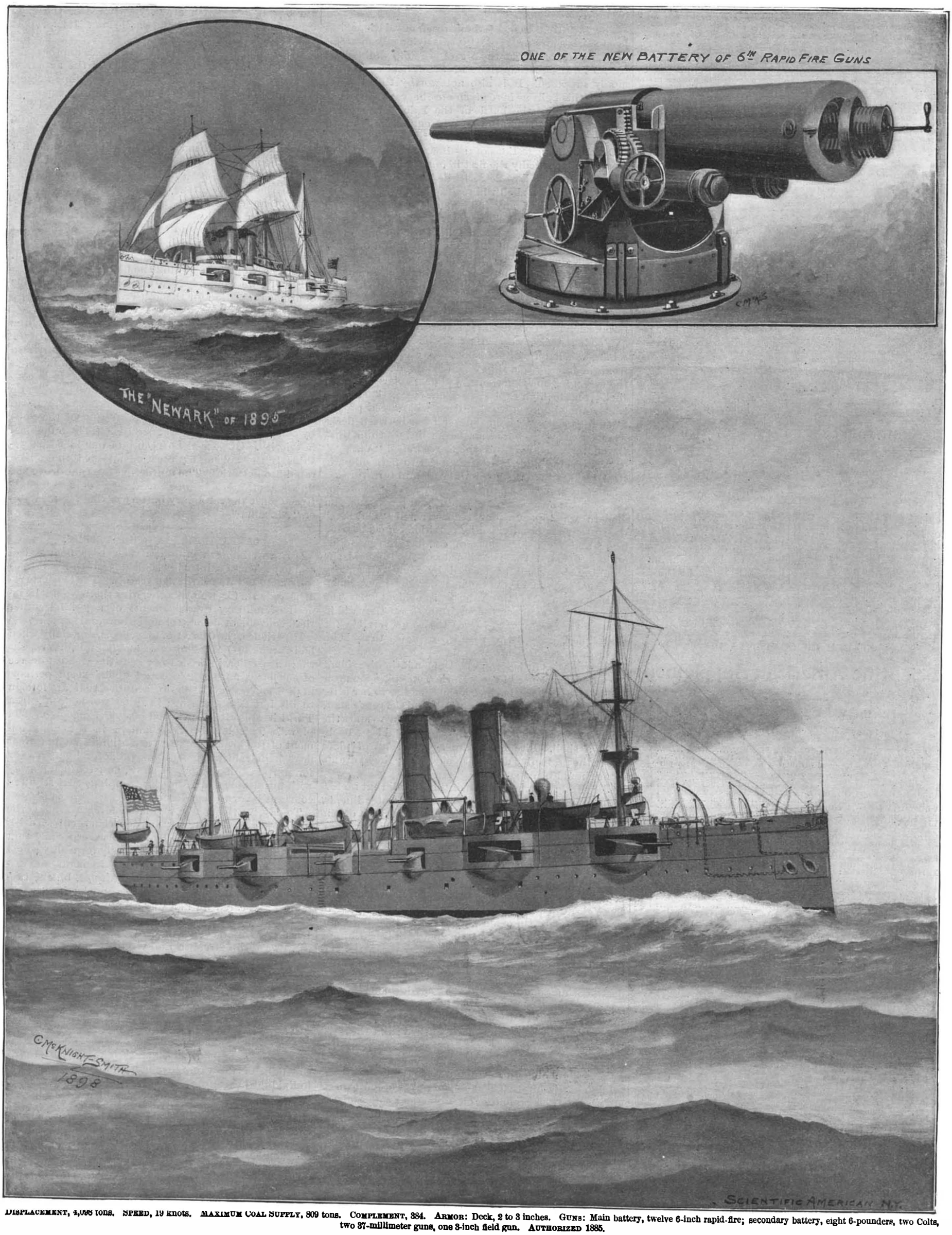
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1898, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS CHEMISTRY, AND MANUFACTURES.

Vol. LXXIX.—No. 4. ESTABLISHED 1845. | NEW YORK, JULY 23, 1898. | $3.00 A YEAR. WEEKLY.



DISPLACEMENT, 4,083 TONS. SPEED, 19 KNOTS. MAXIMUM COAL SUPPLY, 809 tons. COMPLEMENT, 384. ARMOR: Deck, 2 to 3 inches. GUNS: Main battery, twelve 6-inch rapid-fire; secondary battery, eight 6-pounders, two Colts, two 37-millimeter guns, one 3-inch field gun. AUTHORIZED 1885.

UNITED STATES PROTECTED CRUISER "NEWARK," AS RECONSTRUCTED.—[See page 54.]

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....**$3.00**
One copy, six months, for the U. S., Canada or Mexico..... **1.50**
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. **4.00**
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

The Scientific American Supplement

(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year for the U. S., Canada or Mexico. $6.00 a year, or £1 4s. 8d., to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries, *eight dollars and fifty cents a year*, or £1 14s. 11d., postage prepaid.

Building Edition of Scientific American.

(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign countries, $3.00 a year, or £0 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign countries, $6.50 a year, or £1 6s. 9d. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and SUPPLEMENT, $9.00 a year. To foreign countries, $11.00 a year, or £2 5s. 2d., postage prepaid.

Export Edition of the Scientific American

(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, or £0 12s. 4d., postpaid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JULY 23, 1898.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1177.

For the Week Ending July 23, 1898.

Price 10 cents. For sale by all newsdealers.

CONTENTS

Of the July Number of the

SCIENTIFIC AMERICAN, BUILDING EDITION.

(Illustrated articles are marked with an asterisk.)

Subscription, $2.50 a year Single copies, 25 cents.

LESSONS OF THE SANTIAGO NAVAL ENGAGEMENT.

The Board of Survey which has been examining the wrecks of the Spanish ships near Santiago has made certain recommendations regarding the future construction of warships. As reported in the press dispatches the most important suggestions are as follows:

1. That no wood should be used in the construction of battleships.

2. That the fire mains should be placed entirely below the protective deck.

3. That if torpedoes are carried on fighting ships, they should be below the water line.

4. That the rapid-fire batteries are of supreme importance.

The fact that each of these recommendations has been persistently urged of late years by naval constructors goes to prove that the art of warship building is by no means so tentative and theoretical as is commonly supposed. It is also noteworthy that the lessons of this fight as here given are the very same that were taught by the battle of the Yalu between the Chinese and Japanese fleets, and emphasized only a few weeks ago in the destruction of the Manila fleet.

Of the four suggestions of the Board, the abolition of wood is undoubtedly the first in importance. Anyone who understands how fierce is the heat engendered by the explosion of a shell will realize that the presence of wood, or indeed of any inflammable material in the proximity of the explosion, is more than likely to start a fire of greater or less intensity. If the ten pounds of powder were taken out of an 8-inch shell and burnt in the open, comparatively little heat would be noticeable; but when the charge is burnt in the closed chamber of a shell, the temperature increases with the increase of pressure until at the instant of rupture the heat is terrific—sufficient to cause any combustible material, such as wood, to burst instantly into flames.

Wooden decks, wooden partitions between staterooms, wooden furniture, should be absolutely barred from the interior of a ship which is intended to become the target for bursting shells, and particularly so if the shells contain high explosives. The suggestion to banish the time-honored wooden deck will raise a protest from any sailor who has never been between decks when shells were bursting there; but we think that the captains and crews of the fire-scorched "Vizcaya" or "Teresa" will, in the future, prefer to fight on plate steel decks, where wooden bulkheads and furniture are a thing unknown. There is absolutely no excuse for the presence of wooden bulkheads and partitions on a modern warship. In our reconstructed "Chicago," the staterooms are divided by partitions of corrugated iron; and if considerations of comfort in peace-time cruisers demand that wooden decks shall be laid, the planking should all be treated by some satisfactory fire-proof process. From Commander McGiffen's memorable account of the Yalu, it is evident that the Chinese spent as much time fighting fire as they did in fighting the enemy, and it was the same terrible foe that finally caused the Spanish captains to up-helm and run for the beach.

The wisdom of the second recommendation is evident from the experience of the "Maria Teresa." Soon after she came out of the harbor, a shell set fire to her after cabins, and according to one of Admiral Cervera's staff, when a signal was sent to the engine room to start the pumps, it was found that the fire mains had been broken by a shell. Fire mains are as much out of place above the protective deck as steam pipes; the hydrants alone should be exposed.

The third recommendation of the Board, that no torpedo tubes should be carried above the water line, is, no doubt, prompted by the fact that the bow of the "Vizcaya" was torn asunder by her own bow torpedoes, which were exploded either by being struck by our shells, or by the heavy concussions, or the heat of the conflagration to which they were exposed during the fight. The great risk to the ship itself in carrying torpedoes above the water line had already been shown at the Yalu, when a Chinese cruiser which attempted to ram was sunk by the explosion of her bow torpedoes, due to a hit by a Japanese shell. So greatly did the Chinese dread the risk, that in many ships they threw the torpedo warheads overboard before the fight. Until a sea fight takes place between two thoroughly efficient fleets, both manned by crews that can do good shooting and in the care of officers that are expert in the handling of their ships, it will be too early to say that the ram and the torpedo are to be abolished; but the absolute necessity for placing torpedoes below the water line has been recognized for several years, and submerged launching tubes are now installed in the latest foreign battleships. The more advanced of our experts advocated the installation of submerged tubes on the "Alabama," "Wisconsin," and "Illinois," but for some inscrutable reason were overruled. We are glad to know that they will be fitted on all of our new ships. The submerged tube is placed below the protective deck, and therefore below the water line; hence the torpedoes are never brought above the water line, and they are as completely sheltered from shell fire as are the engines, magazines, or boilers. Drawings of the submerged firing tubes as installed in foreign navies will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.

The supreme importance of the rapid-fire gun is once more attested. It was the 4·7-inch guns of this type on the Japanese cruisers that enabled them to crush the more heavily armed and armored ships of the Chinese fleet; and we have it on the word of the Spanish officers that it was the storm of well-aimed shells from our secondary batteries that drove the Spanish crews from the guns. The big 12 and 13-inch guns did not prove to be so effective as the secondary batteries. The ships appear to have been hulled by the 8, 6, and 4-inch weapons, while the superstructures were riddled by our 6-pounders, which are very effective at the close ranges at which the fight was carried on. If the report that the Spanish ships were rarely struck by our heaviest guns is correct, the fact furnishes another parallel to the Yalu engagement. Four of the Japanese vessels carried a 12½-inch Canet gun of 66 tons weight, which was, and is, one of the most powerful weapons in existence. Theoretically, they should have sunk every ship in the Chinese fleet; as a matter of fact, they did very little damage.

We know of no reason why a 13-inch gun should not reach the mark as certainly as an 8 or 6-inch weapon, unless it be that its slowness of fire, coupled with the enormous percentage of misses that occurs in the heat of an engagement, reduces its chances of scoring a hit to a very low figure. It is here that the incalculable value of rapid fire comes in; out of the storm of rapid-fire shells which poured upon the doomed Spanish ships a large number were certain to land, even if only one in ten found the mark.

Finally, we would draw attention to the great value of armor protection for the gun crews. The rapid-fire batteries of the "Vizcaya," "Teresa," and "Oquendo" were very inadequately protected, as the searching fire of our "pounder" guns soon demonstrated. The value of a gun is multiplied four-fold if it carries a stout shield and the sides of the ship in the wake of it are plated with a fair thickness of armor. It is contended by the English designers that if their ships do not carry so many rapid-fire guns as other ships of an equal or less displacement, the protection of the guns by 6 inches of steel more than offsets their numerical inferiority. One excellent feature of our latest battleships is the splendid protection afforded the 6-inch rapid-fire batteries. The murderous fire that drove the Spaniards from their guns would much of it be ineffective against the secondary battery of the "Kearsarge" or "Alabama."

CAMPAIGNING IN THE TROPICS.

It is a well known military axiom that one practical and experienced soldier in the field is worth from six to ten times the value of the new recruit. The truth thereof is patent, for were it otherwise there would be no need of military establishments of any kind, other than convenient depots for munitions and supplies.

Experience, the dearest of all schools, especially when had through repeated mistakes and failures, has taught that the soldier, in order to present the greatest degree of efficiency, must not be called upon, except perhaps in dire emergency, to perform duties that are foreign to his immediate calling; in other words, to quote a Turkish aphorism, "a good bayonet makes a bad plow." This has been recognized in the abandonment of the heartbreaking "attention" that in former days kept rank and file immovable for hours merely for purposes of pomp and show, and the doing away with unsuitable and glittering trappings that required constant labor to keep in order.

To-day, in the better regulated foreign armies, the soldier is relieved of every burden consistent with his career as a combatant. The uniform, especially that for tropical service, is designed wholly for utility; food is carefully selected to meet the requirements and exigencies of the climate; barracks, camps, billets, hospitals, tents, canteens, bath houses and latrines are arranged and cared for in a way to promote a maximum of comfort, freedom, cheerfulness, and health. The British or Dutch soldier in the tropics is no longer asked to waste his strength and vitality in road building, trench digging, or the upthrowing of redoubts; this is relegated to a native and acclimatized contingent, who individually are much more effective. The "kit," too, which, in the "light service order" of the British army, weighs but 25 pounds—everything, in fact, but firelock, cartridges, and water flask,—upon the march is now relegated to the baggage train or to bearers specially provided for the purpose, the latter also performing the bulk of the camp drudgery and routine. Thus individual healthfulness, cleanliness, and smartness is inculcated and enforced by constant salutary inspections, medical and otherwise, for even bathing is compulsory; at the same time the fatigues and accidents of the march are in great degree obviated, individual belongings preserved and made always available that otherwise would be thrown away and lost, and the strength of the command is conserved for those duties which are of a purely military character.

Fatigue and exhaustion, more than any other factors, contribute to the rise and dissemination of the diseases

peculiar to hot climates or that are wont to ravage camps with unusual virulence; and these too often are the result of improper clothing and the burdens of equipment, supplemented, perhaps, by duties required that could be more reasonably and ably performed by natives. In this connection it may not be amiss to call attention to an incident in the French campaign in Madagascar, an island bearing a wonderful similitude to Cuba in that it possesses topographically the same general features, has like peculiarities of climate, and south of the equator has relatively the same latitudes and isothermals as has Cuba to the north of the line.

In 1895, the 200th Regiment Infantry of the Line, 1,200 strong, left Paris for Madagascar. It was composed of young soldiers, practically of the same material physically and socially as our own volunteers. "Robust, agile, and merry, they appeared able not only to defy the efforts of any human foe, but also to remain invulnerable to the onslaughts of a more potent enemy—the noxious emanations of marsh lands and pools." After an uneventful voyage and unopposed landing, this regiment was set to building a highway, whereby artillery and supplies might be transported to the table lands of the interior. In spite of rigidly enforced sanitary measures, suitable food, and appropriate clothing and equipment, the men died like sheep; heat-apoplexy, typhoid, dysentery, malarial fevers, diarrhea, each claimed its quota of victims. Eighteen months after leaving France, this regiment returned—it had not participated in a single skirmish—a mere handful of two hundred and odd gaunt, fleshless, yellow "convalescents," several of whom were to follow the thousand of their comrades that had "gone before." Why native laborers were not employed, which—as is also true of Cuba—could be had in abundance, is one of the mysteries of military administration.

Much has been said about acclimatization, immunes, etc., but it must be remembered no one is immune or acclimatized in the face of exhausting labor and uncalled for hardships, or when camped in the midst of swamps, surrounded by camp effluvia and decaying and fermenting forms of luxurious tropical vegetation. Add to the foregoing terrific heat, improper head covering, deluging cold rains, and oftentimes unfit food, and one has a fair summing up of the conditions under which the army is operating in Cuba.

It is to be sincerely hoped that, with the fall of Santiago, the conditions surrounding the army may be so modified that the loss from fevers and exposure may be reduced to a minimum.

THE FALL OF SANTIAGO.

The capitulation of the city of Santiago de Cuba and its defenses, on the 14th instant, is a cause for general congratulation. Not only has the campaign in the province of this name been exceedingly brief, considering the strength of the fortifications and the topographical features of the country, but the victory has been obtained at an astonishingly small expense of life and blood. In less than a fortnight Cervera's fleet was destroyed, and the American ensign raised over Morro Castle and its outlying and contiguous fortifications—surely, glory sufficient for a campaign of scarce thirty days, made by a mere handful of troops that at no time exceeded 24,000 in number. Gen. Shafter has certainly permitted no useless delays, but has pushed his military operations with surprising vigor. Even the most sanguine, possessed of any appreciation of the difficulties to be encountered, dared not predict so speedy and glorious a result. The terms of capitulation are, moreover, creditable to the military genius of the nation and its humanity.

Gen. Toral and his entire command are to be sent home to Spain at the expense of our government—a procedure that cannot but commend itself to all. May those who fall into our hands by the future fortunes of war ever receive equal consideration, in degree if not in kind, remembering individuals are not responsible for the shortcomings of national administration, and that loyalty is at all times an honor and virtue.

The greater part of the province of Santiago, comprising the easternmost portion of Cuba, is now, actually or nominally, under the United States flag and American rule. Thus is established an excellent base for future military operations, whether they are extended toward Havana or carried across the Caribbean Sea to Puerto Rico.

Many there are who deem the capitulation of Santiago heralds the dawn of peace. This is devoutly to be hoped for, yet is exceedingly improbable. The terms Spain is now willing to accept and those the United States can offer are separated by a wide gulf. Yet the American people can afford to be generous, and an exorbitant indemnity, it is trusted, will not mar any negotiations. The Spanish people and nation have had their own troubles during many a decade. Misfortune has followed misfortune, and it is not becoming to us as a nation to unnecessarily add to burdens that are already extreme. True, the Spanish nation has no real conception of its losses or the utter lack of available resources, and there has ever been the latent hope of foreign intervention, which, after all, appears to be carefully fostered in certain quarters, and for some political purpose that can only be surmised.

TWO INTERESTING DECISIONS.

Judge Lacombe has just handed down a decision in the infringement suit brought by the Welsbach Light Company, under United States letters patent to Rawson, No. 407,963, dated July 30, 1889, against the Apollo Incandescent Gas Light Company et al., in the United States Circuit Court for the Southern District of New York, denying a motion made by the complainant for a preliminary injunction. This patent is for the process of strengthening the mantles, used in the Welsbach and other lamps of that type, to protect them against breakage in transportation and handling, by coating the completed mantle with "paraffin or other suitable material, which is burned off when the mantles are erected." In an action brought by the Welsbach Company against the Sunlight Inc. Gas Lamp Company (83 Off. Gaz., 595), Judge Townsend sustained the patent, giving it a broad construction and holding that a solution of collodion and castor oil was covered by the claim for "paraffin or other suitable material." On the strength of Judge Townsend's decision, several preliminary injunctions have been granted by the courts restraining various manufacturers from infringing the patent. In this suit against the Apollo Company, it was contended that the Rawson patent was void because the alleged invention had been patented in France by Rawson on November 2, 1887, and that this French patent had lapsed because of non-payment of annuities. This point was not passed upon by Judge Townsend, and Judge Lacombe held that the question as to whether or not the lapsing of a foreign patent, subsequent to the application but before the issue of a United States patent, invalidated the latter, was so much in doubt that it should not be decided upon preliminary motion, but upon final hearing.

In the case Kellar vs. Strauss, also an infringement suit, the complainant annexed to the bill of complaint written interrogatories requiring the defendants to state, under oath, how many of the alleged infringing devices (one of which was annexed to the bill) they had made, used, or sold and how many they had on hand for sale. The defendants in their answer refused to reply to either interrogatory and the complainant excepted, insisting, upon the argument, that upon the authority of National Hollow Brake Beam Company vs. Interchangeable Brake Beam Company (83 Fed. Rep. 26), the defendants must be compelled to answer the interrogatories; but Judge Lacombe declined to follow the decision of Judge Adams in that case and overruled the complainants' exceptions, holding that the complainant was not entitled to know how many of the alleged infringing devices had been made or sold until the validity of his patent and his right to an accounting had been established at final hearing.

