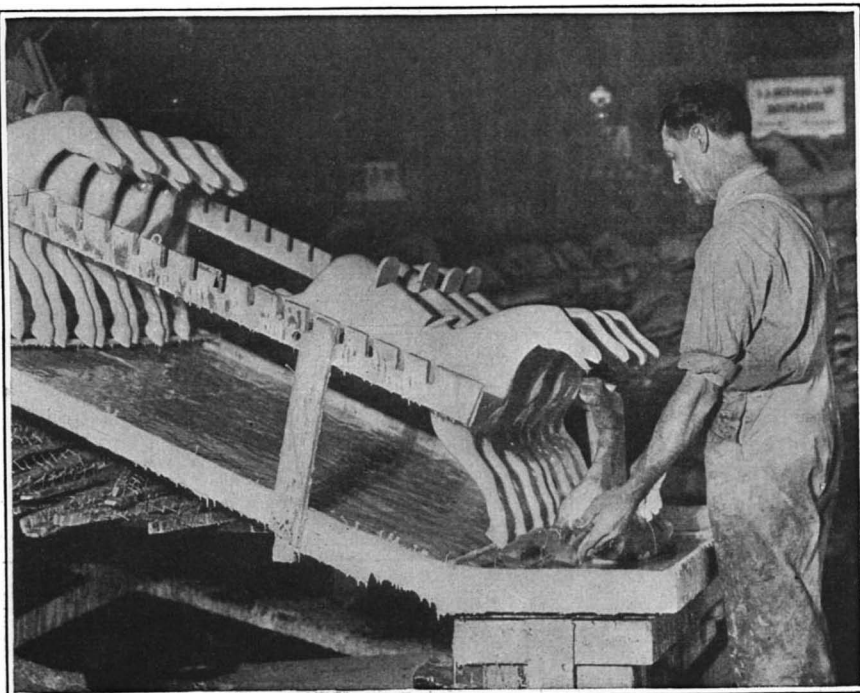
Christmas trade may make on its toy shops. More men have been employed than ever before, and the existing factories have been considerably increased in size to take care of the ever-increasing production. Previous to the war, the community was turning out two-thirds of the toy drums and over one-half of the musical chimes, rocking horses, blackboards, and dolls' trunks made in America, but owing to the establishment of many toy factories in different parts of the country it is probable that these facts no longer hold good. However, it is known for a certainty that Winchendon turns out a large percentage of the dolls' furniture, mechanical toys and pianos that bring joy to the hearts of the American children. From the factories there flows a constant supply of wooden toys, such as dolls' houses, bowls, washing machines, Noah's arks, kiddie carts, toy boats, ten pins and other games. Each day one of the factories turns out over 8,000 toy drums, as well as enough dolls' trunks to fill over half a dozen freight cars.

While the war has given the impetus to the toy factories of Winchendon, it has also brought new troubles. Many of the supplies employed by the toy-makers formerly came from abroad. For instance, a certain grade of burlap used in covering doll trunks has always come from Dundee; the zinc has come from Antwerp; the dye-stuffs and inks have come from Germany. Nevertheless, substitutes have been found, and the industry has gone on undaunted.

The toy-making industry of America is not a "war baby" proposition. Leaders in the industry are firmly convinced that

America will never again buy toys in large quantities from European manufacturers, for domestic manufacturers can duplicate almost all of the German toys and even improve on them in many instances. There are some toys, however, such as the cheap mechanical

(Concluded on page 560)



In this tank the hobby horses receive a coat of thick, white enamel, and are then placed on the rack to dry

homes of glistening white walls. The toy factories are situated on the outskirts of the town, forming the points of a triangle the sides of which encompass the town of Winchendon. The factories are clean and cheery, and are surrounded by toy gardens. Winchendon is ready to meet any demands that the



Making drums by the thousands: assembling the parts together with the aid of a simple press



The present popularity of the familiar "kiddie carts" keeps these girls busy assembling the little three-wheeled vehicles



### Motion Picture Comedies In Clay

**P**OSSESSING every feature that goes to make a good comedy on the screen, and having in addition a distinct touch of novelty, the animated sculptures about to be introduced should prove most opportune to motion picture audiences which have become quite blasé of late. The initial success and continued popularity of the animated cartoons are proof enough that the animated sculptures will meet with universal favor, since the latest innovation is a distinct improvement over its pen-and-ink counterpart.

Animated sculpture films owe their existence to Miss Helene Smith Dayton of New York, a sculptor of note, who is perhaps best known by her grotesque little men and women in clay, which are photographed and widely employed for illustrating purposes in several American magazines.

The principle of the new films is precisely that of the animated cartoons: the photographing of successive subjects or positions of the same subject, each a trifle different than its predecessor so that the proper animation will result when the strip of film is projected on the screen. The photographs are taken one by one, but are projected at the rate of 16 per second; hence due allowance must be made for the rapidity of projection as compared to the slowness of the photographing process.

For months past Miss Dayton has been working on her animated sculptures, developing the mechanical side or technique of the process, for, as in the case of the animated cartoons, she has had to study motion and how to reproduce it successfully with her little men and women of plastic clay, gaging and timing each move correctly so as to obtain satisfactory screen results. Her early efforts were discouraging, for the clay figures went through their antics so fast that the eyes of the spectator could not follow them when projected on the screen. Then, after mastering this phase of the work, she was confronted with the study of the action—the story-of-the-film phase. At first her stories or scenarios called for several characters, each highly animated; but she soon discovered that such stories lost their interest when projected on the screen, owing to the confusion arising from having too many points of interest. As a result, she has learned by experience to use simple plots and limit the main action or point of interest to one figure, although this does not necessarily imply that the playettes may not introduce more than one character at a time. Quite often a group of several different characters are introduced in one scene, with the main action centered at one point while the remaining characters are slightly animated so as not to appear lifeless should the eye of the spectator happen to wander to them during the course of the projection.

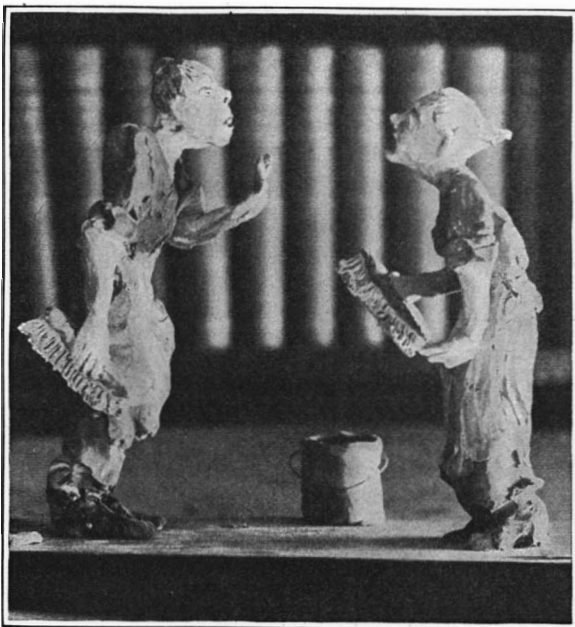
Miss Dayton's method of producing animated sculptures is simple—to her at least—since she has mastered the mechanical difficulties. Formulating first the film story, she models in soft clay the little figures that are to take part in the production. As far as possible these figures are made entirely of modeling clay of different shades, painted when necessary to make them more attractive. Occasionally the figures are dressed in real clothes and have real hair. When design demands it, parts can be reinforced by the use of wire and similar material, although this is only resorted to in rare instances. With the completion of the clay figures the photographing process commences. The sculptor proceeds to alter the poses of the figures, step by step, as the cinematograph camera



These droll little figures are remodeled sixteen times to produce one foot of animated sculpture film



With the exception of the wire handle of the scrub pail, these figures are modeled in clay throughout



Scene in an animated sculpture playette depicting an argument between two scrub-women



Another phase in the argument scene. Note the amount of detail that is necessary



A lamp which conceals a phonograph in its base

records these changes. The camera is of standard design, and for the present purpose the single-picture or trick-picture movement is used. The Cooper-Hewitt mercury-vapor tubes, which supply the necessary illumination, are so placed as to accentuate the shadows and bring out the figures in strong relief.

One would at first suppose that the photographing process is slow, considering that the sculptor must alter the pose of the figures 16 times to produce a foot of film. Yet we are told by Miss Dayton that 200 feet of film is by no means unusual for a day's work. To one who has mastered the production of animated sculptures it is a simple matter to give the required twist to the little figures, or a touch here and there on the soft clay faces to change the facial expressions. Compared to this the preparing of 16 separate and finished drawings for every foot of animated cartoon film is infinitely more laborious. Obviously, some productions require more time than others, as for example a recent playette in which three chorus girls, a full orchestra, and a "bald-headed row" took part. Here it was necessary to have the three girls move in unison, and animate the orchestra to a considerable degree, particularly the leader, while the "bald-headed row" had to receive slight attention so as to add life to the picture. Each picture required as many as two dozen alterations to give the desired effect to the finished production.

But it must not be supposed that the animated sculptures are simpler throughout to produce than the animated cartoons. While the latter can allow of crudeness in certain details of the action, such as the simulation of walking, in the former the walking process and others must be simulated with almost perfect fidelity. Miss Dayton has spent days at a time on a busy street corner, observing how men and women walk; and upon returning to her studio she has found it necessary to spend several more days putting her observations into practice. So it has been with a thousand-and-one other details; and this accounts for the months of preliminary work and the thousands of feet of film that has had to be exposed in order to record the relative success of each week's work during the training period preceding her present achievement.

### A New Type of Phonograph

By C. L. Edholm

**T**HE phonograph has been disguised in various ways in the last couple of years, masquerading as a book case or writing table, and of course the elaborate cabinets are quite familiar. All these types were designed to eliminate the horn

and conceal the mechanism which make an inartistic effect in an otherwise harmonious interior. The cleverest of the concealed talking machines is the reading lamp, which has the appearance of nothing more than an exceptionally large and attractive light for the library table, until the hood is raised from the pedestal, disclosing the phonograph. The sound waves are carried up through the stem of the lamp and are dispersed by a horn-shaped glass shade, which also serves to diffuse the light. As the electric switches for the lamp and the phonograph mechanism operate independently of each other, the light can either be on or off while the music is playing.

The illustration shows the instrument ready to receive a disk record of twelve-inch size. When not used as phonograph, the two parts of the base of the lamp are joined, so that there is nothing to indicate that it is not an ordinary drawing room electrolier.



# The Motor-Driven Commercial Vehicle

Conducted by VICTOR W. PAGE, M. S. A. E.

*This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer any question relating to mechanical features, operation and management of commercial motor vehicles*

## Dumping by Motor

**I**N connection with a road contract at Xenia, Ohio, an interesting series of observations have been made upon the comparative cost of motor-drawn and horse-drawn dump-trucks. The results indicate that every road contractor who has as much as 5,000 yards of loose material to haul can handle it more profitably in a heavy duty dump-truck. The following analysis shows comparative yardage moving capacity and the equivalent cost of the motor and the animal drawn handling system, the actual saving in money and the greater tonnage delivery capacity of the motor truck method. The figures have been verified from the actual experience of road contractors in the states of Ohio, Indiana and West Virginia.

Ten teams have been considered as the equivalent of one five- to seven-ton dumper. The ten teams, with wagons and harness, have been estimated to represent an investment of \$5,000, the cost of a first-class truck of the size mentioned. The operating cost will then figure up about as follows.

|                             |         |
|-----------------------------|---------|
| Ten drivers.....            | \$15.00 |
| Feed.....                   | 10.00   |
| Shoeing.....                | 2.50    |
| Interest on investment..... | 1.00    |
| Natural depreciation.....   | 3.50    |
| Repairs.....                | 2.00    |

We have here a per diem cost of \$34.00. It is claimed that the teams will average five two-mile trips each per day, hauling an average of two yards per trip. Dividing a total haulage of 100 yards into \$34.00 gives a cost of 34 cents per yard.

Now consider the operating cost of the motor dump-truck. It is made up as follows:

|                             |        |
|-----------------------------|--------|
| Interest on investment..... | \$1.00 |
| Natural depreciation.....   | 3.50   |
| Driver.....                 | 3.00   |
| Gasoline.....               | 3.00   |
| Oil.....                    | .50    |
| Repairs.....                | 2.00   |
| Tire wear.....              | 4.00   |

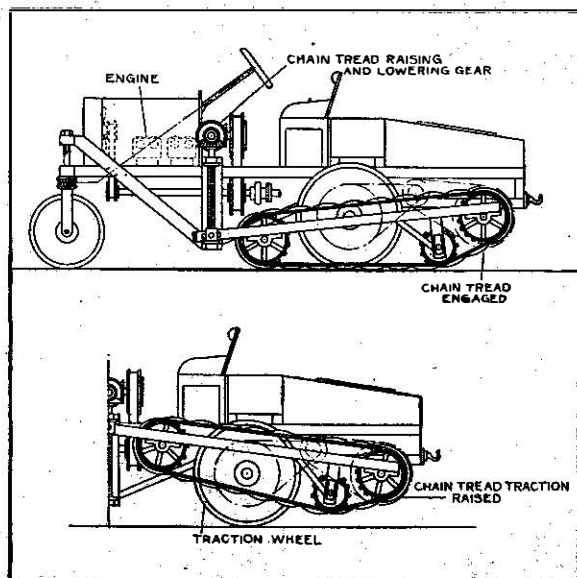
For this \$17.00 the truck will make two round trips per hour (two miles per trip, as above), hauling five yards per load. Hence in ten hours it will just equal the performance of the ten horse trucks, but at a cost of only 17 cents per yard—just half as much.

We illustrate the truck upon which these figures are based. It was engaged in building a  $3\frac{1}{2}$ -mile strip of road 16 feet wide and 9 inches deep.

