SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter.. Copyrighted, 1893, by Munn & Co.]

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

Vol. LXIX.—No. 22. ESTABLISHED 1845. | NEW YORK, NOVEMBER 25, 1893. | $3.00 A YEAR. WEEKLY.

ELECTRIC LAUNCHES AT THE COLUMBIAN EXPOSITION.

No electrical feature at the World's Columbian Exposition was entered upon with more uncertainty than the introduction of electric launches on the lagoons, as up to this time such launches had not been made use of in this country except in an experimental way. In spite of these uncertainties, however, the launches were among the first electrical features that were ready and they have fulfilled their requirements during the entire period that the Exposition has been open, with gratifying results, carrying over one million passengers and earning $314,000.

There are fifty of these launches that did service for the public, all of the type shown in our first page illustration. Each boat is 35 feet 10 inches over all in length and 31 feet 6 inches on the water line. The beam is 6 feet 2½ inches and the draught 27 inches. The lines are as near perfection as they well can be. At whatever rate the launch runs there is practically no wake, so that the wash on the shore, even in such narrow waterways as the lagoons, is of no consequence. The hulls of these boats were constructed of white oak frames, with white cedar planking. The inner paneling, decks and other parts are of mahogany. All the woodwork is finished in its natural color, thus giving a very rich appearance. Cut No. 4 shows the launch complete, with the pilot in the forward end controlling the supply of electricity and steering. The passengers are scattered about, the full seating capacity being 30 people. Cut No. 5 gives an idea of how the launches looked when laid up. Their berths were at the southeastern corner of the Agricultural building, in the South Pond, 30 boats being on the left in the picture and 20 on the right. When the boats were to be charged they were laid up here, and whenever a boat needed repairs it was hauled up in its berth. The charging was all done at night, so as not to interfere with regular trips during the day.

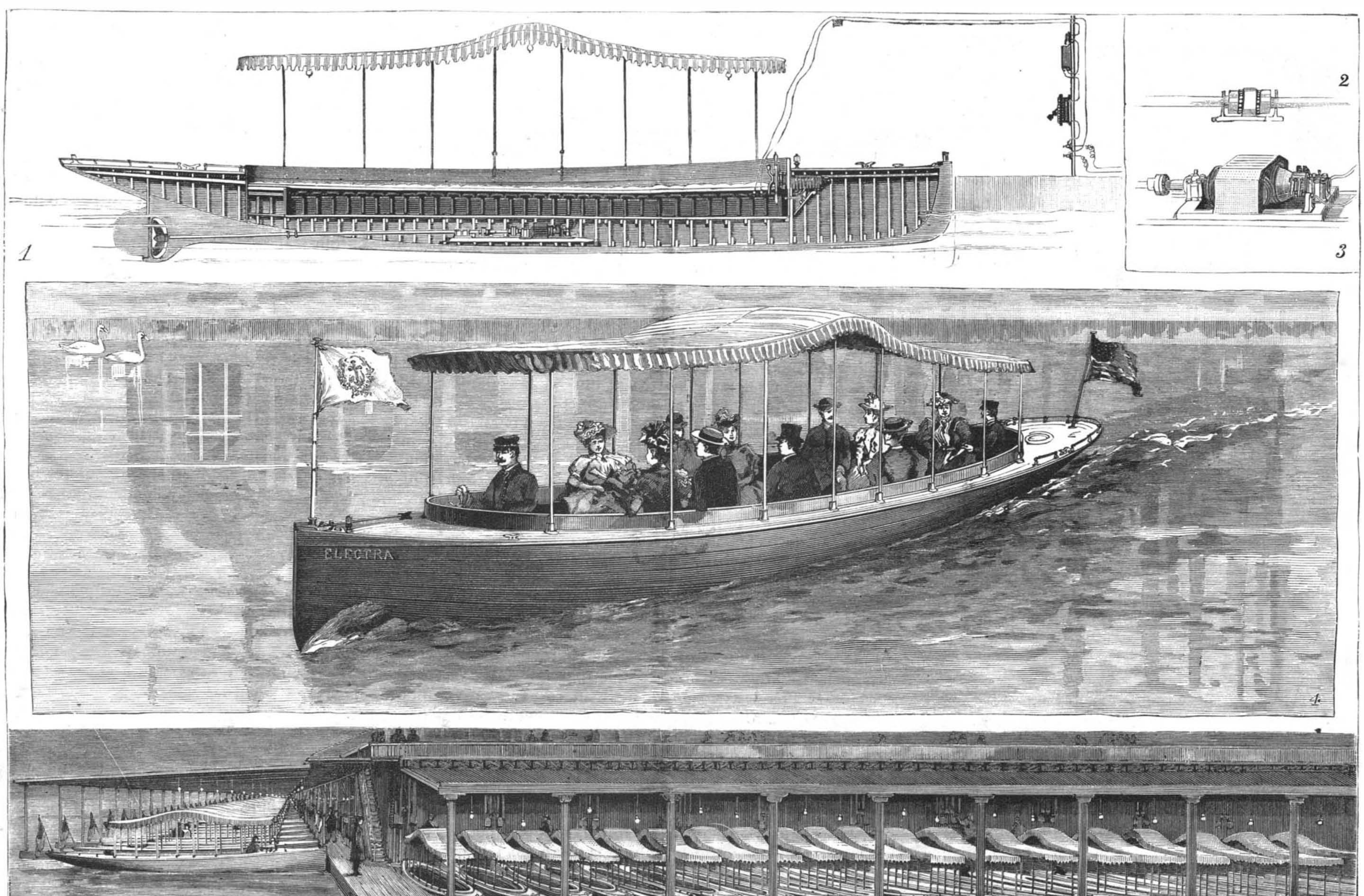
Cut No. 1 gives a sectional view of a launch. It will be noticed that the motor is placed low down and in the center of the boat. This motor was designed and made especially for this use by the General Electric Company for the Electric Launch and Navigation Company, whose offices are at 44 Broad Street, New York City, which holds and owns the patent rights for the launches.