RESPONSIBILITY OF STEAMSHIP COMPANIES IN MARINE DISASTERS.

BY DR. C. E. DE M. SAJOUS.

The particularly distressing circumstances attending the loss of the "Bourgogne," and the suddenness with which she entombed hundreds of unfortunate passengers, recalls the following statement made nearly thirty years ago by the president of the British Naval Architects: "The passengers who pass to and fro are not judges of the question, they can take no precaution for their safety; it is to the skill and science of those who build these ships that the passenger trusts, and to the care which the legislature and the government are bound to take of their fellow subjects." An unbiased critic can but concede that the strides in naval architecture and engineering during the last thirty years are entitled to the highest recognition. In speed and comfort the high-class passenger ships of our day are marvels of ingenuity; and if human intellect required evidence of its greatness, none stronger could be adduced than that afforded by one of those imposing masses of steel, representing combinations whose description alone would fill a large volume. But can the same encomium be bestowed upon the life-saving means of these very ships? Have the improvements in their construction included correspondingly valuable modifications with a view to saving the lives of their passengers? Have the appliances, such as lifeboats, life-rafts, life-preservers, etc., kept pace with those calculated to increase power, carrying capacity, and other purely commercial advantages? Surely inventors have done their share, and the Patent Office contains a multitude of models of appliances of value. But have the companies availed themselves of these? Have they devoted one-tenth of the energy in this direction that they have to the saving of—coal? In the name of the victims, their parents, their widows, their children, and their friends, I ask: Is everything that *could* be done by companies *being* done to prevent disasters such as that of the "Bourgogne"?—a mere repetition of that of the "Elbe" in 1895.

But little knowledge, but little research, but little observation, are required to warrant the conclusion that things about a passenger ship, having life in view, are not much farther advanced now than they were during the earlier years of steam navigation. The old davits with tackle, the so-called ship's lifeboats, the main appliances in case of accident, are practically the same as they were in 1837, when the "Great Western" made her maiden trip across the Atlantic, while bulkheads were a prominent feature in the construction of the old "Great Eastern." Apart from the indirect protection afforded by increased size, what is there to prove that modern genius has been utilized in the interest of life as well as it has in every other direction?

To judge from results, collision bulkheads have rendered valuable service, whether the object struck was a vessel or an iceberg, i. e., under special circumstances. But a review of the collisions of the last thirty years tends to prove that vessels receiving blows, and therefore depending on the intervening bulkheads, sink faster than wooden vessels did. Bulkheads may be at fault, but other reasons are also given by naval authors. Sir Nathaniel Barnaby, K.C.B., late Director of Naval Construction, Whitehall, for instance, says:

"The fact is that the great majority of ocean-going steamships are not divided into water-tight compartments in any efficient manner, and many losses in collision, grounding and swamping are due to this. Although steamships have some bulkheads, and some have many bulkheads, they are as a rule distributed in such a way, or are so stopped below the water level, that for flotation purposes after perforation those lying between the foremost collision bulkhead, through which the screw-shaft passes, are practically useless."

If we add to this the facts that bulkheads are perforated for doors immediately above the level of the water line, that a column of water and increased weight cause listing and increased immersion, the rapidity with which the "Bourgogne" was submerged need not be wondered at.

As regards lifeboats, another eminent constructor says:

"The number of lifeboats usually provided is sufficient to hold all hands on trading vessels, but on the passenger steamers which cross the Atlantic there is not davit room for boats enough to seat the passengers and crew. Moreover, it often happens that only the boats on one side, or in one part of the ship, can be lowered."

This might be adduced as an excuse. Anyone who has traveled to and fro a few times can but notice the paucity of lifeboats, and the fact that the davit room is not all utilized. The examination of fifteen photographs, representing as many liners, showed an average of seven boats on each side; one ship only showing an interrupted line of ten large boats on each side. What does this average of fourteen boats to the ship represent? The fact that only those on the lee side can be used in rough weather reduces the total to seven; two must be considered as sacrificed, smashed or capsized during launching. Five are left, with a capacity of about one hundred and forty persons—less than the ship's crew. Lifeboats? If they are lifeboats, why do they fill and sink with such rapidity? What use are rafts and life-preservers in such calamities as that of the "Elbe" and the "Bourgogne"?

The crew of the "Elbe" as well as that of the "Bourgogne" have been severely criticised. A closer study of the causes of this departure from duty, however, tends to mitigate too harsh a judgment. The passengers embark, trusting that amply sufficient protection for their lives is provided; the crew know the contrary. While hope sustains the passenger until the last minute, death stares the ship's company in the face from the start. Is it a wonder that the instinct of self-preservation predominates among the rank and file of a crew mainly made up of landsmen, stewards, waiters, cooks, bakers, stokers, etc.? What is to be expected of such men when confusion reigns and impending death paralyzes their reasoning powers?

Bona fide seafaring men do their duty as a rule. As far as captains are concerned, there is not one commanding a passenger liner across the Atlantic in whom I would not place implicit trust, if courage and honor were the only factors needed to preserve life. In many minds, condemnation follows the captain of the "Bourgogne" to his watery grave. I knew him well, and no braver man ever walked a deck. Had this poor victim of duty had adequate appliances to save all, rewards would have been showered upon him as they were upon the captain of the steamship "Missouri," seven years ago, when he saved over a thousand passengers. Give those men the means; give their crews the chances that the average man has upon the battlefield—then judge with equity. If the crew of the "Bourgogne" is to be brought before a court, the responsibility of the company should not be forgotten, if justice is to prevail.

Indeed, it is time to realize that outside of the indirect influence of increased size and power, practically nothing is being done by steamship lines to improve the life-saving possibilities, and that increasing rate of speed and traffic are daily increasing the danger. The companies may do all in their power to mitigate the effect of such a murderous catastrophe as that of the "Bourgogne" upon the public mind; nothing can counteract truth, and the silent but crushing result is

there to contradict them. When they will recognize that safety is the primary element among the general public, and utilize intellect for life saving as freely as they do for coal saving, ocean travel will be doubled.

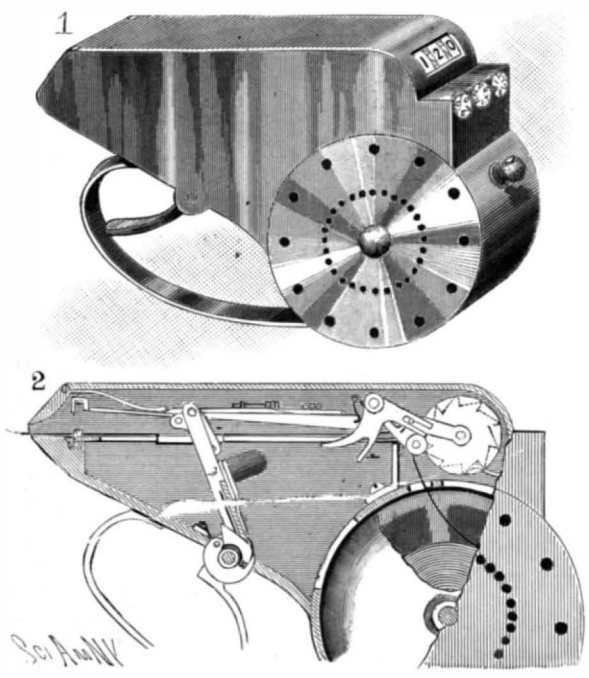
COMBINED TICKET HOLDER AND REGISTER.

We illustrate a ticket holder and ticket register recently patented which is designed to hold and deliver a large number of tickets, such as used on cars or in theaters or other places where a uniform fee is charged. The apparatus is designed to contain a continuous ticket strip and deliver a suitable length corresponding to the length of the ticket, the operative parts being improved in various particulars.

The prime moving part of the mechanism is a spring-controlled trigger which serves to feed the ticket strip by means of a positively acting lever mechanism and automatic clamping and releasing devices for the strip, the parts embodying features of much originality and of simple form, as will be obvious from Fig. 2. The strip is fed a predetermined distance, then held while a knife acts to perforate the strip and facilitate detachment of the ticket by the patron or the employé. It is purposed to intersperse at intervals tickets marked "Free," to induce the patrons to watch the apparatus. The feeding devices are adjustable, that the machine may be adapted to feed according to the length of the ticket used.

Coacting with the other mechanism is a series of registering wheels provided to register the sales. In connection with the cover of the apparatus, a novel combination lock is provided, the dial plates of which are seen in Fig. 1. The total number of tickets registered also appears through the case.

The apparatus is the invention of the late Manuel



FORTUÑO'S TICKET HOLDER AND REGISTER.

Fortuño, whose administrator is Señor Leonardo F. Fortuño, Hospiceo San Nicolas, 23, Mexico City, Mexico.

DR. ISSATSCHENKO, of the bacteriological laboratory attached to the agricultural department of the Russian government, has just made a preliminary communication on a new microbe pathogenic to rats which he has discovered, says Nature. A disease, which assumed epidemic proportions, broke out among the rats kept for experimental purposes in the laboratory, and from the liver and spleen of affected animals a bacillus was isolated, which proved on inoculation to be extremely fatal as regards both rats and mice. Receiving food infected with this organism, rats and mice invariably succumbed, the former after from eight to fourteen days, the latter after from four to eight days. Following Pasteur's example in the case of a bacillus similarly fatal to rabbits, attempts were made to turn this new microbe to practical account and utilize it as a living rat poison. The results so far have not been very encouraging, but further experiments are being made in this direction. It is apparently quite without effect upon pigeons and rabbits. As regards its artificial cultivation, this microbe is very accommodating, growing luxuriantly upon all the customary culture media with the exception of potatoes. In microscopic appearance it varies, as is so often the case, according to the nature of the medium in which it has been previously grown. It is mobile, and is endowed with lateral flagella.

FOR the purpose of cleaning bottles from fatty substances a very simple and practical process has been found. Pour warm water into the bottle, fill in ordinary hay and rub the inside of the bottle with this thoroughly, using a small stick. Now rinse the bottle out with clean water, and not a trace of the odor and the grease will remain. Large bottles which had contained petroleum were successfully cleaned in this way.—Oesterreichische Brauer- und Hopfen-Zeitung.

The Sutro Baths.

The seacoast from San Francisco is reached by either one of two steam railways or the Sutro Electric Railway, all starting from the suburbs of the city and converging near the celebrated Cliff House, in front of the Seal Rocks, says Engineering News. The old Cliff House was burned on December 24, 1895, but a larger structure was at once built, and is a great resort for tourists and people from the city. North of the Cliff House are the new and extensive Sutro Baths. On the top of the hill and overlooking the ocean is Sutro Heights, the residence of Adolph Sutro, mayor of San Francisco, but who is most widely known from his connection with the famous Sutro tunnel on the Comstock lode in Nevada. The grounds of his establishment are open to the public.

On the shore, and close to the Cliff House, are the new Sutro Baths, established and built by Mr. Sutro, which were opened in March, 1896. The buildings are handsome and spacious, and form a pleasure resort for visitors as well as bathers, there being a museum and other attractions, and cheerful promenades lined with palms and growing plants. The entire building is 499·5 by 254·1 feet, and contains about 600 tons of iron-work in the columns and roof trusses, 270,000 cubic feet of concrete, 3,500,000 feet of lumber and 100,000 square feet of glass. Provision is made for spectators at aquatic sports and swimming matches, there being seating capacity for 3,500 persons in the amphitheater and 3,500 on the promenade, while the total capacity of the building, including the aisles, etc., is 25,000 persons. There are seven swimming tanks, as follows: One large tank, 1,409,062 gallons capacity; four small tanks, 70, 283, 400 and 875 gallons; one medium size tank, 112,500 gallons, and one fresh water tank for plunges. There are nine springboards, and seven toboggan slides lined with sheet brass and having a continuous stream of water running down them. There are 517 private dressing rooms and 9 club rooms, the total capacity being 1,110 persons; 29 dressing rooms and all the club rooms are fitted with shower baths, and there are 66 shower baths in all. The laundry equipment can handle 20,000 bathing suits and 40,000 towels per day. The restaurant is on three floors, with an area of 30 by 75 feet on each floor. The water for the baths is taken from the waves or rollers which break on the reef on which the baths are built.

A catchwater basin, 75 by 150 feet, was blasted out of the rock, and this receives the water from the waves, which then flows to the receiving pond, and through a tunnel to the settling tanks, whence it goes to the various bathing tanks. With a high sea rolling in, the tanks can all be filled in an hour. A centrifugal pump with a capacity of 6,000 gallons per minute keeps up a constant circulation, and can fill the baths in from five to six hours. The tanks can all be emptied in an hour, at high or low water, through an outlet of 24 inches diameter, the waste water being led away to a point where it is discharged into a tidal current, so that there is no chance of its being at once taken in again. The water is heated by a system devised by Mr. Sutro, using direct steam driven through small tunnels. The temperature is graduated in the different tanks, and in the smaller tanks it can be raised 10 or 20 degrees in a few minutes. The bath buildings are protected on the west by a breakwater lying north and south, 400 feet long, 20 feet deep, 25 feet wide at the top and 75 feet at the base, containing 450,000 cubic feet of rock; another breakwater runs east and west, this latter being 300 feet long and of the same cross section, containing 300,000 cubic feet of rock.

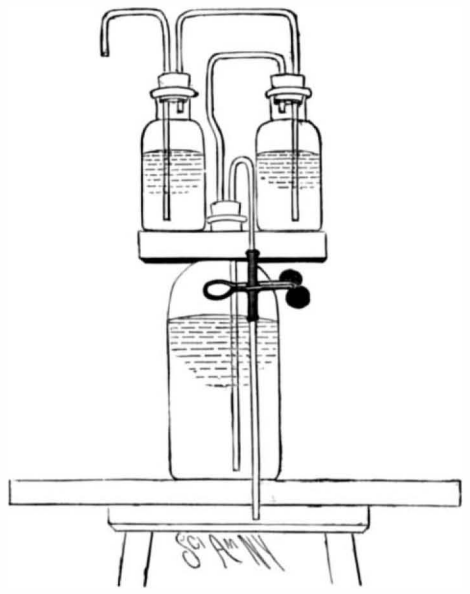
The Current Supplement.

In the SCIENTIFIC AMERICAN SUPPLEMENT of July 23, 1898, will be found many articles of unusual interest to our readers. On the front page is a fine engraving of England's newest battleship, the "Albion," accompanied by a full description of her engines, armament, and general construction. "The Naval War Game—A Strategical Campaign," is a highly interesting article describing by means of Mr. Fred T. Jane's apparatus an imaginary sea-fight off Falmouth, in which the "Indiana" and "Massachusetts" play an important part. The Armstrong discharge tube for torpedoes is exhaustively treated in an article illustrated by nine diagrams. Admiral Cámara's fleet forms the subject of a full page engraving. The new Maxim-Schupphaus smokeless powder is treated at considerable length in a fully illustrated article. Mons. H. Poincare in a very scholarly essay tells of "The Stability of the Solar System," and Mr. Willis H. Moore, Chief of the Weather Bureau, writes on the "United States Atmospheric Survey." The subject of wireless telegraphy is treated in a descriptive article illustrated by details of the apparatus employed. "New Cycle Details" is an article which is illustrated by numerous drawings and which will prove of no little interest to many bicycle riders. The mineral resources of the Philippine Islands are discussed by Frank Karuth, F.R.G.S. Taken as a whole, the current SUPPLEMENT has covered a very wide field and covered it well.

APPARATUS FOR PRESERVING PYROGALLIC ACID SOLUTIONS.

BY RANDOLPH BOLLING.

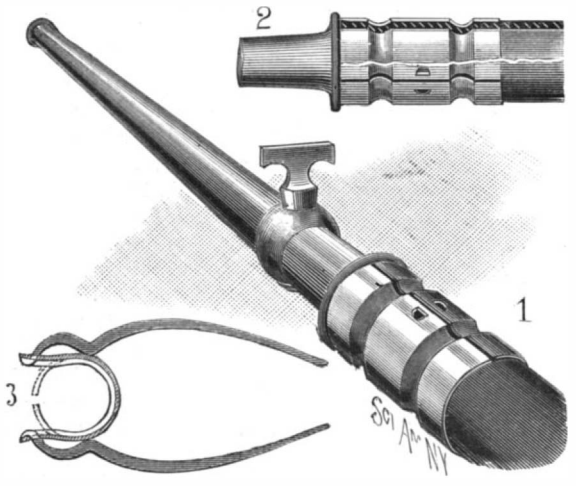
I have devised this piece of apparatus especially for the use of photographers who use a solution of pyrogallic acid and other chemicals to act as a reducing agent on the silver salts of the photographic plate. The use of the so-called "developing solutions" has



almost ceased, due to the solutions becoming brownish from absorption of the oxygen of the air, and so rendering them useless for developing purposes, and requiring a fresh solution to be made up. The explanation of the solution spoiling was simply that repeated opening of the bottle allowed oxygen to come in contact with the pyrogallic acid, which, having a strong affinity for it, combined with it, forming a brown or black compound, and the mixture had to be thrown away. To avoid this I have constructed a simple piece of apparatus which any one can make with a few bottles and a yard of glass tubing. Take a quart bottle, which is to serve as a stock bottle, and, having bored two holes in the cork, pass a bent glass tube through it to the bottom; now connect a short tube by means of a gum tube to this and you have a siphon; slip a pinch cock on the gum tubing so as to regulate the flow of the liquid. Above the large bottle is a yoke of wood having a slot sawed in it. This fits the neck firmly and serves as a support for the two absorption bottles, which are connected with each other and the central bottle with glass tubes; so that when the pinch cock is opened the liquid flows out of the stock bottle by way of the siphon and the air to replace it bubbles through both the absorption bottles. The two small bottles are filled with a strong solution of potassium hydroxide and pyrogallol dissolved in water, so that the air in coming into the apparatus has to bubble through a solution which completely removes all of the oxygen, leaving only the nitrogen, which has no action on pyrogallic acid. You can keep a developing solution for years without the slightest alteration, as nitrogen gas does not combine with pyrogallic acid.

THE "SIMPLEX" HOSE CLIP.

The purpose of this device is to provide a means for conveniently and efficiently securing hose to couplings or to the shank of the nozzle. It consists simply of a split, tubular, metallic spring band, the ends of which



AN IMPROVED HOSE COUPLING.

can be readily forced apart either for applying to hose or removing from the same. It is possessed of sufficient resiliency, and upon its inner surface are beads or projections so spaced as to effectually press the hose into the indentations of the coupling.

To remove or apply the band, a pair of levers are employed, each being inserted in the special openings provided at either end of the band, and then approximated at their distal extremities, Fig. 3. Figs. 1 and 2 exhibit the clip as applied to hose at the nozzle and to an ordinary hose coupling. It is the invention of Mr. John T. Duncan, of 69 Talbot Road, Bayswater, London, England.

The Famine in Russia.

So rapid has been the succession of startling events on this side of the Atlantic, especially since midwinter, that little thought or attention has been given to affairs in the more remote districts of Europe that have not had a political or warlike significance. Hence, it will doubtless be a matter of surprise to many to learn that a widespread famine has existed in the agricultural regions of Russia since last autumn, affecting 40,000,000 of people. Had such condition of affairs been ascribed to Siberia, it would doubtless excite little comment, for the majority have been taught to believe the North-Asian portion of the Muscovite empire is a bleak, dreary, inhospitable region—a desert of rocks and sand in summer, a waste of ice and snow in winter, peopled by convicts, political exiles and fierce and savage Cossack cavalry. But Siberia experiences no famines; its population for the most part are happy, prosperous and well contented; its soil rich and variable, yielding an abundance to ordinary agricultural toil. Siberia is to Russia, in fact, what the "Far West" was to the Eastern States of our own country, or what the Great Northwest now is to Canada—the goal and ambition of the poor.