## Dual Traction System For Tractors

**A**N agricultural tractor of unconventional design has recently been built abroad. It differs from current practice as it uses two methods of traction, one of which can be used independently of the other. The utility of the track laying principle is recognized for use on soft ground and for heavy hauling because of the superior traction afforded by the long tread member and the ground. This same point may be a disadvantage under other conditions owing to its greater friction and wheels

may be superior. In the tractor illustrated the propulsion under normal conditions is by wheels, the track being lifted clear of the ground. When the resistance becomes such that the traction afforded by the wheels is not sufficient, the track may be lowered and put in contact with the ground to supplement the driving effort of the wheels. For example, in hauling loads over the roads or when the tractor is going to the field,



Dual traction system for tractors

the driving wheels will carry the machine along at a good speed and with little loss of power due to friction. When plowing, however, the speed must be reduced and traction effort increased. This could be easily done by lowering the continuous chain track member. As this may be raised or lowered by the engine power, it can be quickly brought into operation when desired or as easily released.

## Coal Gas as Emergency Fuel

**I**T is no secret that the scarcity of gasoline abroad, caused by the government regulations intended to conserve the available supply for war purposes has created considerable hardship among those using motor trucks for business purposes. A large firm in the Midlands of England who run an omnibus service had so much trouble obtaining the necessary liquid fuel supplies that they decided to adopt illuminating gas as a fuel for their omnibus motors. The use of compressed gas as a fuel has been exploited before, but in this case the gas was not compressed appreciably and it was found an economical, clean and handy fuel, though, of course, its use involved considerable inconvenience. That coal gas serves as an efficient fuel for internal combustion engines is demonstrated by the large number of stationary engines that furnish very satisfactory power output from either artificial or natural gas. The problem to be solved was the method of

storing a sufficient amount on the vehicle to make the scheme practical.

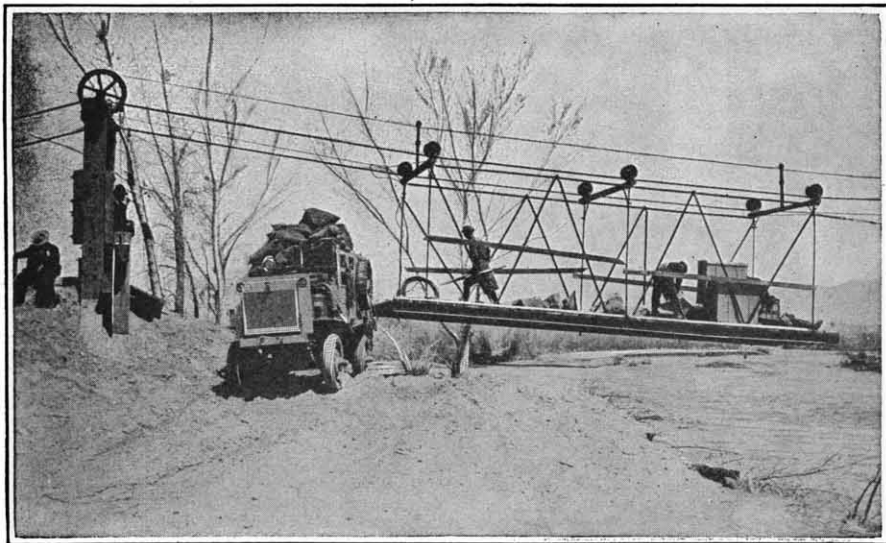
The first trials were made with a collapsible framework built in the form of a bellows and with a canvas covering. Although this served the purpose it offered difficulties in practice because of the area it presented to the wind. The present style of reservoir, which is a

(Concluded on page 557)

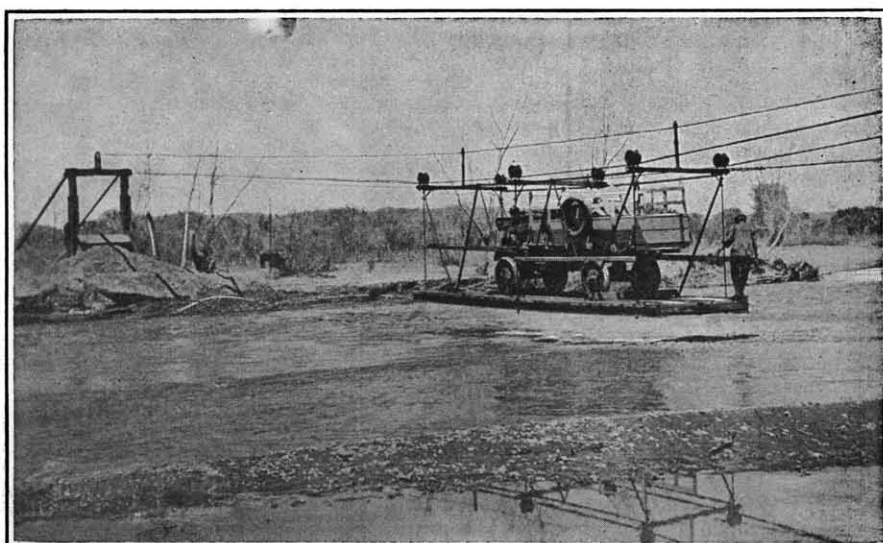
## An Aerial Cable Ferry That Carries a Motor Truck and Its Load in Instalments

**I**T is an unusual method that is resorted to in conveying the motor trucks of a transportation company of Silver City, New Mexico, across the Gila River during high water, as well as their loads. The river is too deep to ford at times, and accordingly it has been found necessary to construct the cableway that is illustrated in the two accompanying views.

The Gila River cable ferry is not unusual in its design and construction, for these follow conventional practice; but it is in the matter of application and operation that the uniqueness of the cableway is at once apparent. Most interesting of all, perhaps, is the fact that the motor trucks and their loads are ferried across in instalments, first the cargo and then the trucks, because the cableway is not of sufficient strength to bear the combined load. The freight to be ferried across the river consists principally of parcel post packages going to Mogellen, a gold-mining camp some 100 miles from Silver City—the nearest railroad point. Arriving at the river bank, the load of a motor truck is shifted over to the platform of the cable ferry; and since the two platforms are of the same height, the work of shifting is greatly simplified. The cable lines are slightly inclined, so that the load is shipped across the river by its own weight. After being unloaded on the opposite bank, the ferry platform is pulled back to the starting point. Meanwhile the motor truck has not been idle, for it has climbed up an embankment which brings it on the same level as the ferry platform, so that it can run onto this platform. The truck then slides across the river by its own weight, is again loaded with its cargo, and ambles off toward its destination.



Motor truck in position for transferring its load of parcel post bags to the aerial cable ferry



The aerial cable ferry which is employed to transport motor trucks and their loads across the Gila River, during high water

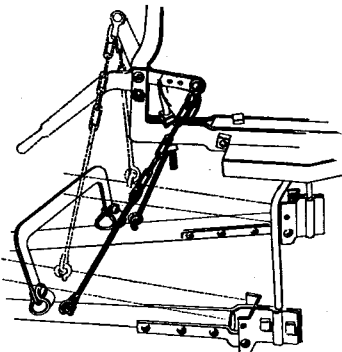


## RECENTLY PATENTED INVENTIONS

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.

## Of Interest to Farmers

**ATTACHMENT FOR CULTIVATORS.**—J. C. MIRE, Dreyfus, La. This attachment is especially adapted for walking cultivators, wherein means is provided for permitting the beams to be simultaneously lifted to free the plows from

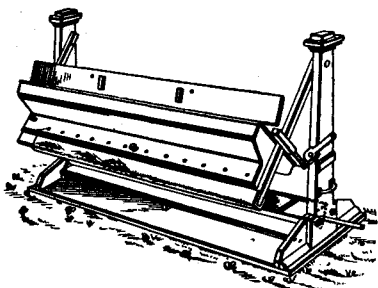


ATTACHMENT FOR CULTIVATORS

the ground, or to lower them into operative position, and wherein the height to which they are lifted may be varied, and wherein other mechanism is provided in connection with the said lifting mechanism for regulating the depth of the cut of the plows.

**CARRIER FOR SHEAF HOISTS.**—W. G. FETROW and E. EBERLY, Address the former, Mechanicsburg, Pa. The invention provides a device in which means is provided in connection with the carrier fingers, whereby the fingers in the loaded position will be supported and the chain will be stiffened at the fingers during the upward run of the chain, so that the fingers will be prevented from yielding in a downward direction, which would result in the sheaf slipping from the fingers, and whereby, at the same time, the chain links and fingers will be free to assume the necessary positions on the down run of the chain.

**FEEDING DEVICE.**—W. M. HARTT, Great Falls, Mont. This invention relates to feeding devices, and more particularly to a sanitary poultry feeder. Means are provided in the form of medicated pads, for preventing the spread of diseases prevalent among poultry, said pads



FEEDING DEVICE

being so arranged that the feet and heads of the fowls, when feeding, will come into contact therewith. Provision is made of superposed perches or supports so arranged in order that fowls of different sizes may readily gain access to the feed receptacle, the uppermost perches being adjustable.

**SAP CUP HOLDER.**—J. O. WALKER, care of Gulf Cup & Still Co., Pensacola, Fla. The invention provides suspension means for cups employed for collecting turpentine, which do not mar the tree nor blemish the same by endangering the lumber-making tools if the tree is subsequently converted into lumber; and provides suspension means for cups for holding the cups in close juxtaposition to the sap-gathering spouts, troughs or aprons used in conjunction therewith.

## Household Utilities

**RADIATOR VALVE CONTROLLING DEVICE.**—A. P. BROOMELL, York, Pa. An object in this invention is the provision of a device to be used in connection with atmospheric vapor or vacuum heating systems where there is no pressure in the return pipe, for automatically closing the inlet valve when the radiator is full of steam.

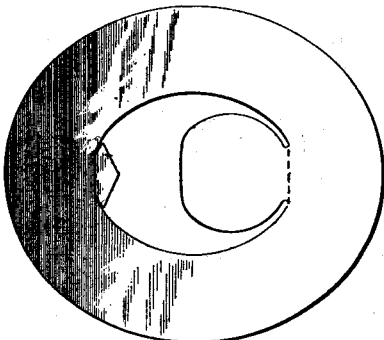
**FOLDING CRIB.**—S. F. Goss, 1591 Vera St., Portland, Ore. One of the primary objects of the invention is to provide a folding crib of improved construction and arrangement of parts, capable of ready attachment with and detachment from a bed of ordinary construction, and adapted to be folded into compact space for shipping and storage.

**INSECT TRAP.**—S. F. SEASHOLTZ, Pocatello, Idaho. This invention provides a plurality of lengths of electrically charged wire which are disposed adjacent and parallel to one another in such manner that the insects will be electrocuted by completing a normally open circuit that is maintained, the current bridging the adjacent wires through the body of the insect that comes in contact therewith.

**PORTABLE OVEN.**—M. W. POTTER, Red Lodge, Mont. This improvement provides an oven consisting of an outer hood provided with an insulated door and having mounted

therein an inner insulated casing elliptical in cross section so that the bake pan will be supported only upon its longitudinal edges to provide sufficient air space thereabout to prevent food from burning.

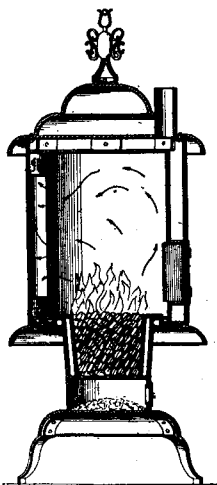
**TOILET SEAT COVER.**—M. J. EARLEY, 976 New York Ave., Memphis, Tenn. This invention relates to sanitary toilet seat covers, and one of the principal objects of the inventor is to provide a seat cover of a shape to fit upon



TOILET SEAT COVER

a toilet seat, and having portions depending within the bowl for preventing accidental displacement of the cover, and for preventing contact of the person with the front and rear of the seat or bowl.

**STOVE.**—R. S. SHEELEY, 43 Indiana Ave., Galesburg, Ill. The invention has particular reference to a heating drum stove. An object is the provision of an inner drum for the stove



DRUM STOVE

constructed in a novel manner, whereby the same will provide an exhaust flue for the products of combustion and thus present a maximum heating surface and a correspondingly increased amount of heat.

**WINDOW CONSTRUCTION.**—M. J. E. MAGNUSSEN, R. F. D. No. 5, Boise, Idaho. The inventor provides a simple inexpensive mechanism, for supporting the sashes in such manner that they may be swung away from the casement, to permit access to the sashes for cleaning or the like, or may be moved into normal position with respect to the casement, and when in such position may be raised or lowered in the usual manner.

**CAMP BED.**—C. J. ANDERSON, Melrose, Ore. This improvement provides a bed in connection with a suitable tent, wherein a framework is provided for supporting the tent covering, and wherein the bed is supported by the frame and is adjustable with respect thereto, to compensate for inequalities of the ground, and to permit the bed to be raised and lowered.

**MEAT COOKER.**—H. ADELMANN, 530 Westchester Ave., Bronx, N. Y. The invention relates to meat cookers and has particular reference to means for boiling boned hams or other meats. By the term "ham," it is to be understood as covering broadly any analogous food product. The ham is delivered with characteristic markings to indicate that it has been wrapped with a cord for the cooking operation.

**SCRAPER.**—J. W. MORRISON, 337 McKee Place, Pittsburgh, Pa. This simple and convenient appliance adapts itself readily to the irregularities that may exist in the surface to be scraped or cleansed. It is of a durable nature, and one of such a construction with reference to the handle portion that the material scraped will not be likely to come into contact with the operator's hand.

## Of General Interest

**METHOD OF PRODUCING AN IMPRESSION PLATE.**—S. GEISMAN, 27 Spruce St., New York, N. Y. This invention provides steps in the process of producing impression plates whereby any desired impression may be quickly and easily secured substantially in the natural state of the impression plate and be, by proper steps, transferred to any suitable material, as for instance, leather, paper, cloth, etc.