The motor is protected by a box which rises flush with the main deck of the boat, and is so set that all working and wearing parts can be readily reached. The storage batteries are placed around the sides of the boat, under the seats and entirely out of sight. The motor is nominally of four horse power, and is coupled direct to the propeller shaft. The type of this motor is shown in cut No. 3, while cut No. 2 illustrates the thrust ball bearing in which the shaft runs. By this combination of direct coupling and thrust bearing, all gearing and loss of power, as well as unnecessary noise and jar, are done away with.

The batteries used are of the Consolidated Electric Storage Company's type, of 150 ampere hours' capacity. Each boat has 66 cells, and these cells can be arranged in three groups of 22 cells in series or in two groups of 33 cells in series. Several improved devices have been brought out to adapt these cells to this use, so that there shall be no danger of the liquid spilling or of the efficiency of the cells being unnecessarily impaired. The cells are readily charged. The manner in which this is done is shown in the illustration. A charging station can be fitted up at little expense, and there is probably no lake, river, or harbor in the country with sufficient water to float a launch where such a station could not be readily had. A current of 18 amperes per group is the one generally used to charge after a run of fifty or sixty miles at nominal speed, and from six to seven hours time is required. In case of necessity, however, a current of 30 amperes can be used, when the batteries can be charged in four or five hours. The plant which provided the current at the Exposition comprised a direct current shunt-wound Edison generator, giving a current of 110 volts. Any form of electric energy, however, arc or incandescent, can be used. Even when only an alternating current is to be had, a charging station can be arranged with not very great expense. When the station is once completed, all that is necessary is to connect the charging wires to a set of binding posts on the boat, as shown in the illustration, and turn on the current.

The operation of one of these boats is exceedingly simple, as shown by the experience of the Electric Launch and Navigation Company at the Exposition. Not one of the pilots or guards that managed the fleet had ever before handled an electric launch, yet they experienced no trouble whatever from the first. The control is by means of a small lever switch at one side of the steering wheel, which is located in the forward part of the boat. This lever allows of four speeds forward and two backward. The nominal speed at which the boats are run is from six to seven miles an hour, but they have a reserve speed of from eight to ten miles. At the ordinary speed the launches at the Exposition have been in constant use from twelve to fourteen hours a day on one charging, and the cost of this charging has never exceeded sixty cents per day per

(*Continued on page 343.*)



ELECTRIC LAUNCHES AT THE COLUMBIAN EXPOSITION.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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 belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

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 to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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 within Postal Union, *eight dollars and fifty cents a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

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, NOVEMBER 25, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 934.