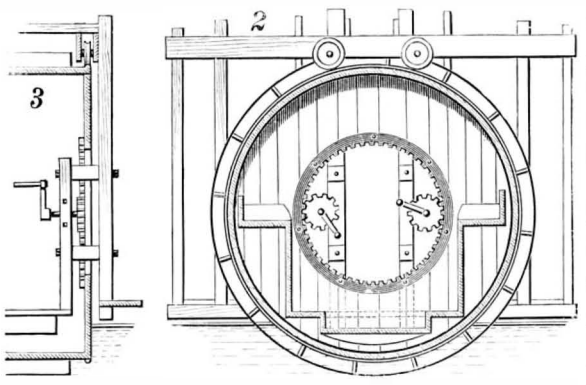
According to the Continental press, the existing famine is constantly increasing and enlarging its boundaries; worse, many of the famine districts are now ravaged by typhus in its most virulent form, "hunger typhus," the inevitable concomitant of unhygienic surroundings and lack of proper nourishment. Space will not permit of enumeration of a tithe of the horrors declared to exist; it can only be said the pictures drawn of the suffering millions of peasantry are distressing and heartrending in the extreme. The services of man and horse have been offered for a daily wage of eight cents. The thatches of dwellings have been pulled down to feed the cattle of the sufferers, and later the creatures themselves bartered away at forced sale to meet the necessities of their owners. Cows and horses "go begging" at four rubles (approximately $2) per head. Thousands upon thousands are seeking to eke out life by means of bread made from the barks of trees, leaves, chaff, etc., with a modicum of black rye flour added; and every available hedge, the byres and other outhouses have been utilized as fuel; while a few, more fortunate, have fallen under the ban of the forestry laws by reason of gathering fagots, and are assured of sufficient food, such as it may be, to keep soul and body together while serving out their sentences, though wives and children perhaps are dying. In some regions the hereditary owners of the soil have attempted to mitigate the suffering existent upon or in the vicinity of their estates, and distributed fuel and food; have even made the forests free to the needy for the gathering of dead wood; but in the majority of instances, the proprietor is represented by a steward who regards the tortures of the peasant with complaisance and insists upon the "pound of flesh" in the way of dues accruing to his master.

The Muscovite authorities, long persistently silent, have at last been forced, by the insistence and positive attitude of the European press generally, to enter upon an "explanation"—an explanation that seems to have for its chief purpose the quieting of alarm rather than any utterance of facts. The "official document," which is very like all documents emanating from the same sources, proves, however, to be in a measure stultifying. It admits that last year the crops wholly or practically failed in nineteen provinces, with a population of forty millions, but adds the private accounts of general starvation, of typhus, and other effects of lack of nourishment, are all "exaggerated," and that the items published are "only the ordinary appearances of poverty and want to be met with in the existing conditions of life among agricultural as well as other classes of population."

Commenting on the famine, Public Opinion (London) calls attention to the fact no such dire and far-reaching disaster has ever overtaken Poland, Finland, or the Baltic Provinces, probably for the reason the bulk of population in these districts is made up of those non-Russian by origin, non-orthodox—that is, do not affiliate with the Greek Church—and who stand generally on a higher level of civilization; that they still enjoy remnants of their old social institutions, which help them in an organized manner to combat the elements of nature, to mitigate the effects of droughts, and generally to be prepared to meet any possible calamity.

THE ROLLER BOAT THAT ACTUALLY WENT TO SEA.

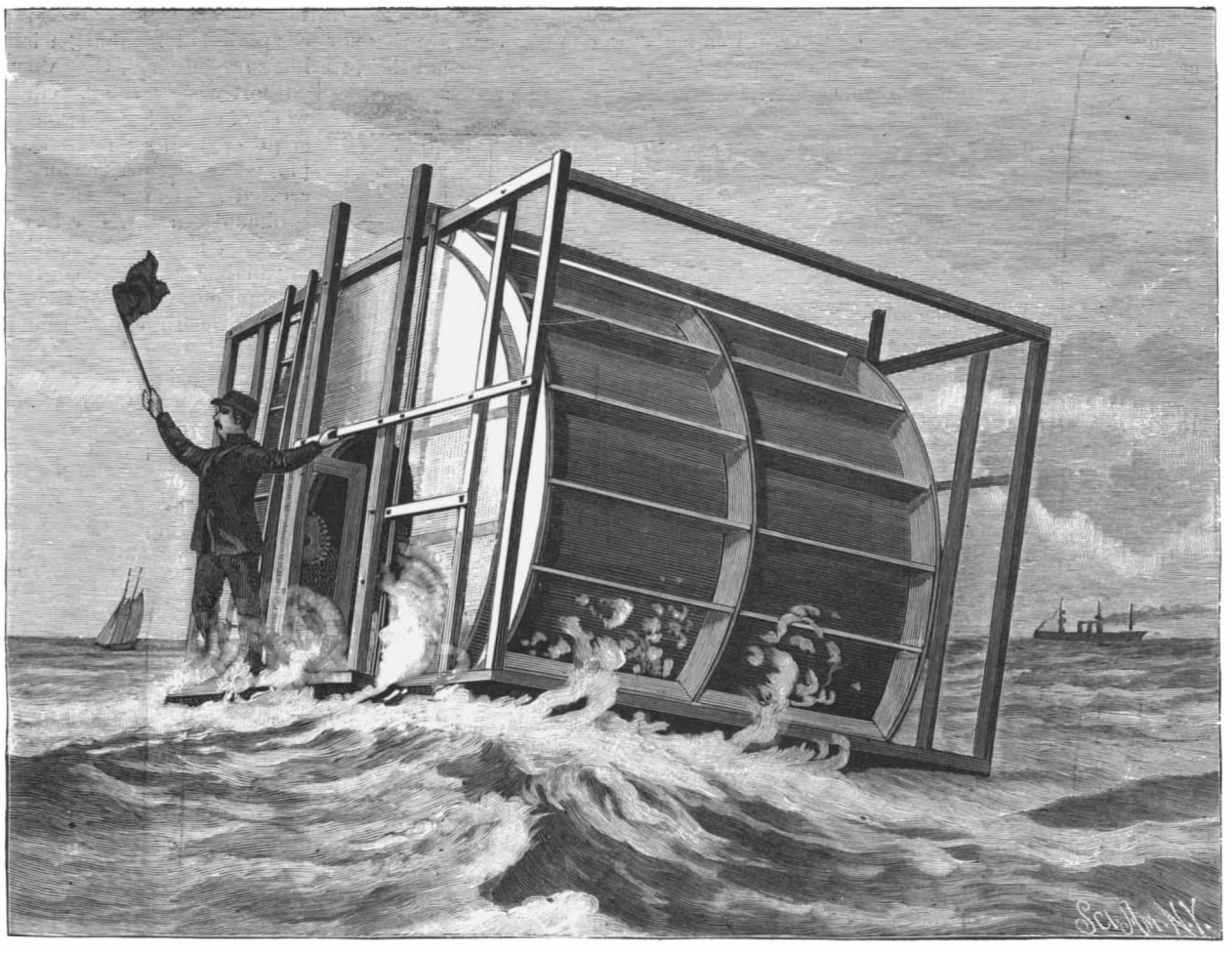
In view of the more ambitious designs for a successful roller boat which have been laid down and actually



DETAILS OF THE BECKMAN ROLLER BOAT.

built, the accompanying views of a home-made craft of this type, which was built and launched on the coast of Maine, have considerable interest. This curious craft actually started on an Atlantic voyage, manned by a crew of two men, or rather a man and a boy, the owner demonstrating his own faith in his seagoing barrel by taking his young son with him. Our readers will not be surprised to learn that the maiden voyage was disastrous, and that after rolling or rather being blown out to sea for fifteen miles, the crew were glad to exchange their swinging platform for the solid deck of a seagoing freighter. The vessel consisted of a cylindrical barrel about 10 feet in diameter and 12 feet in length, which was built of staves and hooped in the usual barrel fashion, and carried on its surface a series of parallel floats or paddles. Around each end of the barrel was laid a circular track of iron, on which, by means of two pairs of wheels, a working platform was carried and maintained in a horizontal position during the rotation of the barrel. The outer frame was made slightly larger than the barrel, and carried at each end of it a couple of stout vertical standards, as shown in Figs. 2 and 3. From these standards four horizontal transoms projected into the interior of the barrel through openings in its ends. Here they were bolted to a couple of vertical posts which formed part of an interior platform or cabin. The platform served as the living quarters of the crew. The weights of the outer frame and inner platform were so adjusted that they would always swing in a horizontal position.

The rolling motion was imparted to the boat by means of hand cranks and gears which meshed in a large circular gear, bolted to the ends of the barrel, as shown in the engraving. The forward movement of the boat was due to the paddles or floats arranged on the periphery of the barrel. The only contact between the frame and the barrel was at the four points where the carrying wheels rested on the circular track. The interior of the boat was furnished with a couple of bunks and storage room for food, baggage, and a cooking galley. On his first and only trip, Peter Beckman started from Bar Harbor, Me., on September 23, and passed out by the breakwater to the open sea. Under the joint action of the hand cranks and the wind, the strange craft traveled for fifteen miles at the rate of six miles per hour. As was to be expected, however, the intrepid mariner found that the wind was his master, and after drifting for some fifteen miles before the breeze he was hailed by the freight steamship "Pentagoet," bound for New York, and taken on board. At Mr. Beckman's earnest solicitation an attempt was made to tow the rolling boat; but after the hawser had parted, the craft was left to continue its voyage alone across the Atlantic.



PETER BECKMAN LEAVING BAR HARBOR, MAINE, IN HIS ROLLER BOAT.

Disturbing Nature's Balance.

The great and growing cost of the attempts in Massachusetts to exterminate the gypsy moth shows how serious may be the consequences to "the balance of nature" by the introduction of foreign insects or animals. A few of these moths were imported some years ago by an entomologist residing near Boston, says The New York Times. Several of the captives escaped from custody, and the State has spent $450,000 in the last four years in a vain attempt to exterminate their descendants. It is now estimated that at least $1,575,000 will be required, and that the appropriation for five years to come should be $200,000 per annum. On the other hand, a perpetual appropriation of $100,000 per annum would serve to confine the moths to the district in which they are now found. The problem resembles that which has taxed the resources of the Australian colonies since the progeny of half a dozen rabbits, imported from England, became so numerous that the maintenance of agricultural industries was menaced by their depredations.

Australia has expended millions in rabbit-proof fences and in devices for killing off the rabbits. But, although bacteriologists have endeavored to remove them by disseminating the germs of fatal disease, the colonists have thus far been able to do no more than hold the animals in check. In Florida several rivers have recently become choked by the rapid growth of a kind of hyacinth imported a few years ago, and considerable expenditures will be required to keep the streams open for navigation. An imported insect called the black scale menaced the fruit industry in California until the State procured from Australia and introduced in the orchards a little beetle which ate the obnoxious insects, and thus brought relief.

These and other instances which might be cited show that the utmost caution should be observed with respect to the introduction into any country of insects or plants for which nature has made no preparation there, and the growth of which may not be restrained by natural enemies and checks with which they must contend in the countries from which they are brought.

DURING the first three months of the present year the North Sea-Baltic Canal has been used by 3,437 vessels, with an aggregate net tonnage of 432,503 tons, against respectively 2,233 vessels and 308,557 tons for the same period last year. The receipts were 232,599 marks (£11,600), against 161,441 marks for the same period last year.

THE RECONSTRUCTED CRUISER "NEWARK."

It is a peculiarly fortunate circumstance that the earlier ships of our new navy were given such good speed and steaming radius that they are in this respect nearly up to the average of the cruisers of the present day. The principal advance which has been made in the intervening ten or fifteen years since they were designed has been in the improvement of the speed and power of the armament. The construction of hulls, engines and boilers, while it has improved, has not advanced so greatly as to render the motive power of such ships as the "Newark," "Philadelphia," "Baltimore," etc., obsolete in the fullest sense of the term; and the worst that can be said against the horizontal engines is that they are not quite so economical as the vertical engines of the present day.

Of the protected cruisers of our navy that have undergone or are now undergoing reconstruction, or will be reconstructed as soon as the close of the war releases them from duty, we have eight ships, as follows: "Atlanta," "Baltimore," "Boston," "Charleston," "Chicago," "Newark," "Philadelphia," and "San Francisco." The "Boston" and "Atlanta" are of 3,000 tons displacement and 15½ knots speed. The former was present in her original form at the battle of Manila Bay. The "Atlanta" is now undergoing refitting at the Brooklyn Navy Yard. The engines and boilers will be overhauled and the speed will remain the same—too low of course to enable her to rank as an up-to-date ship; but her offensive powers will be greatly augmented by the substitution of new 6-inch rapid-fire guns for her old slow-firers. A similar change will be made in the "Boston."

The "Chicago" will shortly sail from the New York Navy Yard practically a new ship, her shell being about all that will be left of the old vessel. New engines and boilers will raise her speed from 16·3 to about 19 knots; her protective deck will be extended the full length of the ship, and a powerful battery of fourteen 5-inch rapid-fire guns will replace the old 5 and 6-inch slow-firers. Similar changes will be made as opportunity offers on the "Baltimore," "Charleston," "Philadelphia," and "San Francisco."

The "Newark," which forms the subject of our front page illustrations, was the latest of our reconstructed cruisers to leave our dockyards with an up-to-date rig and battery. One of the front page cuts shows the ship in the bark-rig which she carried at the time of her visit to European waters as one of the "White Squadron." The "Newark" is one of four vessels which were authorized in the second appropriation made by Congress for the upbuilding of our new navy. The first authorization made in 1883 called for the construction of the "Atlanta," "Boston," "Chicago," and the little "Dolphin." Two years later, the protected cruisers "Newark," of 4,098 tons and 19 knots; "Charleston," of 3,730 tons and 18·20 knots; and two gunboats, the "Yorktown" and "Petrel," were authorized.

The "Newark" was built by the William Cramp and Sons' Ship and Engine Building Company, of Philadelphia. The contract for her construction was signed October 27, 1887, or two years and seven months after the date of authorization. The keel was laid June 12, 1888, she was launched twenty-one months later, on March 19, 1890, and went into commission February 2, 1891, or not until six years after Congress had given the necessary authority. That was in the early days of the reconstruction period. To-day we could build and equip such a vessel in less than one-third the time.

The "Newark" was, and is yet, 311 feet 7 inches long on the water line, with a beam of 49 feet 2 inches, and a displacement of 4,098 tons on a mean draught of 18 feet 9 inches. She is propelled by twin-screw, horizontal, triple-expansion engines of 8,869 indicated horse power at a speed of 19 knots per hour. She carries a normal coal supply of 400 tons; but her maximum bunker capacity is 809 tons. Although her mean draught is given as 18 feet 9 inches, her maximum draught at the lowest point of the keel when the ship is ready for sea with full bunkers is 22 feet 7½ inches.

Her original main armament consisted of twelve 6-inch slow-fire guns, of 30 calibers, which fired a 100-pound shell with the muzzle velocity of 2,000 feet per second and the small muzzle energy of 2,773 foot-tons. The secondary battery was made up of eight 6-pounder and four 1-pounder rapid-fire guns, four Colts, and one field gun. She is protected for her whole length by a steel deck which is 2 inches thick on the flat and 3 inches on the slopes along the sides. Her complement of officers and men is 384. The main battery is carried entirely upon the main deck, the guns being sponsoned out considerably from the sides, so as to secure a strong concentration of fire fore and aft.

It speaks well for the work that was put into this vessel at the Cramps' yard that she should have remained in continuous service for six years before being sent to the navy yard to refit. The work was carried out at the Norfolk yard, under the supervision of Naval Constructor Albert W. Stahl, to whose courtesy we are indebted for the following particulars of the very extensive changes which were made, especially in her armament and magazines.

When we bear in mind that the repairs and improvements were carried out at a time when the necessities of the existing war were calling for the services of the ship, great credit is due for the amount of work that has been done mainly in the past ninety days. So far as mere repairs are concerned, Mr. Stahl removed all woodwork from the neighborhood of the guns; put down a new main deck; built an improved and very much more efficient pilot house; overhauled and put in complete order the system of pumping and drainage; built a new fire main running under the protective deck, instead of as in the original ship above the berth deck, thereby rendering it more secure against the effect of gun fire; overhauled and put in good order all the thousand-and-one fittings, boat davits, search-light stands, watertight bulkheads, doors both watertight and non-watertight, inner bottom, steering engine, anchor engine, ventilation blowers, winches, hatches and hatch covers, flood cocks to magazines, all sea valves; and practically overhauled and refinished every part of her from keel to truck.

It will be noticed that the placing of the fire mains below the protective deck is in direct line with the suggestions of the naval board which examined the wrecks of the Spanish fleet, reference to which is made in our editorial columns.

So far as the changes and improvements are concerned the most important is in her battery. The substitution of the new type of 6-inch rapid-fire for the old slow-fire guns not only provides the "Newark" with a more powerful weapon, but one that can fire three or four times as many shells in a given space of time, as will be seen from the following comparison:

	Length in Calibers.	Total Length.	Weight.	Muzzle Energy.	Rounds per Minute.	Total Energy of One Broadside per Min.
		Feet.	Tons.	Tons.		
6-inch slow-fire...	30	16·3	4·8	2,773	2	33,276
6-inch rapid-fire..	40	21·3	6	3,700	6	133,200

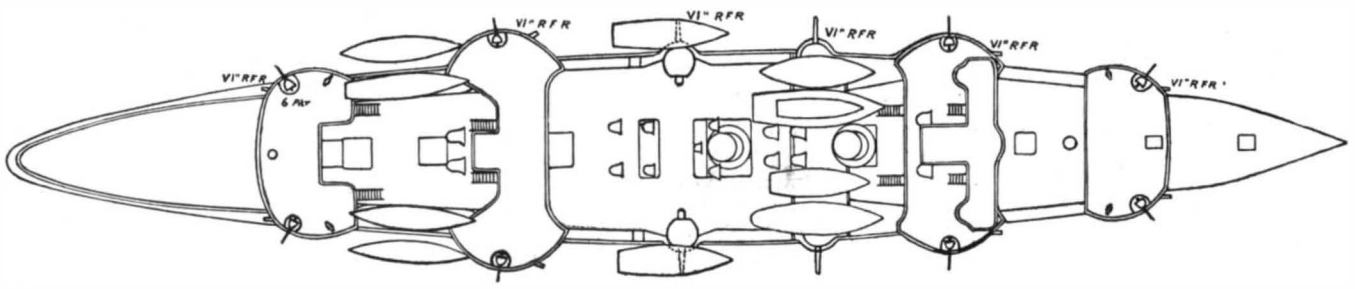
The reconstructed "Newark," then, is about four times as powerful in the amount of shell-fire which she can deliver as she was before she went to the Norfolk yard.

As a direct consequence of these changes, and in order to make the rapid-fire guns efficient, eight electric ammunition hoists were installed for bringing the 6-inch ammunition to the guns, these hoists being designed so as to hoist both powder and shell, and to deliver nine rounds per minute. The hoists had to be designed, material ordered, special electric motors built for the purpose, and the whole apparatus installed at the highest possible speed. We are informed that on the first test they gave great satisfaction, delivering as high as fifteen rounds per minute on the main deck, a speed in excess of the capacity of the guns to use the ammunition. Closely related to this change in ammunition hoists was an entire rearrangement and change in magazines so as to make it possible to deliver the ammunition to the hoists with the proper rapidity. Taken altogether, her main battery, with electric hoists, and her fine magazines, is a most effective combination, and one that has already given excellent results in the operations off Santiago. The present secondary battery consists of eight 6-pounders, two Colt's automatic, two 37-mm. guns, one 3-inch field gun.

Among the other minor alterations of design was the change in rigging. The vessel was originally bark-rigged, but all the yards and heavy topmasts have been removed and a simple pole rig substituted, carrying pole foremast and pole mizzenmast; the mainmast, as being not necessary and somewhat dangerous in action, was entirely removed from the vessel.