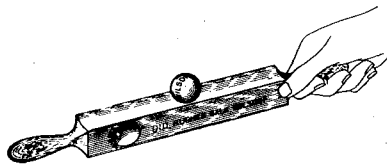
**SPRINKLER.**—E. R. HAWLEY, 211 Scott Bldg., Salt Lake City, Utah. The invention improves the construction of a sprinkler of the type in which the sprinkler head is lifted automatically by the water when turned on in the service pipe and permitted to gravitate to its closed position when the water is shut off, the sprinkler head serving as a closure for the parts connected to the service pipe.

**BOTTLE VALVE.**—C. F. LENG, 42 Broadway, New York, N. Y. This inventor provides a valve arranged to insure proper working of the valve under all conditions, to permit of conveniently decanting the contents of the bottle, and to permit refilling of the bottle with spurious goods either by the use of a force pump or like device, or by the use of a vacuum.

**DISPLAY CASE.**—C. H. JONES, 205 E. 49th St., New York, N. Y. This invention provides a display case for use in stores and more especially designed for displaying candy and other articles of merchandise to the best advantage, and at the same time providing storage capacity for reserve merchandise, tying cord, packing paper, paper bags and the like to enable the seller to readily fill orders from customers.

**PRESSER BAR ACTUATING LEVER FOR SELF FILLING FOUNTAIN PENS.**—W. I. FERRIS and E. F. BRITTON, Jr., Jersey City, N. J., Address L. S. Waterman Co., 173 Broadway, New York, N. Y. This invention improves and simplifies the mounting for the presser bar actuating lever whereby boring of the barrel of the pen for the reception of the fulcrum pin of the lever is avoided, the lever being fulcrumed in a box-like frame which is set into the lever-receiving slot of the pen barrel.

**ADVERTISING DEVICE.**—R. FORTESCUE, Box 185, Dade City, Fla. An object of this invention is to provide an advertising novelty in the form of a game apparatus, consisting of a ball adapted to be thrown at a target or

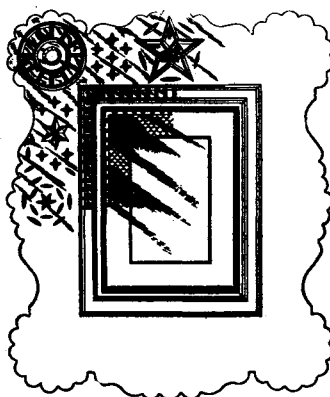


ADVERTISING DEVICE

caught within a receptacle, and a device for throwing the ball and catching the same. A further object is to provide a device which shall be of a durable yet inexpensive construction, and therefore adapted to be distributed gratis as an advertisement.

**COMPOSITE BEAM.**—W. P. FRANCIS, 39 Luckie St., Atlanta, Ga. In this patent the invention has reference to building construction, and more particularly to composite beams of that type having a metallic skeleton frame or reinforce which carries the brickwork, tiling or the like constituting the body of the beam.

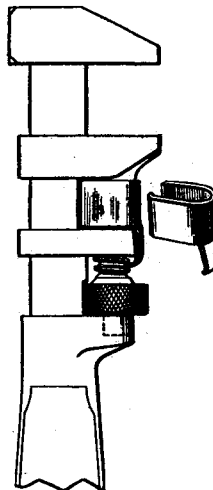
**PICTURE FRAME.**—M. ROOSMAN, 25 South St., New York, N. Y. This invention relates to a picture frame formed completely of glass, including an integral glass facing or panel for the picture. In connection with the all-glass



PICTURE FRAME

frame, a novel picture backing is employed, the said backing and frame having co-acting means to retain the backing in position on the frame.

**ATTACHMENT FOR WRENCHES.**—O. F. DESPAIN, Miami, Ariz. In this patent the invention has for its purpose the provision of an attachment for wrenches which is mounted on an adjustable wrench-jaw, and which en-



ATTACHMENT FOR WRENCHES

gages the thread of the same for moving the said jaw, to remove therefrom grease and dirt. The small engraving is a perspective view illustrating the attachment shown in the large picture.

**BOOK REST.**—R. L. DALGLISH, Okanagan Mission, British Columbia, Canada. Among the principal objects which the present invention has in view are: to provide for the rest a cheap, light construction; to provide means integrally formed therewith for limiting the movement of a prop with which the rest is provided; and to reduce the cost of manufacture of the article.

**BOOK PROTECTOR AND MARKER.**—W. CASS, Richford, Vt. This invention relates to a protector adapted for the Automobile Blue Book or the like, intended to be used in the open, whereby the book is protected from rain, wind and weather. The book can be readily closed without the protector interfering.

## Pertaining to Recreation

**RACE GAME APPARATUS.**—R. M. BRENNER, Box 151, Palisade, N. J. This apparatus is for use in pleasure resorts, exhibition grounds and other places, and is arranged to enable a number of players simultaneously to manipulate racing objects such as figures representing horses, for instance, with a view to cause such racing objects to travel over different tracks thereby simulating a race the winning of which is solely dependent on the skill of the players.

**TOY VEHICLE.**—F. H. WEBSTER, Marvell, Ark. This invention is more particularly intended for embodiment in self-propelled toys, such as toy vehicles, boats, etc. It provides drive means in which the reaction of a stretched rubber strand is utilized to create a torque in a drive axle or like rotary driven element.

**CASE FOR TENNIS RACKET FRAMES.**—F. RICHARDS, 885 Dean St., Brooklyn, N. Y. Mr. Richards' invention has for its purpose to provide a case for tennis racket frames which has its parts U-shaped in cross section, so that the parts may be disposed against the sides and the outer face of the racket frame, and be held in this position to prevent warping of the frame.

**COMPOSITION BOWLING BALL.**—P. J. KLOPSCH, 43 W. 53rd St., Bayonne, N. J. This ball can be cheaply manufactured, is not liable to wear unduly or chip around the finger holes and is one which is properly balanced, of the correct weight relative to its size, not liable to appreciably shrink or expand under different weather conditions, at the same time having the desired resiliency and hardness.

**TOY.**—A. Z. BAKER, Romanie Place, Leonia, N. J. The entire body of the toy vehicle is formed of a foldable blank. The invention provides an inexpensive toy which can be easily and quickly folded into a predetermined vehicle. It provides a wheeled vehicle which is propelled through the medium of an elastic member adapted to be wound on an axle.

**SWING.**—E. O. M. HABERACKER, 2222 7th Ave., Altoona, Pa. This swing is of the suspended type, for porches and in houses, rooms, or with other supports, and so arranged that the inclination of the back and the foot plate support with respect to the seat may be simultaneously changed at will by the occupant, and wherein latch mechanism is provided for holding said parts in adjusted position, which may be compactly folded so as to occupy but little space when not in use.

## Electrical Devices

**HIGH TENSION TELEPHONE LINE CONSTRUCTION.**—A. L. HARRINGTON, Care of Yadkin Power Co., Raleigh, N. C. This invention has to deal more particularly with an improved method of transposing the telephone line so as to effectively neutralize the induction effect of the high tension power line, the construction involving a novel arrangement of cross arms and stringing of the wires so that a considerable saving in the cost of material, in time and expense results.

## Hardware and Tools

**TOOL HOLDER.**—E. M. SMITH, Okanagan, Wash. The improvement provides a holder including a body portion having stationary supporting jaws and a normally open pivoted locking or retaining jaw automatically operated, against a spring tension, by the insertion of a tool into the holder to swing said pivoted jaw to locking position whereby to detachably retain said tool to engagement with the holder.

**CLIP FOR FOUNTAIN PENS.**—W. E. MOORE, 614 North Chatham St., Janesville, Wis. The prime object of the invention is to utilize the pen clip for protecting and reinforcing the open end of the cap. The purpose is attained by a construction that incidentally serves also to more securely retain the clip on the pen and at the same time to provide a clip that will effectually take hold of the pen pocket.

## Pertaining to Apparel

**COMBINED VEST AND PETTICOAT.**—LUCY NAHABEDIAN, 2034 Washington Ave., Bronx, N. Y. This invention relates to children's garments and provides a combined garment arranged to provide the desired freedom for the body and to permit convenient attachment of drawers and diapers, hose supporters and the like, without exerting a strain on the petticoat or marring the proper hang thereof.

**OVERSHOE.**—C. W. MACWILLIAMS, Geneva, Neb. The invention relates generally to overshoes, and more particularly to thin flexible overshoes of the glove fitting type, the object being to provide such an overshoe with a toe-engaging protuberance or projection located so that the shoe of the nature described may be readily removed without applying the hands to this purpose.

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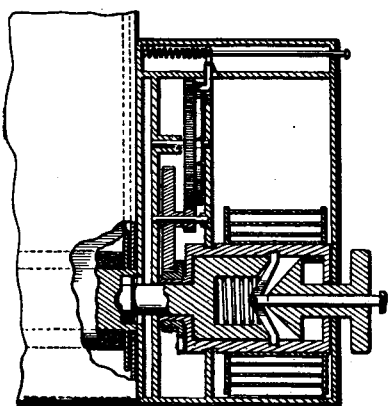
**Machines and Mechanical Devices**

**DRAWING RING AND OPERATING MEANS THEREFOR.**—S. B. HENSHAW, Care of Charleston Window Glass Co., Charleston, W. V. The present improvements relate to the drawing rings employed upon the surface of the molten glass within the drawing chamber, and the means by which these rings may be conveniently and effectively controlled by an operator at any point distant from and overlooking, the drawing chamber itself.

**POWER DRIVEN TYPE-WRITER.**—H. W. MORLEY, Angola, Ind. This inventor provides a device in which the operation of one of the keys of the typewriter results in the throwing of the type-bar against the platen by power means, while at the same time all of the other keys on the keyboard are locked, and are therefore prevented from interfering with the key which is operated.

**MICROMETRIC SPACER FOR TYPE-WRITING MACHINES.**—B. ORDONEZ, Cordoba, Argentina. The spacer is arranged to enable the operator to quickly and accurately set the platen-turning mechanism for producing any desired distance between succeeding lines of the written matter, also enabling the operator to accurately follow ruled paper without being obliged to turn the platen by hand.

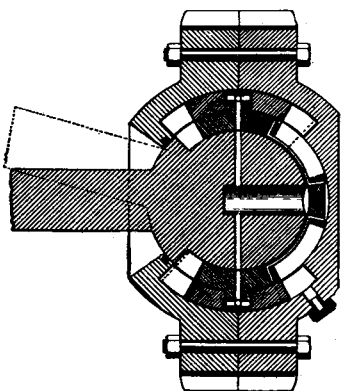
**AUTOMATIC FILM WINDING ATTACHMENT FOR CAMERAS.**—L. E. TREADAWAY and W. T. STEPHENS. Address the latter, 213 East New York Ave., De Land, Fla. The invention provides an attachment by means of which the film may be automatically wound upon the winding spool so as to bring the por-



AUTOMATIC FILM WINDING ATTACHMENT FOR CAMERAS

tions of the film successively into operative relation with the lens of the camera. The device is provided with means for accurately stopping the film winding mechanism at a predetermined point so as to insure the movement of the films to the proper position for taking the picture.

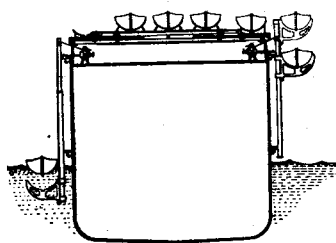
**FLEXIBLE POWER TRANSMISSION.**—H. B. SMITH, Pendleton, Ore. This improvement refers to universal joints, particularly to the ball and socket type, and the main object thereof is to provide such a device between a driving and a driver element the axis



FLEXIBLE POWER TRANSMISSION

of which may be moved into angular relationship and which device is maintained at high efficiency in any such angular relationships irrespective of the vertical load upon either or both of said elements.

**BOAT LAUNCHING DEVICE FOR SHIPS.**—C. A. RICHTER, 1220 Fulton Ave., Grand Haven, Mich. The intention in this invention is to provide a new and improved boat-launching device for use on board of passenger carry-



BOAT LAUNCHING DEVICE FOR SHIPS

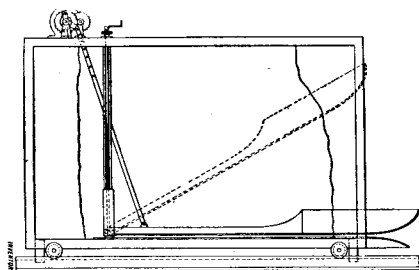
ing steamers and other ships, and arranged to permit of quickly launching a number of boats successively on either side of the ship and without danger of upsetting the boats while lowering the same.

**DRILL EXTRACTOR.**—H. K. MacKENZIE, Sullivan Mines, Kimberley, B. C., Canada. This invention is an improvement in drill extractors, and has for its object the provision of a device adapted for use with power operated drills for extracting drill steels when jammed in the drill hole, and wherein the power of the drill is utilized for extracting the steel.

**DREDGE BUCKET.**—E. G. SHAFFROTH, 201 E. 1st St., Kalispell, Mont. This invention provides a dredge bucket which may be operated by a single line, and which automatically opens and closes at the proper time; the construction is such that there is no danger of the bucket opening until it reaches a predetermined height, and there is no danger of the bucket closing except at the place desired.

**LOCK STRUCTURE.**—F. G. NELSON, Room 2315, 195 Broadway, New York, N. Y. This invention has reference more especially to means for shifting the bolt of a lock or for permitting rotation of a rotatable barrel, as in the ordinary cylinder lock, and the invention comprehends a mechanism controlling the shifting of the bolt or the rotation of the barrel according to the particular type of the lock.

**SURF MOTOR.**—G. E. LANE, Ellendale, N. D. This invention relates to surf motors—that is, to motors controllable by surf waves and other analogous disturbances in the level of the water, the more particular purpose be-



SURF MOTOR

ing to corral or partially inclose a body of water in motion, in such a manner as to cause the depth of the water to increase beyond normal limits, and to use this increased depth of water for actuating machinery.