For the Week Ending November 25, 1893.

Price 10 cents. For sale by all newsdealers.

MORE ENGINEERS NEEDED FOR THE NAVY.

The annual report of Geo. W. Melville, Engineer-in-Chief, Chief of Bureau of Steam Engineering, shows that the repairs of machinery and steam vessels during the past year have cost something over $600,000. The lack of competent engineers to man the rapidly increasing number of war vessels has become a serious matter. On the active list there are only 180 commissioned officers in the engineer corps, namely, 70 chief engineers, 66 passed assistants, and 44 assistants.

The chief says: "Unless something is soon done, our navy, now practically an engineering one, will be crippled for want of engineers.

"This question of the sufficiency of engineers in the service is one of paramount importance, and no other, if left in abeyance, will so vitally affect the efficiency of the navy as a fighting organization. It must be remembered that the efficiency of the modern war ship, either as a fighting machine or as a commerce destroyer, depends wholly and absolutely upon her machinery, and the efficiency of this machinery upon the skill of her engineers, and upon the diligence exercised by them in its care and management. Be her armor and armament the most powerful and her commander the most capable and intrepid, if her machinery fails, she is helpless, and no amount of seamanship and gunnery will avail against the enemy.

"Were the navy a mercantile concern, the present state of affairs would not last beyond the time necessary to change it, for men with capital invested in machinery see to it that there is a force sufficient to keep it in proper maintenance; and surely if business people find such a course economical, the government cannot do better than follow their example. The value of the naval machinery now owned by the government and in process of construction is about $24,000,000, and it has now come to the point where Congress must decide whether it is more economical to properly care for this machinery and keep it always in an efficient condition or to let it run as long as it will and then replace it, taking meanwhile the risk of having it fail when most needed. As an illustration of the increased work thrown on the members of the engineer corps by the acquisition of the new navy, I can state that the New York has added 17 per cent to the horse power of the machinery of vessels in commission; the Columbia will add 17·3 per cent more; and when the ships now authorized and building are finished, the horse power of the propelling machinery of the navy will have increased to nearly *two and a half times its present amount*—and yet we are asked to run it with the same number of engineer officers that we now have.

"The officers of the engineer corps at sea on the new vessels have altogether too much work to do now, and it is merely a question of time before the strain will tell. The result of this hard work is being seriously felt; retirements are increasing, and the government thus subjected to an expense greater than would be involved in now granting a fair increase of numbers, while some of those who manage to complete a cruise in one of the high-powered ships only await a favorable opportunity to resign. Many of our young officers who have resigned to accept lucrative and responsible positions would have preferred to remain in the service if they could have seen any chance of advancement in it."

THE COLUMBIA, THE NEW COMMERCE DESTROYER.

The new American navy has become a popular subject with the people at large. The records of the trial trips are given place in the papers, and much congratulation is expressed over the results obtained. Yet the fact is apt to be forgotten that a few hours' run of a new ship under the most favorable auspices does not tell what she will do in the service. To-day no satisfactory method of keeping an iron ship's bottom free from barnacles and seaweed is known, and the slightest deposit reduces speed. The duration of the engines and boilers under service conditions is problematical. The warship certainly seems to deteriorate or to develop weakness in her boilers or machinery in very short periods.

From the old sailing vessel, through auxiliary steamships, the development has at last brought us to triple screw ships without sail power enough to be of more than the slightest service. It is perhaps true, as ex-Secretary Tracy says, that we have in the Columbia, New York and Olympia three ships unapproachable in good qualities. But admitting this, the question has to be answered of how long these ships will retain their qualities. Will they hold their present efficiency for years, or even months? Time and repeated speed trials can alone show this.