No radical change was made in her main engines and boilers, but both were thoroughly overhauled and put in perfect order, the latter being secured on new and better saddles. A good arrangement of evaporators and distilling plant was also installed.

Taken altogether, the reconstructed "Newark," as represented in our engraving, with her powerful battery, excellent ammunition facilities, and good speed, can compare favorably with the more modern cruisers of the same displacement.



DECK PLAN OF THE "NEWARK."

Possession Island and its Birds.

Off the southwestern coast of Africa, about 500 miles from Cape Town, lies a group of sea-washed rocks, to the largest of which the title of Possession Island obtains. This latter, a few miles away, looks uncommonly like a drab colored clinker set down in mid-ocean; it is crescent shaped and shelters Elizabeth Bay from the westward, the mainland being well defined in the distance. On nearer approach, one experiences a sensation much akin to that induced by a theatrical transformation scene, the forbidding and apparently untenanted waste being alive with birds enjoying to the full the immunity secured from predatory foes, and showing but little sign of timidity from outside intrusion. Thousands upon thousands of penguins line the shore, strutting about with great self-importance, and jealous, one might almost imagine, that Nature has not endowed them with the power of flight, like their comrades, the malagas, a very handsome bird about the size of an ordinary goose, and with much the same plumage, except that the head and neck are tinted with yellowish feathers. Enormous flocks of these malagas are to be seen in every direction, either standing in solid groups, covering a large extent of ground, or wheeling about in the air, now and then darting out seaward in quest of fish, upon which they pounce with unerring accuracy. Then there are various kinds of gulls, guillemots and other sea birds. In July and August is the breeding season, and it is not till later in the year that the islands are what is technically called "in full bloom," when the birds are more numerous than ever.

Some of the habits of the penguin are very peculiar. The nest consists of a hole scratched in the sand, or just a crevice in the rock, into which are dragged a few stones, pieces of seaweed, or any rubbish available; and here are deposited two—or at most three—eggs, the period of incubation lasting six weeks. When the birds are hatched, they very quickly take to the water.

Shortly after the breeding season is concluded the work of collecting the guano begins by those who have acquired rights on the island, and this furnishes employment for thirty or forty hands, the ranks being recruited from all sorts and conditions of men—even a broken-down barrister has been known to cast in his lot amid these untoward surroundings. Yet even the hard labor entailed in guano collecting is not without its compensations, for the island is in a comparatively rainless latitude, and though it presents a wearisome and monotonous picture of barren-looking rocks alternating with long, arid stretches of sand-dunes washed by an angry surf, the atmosphere is singularly pure and invigorating—one feels as if it were almost a luxury to breathe; and when night closes the starry heavens present a glorious spectacle to the eye, while all around the sea flashes and sparkles with the phosphorescent rays emitted by countless forms of marine life.

At one time the island must have been the haunt of innumerable numbers of seals, for the remains of these creatures are to be seen in all directions, abundantly confirming the statement that a few years back a pestilence or plague visited the oceanic inhabitants of this locality, and evinced as much virulence and malignity as Asiatic cholera sometimes does toward bipeds on land. Shortly after the advent of this plague, a visitor to this group of rocks found them literally covered with the carcasses of fur seals with their skins still on them, the flesh having undergone a species of drying and mummification.—Chamber's Journal.

PURDUE UNIVERSITY has a new building in the process of erection which will constitute an addition to the present engineering laboratory, says The American Engineer and Car Builder. The new portion is 50 by 100 feet in size, is located between the steam engineering laboratory and the locomotive laboratory, and is to be connected by passageways with both of these buildings. The addition is to be known as the railway laboratory, and is the last of the series of engineering laboratories which were provided for in the original plan of the present group. The Purdue engineering laboratory now includes seven large laboratory rooms: A woodworking room, foundry, forge room, machine room, steam engineering laboratory, locomotive laboratory, and railway laboratory.

Correspondence.

Our Colored Regiments in Action.

To the Editor of the SCIENTIFIC AMERICAN:

In the article which appeared in the SCIENTIFIC AMERICAN of July 9, 1898, headed "Courage in Modern Warfare," special mention was made of the pluck, courage, and bravery of the "Rough Riders" as they charged up San Juan Hill. All honor to the brave soldiers who were willing to face such danger to defend the flag and honor of our country! But, since special mention was made of the Rough Riders (saying nothing about the gallant boys of the 71st N. Y. Volunteers), I think it is no more than right and just that the chivalry of the colored regulars, composing the 9th and 10th Cavalry, should not be overlooked.

Col. Roosevelt rode at the head of his troops "with the 10th Cavalry ranged alongside." "Up, up they (Rough Riders) went with the colored troops alongside of them." "The shooting of the 10th Cavalry was wonderful. Their ranks closed as fast as they were thinned;" and, when the position was won by the American forces, "the Riders cheered the 10th, and the latter cheered the Riders." Thus, we see bravery and fraternal greetings shared equally by the men who made the gallant charge. The 9th and 10th Cavalry is a fitting representation of the courage to be found in the ranks of the 8,000,000 negroes of these United States, if called upon to sacrifice their lives for their country.

Rev. JAMES MARCUS BODDY.

Troy, N. Y., July 11, 1898.

Possible Passage of the Earth Through a Nebula.

So-called "dark days," of which a number of remarkable ones have been recorded in the earth's history, have usually been explained by the presence of thick smoke due to great forest fires, accompanied perhaps by some peculiar atmospheric conditions. There have always been a few, however, who have thought that this hypothesis does not furnish a complete explanation, and the observations made on a series of such days that occurred in Siberia in 1896 seem to strengthen the case of these doubters. If we are to believe official reports, the dense smoke that covered half the continent of Asia on those days was due neither to fires nor to volcanic eruptions. It is the opinion of M. Adam Rzyszczewski, who describes the phenomenon in the Bulletin de la Société Astronomique, Paris, that the earth at that time was passing through what he calls a great cosmic cloud—perhaps a gaseous nebula. The only trouble is that in this case it would seem that the whole earth ought to have been equally plunged in the smoky substance, but he explains ingeniously the fact that it was not, as will be seen at the end of his statement, most of which we translate below:

"After collecting a large number of minute details, I am now able to present to the Astronomical Society an account of an immense cosmic cloud that covered the whole of Siberia during eleven consecutive days of the month of July, 1896. All the inhabitants of Siberian towns were astonished, at this time, to find themselves enveloped in a thick smoke, containing a large quantity of water vapor. It was generally believed that there were enormous forest fires, but dispatches from the government officials showed that there were no such fires anywhere. Besides, they indicated that everywhere was the same extraordinary smoke . . . over a territory more than 7,000 kilometers [4,300 miles] in extent, from Samara to Chita and from the Sayan Mountains to the Polar circle. The whole Asiatic continent was plunged for eleven days in thick smoke. The odor of carbon was very evident, and the sun's disk appeared like a red ball of fire. I looked at it easily through a field glass without the least fear for my sight. A perfect calm reigned in nature, but the upper layers of the smoke glided quite rapidly over the sun's disk, borne by a northwest wind. Now, since no forests were on fire anywhere, and since there were no volcanic eruptions in Northern Asia, and since, from Samara to Chita, the phenomenon presented everywhere the same peculiarities, we must conclude, it seems to me, that this was a cosmic phenomenon. Could we have been passing, for instance, through a gaseous nebula or the tail of a comet? According to the stories of farmers, whenever the grass was cut during the smoky period, the hay seemed to be poisoned, and the sheep that ate it died by hundreds. A workman who was bleaching wax in the sun found that, after the smoke had disappeared, the wax was completely red, and that it kept this color even after being melted. A civil engineer has recently published a notice on this phenomenon in the Russian Official Journal, and he upholds the same hypothesis, namely, that we were passing through a great cosmic cloud the origin of which has not yet been explained."

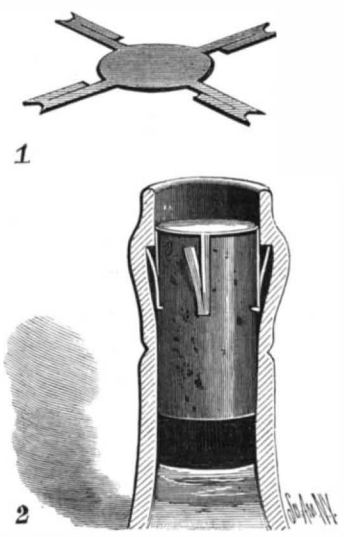
M. Rzyszczewski tells us that according to the testimony of travelers, the smoke extended to the tops of the highest mountains—an additional evidence that it was not due to terrestrial causes, for forest fire smoke, according to him, lies low, so that one can see over it from a mountain peak. Travelers were completely lost in the gloom, and a white tent could not be seen at a distance of a few hundred feet.

In closing, the writer says: "If the earth was then passing through a gaseous nebula, we must suppose that this nebula had for a vast distance a plane boundary, and that, in turning, the earth plunged Siberia into the cloud during the day, while at night it emerged into the clear space; for the nights were all fine, all the stars were visible, and there was not the least cloud or smoke; but scarcely had the day dawned when the dense smoke returned." The proof, of course, would be quite conclusive if it could be shown that on the opposite side of the globe, at the same time, the nights were smoky and the days clear; but no evidence of this kind has, apparently, been sought.—Literary Digest.

[This is in line with the ingenious claim as to cause of the drift as set forth by Ignatius Donnelly, who also holds the forest fires that raged so furiously in 1871 and again in 1881 were of cosmic origin. There are several facts to support this view regarding the fires, since large rocks more than a mile away from forest, lying in sand and sparse and scanty wire grass, were split and even pulverized by heat. A man found dead (asphyxiated), but with no marks of fire on his body or clothing, had in his pocket three silver half dollars that were solidly fused together throughout more than half their larger surfaces. All metallic substances on or about his body were also fused. What known form of heat will fuse metal and yet leave no evidence of its presence on clothing or human flesh?—ED.]

AN IMPROVED BOTTLE-CLOSURE.

To provide a bottle-closure which shall prevent a cork from being pierced or removed, Alexander McLeod, of 88 Queen Street, Brisbane, Queensland, has invented a bottle which necessitates the breaking of the neck before the stopper can be drawn.



McLEOD'S BOTTLE-CLOSURE.

The neck of the bottle, as seen from the accompanying cut, has its inner surface formed with a recess ending in a shoulder at the top. In order that the neck may be readily and evenly broken, an annular groove is cut in the glass. The cork is inserted in the neck with its middle portion nearly opposite the groove and its upper end slightly above the shoulder of the recess. To prevent the cork from being pierced a metallic plate is provided which is stamped with radiating arms, each having a spring-tongue integral with the outer end of the arm and extending parallel with the arm, as shown in Fig. 1. The widened outer ends of the arms are pointed. When the plate is applied to the cork, the arms are bent down perpendicularly, as shown in Fig. 2, and the spring tongues, when the plate rests on the cork and the arms are confined between the cork and the inner walls of the neck, will project into the recess and engage the shoulder. To bind the cork and the plate more firmly together, the points on the outer ends of the arms are bent inwardly so that they shall pierce the cork. By reason of this construction, it is evident that the cork can be neither pierced nor removed, except by breaking the neck at the annular groove.

THE establishment of the National Zoological Park, Washington, has led to the formation of many other zoological preserves in the United States. In the western part of New Hampshire is an area of 26,000 acres, established by the late Austin Corbin, and containing 74 bison, 200 moose, 1,500 elk, 1,700 deer of different species, and 150 wild boar, all of which are rapidly multiplying. In the Adirondacks, a preserve of 9,000 acres has been stocked with elk, Virginia deer, muledeer, rabbits and pheasants. The same animals are preserved by W. C. Whitney on an estate of 1,000 acres in the Berkshire Hills, near Lenox, Mass., where also he keeps bison and antelope. Other preserves are Nehasane Park, in the Adirondacks, 8,000 acres; Tranquillity Park, near Allamuchy, N. J., 4,000 acres; the Alling preserve, near Tacoma, Washington, 5,000 acres; North Lodge, near St. Paul, Minn., 400 acres; and Furlough Lodge, in the Catskills, N. Y., 600 acres.

EDELWEISS is to be protected by law in the Austrian Alps. The Emperor has signed laws passed by the Diets of Styria and Carniola forbidding the removal of the plant with its roots, the sale of it to tourists, and exportation in large quantities.

Science Notes.

The exports of tools and machinery from Stockholm and the other eastern Swedish ports have practically doubled during the last five years, and in 1897 were valued at £384,444. In 1893 their value was only £195,-110.

Prof. A. Liversidge states that when solid carbon dioxide is examined under the microscope, it presents along its edges projecting wire-like crystals, which have branching filaments issuing from them, apparently at right angles, resembling somewhat the groups of minute crystals seen in crystallized iron, gold, and ammonium chloride.—Proc. Australasian Association.

We are pleased to note that Prof. W. R. Brooks, of Smith Observatory, has had the honorary degree of Doctor of Science conferred on him in recognition of his astronomical discoveries. Prof. Brooks' cometary discoveries exceed in number those of any other living astronomer, and include those of the highest scientific interest and value. A large proportion of these discoveries were made with telescopes of his own construction, and that they were of the highest optical excellence is proved by the good record they have made.

The question to what extent the alkaline earth salts in drinking water affect the decay (caries) of teeth has of late been studied in several quarters. Statistics have been collected by Rëse in several localities in Bavaria and by Foerberg in Sweden. These have revealed the interesting fact that the extent of decaying teeth bears a definite relation to the hardness of the water, in other words, to the quantity of calcium and magnesium salts in the earth through which the water passes. The harder the water, the better the teeth; the smaller the quantity of these salts, the greater the decay of the teeth.—Südd. Ap. Ztg.

Very complete experiments in support of the theory of warning colors, first suggested by Bates and also by Wallace, have been made in India by Mr. Finn, says The Independent. He concludes that there is a general appetite for butterflies among insectivorous birds, though they are rarely seen when wild to attack them; also that many, probably most birds, dislike, if not intensely, at any rate in comparison with other butterflies, those of the Danais genus and three other kinds, including a species of Papilio, which is the most distasteful. The mimics of these butterflies are relatively palatable. He found that each bird has to separately acquire its experience with bad-tasting butterflies, but well remembers what it learns. He also experimented with lizards, and noticed that, unlike the birds, they ate the nauseous as well as other butterflies.

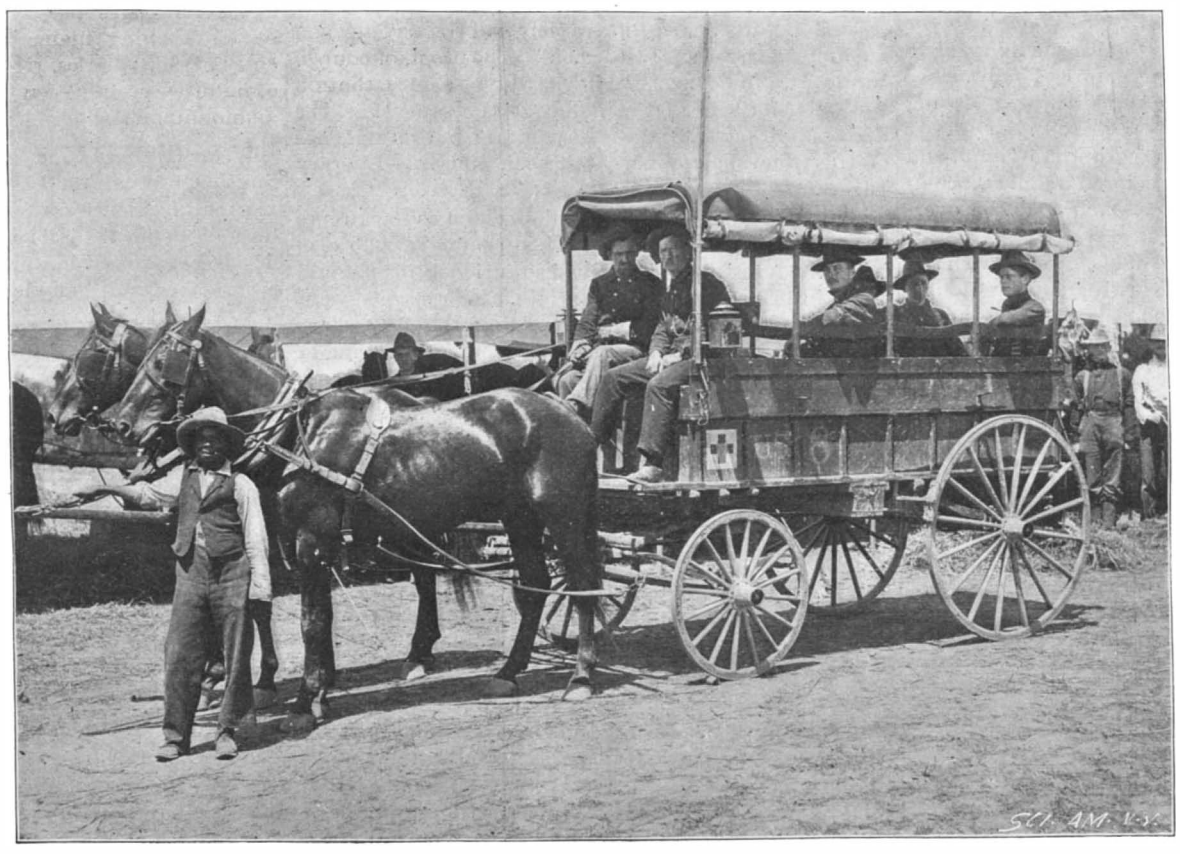
H. Kraemer finds that methylene blue has the advantage of being a decisive reagent for mucilage in plants; only some lignified cell-walls otherwise take up the color, and the stain may be applied by proper manipulation to dry as well as to fresh plant material. Fresh specimens of leaves, etc., are left for several hours in a solution of methylene blue, 0·4 gm. in 95 per cent alcohol, 100 c. c.; afterward cut sections and transfer each to a slide with a few drops of a similar solution, in which four-fifths of the alcohol is replaced by an equal volume of nearly anhydrous glycerin. The mucilage cells are stained blue in a short time, and after covering the specimens they may be kept indefinitely, the contrast between the stained and unstained portions becoming more marked as time passes. Dried material should first be softened in water, then transferred to strong alcohol prior to cutting sections. —Am. Journ. Pharm., lxx., 285.

Only by degrees are the marvelous qualities of our London atmosphere becoming known. No city in the world can boast such a peculiar aerial composition as that which the inhabitants of the metropolis have served to them daily and nightly, without money and without price—for neither the government, County Council, nor vestries have yet attempted to tax the highly nutritive air which we breathe. Most people think that our atmosphere consists of practically nothing. Quite a mistake. It is both meat and drink. A paper contributed to the Transactions of the British Institute of Preventive Medicine states that even in a suburb the dust particles number 20,000 per cubic centimeter in the open air, and 44,000 in a quiet room; while in the city the totals per cubic centimeter were 500,000 when taken from a roof, 300,000 in a court, and about 400,000 in a room. In other words, the air of the square mile is 900 per cent thicker than in the suburbs, which is in accord with the general experience that fogs are both more dense and more frequent over the center than in the outskirts. But what is especially interesting is to learn that although dust is the great carrier of micro-organisms, there is only one of these articles per 38,000,000 atoms of dust. Thus it is calculated that a man could live in the metropolis for seventy years and only absorb 25,000,000 microbes into his system from the air, or about the same number as he drinks in half a pint of unboiled milk. Of course, there are other serious objections to dust; but it is something to know that there is only one microbe to many millions of motes.—London Telegraph.

REGIMENTAL BAGGAGE.