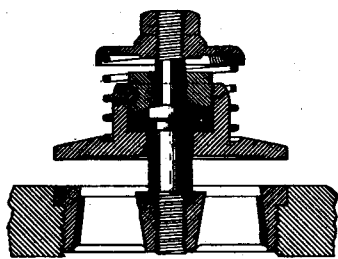
**WASHING MACHINE.**—G. L. FERRIS, Mexico, Mo. This invention has particular reference to that type of machines wherein there is provided a boiler in which a rotary clothes carrying cylinder is mounted. It provides a construction of boiler and cylinder and means supported by the boiler for rotating said cylinder, said means being adjustable relative to the cylinder whereby the latter may be removed from the boiler.

**CLOCK REWINDING DEVICE.**—C. AUER, Fragaria, Wash. This invention relates particularly to an automatic rewinding device for various kinds of clocks, as for instance, power or master clocks, and provides an arrangement whereby the motor for moving the power weight of the clock is arranged on said power weight and forms part of the same.

**TUBING BLEEDER.**—G. C. BUSHONG, Taft, Cal. This mechanism is for use with pumps of deep wells, as for instance, oil wells, wherein mechanism is provided in connection with the casing of the pump for permitting the oil and water contained therein to be bled or drained out at will, and wherein said drawing or bleeding mechanism is arranged to be operated by the pump rod, said rod having means for permitting the rod to be separated and to be moved to operate the bleeder.

**MECHANICAL DRIVE BELT.**—J. CROWE, Address Aniser Mfg. Co., 711 Corby-Farsee Bldg., St. Joseph, Mo. One of the principal objects of this invention is the provision of an improved drive belt, on the alternate links of which traction blocks for engagement with the pulleys are mounted, the blocks being made to conform in shape with the crown of the pulley.

**SELF GRINDING VALVE FOR PUMPS AND THE LIKE.**—H. G. KLEET and C. N. VOIGHT. Address the former, 570 Fordham Road, Bronx, N. Y., N. Y. A specific object of this invention is the provision of a puppet



SELF GRINDING VALVE

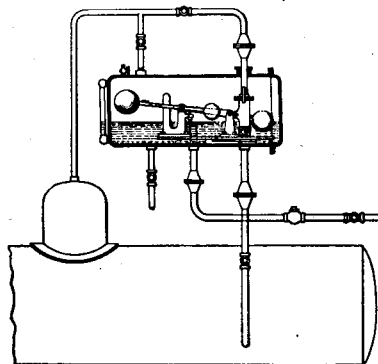
valve in which the valve body as it moves open and closed has a slight rotary motion with respect to the seat to thereby keep the contracting surfaces of the valve body and seat perfectly smooth, whereby leakage is absolutely prevented.

**MACHINE FOR CASTING STEREOTYPE PLATES.**—CARL WINKLER, Berne, Switzerland. This invention relates to machines for casting stereotype plates, and has for its ob-

ject to cast such plates quickly and without any superfluous appendix of cast metal, so that the work and apparatus hitherto requisite for removing said appendix are avoided.

**Prime Movers and their Accessories**

**FEED WATER APPARATUS.**—G. W. MOHR, 182 Central Ave., Jersey City, N. J. The object of this invention is the provision of a new and improved feed water apparatus more especially designed for automatically and period-



FEED WATER APPARATUS

ically feeding heated water under pressure into a boiler or other generator without any waste of the steam or other fluid motive agent or the use of any lubricant. The accompanying engraving shows a side elevation of the apparatus as applied, the tank being shown in section.

**ENGINE.**—W. Box, Georgetown, Tex. An object of this invention is the provision of an engine of the internal combustion type with a rotary valve disposed in the cylinder head, the movement of which affects the entrance of the explosive charge and permits the exhaust of the burnt gases.

**SPARK PLUG.**—J. J. SMITH, JR., 77 W. Napier Ave., Benton Harbor, Mich. This inventor provides a spark plug having a porcelain core, the parts being so arranged that the core may expand and contract without injuries. Means provide for intensifying the spark. The spark plug has a central glass tube around which is molded a porcelain insulator, said tube containing a central conducting member, this member, the glass tube and the insulator being made air and gas-tight.

**SPARK PLUG.**—J. J. SMITH, JR., 232 23rd St., Detroit, Mich. This invention provides means whereby the terminals of the spark plug may be made self-cleaning. It provides a device in which the terminals are provided with movable parts which are actuated both by the motion of the engine and also by the force of explosion, the motion of these parts serving to keep the terminals clean.

**AUXILIARY AIR SUPPLY DEVICE FOR INTERNAL COMBUSTION ENGINES.**—H. C. GILLIAM, care of F. H. Preble, Wenonah, N. J. The improvement refers particularly to a device for supplying air to engines, and provides means which will supply air in any desired quantity to the engine, the same being connected to the manifold between the carburetor and engine so as to dilute the mixture before its entrance into the engine.

**SPARK PLUG PROTECTOR AND CLEANER.**—E. G. WARE, Box 508, Taft, Cal. This device is applicable to a spark plug when the latter is not in use and adapted to engage the threaded cylindrical portion of the spark plug, and form a fluid-tight bearing against the shoulder at the base of the threaded portion, the device forming a reservoir for gasoline, alcohol, or like liquid, the device thereby serving, when applied to the plug, to remove any carbon, dirt, etc., adhering to the plug and forming at the same time a protector for the electrodes.

**CONDENSER.**—W. W. CASSIDY, Deadwood, S. D. The inventor provides a simple and efficient surface condenser having baffle plates therein so arranged as to prevent the steam entering the condenser from flowing directly to the air intake without circulating between the cooling tubes of the condenser.

**GAS ENGINE STARTER.**—G. W. MORTLAND, Lead, S. D. The starting is effected by a pull on a cable, the cable winding on a drum on the starting shaft. The drum acts on the shaft by a novel clutch device, and controlling means is provided to limit the turning movement of the drum and to restore the parts after a starting movement.

**INTERNAL COMBUSTION ENGINE.**—J. LANDGRAF, Briarcliff Manor, Westchester, N. Y. The invention relates to motors of the multi-cylinder type, and provides an engine arranged to reduce vibration to a minimum, especially when running the engine at a high rate of speed, thus rendering the engine exceedingly serviceable for use on automobiles and other power-driven conveyances.

**COMBINED THROTTLE AND MIXING DEVICE FOR INTERNAL COMBUSTION ENGINES.**—H. W. ALLEN, Sugar Pine, Madera Co., Cal. This invention provides mechanism adapted to be arranged between the carburetor and the engine, and provided with means for thoroughly mixing the several elements of the explosive charge to make a homogeneous mixture, and wherein the said means is controllable at will for varying the amount of the mixture passing.

**CIRCUIT CLOSING VALVE FOR INTERNAL COMBUSTION ENGINES.**—R. J. PESCHMAN, Fort Sheridan, Ill. This invention is an improvement in circuit closing valves for in-

ternal combustion engines, and the invention has for its object to provide a valve for use in multi-cylinder internal combustion engines to indicate failure in the operation of any particular cylinder.

**CARBURETER.**—F. L. TATOM, 25 Melrose Ave., Atlanta, Ga. This invention provides a most efficient mixture for combustion in the engine, and in which the relative amount of air may be readily varied. It provides means by which the fuel may be sprayed into a mixing chamber, which is provided with heated walls, thereby bringing the fuel mixture to such a state as to be most economically used in the engine.

**SHOCK ABSORBER.**—M. G. REED, Brookville, Pa. The shock absorber is of the hydraulic type in which a piston works in a cylinder and the ends of which are connected by two by-passes, there being a valve in each by-pass, one of which is normally closed and is opened by an upward flow of the fluid caused by a downward movement of the piston, the other valve being normally open to be closed by the upward movement of the fluid in the by-pass when the velocity of the fluid in the by-pass reaches a predetermined rate.

**Designs**

**DESIGN FOR NETTED FABRIC.**—W. W. CHACE, care of Jennings Lace Works, Park Ave., and Hall St., Brooklyn, N. Y. In this ornamental design the netted fabric comprises alternate narrow bands of closely knitted material and narrow bands of openwork zig zag threads or cords.

**DESIGN FOR AN ARM FOR LIGHTING FIXTURES.**—B. SCHWARTZMAN, 569 Broadway, New York, N. Y. This ornamental design for an arm for lighting-fixtures is No. 49,858. Mr. Schwartzman has invented another ornamental design for an arm for lighting-fixtures, No. 49,862. Also an ornamental design for a bowl hanger for lighting-fixtures, No. 49,861; an ornamental design for a bowl hanger and outside-light support, No. 49,859; and an ornamental design for an ornament for lighting-fixtures, No. 49,860. The above named numbers show five designs of lighting-fixtures, each comprising original forms and details of simple yet highly attractive invention.

**DESIGN FOR CRETONNE OR OTHER TEXTILE FABRIC.**—M. W. RYAN, Care of W. H. Brown Son & Co., 395 Broadway, New York, N. Y. Mr. Ryan has patented five designs for cretonne or other textile fabric and numbered 49,830, 49,831, 49,832, 49,833 and 49,834. The designs show a wide range of original ornamental invention in the application of flowers, vines, leaves, berries, stripes, fields, etc., in their various forms to fabric.

**DESIGN FOR A MOCCASIN.**—E. J. OGDEN, 502½ North 6th St., Springfield, Ill. In this ornamental design for a moccasin the side elevation and front view show an article of simple, neat and attractive form.

**DESIGN FOR A DOLL.**—JANE G. STOKES, 2 E. 23rd St., New York, N. Y. The essential feature here is the general hour-glass shape of the doll, the upper part being smaller than the lower, and the face of the doll appearing at the narrow or contracted part of the doll. This feature characterizes another ornamental design for a doll by the same designer, but marked by very attractive details that differ from the one first described.

**DESIGN FOR A CHILD'S CHAIR.**—N. W. MUMFORD, Beechcroft Farm, Millburn, N. J. In this ornamental design for a child's chair the article is of comparatively massive seat, legs, arms and back and of a very neat and attractive form.

**DESIGN FOR A MANICURE NAIL POLISHER.**—J. LUPPO, 2301 Belmont Ave., Bronx, N. Y. Mr. Lupo in this invention provides an original design of a manicure nail polisher which is simple in form and of very attractive appearance.

**DESIGN FOR A CHIN REST AND TAILPIECE.**—C. K. SHERWOOD, 952 Anderson Ave., High Bridge, Bronx, N. Y. In this ornamental design for a chin rest and tailpiece the plan view shows a chin rest and tailpiece for violin; an edge view of the same is shown.

**Musical Devices**

**PNEUMATIC PIANO PLAYER ACTION.**—J. POSPISIL, 647 South 17th St., Newark, N. J. Among the objects of the invention is to provide a construction involving metallic air chests of sheet metal or the equivalent thereof, whereby the danger of leakage of air due to shrinkage, warping or the like, incident to instruments as ordinarily made, is avoided.

**RECORD CLEANING ATTACHMENT FOR PHONOGRAPHS.**—L. E. RENNELL, 404 Mandeville St., Utica, N. Y. This invention provides a cleaning brush of soft material, the brush being arranged in position in advance of the sound reproducing needle, so as to clear the sound groove of any particles of dust and thereby render the reproduction of the sounds more perfect, as well as to obviate grinding of the surface of the groove.

**SOUND BOX.**—J. HOFFAY, care of Hoffay Talking Machine Co., Inc., 500 Fifth Ave., New York, N. Y. This invention consists in mounting the bearings about which the stylus lever oscillates on a carrier which is itself rigid and is preferably a complete ring, though it may be part of a ring. This ring is insulated from the sound box by a ring or part ring of rubber or similar insulating material surrounding the sound box, and the tension of the insulator

(Concluded on page 558)



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PATENT FOR SALE; steamless, odorless cooking kettle; a boon to the housewife; very practical and convenient; investigate this now. Charles Miller, 906 East Walnut St., Massillon, O.

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## Coal Gas as Emergency Fuel

(Concluded from page 554)

simple bag, was tried with some misgiving because it was feared that a rolling tendency would evidence itself. The gas bag is made in the form of a half-cylinder and is attached to the omnibus roof. It is made of a special canvas, impregnated with rubber solution which renders it both water- and gas-tight. The bags hold about 450 cubic feet. They are filled by coupling an inlet branch to a gas meter outlet and then are roped or strapped to the roof of an omnibus or char-a-bancs. The filling branch also serves for attaching the flexible pipe that conveys the gas to the inlet manifold. The gas is admitted at a point just above the carburetor throttle. An ordinary cock close to the engine controls the gas supply and this is manipulated by a lever attached to the throttle valve control member on the steering wheel so that the gas supply may be increased or diminished and thus obtain varying engine speeds in just the same manner as with gasoline fuel. A number of advantages are claimed for gas used in this fashion. It is clean, and there is no waste by spilling. It is said that the shape of the bag gives an immediate indication of the amount of fuel remaining, while it also serves as a check upon the relative efficiencies of different drivers. Experience shows that the engine gives as much power with coal gas as with gasoline vapor, that it can be made to run more slowly, that it starts easier, and that it requires less lubricating oil because no liquid fuel condenses from the mixture to wash it away from the cylinder walls.

The main disadvantage is in the short mileage possible per charge of gas. The actual running costs are actually in favor of this fuel. It takes but three minutes to fill the bags and as the firm is a large user of gas for industrial purposes, it costs them but slightly over 30 cents per thousand cubic feet. The mileage per thousand cubic feet varies according to the efficiency of the driver, but averages 30 miles. This receptacle does not add anything to the weight of the vehicle and it can be handled with ease because it is almost self-sustaining when filled owing to the lifting power of the gas. The advantages are not sufficiently great, however, to warrant a continuation of the use of this fuel when the present liquid fuel shortage ceases. It shows considerable ingenuity on the part of those responsible for its use.

## NEW BOOKS, ETC.

ELECTRICAL CONSTRUCTION. An Elementary Course for Vocational Schools. By Walter B. Weber. Peoria, Illinois: The Manual Arts Press. 4to.; 130 pp.; illustrated. Price, \$1.25 net.