Our illustration, from a photograph, depicts the arrival at Camp Alger of the quartermaster's train of the 34th Michigan Volunteer Infantry. It also affords some idea of the bulk of what Cæsar termed the "impedimenta" of a single regiment—a matter to which few people give little thought or attention. What, then, must be the proportions of the wagon train accompanying a brigade, a division, or corps? And yet this illustration gives only an inadequate idea of camp equipage proper, plus, perhaps, the commissariat supplies for a few hours — supplies that require to be replenished at frequent intervals and often from considerable distances. Who has ever told of the difficulties encountered by the quartermaster's and commissary departments between Baquiri and the hills overlooking Santiago?

Here too, also, is furnished a clew to the difficulty of transporting large bodies of troops across considerable stretches of water, and the apparent lack of facilities afforded by the largest ships. The "City of Pekin," we are told, could accommodate but barely 3,000 men; even then she was relieved in part by the fact that quartermaster's stores and camp equipage for the campaign were not included in regimental impedimenta. In a general way, it may not be difficult to compute the amount of provision necessary to such a force for a period of fourteen days, but when it comes to estimating the supplies for a six months' campaign for 24,000 men, and the space and tonnage required for transshipment and storage, including horse boxes, forage, etc., the problem assumes no inconsiderable proportions. Remember the "Great Eastern," with all her enormous bulk, could, when crowded, carry but 3,000 men with their baggage, camp equipage, etc., along with supplies for two months. It is only when all these facts are taken into consideration that the difficulties attending the moving of an army, on either sea or land, can be at all appreciated.



A UNITED STATES ARMY AMBULANCE.

THE RED CROSS SOCIETY AND THE AMBULANCE SERVICE.

The Society of the Red Cross appears to be generally misunderstood, for it is neither a charity organization per se, or an "order," but merely a confederation of relief societies existing in different countries, acting under the treaties secured by the Geneva Convention, and deriving its specific title from the fact its work is carried on under the red cross emblem. Its aim, broadly stated, is a system of national relief applied to the mitigation of the sufferings induced by war, pestilence, famine, or other great calamities, without reservation as to friend or foe, race or color; its purposes are now so generally appreciated that on all occasions, by all civilized people, those connected therewith and wearing the proper badge receive the treatment that is due to neutrals and non-combatants, this treatment being even extended to those under the immediate charge of the Society.

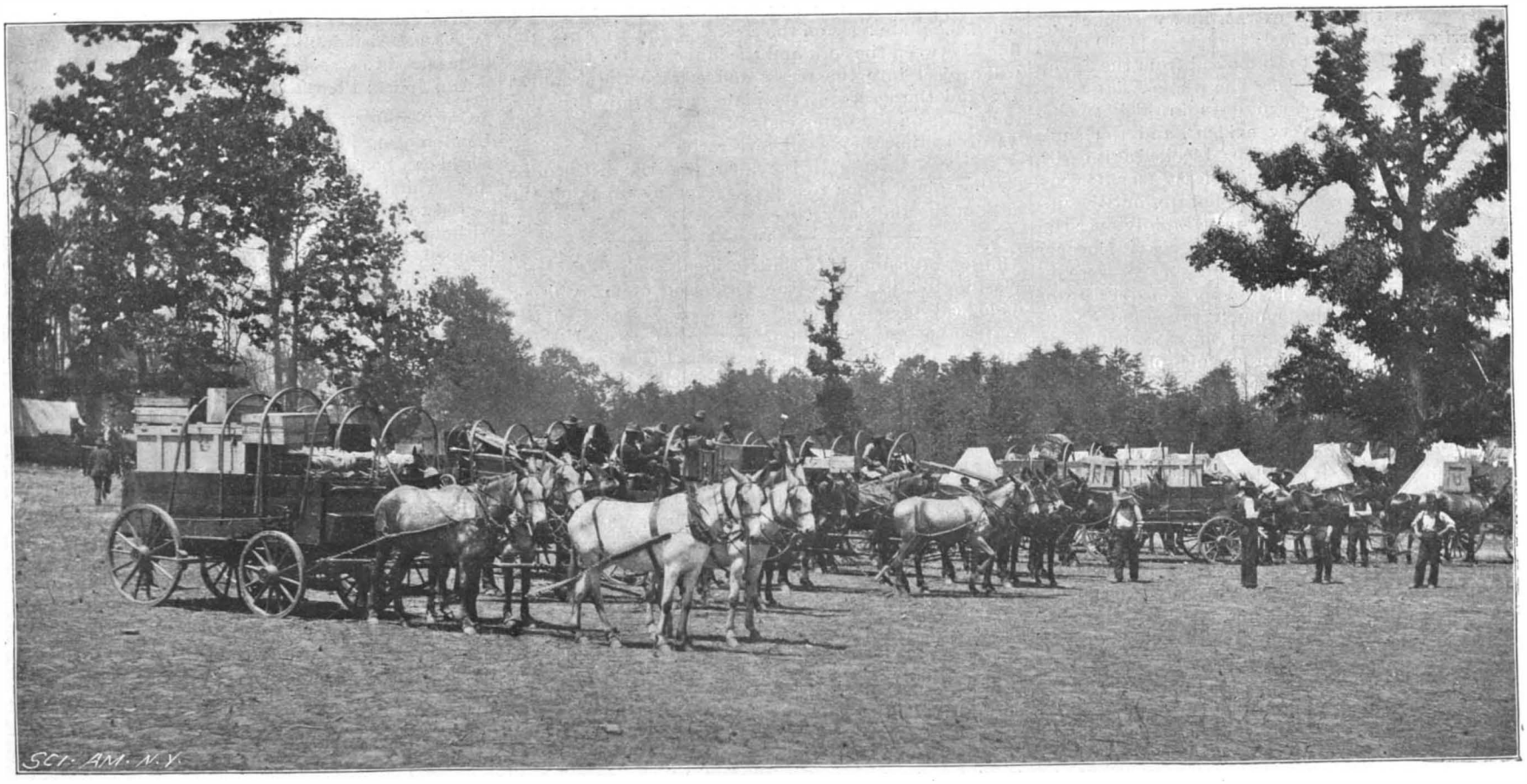
Neither can this confederation be deemed as series of societies existing among different nations, but controlled by one central organization, inasmuch as each society is distinct and independent and governed by its own laws, which are formulated according to the needs and genius of each nationality. With this explanation, it is perhaps hardly necessary to state there are no members, regularly constituted as such.

In the confines of United States authority, the Red Cross Society is at present engaged in a laudable attempt to ameliorate the condition of ill and wounded sailors and soldiers, not alone of this country, but also —in so far as possible—those of the allies and foes which are parties to the existing conflict. It is neither its intent nor purpose to in any way supersede or conflict with the medical staff afloat or ashore, but to afford aid and support to both in a way to admit of greater scope, more prompt action and more ready relief to want and suffering.

The first International Conference looking to such universal organization as now obtains was held in Geneva, Switzerland—hence the red or Geneva cross—in 1863, and an outline treaty drawn up that subsequently was greatly remodeled and improved. This treaty, as at present constituted, has been subscribed to by thirty-two powers, including Japan, certain South American republics, and several European states and grand duchies. It was, of course, not available during our late Civil War, its place being substituted for by the Sanitary Commission, but it was no inconsiderable sanitary and hospital factor in the Austro-Prussian war. In the Franco-Prussian conflict it assumed magnificent proportions, and the services afforded won the warmest encomiums from both parties to the strife. Since, it has found a field of usefulness in almost every war, including petty rebellions in the Balkan States and Turco-Hellenic Peninsula —often when one or the other of the two sides had given it no recognition. Russia carried it to the gates of Samarkand and within the walls of Khiva; and even in South American wars its labors have been inestimable; and now its ships fully equipped are in Cuban waters, and its surgeons, nurses, attendants, etc., are faithfully performing the duties appertaining to each. Its badge is everywhere recognized, and the only requirement is that such shall be properly *visé* by the Central Commission and one of the belligerents, as a protection against deceit and fraud.

The ambulance, which has now become an essential part of the equipment of every army medical corps, in its wheeled form originated in the United States; but its use as a means of affording initial aid on the field of battle and as a means of immediate transport for the wounded and invalid, so far as foreign countries are concerned, is due to the practical exhibition of its value in the hands of the Red Cross Society. Further, in all services, ambulance corps are now existent, made up of surgeons, nurses, bearers, attendants, and drivers, all well drilled experts in their individual duties; so that the wounded are no longer left, as formerly was the case, to the tender mercies of comrades, or the oftentimes ill-directed efforts of the drum corps and other non-combatants.

In the United States the meager proportions of the regular army rendered its medical corps inadequate to the emergencies of an extended campaign, or the care



ARRIVAL OF QUARTERMASTER'S TRAIN OF 34th MICHIGAN AT CAMP ALGER.

of large bodies of troops, which has necessitated, with the hurried organization of the volunteer service, retaining the old regimental medical staff; but, with the present availability of Red Cross aids, it is believed most of the defects inherent thereto will be obviated.

The United States army ambulance is a model in its way, consisting of a body 48 × 90 inches, protected by a canopy top and movable leather curtains, mounted on four wheels by platform springs. With the seats in, it carries eight persons; with seats stowed, it admits two litters, side by side, the handles of which rest on and are secured to brackets; or one litter can be entered, and yet space reserved for four persons in sitting posture. Lockers at the sides and under the box seat afford storage for supplies and the appliances essential to "first aid," while beneath the box are two water tanks. Formerly a two-wheeled ambulance also received official sanction, of the same capacity as regards litters, but admitting of but four passengers in sitting posture. For the campaign in Cuba, it is understood mule litters have been provided for use in such localities as cannot be reached by wheeled vehicles, and the French cacolet—two chairs, resting pannier fashion on a mule's back, with a hooded shelter—has been advised.

The Red Cross ambulance, as recently adopted, differs slightly from that of the United States army. Constructed in much the same way, it admits of a second pair of stretchers being inserted half way between the first and the canopy top: and the water tanks, beneath the driver's seat, are arranged to be surrounded by ice: the top and curtains, moreover, are of canvas instead of leather; but leather padded litters replace the canvas stretchers of the army department.

No hard and fast rules can obtain, however, to any ambulance service. Both the character of the vehicles and the scope of their usefulness are necessarily modified by conditions and surroundings, and to meet the demands of military operations. Undoubtedly the present conflict will lead to many changes in medical military service and in medical organization, and such may entail a material modification of the ambulance and field hospital system. One of the great steps in advance, dictated by the exigencies of the present war, is the establishment of the hospital ships, such as the government steamer "Solace" and the Red Cross steamers "Relief" and "Red Cross."

One notable feature of Red Cross work brought out by the present war is the number of societies that have sprung into existence as auxiliaries. Every city and almost every town or village of considerable size possesses at least a "branch." Some of these, too, have greatly lightened the work of the Central Committee, by taking upon themselves certain lines of work. One of the greatest drawbacks, usually, to work of this character is the miscellaneous assortment of supplies forwarded, the useful often being neglected for the æsthetic, the amount in one line being greatly in excess of demand on one hand, on another equally deficient. Thus, one organization devotes all its energies to supplying a hospital launch, another to the procuring of hospital clothing, another to the forwarding of hospital delicacies, another to the furnishing ambulances, etc. Consequently, the supplies that reach the wounded and the hospitals are suitable to, and in consonance with, the demand. Far from being a charity, miscellaneous in its garnerings and applications, the Red Cross has assumed the character of a self-imposed, cheerful, definite taxation.

Waterproof Placards.

Mix glue water with zinc-white, chalk or barium sulphate and paint the paper with this liquid. As soon as dry, apply another layer of soda waterglass with a little magnesia, and finally expose the paper for some days to a temperature of 25° C. The sheets thus prepared may remain under water or be exposed to dampness for a long time without any part of the writing or drawing becoming blurred.—Die Werkstatt.

A RAILROAD ATTACHMENT FOR BICYCLES.

The invention which forms the subject of the accompanying engraving seeks to provide a simple attachment by which an ordinary bicycle can be used upon a railroad track, the bicycle running upon one rail, means being provided whereby it is held in position.

A RAILROAD ATTACHMENT FOR BICYCLES.

Below the front wheel of the bicycle, a frame is suspended from a forked brace fastened to the bicycle frame and from a bar running from the axis of the front wheel. On the lower portion of this suspended frame rollers are journaled to engage the track and the adjacent portion of the tire. At the rear of the wheel, about midway of its height, two additional rollers are journaled in the forked brace already mentioned, and engage the bicycle tire for the purpose of relieving the lower rollers of undue strains. The axes of these latter rollers are perpendicular to the periphery of the bicycle-wheel.

Beneath the rear wheel of the bicycle, a somewhat similar arrangement is employed. In this case the frame carries but a single roller and is suspended in position by a supporting brace attached to the bicycle frame and by a bar running from the bearing of the rear wheel. As in the device used on the front wheel, so here, the roller engages the inner side of the rail and the adjacent portion of the wheel.

In order to keep the bicycle in position on its track, a lateral frame is fastened to the lower brace and is provided at its outer end with a flanged wheel running upon the rail opposite that upon which the bicycle is mounted. The flange of this wheel is opposed to the flange devices on the bicycle, so as to keep the latter in position on the track.

The attachment in itself is lightly constructed. It can be removed from a bicycle and easily applied, and, moreover, can be packed in a case carried on the bicycle. A rider is thus enabled to use his wheel not only on ordinary roads, but also on railway tracks.

The attachment is the invention of Henry J. Otto and Arthur E. Wielsch, of Butte, Montana.

RECOVERY OF GOLD FROM LOW GRADE ORES.

In the southern part of California mining is a familiar topic of the day among all classes. The wealthy are turning to this industry as a means of increasing their revenues, and the poor are engaging in it with the hope of becoming rich. The study of mineralogy, with the technicalities of mining, is the most popular of the many branches taken up by the Los Angeles Y. M. C. A. educational course this season. It is the first class of the kind conducted by this organization.

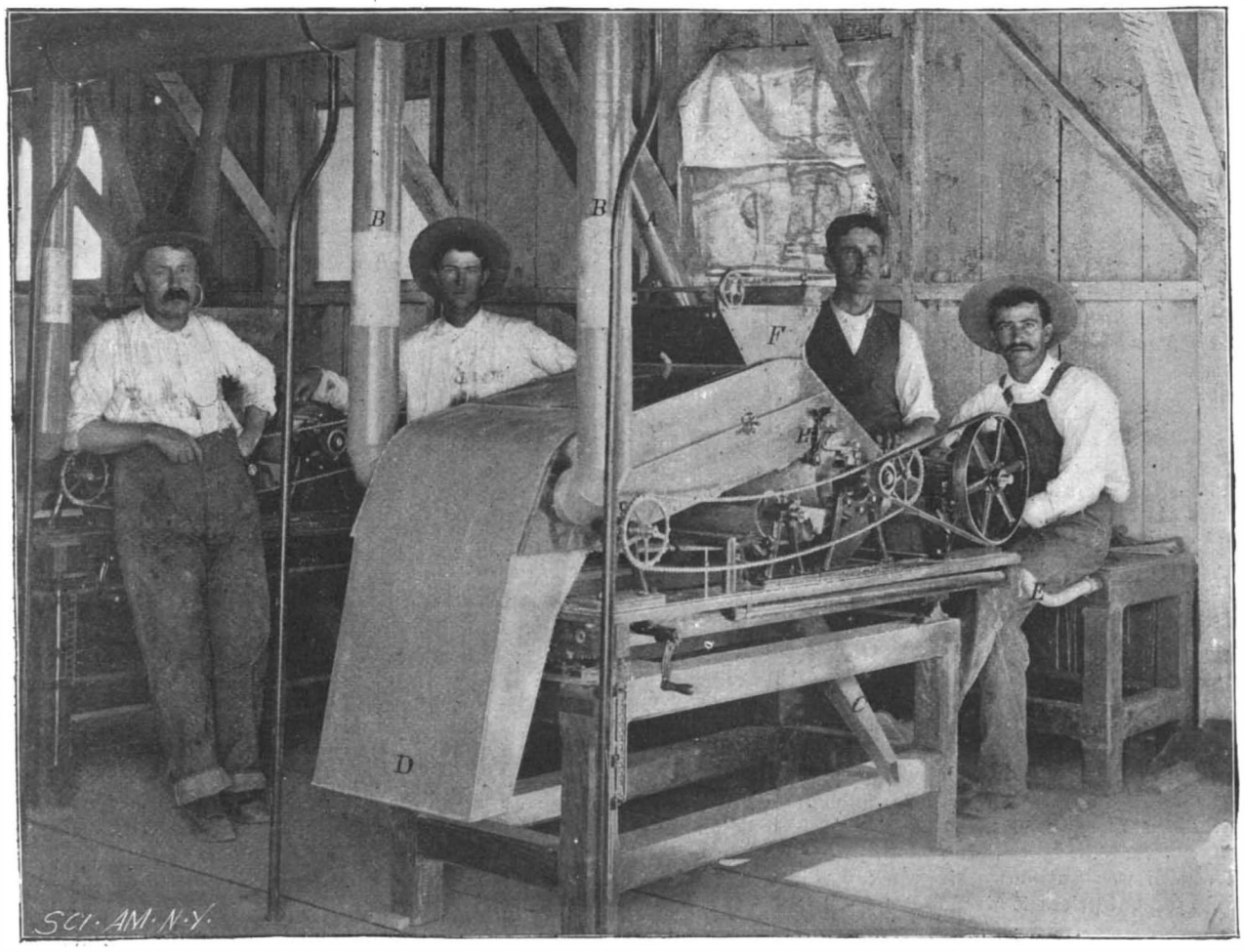
A large proportion of the 3,800 mines in Southern California, which yielded $1,360,000 in gold last year, are on the great desert lying just west of the Colorado River. The region, as large as several Eastern States put together, is full of resources that are yet unknown to the general public. The most promising mining district in California—the Rand, discovered two years ago—is in the heart of this desert, and already the towns of Randsburg and Johannesburg are thriving and comparatively comfortable places. Life here is infinitely preferable to the conditions on the Klondike, and if gold nuggets are not picked up so freely as in the Arctic region, neither is the search for them so hazardous or costly.

Scarcity of water and fuel, with the cost of transporting ore to mills and smelters remote from the mines, are drawbacks on the desert. More water will ultimately be discovered and developed; meanwhile, a dry process of treating ores would be of great value to this section and to all other arid mineral territories. Especially is some method needed by means of which low grade quartz may be made to yield a percentage of concentrates which will be profitable in bulk.

Such a process has recently been successfully tested in the Rand district, with new concentrating machines invented by an Eastern man, who has been in the habit of spending his winters in California, and was advised, when in Los Angeles last winter, to turn his attention to something which would benefit the mining interests of this section. He saw the difficulty, chiefly resulting from a lack of water, of handling the vast bodies of low grade ore which are found on the desert, and began to experiment with the dry concentrating process.

After the machines were perfected, they were viewed with approval by numerous mining men; and, in September, a plant was erected at Johannesburg, on the Alameda mine, where tests were recently made which gave excellent results.

Rock which had been cast aside, on the Alameda dump, as unprofitable to ship to a stamp mill, was put through a rotary crusher and reduced to what is known as "pulp" in mining parlance. It was then elevated by a conveyor to an inclined screen located in the second story of the mill, directly above the concentrators.



NEW METHOD OF CONCENTRATING GOLD BY THE DRY PROCESS.

The screen is octagon in cross section, covered with fine wire, and divided into four mesh spaces running from 100 to 40. It receives the pulp at the upper end, and as it slowly revolves, the crushed rock is thrown from one flat surface to another, gradually reaching the lower end, where all that passes over is returned to the mill to be ground again. The screened pulp is supplied to the concentrators in the room below through pipes, A, which lead down to a hopper, F, on the top of each machine. From the hopper the pulp falls upon an endless traveling screen, the upper half of which is inclosed in a rectangular box as shown in the illustration. Here it encounters two currents of air which are delivered by a rubber tube, E, and are admitted

at opposite ends of the box, one near the point marked H and the other at the lower end of the machine. The currents meet each other at right angles and the resultant wave-like action of the air separates the gold and the heavier portions of the pulp from the dust and lighter matter. The former settle on the slats of the screen and are carried around to the underside, where they fall off by gravity, or are detached by a light stroke on the screen arranged to fall automatically about twenty times a minute, as the screen slowly revolves. They are run off by spout, C, into a box, and form the concentrates. The rejections or tailings are delivered through the spout, D, at the rear of the machine, and fall upon an endless belt which carries them out to the dump.