This collection of problems presents some unusual features that should commend it to the instructor. The drawings, plainly giving constructional details, will save much of the time now expended by the teacher in preparing such delineations and blue-prints; and as the volume is bound upon the loose-leaf system, the student may be given one lesson sheet at a time to fill in and answer after completing work on the problem involved, while extra sheets may be added at any time. Problems are graduated according to their difficulty, and most of the lessons embody the more important features of the lesson immediately preceding. These and other niceties of method and arrangement distinguish the text and enhance its educational value; each problem plainly states the nature of the task assigned, the principle involved, and the object of the demonstration, and concludes with searching questions well calculated to exhibit the student's grasp of the subject.

THE BOOK OF ELECTRICITY. Written to Conform to the Tests of the Boy Scouts. By A. Frederick Collins. New York: D. Appleton and Company, 1916. 8vo.; 185 pp.; illustrated. Price, \$1 net.

The best way to learn the fundamental principles of electricity is by personal experiment; and the best way to experiment is to make your own apparatus. As the author remarks, the one thing we can't buy ready-made is brains; his book shows the young student exactly how to make and use the telephone and telegraph, and how to make and run generators and motors; it tells all about electric wiring and the easy measurement of electricity. By interesting stages, the boy is led to think intelligently from cause to effect, and to acquire ability in the handling of common tools, and a knowledge of common, simple, electrical construction.



## Cutting Down the Nation's Fuel Bill

Anything conserving the natural resources of this country is a national asset.

We claim this distinction for Goodyear Cord Tires.

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They cut eventual tire cost, because while priced a little higher, they wear longer and go farther.

Every advantage to be found in Goodyear Cord Tires traces straight back to their peculiar construction—a construction combining extreme flexibility with extreme strength.

They are built up of thousands of cords placed side by side in diagonal layers, without cross-weave, each cord and each layer being cushioned in springy rubber.

Their quality makes them higher-priced—and better.

They come in No-Hook and Q. D. Clincher types, in both All-Weather and Ribbed treads, for gasoline and electric cars.

Goodyear Tires, Heavy Tourist Tubes and "Tire Saver" Accessories are easy to get from Goodyear Service Station Dealers everywhere.

The Goodyear Tire & Rubber Company, Akron, Ohio

**GOODYEAR**  
AKRON  
**CORD TIRES**

(Concluded from page 556)

is preferably adjustable. The carrier thus forms a floating ring or section of ring thoroughly insulated from the sound box, while at the same time the adjustment of the stylus lever on its rigid carrier can be readily made.

**GRAMOPHONE AND THE LIKE MACHINE.**—J. HOFFAY, care of Hoffay Talking Machine Co., Inc., 500 Fifth Ave., New York, N. Y. This invention consists in a coupling permanently or detachably connected to the sound box or the tone arm or sound tube, and pivoted on the tone arm or sound tube or on a support thereon, at a point adapted to present an opening facing forwardly, approximately in the direction of the sound groove, or facing laterally transversely to the sound groove, for connecting the sound box to the tone arm or the like, the coupling being adapted in one position, to complete a tight communication between the sound box and the tone arm, and in another, to break it, and means being provided for restoring the communication when so broken, and at such time aiding in securing the coupling in position.

#### Musical Instruments

**MUSICAL WIND INSTRUMENT.**—W. J. GRONERT and W. C. REID, care of Elkhart Musical Instrument Co., Elkhart, Ind. This invention relates to pitch changing and tuning attachments for musical instruments, and particularly to combined attachments of this nature for use in connection with cornets and other wind instruments using open or cup-shaped mouthpieces, the object being to combine independently—acting, tuning and pitch changing facilities in a single slide, permitting instantaneous change from one pitch to another and maintaining the same tonal qualities in either pitch.

**MUSICAL NOTATION.**—H. KINNEY, Box 262, Yuma, Ariz. In this instance use is made of a staff having spaced lines to provide spaces representing the strings of the instruments and notes having heads of various shapes for indicating the fingers of the hand used for fingering the strings, the positions of the notes on the staff lines indicating the positions relative to the frets of the finger board.

**VIOLIN HOLDER.**—N. R. GAYLORD, Eugene, Ore. A yoke is supported on the shoulder of the player and a clamp receives and holds the violin body adjacent to the tail-piece, there being a member establishing connection between the yoke and the violin clamp and arranged to permit an adjustment to position the violin and yoke properly for the playing of the instrument is properly held without the player clamping it beneath his chin.

**DEVICE FOR USE IN THE MANUFACTURE OF GRAMOPHONE, PHONOGRAPH, AND THE LIKE SOUND BOXES.**—J. HOFFAY, Room 625, 500 Fifth Ave., New York, N. Y. The present invention relates to means for subjecting and holding the bifurcations of a forked stylus lever under predetermined stress, while the permanent connecting means are being applied to the bifurcations, without liability of unduly straining or damaging the stylus lever.

#### Railways and Their Accessories

**RAIL FASTENER.**—H. A. BERQUIST, St. Croix Falls, Wis. The invention relates to means for fastening the rails of railway tracks to the ties, as a substitute for the unreliable spikes, and is adapted for use with the conventional ties or with the ties shown and described in Letters Patent of the United States, No. 1,102,857, issued to Mr. Berquist.

**TRAIN STOP.**—E. A. KRONES, SR., 354 E. 87th St., New York, N. Y. The invention pertains to means for bringing a train to stop should the engineer pass a danger signal. The object is to provide a simple and inexpensive device for applying the brakes of a train should an engineer pass a danger signal inadvertently.

**UNIVERSAL JOINT.**—E. F. SCHURMAN, 330 East 152nd St., New York, N. Y. This joint has its two parts connected by a ball and socket joint, one of the parts having a cylindrical portion with a plurality of slots spaced apart and disposed longitudinally of the axis of the part, pins which extend from the other part being movably disposed in the slots. The sides of the ends of the slots diverge for a distance from its center in the direction of its ends so that the pins, which fit the slots at their centers, may move laterally for a distance relatively to the part having the slots, as the pins move in the slots toward their ends.

**INDICATING LOCK.**—W. A. RATCLIFF, 1929 King St., Bellingham, Wash. This invention relates to locks, the more particular purpose being to provide a lock suitable for general use, and especially adapted for service in connection with railway cars, the lock being provided with means for indicating the person or agent whereby the lock was last actuated.

**BANANAETTE MACHINE.**—D. W. ROYER and J. W. VON NIEBA, Ephrata, Pa. The improvement has for its object to provide a machine adapted for inverting a core of ice cream within an opening in the body of a banana to provide a combination consisting of the banana and the ice cream in a convenient and attractive form for immediate consumption.

**GATE.**—J. D. TESTERS, Newton, Neb. This improvement relates to the fencing off of land, and the main object thereof is to provide an opening through said fencing and a gate therefor, which opening is unlimited as to width in

view of the fact that the gate is not supported by hinges in the manner of conventional gates.

**LATERAL TAKE-UP DEVICE FOR LOCOMOTIVE AXLES.**—H. B. FURSTONBURG, Address O. H. Bruhn, Box 234, Leesville, La. This invention relates generally to a device for taking up the longitudinal thrust of locomotive axles, and preventing undue lateral play thereof with respect to the driving boxes, and provides a device which will be inexpensive, which may be utilized without danger of displacement, and which will be extremely durable in use.

**RAILWAY GATE.**—F. A. GRANT, Cortland, N. Y.—Mr. Grant's invention relates to the protection of street crossings of railways, and the main object thereof is to provide means operable by an approaching train, from either direction, for closing the gates, for insuring their return to open positions.

**AUTOMATIC TRAIN STOP.**—M. B. BULLA, De Witt Apartments, El Paso, Tex. This invention refers to railway appliances and has particular reference to safety appliances for railway trains, trolley cars or other analogous vehicles. It provides means for enabling the engineer to pass a danger point under orders or to flag a block and yet cause a record to be made of what he has done. Mr. Bulla has invented another automatic train stop which has particular reference to automatic devices for causing the operation of certain signal and indicating devices in the locomotive cab or its equivalent when a danger signal is passed.

**CAB SIGNAL AND AUTOMATIC STOP.**—M. B. BULLA, De Witt Apartments, El Paso, Tex. This invention provides a signal which is adapted to be sounded while the train is passing a certain point, say five hundred or a thousand feet ahead of the point where a danger signal may be set whereby the engineer will have his attention called to the fact that the danger point will soon be reached and will put him on the lookout to see whether the signal is set at danger or not.

**RAILROAD CROSSING.**—R. C. SUTPHIN, Horse Cave, Ky. The principal object here is to improve the construction of crossings so as to avoid gaps between the angle or corner rails and the crossing rails, whereby jolts as the wheels of the cars pass the crossing are prevented and noise and wear reduced to a minimum.

**CHECK HOLDER.**—T. ROSS, Marianna, Pa. An object in this case is to so hold the check as to necessitate the use of a strong magnet for gaining access thereto whereby to guard against tampering by workmen whom it may be reasonably expected will not possess the required magnet for the purpose.

**LUBRICATION DEVICE FOR CAR AXLES.**—J. J. LEONARD, care of Y. M. C. A., 111 Halsey St., East Orange, N. J. This improvement relates to lubricating devices for axles and particularly to car axles, and has for an object the provision of an improved arrangement which may be used in connection with any kind of a car axle, whereby an ample lubrication is provided at all times without wasting any material.

**DERAILING DEVICE.**—W. P. NEWKIRK, care of B. & O. Storage & Warehouse, Portsmouth, Ohio. This device is a warning and derailing device to prevent injury to inspectors, repairmen, etc. It is placed on the track by arranging a plate transversely of the rail and with the lower edges of two depending flanges resting on the tread of the rail and with extensions depending on opposite sides of the tread. It is then turned into parallelism with the rail and two flanges drop on opposite sides of the tread and with the above named extensions below the tread and with webs in contact with the web of the rail. Two key blocks are then placed, one being locked by a chain and the other by a padlock.

#### Heating and Lighting

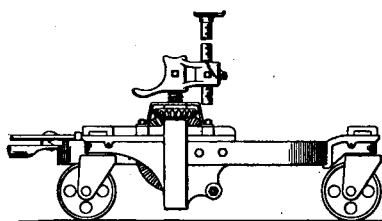
**TABLE LAMP ATTACHMENT.**—J. S. CLIFFORD, 227 W. 29th St., New York, N. Y. The invention relates to a lamp attachment whereby the lamp can be applied to a vase which forms the base or support of the lamp. It provides an attachment which is inexpensive to manufacture, reliable and efficient in use, and so designed as to be adaptable to vases having necks of different sizes.

**HYDROCARBON BURNER.**—J. MILLBOURN, Morris Heights, New York, N. Y. This invention relates to hydrocarbon burners mainly intended for the consumption of alcohol as a fuel. The invention provides an inexpensive burner of high efficiency. Under the action of heat the fuel readily gasifies and a uniform feed of gaseous fuel flows through an outlet controlled by a needle valve. Thus a greater economy of fuel is obtained and a more efficient burner results.

**HEATER.**—H. E. REDEKER, Rupert, Idaho. The inventor provides a heater especially adapted for laboratory use, wherein a heater casing is provided of frusto-conical form and provided with axial openings for admission and departure of air, the casing having a heating coil and a switch below the casing for controlling the flow of current to the coil, and wherein a supporting sleeve is provided with means for receiving a beaker, and wherein means are provided, each adapted to seat within the sleeve upon the casing, and each having a cylindrical extension fitting within the opening at the upper end of the casing.

#### Pertaining to Vehicles

**AUTOMOBILE JACK.**—F. O. COOLEY and A. J. MILLIGAN, Care of Clyde Iron Works, Duluth, Minn. This invention has the following advantages:



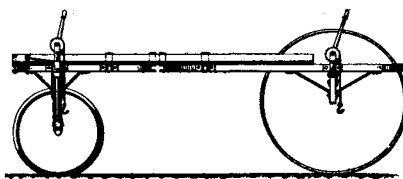
AUTOMOBILE JACK

It is the only twin "auto jack" whose two sides are independent of each other, it being possible to raise, stop or lower either side at any time while operating the same; it has adjustable swivel seats to clear truss and steering rods; in raising or lowering the full force is obtained on the sides alternately, that is, one side raises on the up stroke as does also the opposite on the down stroke; it is impossible to tip or drop the load in the various operations; has ball bearings throughout; and may be used as jack, turntable or transport, and to test the emergency brake, and repair tires, springs or wheels.

**CONCRETE TAMPER.**—E. G. CARR, 473 Haddon Road, Oakland, Cal. The invention relates to improvements in tampers used in constructing concrete roads or beds and has for its object to utilize the vibrations of a gas engine or similar motor and communicate such vibrations to the tamper, with a view to render the tamping operation on a road more uniform and certain.

**VEHICLE TOP.**—O. N. ROBARDS, 426 Sixth St., Henderson, Ky. The primary object here is the production of a collapsible top for vehicles upheld by a folding frame consisting of cooperating parts of particular arrangement and construction whereby said frame may be readily folded and unfolded with a minimum amount of labor.

**TRUCK.**—O. BINFORD, Citronelle, Ala. This invention facilitates loading and unloading the truck, and to this end there is provided a frame supported upon arched axle members, and between the sides of which and below said frame the load is suspended, the same being



TRUCK FOR HAULING LOGS, ETC.

elevated and lowered by suitable mechanism mounted on said axle members. For the purpose of adapting the truck to different sized loads the frame is made adjustable in length by constructing the same in sections having a common support, one of the sections being movable longitudinally thereof.

**SHOCK ABSORBER FOR MOTOR CARS AND OTHER VEHICLES.**—F. M. BEST, Yarra Glen, via Morgan, South Australia, Australia. The shock is taken up by a spiral spring device, and transmitted to the spring device by a flexible connection passing around a pulley or pulleys, one end of each flexible connection being attached to the spring device and the other end to a bracket, the bracket being attached to the body of the vehicle and the pulley to the axle of the same, or vice versa, the bracket being attached to the axle and the pulley to the body. The bracket may be either a rigid construction or a leaf spring.

**AUTOMOBILE SIGNAL.**—W. E. JONES, Delmar Bldg., St. Louis, Mo. An object here is to provide illuminating means adjacent to each signal for illuminating the said signal when in operative position. Further, to provide mechanism controlled by the movement of the signals into and out of operative position for actuating the illuminating means adjacent to the said signals. Mechanism provides for operating the signal either manually or electrically controlled, the mechanism in each instance, however, being controlled by the movement of the steering wheel.

**TIRE HOLDER.**—C. T. PERKINS, Care of Manley & Slater Auto Co., Cor Main and Athabasca Sts., Moose Jaw, Saskatchewan, Canada. This invention relates to tire holders and particularly to an improved tire holder used on automobiles, and has for an object the provision of such a structure as will properly hold a tire in position on any form of automobile so that the same may be readily removed at any time.

**DRAW BAR.**—S. G. BARNARD, 1408 Fourth Ave., Seattle, Wash. The invention is an improvement in draw bars, for vehicle trailers, and provides a device which may be easily attached to or detached from the vehicles, and which will be simple in construction, and will connect the vehicles in such a manner that they will cushion against each other.

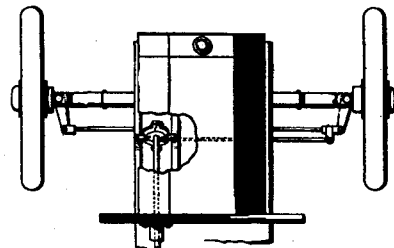
**REAR SIGNAL.**—J. REYNOLDS, 2140 E. 4th St., Brooklyn, N. Y. In the present patent the invention has reference to rear signals for vehicles; and the object thereof is the provision of a simple inexpensive and efficient rear signal whereby the visual and hearing faculties of the person controlling the vehicle in the rear can be easily attracted.

**SHOCK ABSORBER.**—C. SIMON, 34 W. 13th St., New York, N. Y. This invention relates to shock absorbers for vehicles, and is intended for cooperation with the vehicle springs. It is characterized by the provision of inter pivoted levers connecting one end of the spring to the frame of the vehicle. The shock absorber can be easily and quickly applied to motor vehicles without necessitating alteration to any part of the vehicle.

**CONCRETE TAMPER.**—E. G. CARR, 473 Haddon Road, Oakland, Cal. This improvement relates to tamping devices used in constructing concrete roads or beds, and the object is to utilize the various vibrations of a power driven shaft carrying an eccentrically mounted weight to impart a horizontal motion to one tamper templet or blade and a vertical movement to another templet or blade, either simultaneously or intermittently.

**SECTIONAL RIM.**—G. T. FIELDING, 2186 Loring Place, Bronx, N. Y. The invention provides a sectional rim arranged to permit of quickly assembling the sections and securely fastening the same together for properly supporting the tire or unlocking and disconnecting the rim sections for convenient removal of the rim sections from the wheel with a view of removing the tire.

**STEERING GEAR FOR MOTOR VEHICLES.**—G. R. ROSENBERG, White Cloud, Mich. This invention relates to improvements in steering mechanism for vehicles and more particularly the motor driven type and provides a device so arranged as to reduce the leverage on the

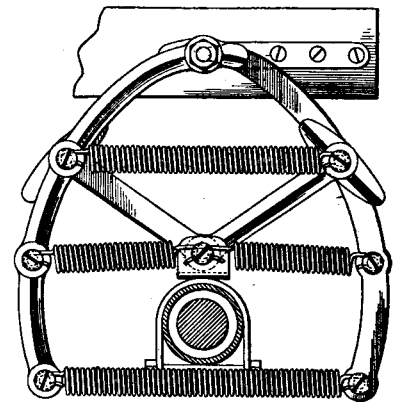


STEERING GEAR FOR MOTOR VEHICLES

steering post. It provides a steering mechanism wherein a greater power may be applied to the steering wheels with a small leverage on the steering post. It also provides a device wherein the percentage of throw of the steering rod may be increased or diminished.

**VEHICLE WHEEL TIRE.**—E. SCHMITT, 58 Fulton Ave., Astoria, L. I., N. Y. The invention provides a tire arranged to provide the desired cushioning effect without the use of pneumatic means, to permit of conveniently attaching the tire to the felly of the wheel and to allow replacing of a worn out tread by a new one whenever necessary.

**VEHICLE SPRING.**—M. P. GILLEN, 1412 5th St., San Diego, Cal. The improvement refers especially to automobiles and provides resilient means between the frame and axles to take



VEHICLE SPRING

strains in a yielding though gradually resisting manner, whereby shocks to the occupants of the vehicle will be avoided while riding over rough roads or any surface inequalities.

#### Medical Devices

**OPERATING TABLE.**—A. F. BRAND, care of Kny Scheerer Co., 404 W. 27th St., New York, N. Y. This table is universal in adaptation to any possible demands which may be made thereon, because of the great number of general positions into which it may be set; of the considerable variations possible in any desired degree in any general position; the ease by which such adjustments are made, and the automatic locking of the parts in adjusted positions, thereby adapting the tables to examinations and treatments, both G. U. and gynaecological.

**SURGICAL INSTRUMENT.**—G. BACOLINI, 367 14th St., Brooklyn, N. Y., N. Y. This invention relates to surgical instruments particularly adaptable for manipulating the clips applied to incisions. The object is to provide an instrument which will automatically feed the clips to the plying ends of the instrument after each manipulation of said plying ends.

**MASSAGE DEVICE.**—L. J. WIDNESS, 208 Van Buren St., Brooklyn, N. Y., N. Y. This improvement relates to massage devices, and the main object thereof is to provide a device which permits both kneading and suction operations at the same time whereby a heightened blood circulation is induced on the surface massaged in an instantaneous and painless manner.

**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.



### Wit vs. Wisdom in the Patent Office

THE brief of a recent appeal from a decision of the United States Examiner of Trade Marks demonstrates that even in the solemn halls of justice the god of humor has an occasional inning. The examiner had decided that the use of the mark "Limestone Brand" on a cathartic medicine would be descriptive if the medicine contained limestone, and descriptive and deceptive if it did not, and that in either case it must therefore be not allowed.

The case hinged upon whether such employment of the word "limestone" was in accordance with the usages of the English language. Can a word with a well defined meaning of its own be divorced from that meaning and used as more or less suggestive part of a phrase in some other connection? The appellant claimed that this could be done, and cited a large number of trade names which appeared to bear out his contention; in particular he exhibited various botanical names such as white lily, laurel, rose leaf, hickory, ivy, marigold, goldenrod and heather, allowed in connection with products from which logical application of the examiner's ruling would certainly appear to bar them as deceptive.

Then the brief proceeded to point out certain cases in point in the ordinary language of every-day, as follows:

"There is no cream in cream of tartar, in cold cream or in chocolate creams, no milk of magnesia, in milkweed or in the cocoanut. These are all as remote from the cow as the cowslip.

"There is no grape in grapefruit or bread in breadfruit. A pineapple is neither pine nor apple; a prickly pear is not a pear; an alligator pear is neither a pear nor an alligator, and a sugar-plum is not a plum.

"Apple-butter is not butter. All the butter is taken out of buttermilk, and there is none in butter-nuts, or in butter-cups, and the flies in the dairy are not butterflies.

"Peanuts are not peas, and it is doubtful if they are nuts. Sailors wear pea-jackets—peas do not, they have peacocks, which, by the way, are not fish.

"Monkey wrenches are neither made by or of monkeys, and otter of roses is not extracted from the otter. Poles are not made from pole-cats or badges from the badger.

"A lathe chuck is a contrivance fixed to the mandrel to hold the wood—it is not a wood-chuck. A woodchuck is a ground-hog, which is not a hog and is not ground—ground hog is sausage. And a lathe mandrel is not a monkey, though a mandrill is.

"Angel-food is eaten by everybody. There are no sponges in sponge-cake, and the eating of lady-fingers does not import cannibalism.

"Chicken-pox has nothing to do with chickens, neither has an egg-plant—nor a cocktail.

"A horse-chestnut is as far removed from horses as a saw-horse, clothes-horse, or a horse-radish. A horse-chestnut is a nut, so is the thing that goes with a bolt, so is a doughnut.

"Sweetbreads are not sweet and are not bread.

"Catgut is no more feline than pussy-willow or cat-tails and fire-dogs are andirons and are made frequently of brass, and a copper is a policeman or a bull, but an Irish policeman is not an Irish bull.

"Whiffle-trees, boot-trees, hall-trees and family-trees are as out of place in the woods as a railway-frog, a fish-plate, a fish story, a mackerel sky or a crabapple in the water.

"Perhaps," continued the brief, "the Court may remember the Country Summer Pastoral which was written by a learned but city-bred scholar, from knowledge derived from etymological deductions rather than from actual experience. He was an advocate of the back-to-the-land movement and sang:

"I would fly from the city's rule and law  
From its fashion and form cut loose,

And go where the strawberry grows on its straw.

And the Gooseberry on the goose.  
Where the catnip tree is climbed by the cat,

As she crouches for her prey,  
The guileless and unsuspecting rat,  
On the rattan bush at play.'

"There is no use in going on with this. Every day of our lives we use words understood by everybody which if taken literally, would get us into trouble. It is not what we say that counts, it is what people understand by what we say. So, in the present case, limestone is used to make roads. Everybody knows that it does not come in little tin boxes selling for thirty-five cents and recommended as a cathartic. The word is so obviously inappropriate, when applied to such article, that it cannot by any possibility deceive any one. No one can be fooled into buying medicine for macadam, or the reverse.

"We think the Examiner of Trade-Marks was too literal and should be reversed."

It grieves us to record the fact that in spite of the ingenuity of his attorneys, Messrs. Edward S. Rogers and Francis M. Phelps, the decision against the appellant was sustained and he will have to find a new trade-mark.

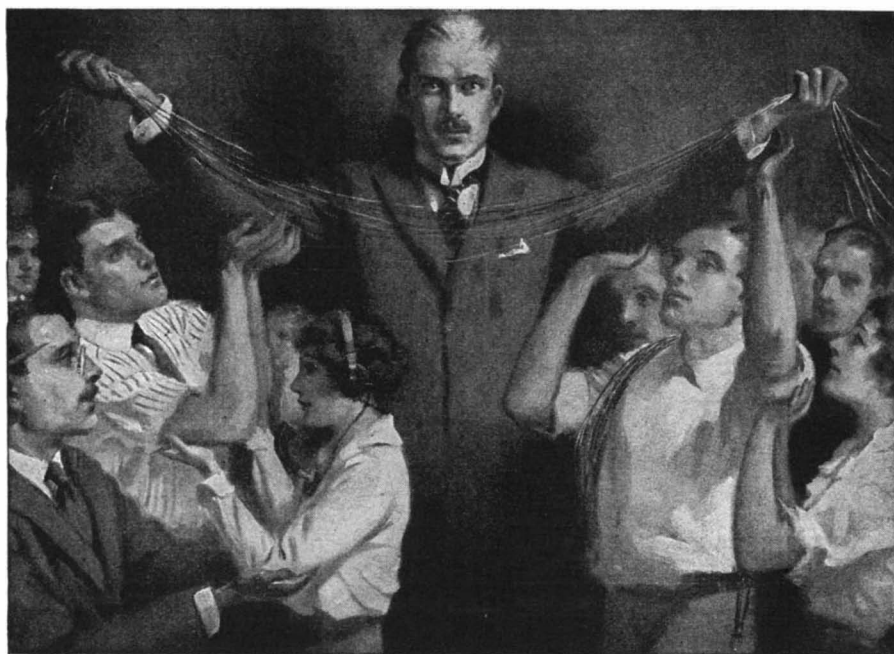
### The Breeding of Silver Black Fox on Prince Edward Island

(Concluded from page 543)

the Association was established to assist its members in disposing of their peltry, and the mission of the Board to New York was made to test the American fur market at a time when the great European markets for fur are closed. The result exceeded all expectations, in view of the conditions brought about by the war, and gives the best promise that when the return of peace shall restore normal trade conditions the price of the best furs, such as are here reproduced, will again steadily advance. This view is strongly supported by the fact that in the 20 years preceding the outbreak of the war the natural supply of the more valuable furs had fallen off by one-half, while in the same period prices had advanced threefold.

The solid and stable character of the silver black fox breeding industry is attested by the manner in which the fox companies have during the past two years stood the stress and strain of war conditions; closed markets and diminished values. Not one of the 300 odd companies on Prince Edward Island engaged in fox breeding has sought relief in liquidation. On the contrary, they are carrying on their business at the old stand and in increasing their production from year to year. While temporarily suspending the payments of dividends, they have increased the numbers of their breeding stock and added largely to their productive capacity.

In conclusion, it may be safely stated that the pioneer silver fox breeders "built better than they knew." They created a new industry necessary to commerce and capable of a vast expansion. It is especially adapted for extension in every one of the nine border provinces of Canada and the ten or twelve States of the great American Republic. Any farm throughout these vast agricultural regions might profitably add a fur ranch to its equipment. Fur farming as an adjunct to agriculture adds a profitable factor to the ordinary farm without displacing or disturbing any of the ordinary activities. The grove or wooded lot furnishes the site and supplies the lumber for ranch construction. No farmer who adds a fur ranch to his establishment need keep fewer horses, cattle, sheep, swine, or poultry on that account. A small ranch will hardly require any addition to the number of farm help. The ordinary products of the farm, and in fact much of the waste products, go to supply food for the foxes. What will feed a dog or a cat will be sufficient to feed a pair of silver foxes, whose yearly product in furs may easily amount to hundreds and possible to thousands of dollars.



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ble worry regarding his own welfare. His whole-hearted attention can be devoted to serving the public.

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There is something in the telephone organization which imbues every employe with a spirit of loyalty to the public. All feel a direct responsibility for each other because each recognizes that only by mutual endeavor can they render the high standard of service which is expected of them. They uphold each other's hands so that the public may be served.