The dust, which contains some gold in an extremely fine state of subdivision, is carried up by the pipes, B, B, to a larger transverse pipe which leads into a separate building of perfectly close construction. Here the dust settles and is subsequently subjected to a special treatment for recovering the fine gold which it contains.

Each concentrator has a capacity of ten tons a day. They are operated by Foos gasoline engines, a machine requiring one-eighth of a horse power. All the bearings are boxed and dustproof, and the parts are so well adjusted that but little friction or noise is created by their operation.

The best result was obtained from ore which assayed only $1.25 a ton in gold.

It yielded concentrates to the value of $879.17 a ton, a second test corroborating the first. This is a concentration of 700 to 1.

Another lot, assaying $1.90 per ton, produced concentrates which would amount to $87.80 a ton.

In this condensed form, the gold can be shipped away for final treatment without difficulty, and many mines which do not rank high enough to pay when the ore is passed through a stamp mill can be worked by this process.

Artesian Irrigation.

The results of irrigation the past season in South Dakota have been very gratifying, and demonstrate that the semi-arid portions of the State by this means can be made as productive as any part of the Northwest, says The Chicago Record. There are two distinct methods of irrigation in South Dakota—canals which receive their supplies of water from the spring freshets and from the overflow of rivers and canals, whose water is obtained from artesian wells.

The artesian basin underlies nearly the whole of that portion of South Dakota lying east of the Missouri River, and hundreds of artesian wells have been sunk throughout this vast region. In the southern part of eastern South Dakota there are numerous 2-inch and 3-inch artesian wells, which were sunk at nominal cost. Many of them are from 100 to 400 feet in depth. From 100 to 400 feet in the southern part of the State, the depth of the artesian basin varies to 1,000 or 1,200 in the northern portion. Some of the 2-inch and 3-inch wells in Hutchinson and other counties in that section cost less than $100, and furnish sufficient water to irrigate large tracts of land.

Further north it is necessary to go deeper to reach the artesian basin, and in consequence the wells are of greater diameter, varying from four to eight inches. Brule county has thirty-five such wells, whose combined flow aggregates many millions of gallons in twenty-four hours. A number of wells were sunk by the townships to supply water for stock, and cannot be used for irrigating purposes without the unanimous consent of the taxpayers of each township. The surplus of water is carried away in ditches and affords an abundance of water for cattle, sheep, horses, and other farm animals. These ditches of running water, aggregating several hundred miles in length, extend to practically all parts of the county. Other wells are used for power purposes, while still others were sunk for irrigating purposes only.

This season about 10,000 acres were irrigated in the county. Among the notable irrigated farms in Brule county are the Carpenter farm, belonging to W. O. Carpenter, a Chicago capitalist, and containing more than two sections of land, and the J. M. Greene farm of 640 acres. The owners are well satisfied with their success thus far, and next season will engage in irrigation on a still larger scale. The pioneer irrigated farm in eastern South Dakota is the Hunter-Salzer farm, which has been raised to a high state of perfection.

The farm contains 800 acres of slightly rolling prairie land. The artesian well has an 8-inch pipe down to sand rock. There the diameter was reduced, and a 6-inch pipe reaches to the artesian basin, 1,000 feet below the surface. The normal flow of the well is 1,200 gallons a minute, sufficient to irrigate a tract of 1,200 acres. As a matter of precaution, the well is not permitted to flow its full capacity, being reduced to a flow of 780 gallons a minute. The well was put down six years ago, and cost $3,500. At present prices it would cost not more than $3,000.

Adjacent to the well is a circular reservoir covering five acres. It is constructed on the highest point of the farm, at an elevation of 2½ feet. Three feet to the mile is found to be a sufficient fall for irrigating. The banks of the reservoir are formed by earth, thrown to a height of 5½ feet--22 feet wide at the bottom and 5 feet wide at the top. The inside of the wall thus formed has a slope of 2 feet to 1. The inside of the reservoir is riprapped with stone. The original cost of the reservoir, all work by the day, was $650. The cost of riprapping was about $600 in addition, as the stone had to be shipped in. Where the stone can be obtained on the farm or on adjoining land, an expenditure of $300 would suffice.

The openings from the reservoir into the ditches are two feet square. Each of the ditches follows ridges or slight elevations and the fields on either hand can flooded without difficulty. The ditches are 6 or 7 feet wide and 2 feet deep. When irrigation was in its infancy in this State, it was thought best to keep the ditches full of water all the time, but experiments on the various farms have proved this to be not only unnecessary, but detrimental to crops, the seepage furnishing too much water. After the adjoining land is irrigated, the water in the ditches must be kept below the level of the field.

The mode of irrigating which experience has demonstrated to be the best is to divide a field by throwing up lateral ridges. A break is then made in the main ditch opposite the land to be flooded, and sufficient water is permitted to run over the tract to thoroughly soak it. Then the break in the ditch is repaired and another made opposite the land embraced within the next set of lateral ridges, and so on. These ridges are low enough not to interfere in the least with the proper cultivation of the land. The principal thing is volume of water, and this is the chief advantage of the reservoir system.

One of the ordinary artesian wells, such as can be struck anywhere in the central portion of the State, east of the Missouri River, will fill a five-acre reservoir in eight days. During the irrigating season the reservoir would be emptied in about thirty-six hours. Still, the average well would irrigate from 1,000 to 1,200 acres, because it is customary to thoroughly soak the land in the fall, and when it is once saturated it takes very little water to keep it moist.

The ditches, when all the work is hired, cost about 35 cents a rod, but when once constructed it requires very little expense to keep them in good condition. On the farms under irrigation there are usually four of these ditches to each quarter section of land. The cost of the ditches would be about $224 for a quarter section or $896 for a section of land. The cost, where a farmer does the work himself, is very slight. Small ditches are used only when an odd-shaped piece is to be irrigated, or when the tract is detached or cut up by "draws" or lake beds. The small ditches are easily made, being a matter of plowing two straight furrows.

When the soil is once saturated to the blue clay, moisture will come to the surface fast enough to furnish plant life with all necessary sap. Too much water is fully as disastrous as none, and extreme care is taken not to injure land by wetting it too much. By the reservoir system one man, after he has become familiar with the topography of his fields, can irrigate twenty acres in five or six hours. If the ditches have to cross hollows, the low places are graded up and the water is carried along the top.

The benefits of irrigation are shown by the fact that in the central part of the State, wheat, without irrigation, yielded an average of ten bushels to the acre, while on irrigated fields it yielded from twenty to thirty bushels an acre. In the western part of the State, notably in Fall River county, where irrigation is carried on by means of canals with rivers as their source of supply, wheat averaged about twenty bushels an acre, while without irrigation it probably would not have yielded more than five bushels to the acre. Other crops have yield in proportion, and next season will witness a marked increase in the number of acres which will be irrigated.

New Devices for Deep Submarine Operations.

Hitherto the capacity of a diving dress for resisting the pressure of the superincumbent water has been the limit of man's activity beneath the surface of the ocean. This limit is about fifty yards, so that ships which have sunk in deeper water have had to lie unreclaimed with such treasure as they may have contained, because there existed no method by which a man could go to them. True, diving bells were available, but diving bells, even when made of timber and steel, are crushed out of all recognition of their original shape when let down a greater depth than that in which they are intended to work. Only a little while ago one of these structures was sent down in the waters of Lake Michigan for experimental purposes; and, when brought up, it was found that the steel work was bent out of all relation to its former form. Previously some of the timber of which it was in part composed had been splintered and rose to the surface of the water, the metallic mass remaining below. With a view, however, of resisting this pressure, some machines have recently been constructed to aid the submarine diver, and to enable him to go down to depths which he would not dare attempt in a diving dress, and could never expect to reach in a diving bell. Only a little while ago one of these structures was designed by M. Peatee del Pazzo, who has given his invention the name of the "Travailleur sous Marin," or "Submarine Worker." It consists essentially of a huge sphere of cast iron. On the top of this is a hand rail, in the center of which is a trap door, large enough to allow the workers to enter the bell. It is covered with oilcloth three inches thick, to adequately resist the pressure, so that it can sink to a distance of about five hundred and fifty yards, instead of the ninety which has hitherto been the limit imposed on an ordinary diving bell. The inside of the "submarine worker," which, it need hardly be said, is absolutely airtight, is the room in which the men live, and it is hermetically closed by means of screws before it is lowered beneath the surface. In front of this sphere is placed a powerful lens, enabling the operators to view the surrounding water. This lens is lighted by means of an enormous electric light stationed in immediate proximity to the bell and, like it, suspended from the ship above. This machine can be moved or shifted from one place to another by means of three screws regulated by the rudder, just as a ship is steered on the surface of the water. Furthermore, it is furnished with shovels, pincers and steel hooks fixed to the outside. These are all manipulated by the men inside, who can thus grip or seize any object and take it to the surface, and can even grapple with wrecked ships or parts of them.

It would, of course, be impossible for them to attempt to work outside in these great depths, for the pressure of the water would crush them as flat as the traditional pancake.

In order that the people in the "submarine worker" may be able to communicate with the outside world, a cable is attached to the bell. Along it run fine electric wires connected with a telephone, and this cable also serves to bring the bell to the surface when necessary. If, however, the cable were to break, no serious consequences would occur. The men inside the bell would neither die of asphyxiation after using up their supply of compressed air nor would the bell remain at the bottom of the ocean, or sink thither. All the men have to do would be to detach some bags of ballast with which the machine is furnished for the purpose of keeping it steady, when it would rise of its own accord to the surface.

Entirely different from this is the idea of a Swedish engineer. His apparatus consists of what may be described as a submarine telescope of gigantic porportions or a diving chimney—which latter is perhaps the better description, for it is a chimney which goes down into the water instead of up into the air. The resemblance to the telescope is, however, readily appreciated when it is stated that the chimney is made up of pieces which fit into one another, exactly in the same way as do the sections of a telescope, and it is lengthened in precisely that manner. Each section is about twenty feet long, and the largest, which is sunk to the greatest depth, has a diameter of fifteen feet. These sections diminish gradually upward until the smallest is only about half this diameter, and to it is attached an inverted bell-shaped mouth, which forms the entrance into the long tube. It is made of the strongest aluminum bronze, and of such a thickness that it can withstand a pressure of four hundred pounds to the square inch. The bottom section, which is, naturally, closed, is supplied with windows all round the circumference at intervals of about two feet, so that it offers opportunities for perfect examination of everything in the neighborhood on all sides. On each side of each window are attached rubber arms enabling the workmen within to fix grappling hooks and chains round about a sunken ship, for the chimney is designed especially for the purpose of enabling wrecks to be raised to the surface. Indeed, the passenger steamer "Soedra Scerige," which was sunk a couple of years ago in three hundred feet of water off the Swedish coast, has been recovered by the possibilities which the diving chimney has introduced, and she is now once more sailing on the surface of the ocean, none the worse for her submersion.—Pearson's Magazine.

THE Hospital extols the virtues of hot oil as more efficient than boiled water in sterilizing instruments, especially syringes. Olive oil at a temperature of 320° to 356° F. acts very quickly and with great power. To obtain complete sterilization of the instruments, it suffices to dip them for an instant into the hot oil, and in the case of syringes it is sufficient to fill them twice with oil at the temperature mentioned. The temperature of the heated oil may be determined by a thermometer, which certainly is the scientific way, but Prof. Wright, of the Netley Hospital, in England, suggests the very crude but rough and ready method of dropping a bread crumb into the oil, which becomes brown and crisp as soon as the required temperature is obtained.

Fluctuations in Rainfall.

A correspondent, in a recent communication to Nature, pointed out that the statistics of rainfall which have been collected in various parts of England for many years past show that there is a regular recurrence of cold and wet periods every thirty-five or thirty-six years, measuring from the centers of each period. The correspondent adds: "Curiously enough, other observations show the same rule to apply to many distant parts of the world as well. On the assumption that these fluctuations may be depended upon, the center of the next wet period should occur in the second decade of the coming century, but in the immediate future we should have a preponderance of dry years for some years yet to follow."

The subject being called to the attention of Prof. Draper, who has charge of the meteorological observatory in the Central Park Arsenal, he said he believed the statement made by Nature's correspondent to be at least approximately correct, and hazarded the guess that the correspondent is Mr. Symmons, who has charge of the British rain records, and receives results from 2,500 rain gages in the British Isles.

Prof. Draper produced records of the rainfall in New York from 1836 to 1886, and a chart which he had prepared from them. This chart shows a well-defined wave, beginning in 1836 far below the mean rainfall and rising slowly (with one violent fluctuation) year by year until it crept above the mean line. It continued to rise for a number of years, and then began to fall, going again below the mean line and remaining there more than ten years. The violent fluctuation spoken of was one from a total rainfall in 1836 of 27·57 inches—the lowest recorded—to one of 65·51 inches in 1837, the highest recorded.

Prof. Draper also has like charts of the rainfall at Washington, Philadelphia, and Providence, R. I., extending through a long period of years, which show results differing only in degree from those obtained in New York, and lead to the conclusion that the fluctuations vary with localities. He said that he had examined the French records for two hundred years and found only three decided fluctuations in that time.

The reason for these fluctuations in the rainfall, Prof. Draper said, is not known to man.

The Temperatures of Animals.

A number of interesting observations on the temperatures of animals in relation to the temperature of the air or water in which they live are described by Mr. Alexander Sutherland in the latest volume published by the Royal Society of Victoria. It is well known that the temperature of the human body in health is 97° or 98° Fah., and this is the same within a degree both in winter and summer. The average body temperature of what are known as warm-blooded animals is a little higher than this, being 100° Fah., and except in constitutional disturbances, this does not vary more than three or four degrees at any time of the year. No mammal, indeed, seems in good health to be warmer than 104°; scarcely any descend lower than 98°. The warm-blooded animals are thus animals whose temperatures, whether the weather be hot or cold, are practically uniform. On the other hand, cold-blooded animals have no proper temperature of their own; they are warm in warm weather and cold in cold weather. A fish, a snake, a frog, or an insect, when at rest, is rarely more than two or three degrees warmer than the air or water in which it is living. Mr. Sutherland placed some lizards in cold water, which was then gradually heated, and he found that in all cases the lizards became warmer as the water was warmed and cooler as the water was cooled—in other words, they depended upon external circumstances for their heat. But this is not absolutely true, for when angry, cold-blooded animals, like human beings, become hotter than usual, even a fish rising several degrees above the temperature of the water when it is exasperated. Under normal conditions, however, fishes and reptiles have practically the same temperature as the medium in which they live; when it is warm, they become warm and active, and when it is cold they lose their bodily activity and become torpid. The animals which are active in all weathers are those which are self-supporting as regards heat, and whose body temperatures vary very slightly. An interesting point brought out by Mr. Sutherland's observations of the temperatures of Australian animals is that the mammals which are classed lowest from considerations of body structure are not only of the lowest temperature, but also of the greatest range of variability, being most affected by the temperature of the air or water surrounding them.

THE MIRACULOUS WINEGLASSES.

BY W. B. CAULK.

As a rule, magicians are very generous fellows, always ready to give their audiences something, such as coins and handkerchiefs, but just when one thinks

THE MIRACULOUS WINEGLASS.

they have the gift safely in their grasp, it mysteriously vanishes. However, there are a few exceptions to this rule, one of whom is a very popular English performer.

This magician goes among the audience and borrows a gentleman's handkerchief, and immediately produces from it a glass filled with sherry. This he offers to the ladies, then, shaking the handkerchief, he produces a second glass full of port for the gentlemen, next one of ginger beer for the younger members, and one of milk for the very young, but there being present one or two teetotalers, he next produces a glass of water, and lastly a glass of stout for himself. All of these are pronounced by the audience to be excellent.

THE GLASS COVERED WITH RUBBER.

The glasses are of the small stem wineglass pattern. On both sides of the magician's coat, inside, of course, are large pockets, and in each pocket is placed in a prearranged form three of the glasses. To prevent a possible spilling of their contents (and, as each glass is filled to the brim, this would be very difficult), there is fastened over the mouth of each glass a thin soft rubber cap or cover, as shown in the small engraving.

To produce the glass, the performer spreads the borrowed handkerchief, which should be a large one, over his breast in such a manner that one hand is concealed under it, and with this hand he reaches in the pocket and brings forth the proper glass, removing the rubber cover and leaving it in the pocket. This move is repeated until all the glasses have been produced. After producing three of the glasses with say the left hand, he must spread the handkerchief so as to cover the right hand, leaving the left one free to manipulate the handkerchief, as it would be most awkward to try and produce the glasses from both sides of the coat with the same hand.

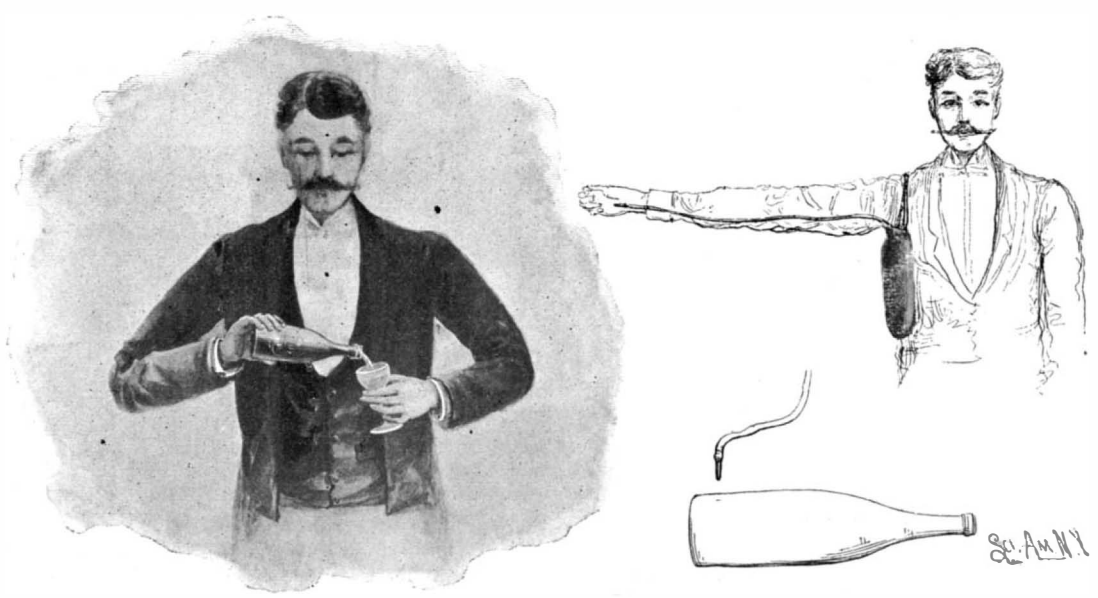
This trick is a most effective one, as the spectators cannot understand how it would be possible for the performer to conceal a glass filled to the brim, as these are, about his person.

After distributing the glasses, and offering an apology for his inability to treat all present, he pretends to overhear a remark that his audience is not satisfied, and that many think they have been slighted. He states that he will endeavor to comply with the demands of his thirsty audience, and retires to fetch a bottle. Off the stage he removes his coat and places under his right arm a rubber bag filled with wine. To the bag is attached a rubber pipe with a small metal point, which pipe he holds next to his right arm and replaces his coat, leaving the metal end just within the cuff.