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### New York's Army of Snow Fighters

(Concluded from page 547)

bodies are used in large numbers. The speed with which they haul their loads to the dumping docks, unload and return to the squads of shovel men is an important factor in their usefulness. The area to be cleared runs well toward a thousand miles, 946.17 miles to be exact and it is evident that a system of rapid transportation is essential when the distances total to such a figure.

Estimated in square yards the area scheduled for snow work last season was 33,311,899, and this was assigned as follows: To the City forces more than thirty million square yards; to the street railway company's, more than three million square yards.

This vast area was generously covered with snow in the winter of 1915-1916, as the fall was more than 50 inches, while the average is 32.2 inches, so the modern system of snow fighting was given a severe test. The unusual snowfall required the removal of nearly twelve million cubic yards, more than twice the amount removed by the city in any former winter, and the cost per cubic yard was less than half the average cost for the seven years previous. It is estimated by Commissioner J. T. Fetherston that if this enormous amount (11,911,038 cubic yards) had been handled by the contract system that obtained from 1907 to 1914, the cost would have been \$6,348,583, while the actual cost was \$2,521,299. Thus the modern methods, the planning well in advance, the use of machines and the utilization of the sewers, resulted in a saving to the taxpayers not far short of four million dollars.

To this should be added the incalculable profit to business men, whose trucks and delivery wagons were able to proceed with comparatively little interruption. On this account the Department received many commendations.

Not only was the fall of snow greater than the average last season, but the number of storms was greater. Instead of four heavy falls that occur in the average New York Winter, there were eight storms that required calls for emergency men. The largest number that reported for any one shift was 12,487, and the average was a few more than nine thousand, so it will be seen that the Department was always handicapped by lack of volunteers, as the plans call for a force of 14,737. With the desired number of workers, the snow fighting would be completed and the piles removed shortly after the cessation of the storm.

The use of sewers to carry off the snow proved so economical and efficient that the expectations of the Department officials was surpassed by the results. It had been hoped that by this method 39.5 per cent of the area assigned to city forces could be cleared, but the actual area sewered during the season was 41.5 per cent and as the cost is less than removal by trucks it is planned to extend this system. This will be accomplished by the use of more hose and by connecting water mains to sewers in which the normal flow is not sufficient to carry off the snow that is dumped into them.

The work done by the street railway companies was satisfactory as far as it went and it has been suggested that they might extend their service to the advantage of the city and themselves. Besides clearing their tracks, one of the companies operated a plow with an extension arm supporting a rotating broom, which cleared a way for vehicles outside the space occupied by the tracks. An arrangement whereby the street railways could add equipment for hauling and dumping snow would help solve the problem of labor shortage.

Besides the physical labor of sewerage, piling and removing the snow, there is a vast amount of clerical work in checking the reports of the emergency gangs and making out the payroll. Extreme care must be taken to prevent irregularities, as is indicated by the fact that a few attempts at "grafting" were made, but they were discovered and followed by indictments

Yet speed is only second to accuracy in importance when paying the emergency laborers. Many of them are in immediate need of the money thus earned, and an unavoidable delay in making payment last December resulted in a storm of protest. Since then the wages have been paid with regularity and promptness, automobiles carrying the money to the widely distributed stations, 103 in number, so that the snow fighter is paid at the neighborhood station where he registered.

### Our Superb Battle Cruisers

(Concluded from page 546)

of 10,000 yards will be emplaced, four of these being above water and four below.

The new ships, because of their great size, will naturally carry a large complement, greater indeed, than that of any ship afloat. The total number, including officers and men, will be 1274.

So far as appearances go, it must be admitted that these stupendous ships will be exceedingly handsome in appearance. Although their freeboard is ample for all conditions, except perhaps that of chasing the enemy at full speed in a head sea; they do not tower above the water to anything like the height of modern transatlantic liners like the "Aquitania" and "Imperator," and hence they will look even longer than their great length. Their appearance will seem to justify the enormous speed, for ships of this size, of 35 knots. Thirty-five knots is over 40 land miles per hour, and, in view of their great length, fineness of model, and large horse-power, we believe there is every prospect of their making this speed when the Government trials take place. It will be noted that the upper, or spar deck, extends for fully three-quarters of the length of the ship, its after-end projecting beyond the muzzles of the aftermost 14-inch guns.

An excellent improvement is the placing of the forward mast immediately upon the conning tower, thus preventing the possibility of its being brought down by a shell bursting between decks below it—a liability to which the main mast would seem to be exposed. Another novelty is the provision of a lower, or secondary control station for both fire and ship control, below the fighting top on each mast.

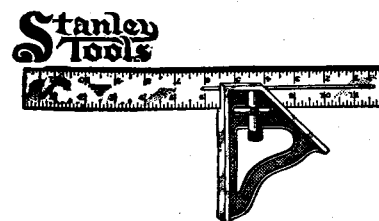
The possession of a division of six of these ships, assisted by the two divisions of 7,000 tons 35-knot scouts which are to be built, should render our fleet supreme in the field of scouting, or information. They will be able to drive in or break through any enemy screen, and because of their great speed they can accept or refuse battle as the conditions demand. The combination of great speed and heavy batteries will make them the terror of destroyer flotillas, and their speed and quick maneuvering power should render them practically safe against the torpedo.

### America's Toy Town

(Concluded from page 552)

toys turned out by German manufacturers in immense quantities and sold at extremely low prices, which the domestic manufacturers are making no attempt to supply. For years German manufacturers have made a specialty of these toys, devising special machinery to turn them out in tremendous quantities and perfecting a scheme whereby the tin-plated stock is obtained from the waste products of other industries. Our manufacturers contend that the demand for these toys is negligible; in fact, it does not exist until it is created by showing these mechanical toys.

The same methods that have marked the success of other American industries are being followed in the toy industry. Wherever possible machinery is introduced, and quantity production, consistent with the best of workmanship and materials, has been systematically developed. Each worker is assigned to one particular task, with the result that he or she soon becomes highly proficient in the assigned task. The accompanying illustrations tell their own story of the toy-makers of Winchendon, America's Toy Town.



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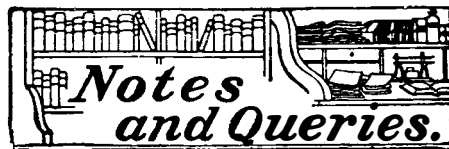


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(14173) R. L. H. asks for a formula for Rosin for violin bows? A. 1. For violin rosin, boil down Venice turpentine with a little water until a drop, cooled on a piece of glass, is of proper consistency. During the boiling, cold water must be added from time to time. When sufficiently thick, pour into cold water, knead well, and when cold break into pieces. Expose to sun until dry and transparent. 2. Select the best clear brown rosin, melt it in a clean basin, to merely boil, which will clear it of turpentine or other volatile oils. Pour in paper molds.

(14174) H. J. P. says: How can I make a Non-freezing Fluid for Central Heating Plants, Machines, etc? A. For such purposes glycerine and alcohol are used. A solution of 28 per cent of chloride of calcium in water, which will withstand a temperature of 22 below zero Fahrenheit without Freezing, and does not attack metals, is cheaper. Other recipe: In 100 parts are contained 1 part of chloride of magnesium, 10 parts of chloride of calcium, 20 parts of chloride of alumina. "Tektron," a charging fluid for central heating plants, consists of a 25° B. solution of chloride of calcium that boils at a little over 212° F., and resists cold of 5° F. For heating plants that are not so liable to be frozen up, a chloride of calcium lye of 15° B., which resists freezing to 17½° F., may be used. The addition of glycerine to the solution is not advisable.

(14175) A. J. C. asks for information as to the fastest trips around the world. A. The first of these journeys around the world against time was made in 1889 by Nellie Bly in 72 days 6 hours 11 minutes and 14 seconds. Geo. Francis Train made the trip in 1890 in 67 days 12 hours and 3 minutes. In 1901 Charles Fitzmorris made the trip in 60 days 13 hours 29 minutes and 42 2-5 seconds, in the race of schoolboys conducted by the Heast papers.

Fitzmorris left Chicago . . . . . May 20, 1901  
New York . . . . . May 22, 1901  
Berlin . . . . . May 30, 1901  
Moscow . . . . . June 1, 1901  
Irkutsk . . . . . June 10, 1901  
Stretensk, Siberia . . . . . June 13, 1901  
Blagoveschensk . . . . . June 21, 1901  
Vladivostok . . . . . June 27, 1901  
Yokohama . . . . . July 5, 1901  
Victoria, B. C. . . . . July 16, 1901  
Arrived in Chicago . . . . . July 20, 1901

In 1911 Andrew Jaeger-Schmidt made a record-breaking trip, the elapsed time being 39 days 19 hours 42 minutes 37 4-5 seconds.

July 17, 1911, 1:15 P.M., left Paris,  
July 20, Moscow,  
July 22, Omsk,  
July 25, Irkutsk,  
July 28, Harbin,  
July 29, Vladivostok,  
July 31, Yokohama,  
Aug. 12, Vancouver,  
Aug. 18, Montreal,  
Aug. 19, New York,  
Aug. 26, Paris.

This trip cost \$1,426. On this amount only \$596 was spent for railroad fare and transportation while \$600 went in tips and gratuities.

The record of Jaeger-Schmidt was broken in 1913 by John Henry Mears by 3 days 22 hours and 37 seconds. Mears made the world trip of 21,066 miles in 35 days 21 hours 35 minutes and 4-5 seconds, thus traveling at an average speed of 587 miles a day or 24½ miles an hour. Jaeger-Schmidt had traveled 19,300 miles at an average daily rate of 480 miles, or 20 miles an hour. Mears left New York . . . . . July 2, at 12 45 a.m.

Berlin . . . . . July 9  
St. Petersburg . . . . . July 12  
Harbin . . . . . July 21  
Yokohama . . . . . July 24  
Victoria . . . . . Aug. 2  
St. Paul . . . . . Aug. 5  
Chicago . . . . . Aug. 5

Arrived in New York . . . . . Aug. 6, at 10.20 p.m.

During the entire trip Mr. Mears slept in a hotel but once, and that was for two hours in London. The trip cost less than \$800; this includes the liberal tips he distributed along the way and the money he spent in bribing the engine crew on the Trans-Siberian Railway.

(14176) R. L. M. says: How can I clean and prepare bones and ivory? A. 1. The curators of the anatomical museum of the Jardin des Plantes have found that the spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for 3 or 4 days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion

is an acid liquor, which sinks to the bottom, and strongly attacks the ivory if allowed to touch it. 2. Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean, dry, hard brush, adding one or two drops (not more) of alcohol. 3. Mix about a tablespoonful of oxalic acid in ½ pint of boiling water. Wet the ivory over first with water, then with a toothbrush apply the acid, doing one side at a time, and rinsing, and finally drying it in a cloth before the fire, but not too close.

(14177) C. asks: What is the meaning of a volt in an alternating current? How are voltmeters graduated for alternating currents, say, for 1 volt, for 100 volts, for 10,000 volts? Please explain with some details. A. The volt of an alternating current is the same thing as of a direct current. It however has not a steady or constant value. It rises from zero to a maximum value, falls to zero and rises to a minimum value in the opposite sense and falls again to zero during each cycle. The current also fluctuates with the voltage. The voltage given for any alternating current is the mean effective voltage. This is taken as the square root of the mean square of all the values of the voltage in a cycle. Its value is .707 of the maximum value. This is explained in the various electrical pocket books. We can send you Pender's American Handbook for \$5.00. Voltmeters are now graduated by comparison with a standard instrument.

(14178) G. F. G. asks: Will your Information Department kindly give me any information available about the Nobel Institute? A. The Nobel Institute is in Stockholm, Sweden, and consists of deputies elected by the societies empowered to award the Nobel prizes. The Swedish Academy of Sciences elect six to represent physics and chemistry. The Caroline Institute, which is the faculty of medicine in Stockholm, the Swedish Academy in Stockholm and the Peace Committee of five persons, which is elected by the Norwegian Storting, each elect three deputies. These deputies elect four directors, who serve for two consecutive years, and are always Swedes. They must reside in Stockholm. A fifth is chosen by the Swedish Government. The directors have in their care the funds and hand over to the societies named above the sums to be given. Full information can be obtained from the Nobelstiftelsens Styrelse, Stockholm, Sweden.

(14179) E. J. McC. says: Will you please inform me as to a differential screw and how it works? Also describe Oldham's off-set coupling. A. Here is a sketch showing the parts of an Oldham coupling. "c" represents one of the lines of shafting; "a" represents one of the two flanges containing a groove as shown, one being keyed to each piece of shafting; "b" represents a movable block having a shoulder on each side as shown set at 90°, this block sets between the flanges on the shafting, one of the shoulders fitting into the groove on each flange. You will readily see that, as long as the lines of shafting are parallel, these shoulders will fit into the grooves regardless of any eccentricity of the shafts. When in operation, the center of the block "b" revolves twice in a small circle with a diameter equal to the eccentricity of the shafts for each revolution of the shafts. A differential screw is merely a bolt, each half of which is threaded with a different pitch. This arrangement allows the slow motion of the fine thread combined with the strength of the coarse thread. When the desired set is obtained by means of the fine thread the strength of the coarse thread may be brought into play by backing the nut on the coarse thread up against the base provided.

### The Attar of Rose Industry in Bulgaria

THE most ancient and most attractive Bulgarian industry is the cultivation of the rose, from which is distilled the well-known essence "Attar of Rose." Bulgaria's extensive rose fields are on the southern slopes of the Balkan Mountains, the rose district being 80 miles in length, 30 miles in width, with an average height above sea level of 1,300 feet.