The bottle has a small hole in the side, near the bottom, of such a size as to fit the metal point on the rubber pipe. In rinsing the bottle the performer keeps one finger over the hole, thus preventing the audience discovering that the bottle differs from an ordinary one. In rinsing the bottle the outside has become wet, and in drying it with a cloth the performer places the metal point on the rubber pipe in the hole in the side of the bottle, thus making connections with the bag of wine. By holding the bottle well down toward the neck, and close to his wrist, he can venture among the audience without fear of detection.

By pressing the right arm against his side the bag is compressed, forcing the wine through the pipe into the bottle.

The glasses are of special make and of very thick glass, making quite a bulky appearance, but of very limited capacity. An assistant carries a tray containing one hundred of the glasses.



THE MIRACULOUS WINEGLASS.

Material from Space.

Recent researches have gone far to render possible the assertion of Nordenskjöld and others that a large portion of the earth's constituents may be of cosmic origin—that, in other words, in the course of ages the distant stars and other heavenly bodies may have contributed of their substance to thicken the crust of our world. For example, at various times and in various places there has been collected from the snow a black powder containing metallic iron, and in some instances cobalt and nickel, while on the "inland" ice which covers Greenland a peculiar mineral powder, named kryokonite, mixed with grains of metallic iron, has been detected.

This dust consists of small, angular, double refracting crystal fragments, without any mixture of particles of glass, and is, therefore, very different from the glass dust that is commonly ejected from volcanoes. From these and similar data Nordenskjöld ventures on the assertion that not improbably, if this dust falls in an equal amount all over the globe—and though the snow enables it to be detected more easily than on earth, there is no reason for supposing that it does not—something like half a million tons drop from the celestial spaces in the course of a year. The shooting stars must discharge an immense quantity of those luminous particles. For hours at a time we see them falling; and when we remember that this has been going on during unnumbered geological ages, it is not impossible to regard it as an important factor in the history of our planet. In brief, it may be found that "a considerable quantity of the constituents of our sedimentary strata, especially of those that have been deposited in the open sea far from land, are of cosmic origin, and will throw an unexpected light on the origin of the fire hearths of the volcanoes and afford a simple explanation of the remarkable resemblance which unmistakably exists between plutonic rocks and meteoric stones, namely, by showing that the principal material of the plutonic and volcanic rocks is of cosmic origin, and that the phenomena of heat which occur in these layers depend on chemical changes to which the cosmic sediment, after being covered by thick terrestrial formations, is subjected."

Without quite homologating this idea, it is certain that meteoric or native iron is and has from the remotest ages been falling on the earth's surface from the immeasurably distant regions outside of our atmosphere.—Our Earth and its Story.

THERE were in 1801 only twenty-one towns in Europe with a population of over a hundred thousand.

Aborigines of the West Indies.

BY F. L. OSWALD, M.D.

The chronicle of the Spanish-American colonies during the first fifty years of the conquest has been justly called the darkest page in the history of the human race, but the portentous fact of the almost total extinction of the West Indian aborigines has led many historians to overrate the inhumanity of their taskmasters.

Many thousands of the helpless natives, it is true, were burnt, flogged to death, and torn by bloodhounds or shot down like wild beasts on the mere suspicion of a revolt; but many thousands also perished by suicide or succumbed to hardships that would hardly have affected the good humor of a Senegambian or Yucateco. At the end of the sixteenth century, when the plantations of the Spanish Antilles had mostly been stocked with imported slaves, the governors of Cuba and San Domingo made an effort to collect the scattered native refugees on government estancias, resembling the agricultural agencies of our Indian reservations; but the result of the experiment disappointed its managers, and the aborigines died on their own terms, the government having granted their request to let them choose their overseers and limit their obligation of community labor to three days per week.

The truth seems to be that the Lucayans, or natives of the West Indian archipelago, were a feeble race, and owed their independent existence only to the favor of wholly exceptional circumstances. The climatic advantages and productiveness of their island homes rivaled those of the Mediterranean coast lands in the golden age of the Juventus Mundi, and the historian Valverde sums up his description of the paradise regions of southern San Domingo with the remark that three hours of daily labor sufficed to support a family of colonists, whose list of necessaries included many articles unknown to the primitive Indios. The wilderness of their virgin woods had no terrors for the natives of the Antilles. There were no panthers in the coast swamps and no bears in the caverns of the Sierras; the fauna of the four larger and eight to nine hundred smaller islands included neither wolves nor wildcats, foxes, badgers, jackals or hyenas—the only mischievous mammal being a rodent about the size of a half-grown groundhog. There were, in fact, no predatory beasts whatever, and against men of prey the sea protected the unwarlike natives, as it had for ages protected the aborigines of Otaheiti and the harmless yam eaters of the Loo-Choo archipelago, where "swords were unknown and quarrels were settled by hands, rarely clenched."

Human brains do not develop under such circumstances, and the Spanish colonists did not hesitate to palliate their atrocities with the plea that their victims were a gente sin razon—creatures in the form but without the intellectual faculties of human beings.

Still, the Lucayans were probably the earliest settlers, if not the autochthones of the American Polynesia, and the few survivors of their race are by far the most interesting ethnological relics of the western hemisphere.

Highland valleys are the archeological curiosity shops of nature, and the largest settlement of primitive Lucayans is found in the uplands of the Cachos Mountains, on the border of Haiti and Dominica, and about twenty miles southwest of San Rafael. Thirty years ago, when Frederick Gerstaecker visited that part of San Domingo, the total number of full-breed Indians was estimated at two hundred ("forty families"), with some fifty or sixty half-breeds, the latter a most villainous-looking set of mongrels, and morally much inferior to the stolid but honest representatives of the original island race. And if the exigencies of the present campaign should involve an expedition to the interior of the province of Santiago de Cuba, our countrymen can study the habits of a similar tribe in the Sierra de Valcarras, between Las Tunas and Bayamo.

Some fifteen miles due south of Arroyo del Obispo ("Bishop's Brook") the country becomes mountainous and too rocky for agriculture in the civilized sense of the word, and for a stretch of two leagues the old overland road to Bayamo is bordered only by cliffs and sierra pines. But a few miles further south the valley widens, and here, at an altitude of some five thousand feet above the coast plain, a small pueblo of Lucayans has solved the problem of survival, having been tolerated, and now rather enjoying the good will of their Caucasian neighbors, like our North Carolina Cherokees near the headwaters of the Hiawasseo, or the aborigines of southern Europe in the Basque valleys of the Spanish Pyrenees.

The entire Indiada, or Redskin Roost, comprises some thirty English square miles, and few of the twenty-odd families ever stray more than a day's journey from their mountain refuge. They are poor, ten bushels per acre being about the maximum yield of their scattered maize fields, but their staying powers were developed by a process of artificial selection—those of their ancestors who ventured to visit their kinsmen in the coast lands having been snatched by the slave hunters, while those who stuck to their sierra survived and contrived to perpetuate their species.

For the first two hundred years after the discovery of the new world, that part of Cuba was visited only by prospecting miners. At the beginning of the eighteenth century villages sprang up, and coffee plantations spread along the valley of the Rio Valcarras; but by that time the planters had learned the superior value of imported peons and did not think it worth while to trouble themselves about the few Indios who lived in strict retirement in the fastnesses of a distant sierra.

The latter day creoles seem rather inclined to make pets of the poor highlanders. Their prejudice against the gente sin razon may not have diminished, but pure breed Lucayans have become extremely scarce, and the Valcarras specimens were tolerated, or even protected, as the Czar protects the small herd of urus cattle that roam the woodlands of Byalistock. They are now safe from slave-kidnappers and heretic hunters; but their survival to the end of the twentieth century is as problematic as that of our Seminoles in the uncongenial climate of the far West. Before the arrival of the Spaniards the native Cubans rather avoided the highland regions of the sierras, and their natural increase was very slow, though their sexual precocity was as remarkable as that of the Brazilian coast-dwellers. Girls of twelve years began to take an interest in the moonshine poetry of their male contemporaries, and two years after had, perhaps, subsided into the prosaic facts of nursery management; but prose and poetry soon yielded to the passion for smoking tobacco, and the eastern Antilles might have encouraged the missionary labors of the Russian Skopzis, who expect their converts to discontinue their matrimonial enterprise after the birth of the third child.

Edmond About remarks that no effort of friendly persuasion will induce Spanish Jews to engage in religious controversies. The terror of the Auto-da-Fé still trembles in their nerves, and it is almost equally difficult to get a Valcarras Indian to discuss the domestic economy of his little pueblo. To be ignored and left alone has come to seem a condition of existence to the descendants of a cruelly persecuted race. Still, it is known that they have organized a sort of oligarchy, and refer their occasional disputes to a committee of patriarchs, who make it a point of honor to recognize no higher court of appeal and would compromise litigation at the expense of their own scant resources rather than invoke the tribunals of the dread invaders. "No son Christianos"—they are no Christians, whatever they may call themselves, is the verdict of their Caucasian neighbors, though the canny highlanders avoid the consequences of that suspicion by rather overpaying their quota of tithes at the next village church and sending delegates to the processions of certain festivals.

For the rest, they give the valley dwellers a wide berth, and only in years of exceptional scarcity are apt to appear at a cross-road store with a cargo of charcoal or a few bundles of splint baskets. Besides corn, they raise sweet potatoes, melons, and frijoles, a sort of dark brown beans, and keep a few goats and pigs, but no cows or chickens, because, your guide will explain, the ownership of black cattle would be apt to involve an undesired imputation of prosperity, while deliverance from rooster shrieks appears preferable to eggs, even if poultry had a chance of survival against the myrids of hutia rats that infest the rocks of the sierra.

In primeval Cuba a frugal diet was Hobson's choice, and at a lower level of the terrace lands the descendants of the horticultural natives would probably prefer to season their food with vegetable fats (nut oil) and, under present circumstances, avoid a direct violation of the Mosaic interdict by feeding their dogs with pork and contenting themselves with a modicum of bacon fat.

In Jamaica and Porto Rico the aboriginal races were entirely exterminated within a hundred years after the arrival of the first colonists; and on only two of the medium sized islands of the neighboring archipelago a few Lucayans have contrived to elude the long continued raids of the slave hunters. A dozen families, scattered in a settlement of Mestizos, are subsisting on yams and marine products on the west coast of Inagua, some fifty miles north of San Domingo, and about as many a hundred miles further east, on Gran Cayo, at the southeastern extremity of the Bahama group.

Perhaps only a small minority of those islanders can be classed with the full-breed Lucayans, but their habits are supposed to be almost identical with those of their ancestors in the lowlands of the Antilles, and, judging from their characteristics, the West Indian natives seem to have been about the most unemotional tribe of the human race. They are taciturn, wear a breech-clout and an expression of chronic melancholy, and walk about as in a dream, listless and languid, averse to exertion even in their hours of recreation. Their papooses, like other young mammals, are frisky enough to indulge in an occasional game of romps or catch ball, but their elders never join in such frivolities, and sit in the shade, smoking in silence, till the boom of the evening tide summons them to a stroll along the beach.

Yet, perhaps, that economy of muscular exertion was likewise a condition of survival. No orthodox Mussulman abstains more strictly from animal food during the four weeks of the Rhamadan season than the natives of Inagua abstain from work during the four hours following the noon of a tropical summer day. They hang in their hammocks day-dreaming with half open eyes, often to the prejudice of their field crops, but not of their digestive prosperity. In spite of summer heat and stagnant atmosphere, their noonday meal is sure to be completely assimilated, and to that rigid observance of a long siesta they probably owe their total immunity from climatic disorders.

They work about two hours in the cool of the morning, then adjourn to the shade, to dandle their youngsters or engage in household chores of the pastime variety, till the clatter of wooden plates heralds the noonday meal. Then comes the long afternoon intermezzo. There is probably a little kitchen garden behind the cabin, and between cornchuck cigarettes the paterfamilias chews red pepper with an instinctive appreciation of its prophylactic value, and toward sunset beats Father Kneipp at his own tricks by sauntering barefoot through the surf of the summer sea.

England on the American Navy.

Although the achievements of our navy in the brief ninety days of the war speak for themselves and stamp the quality of our ships and men as second to none, it would be mere affectation to say that we are insensible to the instant recognition which our brilliant success has received at the hands of the English people. This recognition has been too instant, unanimous and altogether spontaneous for us to doubt for a moment that it represents the national sentiment.

It is well known that the ideas of the English people are reflected with great fidelity in their leading journals, and the following comments on the Santiago engagement will be of special interest. The Saturday Review remarked:

"It is impossible not to feel a certain pride in these achievements of men of our own race. Every Englishman, too, will remember that it was the possession of this same quality—the fine marksmanship which the Americans display—which gave us victories both on land and sea; and something peculiar and noble happened in this fight which showed in a far higher way the kinship between the two peoples:

"'Don't cheer,' shouted Captain Philip, 'the poor devils are dying!' It seems to us that this expression of tender, sympathetic humanity is just as fine as the 'Kiss me, Hardy,' of the dying Nelson."

In the course of a lengthy review of the fight, The Spectator said:

"The whole performance of Admiral Sampson's fleet was in accordance with the best traditions of the Anglo-Saxon navies, and every Englishman has read of their doings with a flush of pride. There was the same old, hard pounding as the Elizabethan seadogs used, the same curious mixture of steadiness, daring, coolness, and reckless dash. The moral aspect of what was almost the first and of what may be the last fleet action between the Spanish and English races is very much alike. In both cases it was the man behind the gun who, in the last resort, won the battle.

"The battle shows that the American navy is a most efficient fighting machine. We did not need to be told that here. We knew it already. They, however, did not know it on the Continent, though they apparently know it now. For ourselves we have little doubt that the Ameriean fleet could face even that of France without any great risk of disaster, in spite of the fact that, by the rules, the French fleet is ten times stronger. We believe this could be done if it were needful; but it won't be, as America won't be attacked by France without our taking a hand in the game. Sampson, Dewey, and the officers they have the happiness to command are able to destroy French ships of vastly superior power, just as we did a hundred years ago.

"As for the German and American navies, there can, of course, be no comparison. The Germans are fine sailors and brave men, but a naval struggle between the United States and Germany would be very short and very complete."

The Speaker remarks: "The greatest credit is due to the American navy for the manner in which this operation has been carried out. Like the exploit of Dewey, the sea fight at Santiago has proved that the British sailor has in his American kinsman a worthy ally and rival. So far as her fleet is concerned, America need not fear comparison with any country in the world."

It will be seen that the English people, who follow all naval operations and development with a feverish interest, have been quick to recognize that the secret of our success lies in our excellent gunnery. The estimate of our ability to face the French fleet, "ten times stronger" than our own, makes too much both of our own prowess and the numerical superiority of the French. Their fleet is not ten times nor even three times as strong as our own. If it be taken as three times as strong in ships and material, we agree with The Spectator that the personal element would probably, as in the last century, more than offset the difference.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TELEPHONE SYSTEM.—BURTON R. DODGE, Post Mill Village, Vt. This invention is a party-line telephone system by which any one of the several subscribers may sound a signal for a certain one of the remaining subscribers and, having signaled, this subscriber may converse without the intervention of a central office. The system has two metallic main leads and a number of stations. Each station comprises a talking circuit, a signaling circuit, and a telephone switch alternately closing the circuits. The signaling circuit has a ground-tap and a bell for signaling. A generator and a resistance are provided, the resistance being in parallel with the generator and in series with the bell. The talking circuit also has a switch to hold the resistance normally in the closed circuit and capable of throwing the bell into such circuit to the exclusion of the resistance.

Engineering Appliances.

VALVE.—EMILIO ZERTUCHE, Puebla, Mex. The purpose of this invention is to provide a valve designed to control the flow of a liquid and to arrest such flow at a predetermined period. The valve has an outlet tube with a valve-casing at its end tapered outwardly. Within the casing a valve is located. A valve-operating device moves longitudinally of the outlet and is arranged to engage the valve. This operating device is also arranged to engage the tapering surface of the casing, whereby this surface will form a stop for the valve-operating device. The tube is designed to act by gravity. When it is raised the valve is unseated and liquid can flow through; when it is allowed to fall, the valve is seated and the tube closed.

Miscellaneous Inventions.

DUST GUARD FOR CAR-AXLE BOXES.—JAMES S. PATTEN, Baltimore, Md. This invention is an improvement in that class of dust and oil guards in which two plates, having opposite concave edges, embrace a car-axle and are held in working contact therewith by means of suitably arranged springs. The dust-guard is formed by upper and lower alined sliding members. One end of a spring bears upon the upper member, the lower portion being attached to the lower member. An intermediate portion projects from the latter whereby the springs are adapted to press laterally on the guard.

WIRE-STRETCHER.—GEORGE M. DOYLE, Jonesville, Va. To provide a tool which may be operated with great power to stretch wire in either direction, which may be quickly and securely anchored to a post, and which may be utilized in uniting the ends of wire sections, this inventor devises a frame having longitudinal guides for the stretcher-bar furnished at its opposite ends with folding hooks and having at points near these ends rearwardly-projected offsets provided with spurs extended toward each other and having the hooks adjacent to the offsets. To the main frame a chain is secured at one end between the offsets and is arranged at its other end to engage the proper one of the hooks on the main frame. The stretcher-bar is movable lengthwise in the guides of the main frame, and has at its opposite ends the stretching hooks and between these ends a rack-bar. A stretching-lever is meshed with the stretcher-bar and operates the working parts.

MUSIC-BOOK HOLDER.—CALEB D. HALE, Alpha, Md. This music-book holder has two telescopic sections with guided longitudinal movement. The upper surface of the outer section forms a rest. At the outer end of each section a head is carried. Within the inner section and connected with the heads to draw the sections together, a spring is arranged. On each section a post is carried and on each post a lever is fulcrumed. At the outer end of each section and engaging the lever, a spring is supported which keeps the lever firmly pressed down upon the music.

COMBINED SLEIGH AND BOAT.—LEONARD WEBER, Roslyn, Wash. This combined sled and boat is provided with means adapted for propelling it either on land or on water. The runners of the sled serve also as floats or boats in the water and the propeller is adapted to work on or in snow and also in water. In the free space between two parallel floats, a shaft carrying propellers arranged at different points in its length is mounted. To the end portions of the shaft vertically slidable rods or hangers are attached. Levers and rods are provided for adjusting the hangers vertically. There are also means for connecting the rods intermediately.

KEYBOARD FOR TYPEWRITERS.—BATES TORREY, Weymouth, Mass. To promote convenience of attack or touch by the fingers, this inventor provides a keyboard in which the keys are arranged to conform with the anatomical structure of the hand, and in which the operator can locate the keys without the necessity of looking at the keyboard. The keyboard comprises right and left groups of keys, there being four rows of four keys each. The central keys of each row are elevated above the others on each side, so that the group presents an arch form. Each of the keys back of the front row is arranged diagonally to the one in front of it, and two supplemental keys are located between the two divisions of the front row and project forward to be used by the thumbs.

DEVICE FOR RETURNING TYPEWRITER CARRIAGES AUTOMATICALLY.—WILLIAM E. JACKSON, JR., Augusta, Ga. The improved carriage for typewriters provided for by this invention is so constructed as to be returned and the paper shifted for a new line, either by the carriage reaching the end of the line or by the operation of a shifting key. The invention consists essentially of a cylinder having its piston connected with the carriage, the cylinder being connected by suitable pipes having a valve therein with an exhaust chamber or reservoir from which the air is exhausted by any suitable means. The valve, which is located between the cylinder and the exhaust chamber, is connected to the ordinary mechanism of the typewriter, so that it will be opened by the forward movement of the carriage when it has reached the end of the line. It is also connected with a lever-key which may be operated by hand to return the carriage from any point. The carriage is also provided with a lever acting as a stop to check the carriage at the end of the return, and is connected with the paper feeding mechanism, so that the feed-roller is actuated thereby at the end of the return, thus feeding the paper the amount of spacing between the lines. The device can be applied to any typewriter without changing the mechanism.