Several conditions are essential for the cultivation of the rose and the production of the attar: the soil must be easily permeable to water; the bushes must be protected from the cold north winds of the winter; there must be no excess of unseasonable rain and no early and excessive droughts. These conditions all exist in the "Rose Valley," where the rose thrives as in no other spot on earth. After Bulgaria attained its independence from Turkey in 1878, the Ottoman government attempted to establish the rose industry in Asia Minor, many acres of gardens being planted around Broussa, where roses grew in abundance; but upon distillation these roses produced practically none of the attar.

In Bulgaria but two varieties of roses are cultivated, the red "Rosa Damascena," and the white, "Rosa Alba," which are

combined in the process of distillation; but the red rose, which resembles the French "Rose du Roi," is richer in perfume and essence than the white. In the Rose Valley, where there are some 20,000 acres of gardens, the atmosphere of the entire district is charged with perfume when the roses are in bloom.

The planting of a rose garden is much like that of a vineyard. The soil is prepared by careful tilling and fertilizing, ditches being dug in rows a foot and a half in depth and width, and a yard and a half apart. The shoots are planted in the bottoms of these ditches in a mixture of soft earth and manure, and within a year the bushes are about a foot high.

The first crop of consequence comes with the third year—the bushes attain their full growth, about 6 feet in the fifth year and continue to yield abundantly for 20 years. There is but one crop a year, the harvest beginning about the third week in May and lasting 18 to 30 days, the duration depending on weather conditions. In hot summers the harvesting proceeds rapidly, the plants completely flowering in 14 to 20 days.

The roses, gathered by women and girls, are carried to the nearby distillery, spread out in cool, cemented chambers, and distilled the same day. The gathering continues from daybreak until 10 or 11 o'clock, or, if the day is cloudy, for an hour or two longer—roses gathered in a hot sun have a comparatively feeble odor and yield but little essence. In times of rapid harvests the flowers are often so plentiful that they overtax the capacity of the stills and have to be thrown away.

The alembic, or still, is usually of the simplest construction; a convex, tinned copper boiler, narrowed at the top to a neck on which is affixed a spherical head. It is about 3½ feet high, the diameter at the widest part being about 2¾ feet. From the head a straight tube inclines to a worm condenser placed in a tub of running water. The average capacity of the still is .20 gallons, 20 pounds of roses and 15 gallons of water being used. This first distillation, which is completed in about 45 minutes, yields 30 to 35 pounds of rose water, which is redistilled—100 to 120 pounds producing some 30 pounds of the second distillate—to get the concentrated extract. The extract is strong in odor and has a turbid appearance from the presence of minute yellow-white globules—the attar—which, being lighter than the liquid, gradually rise to the surface and are carefully skimmed off.

About 20,000 acres are devoted to rose culture in Bulgaria, the annual harvest yielding 35,000,000 to 45,000,000 pounds, or about 8,000,000,000 roses. A one-acre garden under favorable conditions produces 2,000 to 2,500 pounds of roses, from which 10 to 15 ounces of attar of rose may be distilled. Generally 180 to 200 pounds of roses will produce one ounce of the attar; there are about 200 roses to the pound. The total production of the attar varies with the seasons, but it averages 175,000 ounces.

The largest rose crops on record were those of 1900, 1903 and 1906, which resulted in 180,000 ounces, 210,000 ounces, and 225,000 ounces of attar, respectively. The 1916 production is small in comparison, not more than 110,000 ounces being distilled.

Nearly all the attar of rose produced in Bulgaria is exported, the largest markets being Paris, London and New York. The export in 1900 amounted to 180,000 ounces; in 1905, to 210,000 ounces; and in 1910, to 216,000 ounces. The average price, prior to the war, was \$12 per ounce.

At one time during the Turkish régime the rose leaves were sprinkled with geranium oil, which produced a heavy yield of attar upon distillation; but this practice has long since been disconnected as the attar obtained partook more of the perfume of the geranium than of the rose.

The rose crop of Bulgaria is subject to damage from hailstorms, excessive cold, an early and deceptive spring frost during the budding season, and hot, dry weather in the harvest time. In the last two lies the greatest danger.

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Mrs. Humphry Ward knew Wordsworth, Matthew Arnold, Taine, Renan—the great figures in the English and French literary worlds. Her literary reminiscences will appear in a series full of anecdotes and unpublished incidents.

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More Old Chester Tales by Margaret Deland. The much-loved Dr. Lavendar is once more to be the central figure in a group of new stories.

My Trip to the Verdun Front, by Mrs. W. K. Vanderbilt is the intimate narrative of what she saw and what she experienced.

Mexican Days of "A Diplomat's Wife." Mrs. Nelson O'Shaughnessy, shows the inside features of crisis after crisis—the fall of Diaz, the triumphal entry of Madero, his election and tragic end, Huerta and what followed—and more of that delightful thing the author calls "Mexican Magic."

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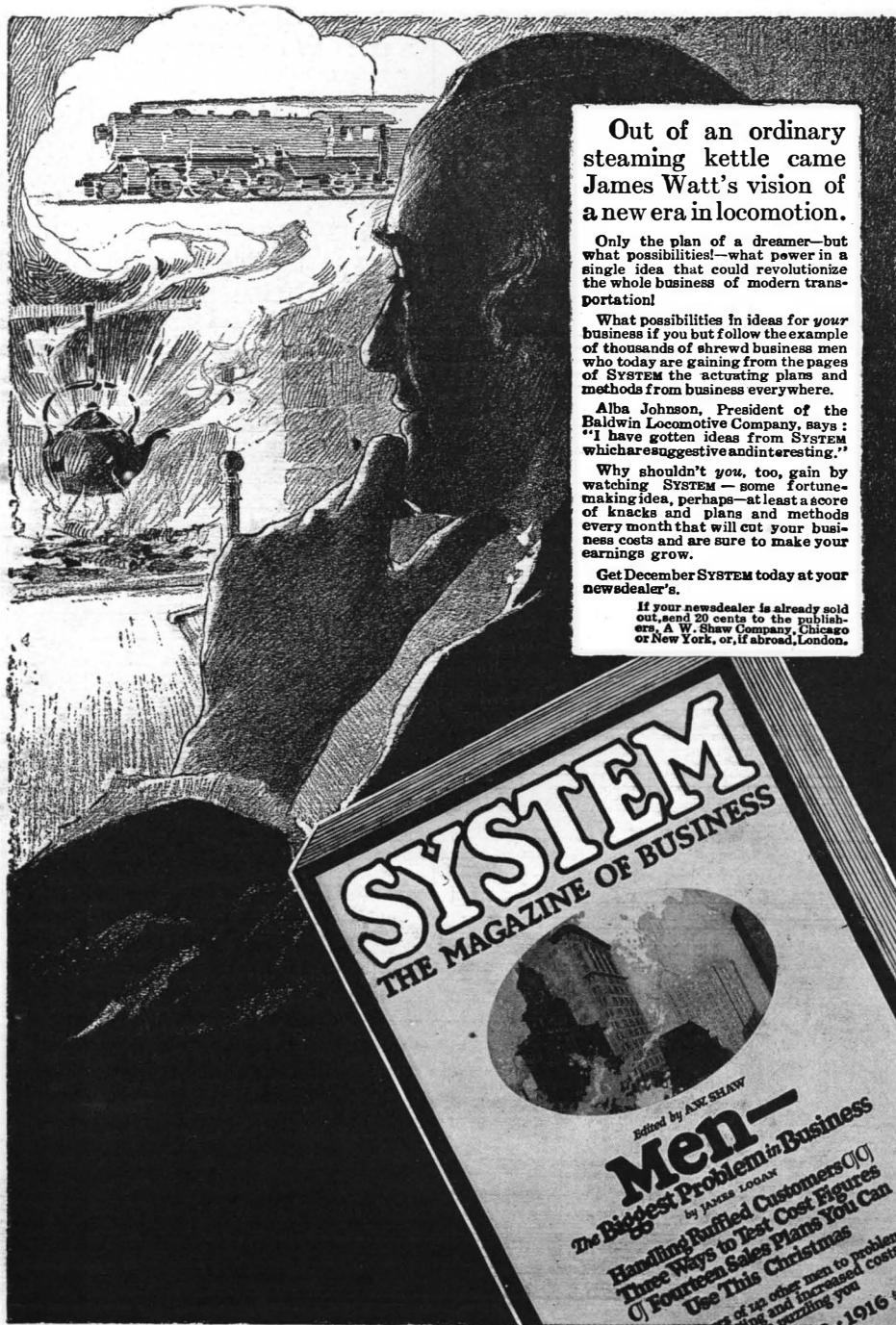
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Get up to 20 other men to problem solve and increased profits by solving you

### The Production of Coral In Italy

VENICE is a center for tourist trade in coral and shell cameos, and inquiries for coral articles often come to the American consulate in that district from those who believe that Venice is extensively interested in the manufacture of such goods. Trinkets and cameos of coral are often most skilfully mounted by expert jewelers of Venice, but coral itself is never gathered nor worked there.

Signor L. Borriello of Rome, in an article in a scientific magazine published at Milan, Italy, gives some interesting facts regarding coral from which the following extracts have been translated:

Coral fishing is carried on in Italy by fishers of Torre del Greco (Naples), of Leghorn, and of Genoa; in other countries by Greeks, Turks, and Japanese.

The manufacture of coral is confined to Torre del Greco. In other cities, such as Naples, Rome and Paris, often pointed out as centers of coral manufacture, only the mounting of coral in metal is done. The manufacture is entirely by hand, because this material, on account of its many irregularities, cannot be worked by machinery. Coral, therefore, may be cut, sieved, bored, planed, rounded and polished, branch by branch. Each of these operations requires special workers (men and women), who use special instruments and work tables. Thus cutting is done with files (triangular, flat, rectangular, and toothed), and with nippers. Sieving is done with special sieves and distributes the cut coral according to size. The boring is intrusted solely to women. This work is done by means of a special type of small perforators. Leveling or planing is done by threading the bored corals on iron wire, laying them on a beam of hard wood, and passing over them, at a regulated pressure, a grindstone dipped in water. This work is done solely by women. Afterward the coral is rounded or turned, either at the grindstone, if the edges alone are to be rounded off, or with a file, if the so-called "pallini" (small balls) are desired.

For other objects, such as buttons, pendants, horns and reels, much the same processes are employed, with some omissions. The bars, for examples, do not require boring; the horns and buttons do not need leveling. Coral may be worked with the chisel to make cameos, flowers, animals and lettering. In this case the work of reducing its thickness is limited to the cutting and the grindstone wheel.

Polishing of coral follows immediately the work of the file or chisel. Then it is a matter of polishing either a quantity of coral, uniform and of medium size, or special pieces such as penholders or cameos. In the first case a quantity of coral is put into a small bag of strong, raw linen together with crushed pumice stone and the bag is shaken in a special tub with a hole for drainage under a small column of water. When the coral is well pumiced it is washed and passed into a clean bag. Instead of the pumice the so-called "pulimento" (red or white) is used, and the former operation is repeated, first without water, then with a little, and finally with much water, when the coral has become brilliant.

What the "pulimento" is the inhabitants of Torre del Greco, while so proud and jealous of their industry, have never taken the trouble to find out, as indeed what the "acqua ossigenata" (hydrogen peroxide) is, which is used to change the color of the coral, black when extracted from the sea, to red. As for the "pulimento," it is believed that this substance is not at all different from that which the jewelers use to polish precious stones.

If a single piece is to be polished, the process used is that for polishing shells, by means of finely powdered pumice stone mixed with common oil. The grease is removed by soap and water, pulimento, or common chalk with sulphuric acid.

The coral trade of Torre del Greco branches out everywhere, especially in India, where Calcutta has been for very many years the largest coral market, to the United States, to Russia and to Turkey.

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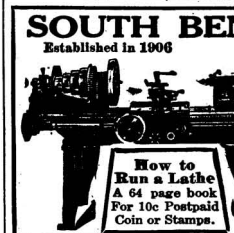
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# NINETEENTH ANNUAL MOTOR NUMBER of the SCIENTIFIC AMERICAN

January 6, 1917

The SCIENTIFIC AMERICAN can justly claim to be the oldest automobile journal. It started writing the history of the motor car in 1845 and has consistently kept pace with the progress of the power-driven vehicle ever since. A review of the early days of the automobile, profusely illustrated with quaint cuts from the files of the SCIENTIFIC AMERICAN will be published in our Motor Number.

Although this will be our *nineteenth* annual Motor Number the subject has been by no means exhausted. Recent progress in the automobile industries has been simply stupendous. We are sure that our readers will be astonished at the number of cars now in use and the large proportion of the total represented by cars purchased during the past year. Public endorsement of the automobile, as represented by the amount of money invested during 1916 in the purchase and operation of motor cars, is startling. The figures are so vast that we have shown them in the form of a graphic comparison which will enable the mind to grasp them.

Following the usual custom, there will be an article on the pleasure car of 1917. An expert will dissect the car and point out the improvements and novel features. In a companion article the commercial car of 1917 will be described minutely in this SCIENTIFIC AMERICAN way.

The Bureau of Standards has recently been investigating gasoline pumps and has found that many of these pumps do not deliver full measure. The trouble is not always due to dishonesty, but is very often attributable to faulty design. An illustrated article on this subject has been prepared for our Motor Number, which gives the construction of various forms of pumps, placing the motorist on his guard, and showing him where to look for faulty design or dishonesty.

Motorists will be interested to know just what work is now being done, or what is proposed to be done in the immediate future, toward the betterment of roads under the new law which provides for Federal aid. It has probably not occurred to the general public that not only does the automobile make for good roads, but good roads increase the number of automobiles in a State. Some interesting statistics have been prepared on this subject.

"Attacking the Motor's Mightiest Enemy" is the title of a very interesting article by an automobile engineer. It deals with the problem of getting rid of carbon accumulations, in the most efficacious way.

The latest automobile novelties and accessories will be shown in a double page spread of pictorial notes.

As in previous Motor Numbers, there will be the usual charts of gasoline and electric pleasure and commercial vehicles, in which the names of manufacturers and the prices of cars will be given. The material will be arranged in such form as to constitute a valuable price list and reference table for prospective purchasers of motor vehicles.

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