TRACE-HOLDER.—GERHARD BAUMANN, Monmouth, N. J. The trace-holder provided for by this inventor comprises a socket fitting over the end of a whiffle-tree. Within the reduced outer portion of the socket and adjacent to a partition abutting against the tree, jaws are pivoted at their inner ends. The free ends of the jaws are curved and project normally through slots or openings in the front and the rear of the reduced outer portion of the socket. A spring inclosed in the socket engages the jaws to hold them normally projected in position through the slots or openings already mentioned.

DISPLAY CABINET.—FRANK E. HALDEN, Winthrop, Minn. To provide a cabinet especially adapted for the exhibition of laces, embroideries and the like, this inventor has devised a cabinet comprising a base and a top, a central fixed section from which the base and top are projected at the ends, and end sections hinged to the fixed section and adapted to close within the extended portions of the base and the top. In each of the sections at the front and at the rear, standards are secured. With the standards in the several sections supporting bars are slidably connected. For the supporting bars locking devices are provided. In each section of the cabinet convoluted racks are located and carried by the supporting bars for the purpose of receiving the material to be displayed.

CAN-OPENER.—FRANK E. GOWEN, Norrie, Colo. This can-opener consists of a base formed with concentric circles all in the same horizontal plane. A standard is mounted on the base and is provided with recesses on one of its side edges. A hand-lever carries the cutter, and is formed with an opening by which it is received on the standard to rest in any one of the recesses. A spring is secured to the lever, extends in the opening and is adapted to press against the side of the standard opposite the recessed side.

ENDLESS BAND OR CORD.—JEREMIAH H. MURPHY, Flatonia, Tex. The endless band or cord provided by this inventor consists of a number of tubular bands. Each band incloses in its central portion the ends of the adjacent bands, these inclosed ends meeting. The band is designed to combine great strength and durability, to prevent undue friction by having smooth joints, to reduce shrinkage or expansion to a minimum and to prevent slipping or breaking.

SHIRT.—PAUL SCHOEN, Glens Falls, N. Y. In order that the heat coming from the body may find a ready outlet, this inventor provides a shirt having its bosom formed of a backing of open mesh fabric and a series of independent plaits, each secured along one longitudinal edge to the outer surface of the backing and overlapping one another.

DEVICE FOR REMOVING PAINT AND VARNISH FROM SURFACES.—BENJAMIN F. AIKEN, Freetown, Mass. The purpose of this invention is to combine a burner, a tank for supplying the burner with fuel and adapted to serve as a handle, and a scraper whereby an implement or tool may be provided capable of being operated by one hand, if necessary, and of removing the loosened varnish or paint. The device comprises a reservoir to which the burner is connected, a filling plug removably connected with the reservoir and having a valve-controlled passage and a pump. This pump consists of an elastic bulb provided with a shank arranged for connection with the filling-plug. The shank has a passage adapted for communication with the passage in the filling-plug, the inner end of the shank serving as a valve to establish and cut off communication between the bulb and the reservoir.

BOX-FASTENER.—JOHN W. EVANS, Greenville, Mo. In order that a cover may be both removably fastened and hinged to a box, this inventor provides a transverse bar secured to one end of a box and extending horizontally therewith and forming a handle. A staple is driven in a recess in the upper surface of the bar and below the upper surface of the bar. A rigid pin projecting downwardly from the cover is bent downwardly and upwardly to form a hook which is adapted to fit snugly within the recess and to lock with the staple.

Designs.

PUZZLE BOX.—JOSEPH H. MCCARVILLE, Armah, Ia. The essential feature of this design consists of a box having longitudinal and transverse intersecting partitions forming chambers communicating with one another by passage-ways in the partitions. The puzzle consists in attempting to roll a ball through the various passage-ways without allowing it to enter any of the chambers.

ENVELOP.—ROBERT M. JOHNSON, Hainesport, N. J. The free edge of the sealing-flap in this envelop is provided at one end with a lip forming a continuation of the free longitudinal edge of the flap and meeting a corner of the body of the envelop at which the flap is attached. The envelop can be readily opened by lifting the lip and tearing the paper along the upper edge of the flap.

EAR FOR VESSELS.—THOMAS LOYND, Worcester, Mass. The features of this design consist in a base, neck and a head. The base is laterally elongated and the neck rises from the upper portion of the base between its ends. The neck is so curved as to extend at its upper portion beyond the vertical plane of the upper surface of the base. The head is in the same vertical plane with the upper portion of the neck and its upper portion is stepped, being formed with a vertical extension at one side and a convexed surface at the opposite side meeting the extension at its base. An opening there is, in the head below the point where the extension and curved surfaces meet.

WINDOW-CLEANER.—PAUL R. CUMMING, Kansas City, Mo. The leading feature of this design consists in a head delineated by two concentric segmental plates, one plate terminating at the sides in oppositely-inclined aprons and the other plate terminating in similar oppositely-inclined aprons. A filling is placed between the segmental plates and is provided with diverging skirt-sections. The filling is provided with corrugations on its outer face. For ready manipulation, a claw-handle is provided.

TRIMMING.—LOUIS L. RUPP, New York city. This design consists of a series of parallel-spaced strands interwoven with crossing strands and forming the body of the fabric. Festoons overhang the front of the first-named strands and interloop at their beginning with the crossing strands, the adjacent festoons crossing each other. Some of the festoons are plain strands, while the strands of others are wound spirally round a core.

ANTI-RATTLING PLATE.—CHARLES T. REDFIELD, Glen Haven, N. Y. In this design a tongue-like wing is deflected from the plane of the main or base portion of the plate. At one end of the base portion an upright flange is provided, having a notch in its upper edge. At the other end of the base portion an upright slightly-inclined wing is provided whose upper edge is bifurcated and furnished with lateral projections. The opposite edges of the base portion are curved nearly from end to end on lines simulating the line of beauty.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for 10 cents each. Please send the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

THE TWENTY SIXTH ANNUAL REPORT OF THE BOARD OF DIRECTORS OF THE ZOOLOGICAL SOCIETY OF PHILADELPHIA. Incorporated March 21, 1859. Read at the annual meeting of the members and loan-holders of the society. Philadelphia. 1898. Pp. 24.

PROSPECTING FOR MINERALS. A practical hand book for prospectors, explorers, settlers and all interested in the opening up and development of new lands. By S. Herbert Cox. With illustrations. London: Charles Griffin & Company, Limited. Imported by J. B. Lippincott Company. 1898. Pp. 239. Price $2.

The aim of this volume is to give a sketch of those subjects which underlie the calling of the prospector, and not encroaching to any extent upon the province occupied by the science of mineralogy and geology or the arts of mining and metallurgy. The work contains exactly the information which would-be prospectors are always asking.

CANADA'S METALS. By Prof. Roberts-Austen. London: Macmillan & Company. New York: The Macmillan Company. 1898. Pp. 46. Price 75 cents.

The present volume is an important lecture on the metals of Canada by one of the greatest mineralogists in the world. It will undoubtedly tend to make the mineral wealth of Canada better known.

PARTIAL REPORT OF WORK OF THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNIVERSITY OF CALIFORNIA. For the years 1895–96, 1896–97. Being a part of the report of the Regents of the University. Berkeley, Cal.: University Press. 1898. Pp. x, 455.

THEORY AND CALCULATION OF THE CANTILEVER BRIDGES. By R. M. Wilcox, Ph.B. New York: D. Van Nostrand Company. 1898. Pp. 108. Price 50 cents.

This volume replaces the original number of the Van Nostrand Science Series, bearing the title "Theory and Calculation of Continuous Bridges," by Prof. Mansfield Merriman, which was published in 1875. The continuous girder that was so extensively built in Europe prior to 1875 has now gone entirely out of use, except for revolving drawbridges, and the cantilever bridge has taken its place. Indeed, the modern cantilever bridge is simply a continuous girder with the chords cut—a form of construction which lacks most of the theoretical objections of its ancestors and at the same time possesses the very great advantage over simple trusses of erection without false work. The author is instructor in civil engineering in Lehigh University, and the book presents as clearly as possible the theory and methods of conducting calculations in the construction of the cantilever bridges.

PRACTICAL TOOL MAKER AND DESIGNER. A treatise upon the designing of tools and fixtures for machine tools and metal working machinery. By Herbert S. Wilson, M.E. Philadelphia: Henry Carey Baird & Company. 1898. Pp. 207. Illustrated. 8vo. Price, postage free to all countries, $2.50.

This book comprises modern examples of machines, with fundamental designs for tools for the actual production of work, together with special reference to a set of tools for machining the various parts of a bicycle, etc. A new book upon tool making has been needed for some time, and the author appears to have succeeded very well indeed with his task. Few tool makers seem to have a great experience in more than one or two lines of tools, and to become a general workman necessitates traveling from shop to shop, where various kinds of machinery is being built. This the author has actually done, and the present work gives the experience which he has gained. The intention is to publish methods, as this is far more important than detail, and the dies, jigs, special fixtures, etc., given in this book are intended for a groundwork for elaboration and variation according to conditions. The book is fully illustrated with well selected engravings and line drawings.

LIGHT AND FIRE MAKING. By Prof. Henry C. Mercer. Doylestown, Pa.

This beautiful pamphlet consists of extracts from an address made at various places by Prof. Mercer and forms a part of a series known as "Contributions to the American History of the Bucks County Historical Society." It is filled with interesting half tone engravings showing lamps and methods of lighting of all kinds and in all ages. The writer must indeed have a valuable collection. The illustrations of fire making are no less interesting than those devoted to lighting, the engravings of the latter being made from actual experiments, where the various methods of making fire are clearly shown.

INDUSTRIAL ELECTRICITY. By A. G. Elliott, B.Sc. London: Whittaker & Company. New York: Macmillan Company. 1898. Pp. 149. Illustrated. 18mo. Price 75 cents.

The present work belongs to the legion of books which attempt to deal in non-mathematical language with the many and various applications of electricity and does not call for special comment.

REVIEW AND BIBLIOGRAPHY OF METALLIC CARBIDES. By J. A. Matthews. Washington: Smithsonian Institution. Smithsonian Miscellaneous Collections, No. 1090. 1898.

LIGHTING BY ACETYLENE GENERATORS, BURNERS AND ELECTRICAL FURNACES. By W. E. Gibbs, N.R. New York: D. Van Nostrand Company. 1898. Pp. 141. 16mo. Price $1 50.

The literature upon acetylene in book form has been limited to a few French books of more or less value. The present work draws freely upon the French sources, but various American generators are not neglected, and the author's statements are interesting. All those who are working upon the problem of generators for acetylene gas will find this book useful.

THE PUBLIC CHARITY BAZAR FIRE. By E. O. Sachs.—NEW YORK FIRE DEPARTMENT. By Hugh Bonner.—FIRE-RESISTING FLOORS USED IN LONDON. By F. R. Farrel. London. 1898. Pamphlets issued by the British Fire Prevention Committee, Waterloo Place, Pall Mall, London.

The committee which issues these pamphlets is doing excellent work in disseminating information regarding faulty construction and the best method of preventing it, as well as detailed studies of fires and fire departments The subject is a very interesting and important one, and the literature devoted to it is nothing like as extensive as it should be.

YEAR BOOK OF THE SCHOOL OF ARCHITECTURE OF THE UNIVERSITY OF PENNSYLVANIA. Published by the Architectural Society. 1898. 12mo pamphlet. Pp. 64.

The present pamphlet is filled with plans and elevations showing how various problems are treated. The designs are excellent for the subjects proposed, but it is not at all likely that the young architect will have occasion to design a monumental "villa on an island," a "crematory," a "circular belvidere," or a "covered bridge in a park." Such designs are probably intended to bring into play the imagination of the student, but they are rather impractical. The book is beautifully printed and the half-tone engravings are excellent.

NESTS AND EGGS OF NORTH AMERICAN BIRDS. By Oliver Davie. Columbus, O.: The Landon Publishing Company. 1898. 8vo. 765 illustrations. Pp. 548. Price $2.25.

The text of the present book, which is the fifth edition of this work, describes the characteristic habits of the North American birds, with special reference to their nest, habits, and eggs. The illustrations are introduced simply to give the beginner an idea of the characteristic forms, etc., of the birds, together with their environments. The book will prove of particular value to a beginner.

HAY FEVER AND ITS SUCCESSFUL TREATMENT. By U. C. Hollopeter, A.M., M.D. Philadelphia: P. Blakiston's Sons & Company. 1898. Pp. 98 Price $1.

The author of this book may be regarded as a specialist in cases of hay fever; so that he is particularly well able to write concerning it. The work is nearly all devoted to the all-important point in this interesting disease—the successful treatment. A complete bibliography is appended.

ANNUAL REPORT OF THE UNITED STATES LIFE SERVICE FOR THE FISCAL YEAR ENDING JUNE 30, 1897. Treasury Department Document. 8vo. Washington. 1898. Pp. 512.

MEMORIAL OF ROBERT MCCORMICK. Being a Brief History of His Life, Character, and Inventions, including the Early History of the McCormick Reaper. Chicago. 1898. Pamphlet. Pp. 61.

THE TELEPHONE: OUTLINES OF THE DEVELOPMENT OF TRANSMITTER AND RECEIVERS. By William J. Hopkins. New York: Longmans, Green & Company. 1898. Pp. 83. Price $1.

In the introduction to this little book, Prof. Hopkins states that it "is offered without apology." It needs none. It has excellently treated the subject of telephones with the aid of those instruments only which have demonstrated their efficiency by long service. The book was primarily written for men engaged in practical telephone work, but it was the author's intention that his work should also serve as the basis for a lecture course to students. The book is, however, essentially a technical book and presupposes a general comprehensive training in mathematics and electrical science in general. The work is of particular value to telephone specialists, since it is the only book devoted entirely to the technology of transmitters and receivers.

"What Correspondence Instruction is and how it has Brought about an Improvement in Technical Books" is a neat little booklet which has just been issued by the International Correspondence Schools, of Scranton, Pa. It gives precisely the kind of information which prospective students are looking for. Often they do not know whether correspondence instruction is adapted to their needs or not. We think that this pamphlet will tend to enlighten them on the subject of education by correspondence.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

"U. S." Metal Polish. Indianapolis. Samples free.

Gasoline Brazing Forge. Turner Brass Works. Chicago.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Schwaab Stamp & Seal Co., Milwaukee. Send for cat'g.

Gasoline Engines and Launches. Free catalogue. Geo. H. Gere Y. and L. Works, Grand Rapids, Mich.

FERRACUTE Machine Co., Bridgeton, N. J. Full line of Presses, Dies and other Sheet Metal Machinery.

Valuable Canadian Patent for sale. Just issued. For particulars, address L. J. Bodenheimer, Hgh Point, N. C.

Improved Bicycle Machinery of every description. The Garvin Machine Co., Spring and Varick Sts., N. Y.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Bicycle, L. Petterson 607,075
Bicycle, A. Winton 607,106
Bicycle carrier, C. Eickemeyer 607,355
Bicycle gearing, N. P. Cobb 607,218
Bicycle gearing, V. Weber 607,149
Bicycle holder, Durfee & Williams 607,024
Bicycle lock, F. Stienen 607,142
Bicycle runner attachment, G. Sattler 607,088
Bicycle saddle, H. C. Phillips 607,191
Bicycle saddle, H. L. Schaffner 607,282, 607,283
Bicycle saddle adjusting device and spring, C. F. Webber 607,148
Bicycle seat post, G. W. Lord 607,181
Bicycle separable frame, B. F. Barnes 607,325
Bicycle stand, J. F. Bengert 607,330
Bicycle support, W. E. Hunt 607,395
Blind fastening, A. J. Curtis 607,220
Boiler. See Cooking boiler. Water tube boiler.
Boiler tube cleaner, E. F. Gwynn 607,169
Boiler tubes, device for removing scale from, E. F. Gwynn 607,168
Boilers, coupling nut for stand, F. V. Winters 607,316
Bolt heading machine, F. W. Bruch 607,157
Bookbinding, W. Boehner 607,012
Boom, C. O'Brien 607,269
Boot or shoe, F. McDonald 607,188
Boot or shoe stretcher, C. H. Prescott 607,192
Boot or shoe, ventilated, P. Stuyvert 607,289
Boring implement for frozen earth, E. H. Dyer 607,229
Bottle, U. O. Crane 607,345
Bottle stopper, L. A. Scholz 607,285
Bottle stoppering machines, automatic feed device for, N. Muslar 607,262
Box. See Feed box. Lunch box. Oil retaining box. Paper plant box.
Brace. See Ankle brace.
Brake. See Air brake. Car brake. Vehicle brake. Vessel brake. Wagon brake.
Brake beam, L. C. Burgess 607,016
Brush, W. & I. Wilkinson 607,105
Brush for screen doors, fly, M. Ackerman 607,206
Buckle, A. Lord 607,060
Burner. See Gas burner. Hydrocarbon burner.
Butter mould, M. Pfening 607,128
Caddy, grocer's, C. M. Symonds 607,198
Calipers and dividers, J. E. Taulman 607,296
Can end crimping machine, J. F. Neilson 607,266
Car brake, E. C. Nichols 607,069
Car coupling, W. H. Bonwell, Jr 607,334
Car coupling, J. O. Marks 607,183
Car fender, W. H. Martin 607,118
Car replacer, T. Maroney 607,256
Car seat, step over, C. K. Pickles 607,414
Carrier. See Bicycle carrier. Parcel carrier.
Case. See String case.
Cask or barrel manufacturing machinery, B

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Handle. See Tool handle.
Harrow, A. V. Ryder 607,278
Harrow, riding and folding, J. H. Ayrhart 607,008
Harvester attachment, W. M. Wadleigh 607,099
Harvester, reaper, etc., W. M. Wadleigh 607,100
Hay rake and baling press, combined, T. Caswell 607,216
Heel cutting machine feed, A. A. Hudson 607,041
Heel for boots or shoes, cushioned, J. A. Safford 607,086
Hinge, Jones & Dearborn 607,050
Hinge, detachable, E. J. Blekkink 607,156
Hoe and edge trimmer, combined, C. H. Purdy 607,273
Hook, J. L. McVay 607,123
Hook and eye fastening hook, B. F. Orewiler 607,189
Horseshoe, expansible, L. P. Touchet 607,199
Horseshoe pad, C. Sheather 607,196
Horseshoe, soft tread, J. Patrick 607,190
Hub, C. W. Robinson 607,082
Hydrocarbon burner, A. P. A. Rosenstar 607,136
Indicator. See Station indicator.
Infusions, means for making, J. S. Dunlap 607,352
Injector, W. A. Downes 607,227
Inner soles, appliance for making, A. Seaver 607,396
Insulator, C. L. Wingard 607,315
Internal combustion engine, G. L. Woodworth 607,317
Iron. See Sad iron.
Jug lid, L. F. East 607,354
Key fastener, King & Burns 607,381
Kiln. See Charcoal kiln.
Kitchen utensil, combination, D. L. Falardeau 607,409
Kite, S. A. Potter 607,129
Knitting machine needle, R. L. Lyons 607,253
Ladder, cornice, J. W. Anderson 607,323
Lamp, W. P. Crary 607,162
Land roller and pulverizer, M. Miller 607,186
Laths, machine for making sheet metal, G. A. Ohl 607,071
Laying out or lining device, H. M. Burnett 607,158
Lens cutting machine, J. J. Bausch 607,009
Letters, etc., safety device for, Young & Macdonald 607,319
Life preserver, etc., E. E. Roussel 607,137
Lock. See Bicycle lock. Seal lock.
Locomotion, electric, H. Van Hoevenbergh 607,302
Locomotive boilers, device for retaining heat in, P. Miller 607,066
Loom, Gillet & Rutter 607,360
Loom shuttle supporting mechanism, M. Saile 607,087
Loom temple, G. F. Hutchins 607,377
Lumber stacker, W. R. Carroll 607,214
Lunch box, E. E. Swift 607,294
Mail bag fastener, J. Howells 607,375
Marker, corn row, W. M. Douglas 607,021
Marking attachment, S. W. Lane 607,248
Meat hook support, F. Thacher 607,096