An attempt was made on Thursday, November 16, to subject the new cruiser Columbia to an official trial over a 44 knot course. Buoys were placed along the course, vessels were anchored near each buoy, and the ship started on her trial run. On the trip from Philadelphia to Boston, she had already shown very high speed. On attempting the trial, however, the sea was so high that the buoys were displaced, and the attendant vessels could not lie at anchor, so the trial was abandoned. Sufficient, however, was done to show that the vessel does possess very high powers, reaching a rate of speed, for a short run, from 28 to 29 statute miles an hour. This speed of course she could not long maintain, but for a ship of her size to reach it was very extraordinary. Not only was her rate of travel very high, but the Columbia is designed to have a very long radius of action, being able to steam around the world without recoaling.

While the above sounds very satisfactory, and the ship is apparently a triumph of American construction, experience has shown that it is not safe to judge a war vessel from these trials. A vessel designed for use as a warship, when put in charge of the navy and kept in such service, never is able to hold her original record. The English government has all its ships of war rated, each one at its specific speed, but it has time and again been shown that the rating is far too high, and the ships, owing to deterioration of the propelling apparatus or to marine growth on their bottoms, always show a greatly reduced speed.

The Columbia is built for a commerce destroyer. She may be able to run away from any heavy fighting ship. In war her competitors would be the fastest ships of the British navy. Among these, at present, are the reserve ships Campania and Lucania, of the Cunard line, ships which day in and day out maintain speed approximating to the highest obtainable by the Columbia on her trial trip, ships which from the conditions of their service are always kept in the best possible condition for instant service. Each regular trip consists of a run of some 3,000 miles, in which runs a gain of five or ten minutes over the record is eagerly striven for. It is not improbable that the Columbia, driven under forced draught, straining every fiber under the action of the machinery, stripped and in the most perfect condition for a few hours' run with selected coal, will earn for her builders a premium of $400,000. After all this she will not have been properly tried. She should be manned with a crew from the American navy, she should be coaled under ordinary conditions of quality of fuel, and her trial course should be the same as that of the Cunard ships or of the German or American line vessels—the course of about 3,000 nautical miles across the ocean. Then we could establish her true rating, and the trial would show whether she could compete in war with the Lucania and Campania, with the Furst Bismarck or the Paris. In the present system of trial trips everything is subordinated to making the highest possible speed over the short course of forty to fifty miles.

While her trial has been in progress or preparation, Mr. Charles H. Cramp, of Philadelphia, who represents the firm which built her, presented before the Society of Naval Architects and Marine Engineers of this city a paper on the "Evolution of the Atlantic Greyhound." In about a year the two ships of the American line built at the Cramp yard will be in commission. In them he proposes to go back to the old American idea of high initial stability and make ships which will stand on their own bottoms without the use of 1,000 tons of ballast. These ships will be in continual service and will be driven at full speed under the regular conditions of their work. In such vessels as these enrolled as a naval reserve would seem to be the greatest hope of our navy for the really efficient commerce destroyer.

A Singular Balloon Accident.

A Rome correspondent of the London *Daily Graphic* says: Captain Charbonnet and his wife recently met with an extraordinary balloon accident in the Alps. Captain Charbonnet was a well known Italian aeronaut. He was recently married in Turin, and, in accordance with a previous decision, the couple set out immediately in a newly constructed balloon—the wedding present of the bridegroom to his bride. Their intention was to spend their honeymoon in making a series of aerial trips across the Alps. They were accompanied by a male friend named Giuseppe Ponta. The first day's trip proved successful. On the following day, however, when near the Cairainella Peaks, the balloon was caught in a hurricane, dashed violently against a glacier, and broken up. Strangely enough, the occupants escaped this mishap with trifling injuries. The balloon, of course, was useless. The unfortunate trio remained on the snow and ice until the following morning, when a descent of the mountain was attempted. It was during this descent that Charbonnet lost his life, disappearing suddenly in a crevasse. His unfortunate wife and Signor Ponta, who were forced to spend the rest of the day and the following night on the mountain, suffered terribly from the cold. Signor Ponta fell and sustained serious injuries, Signora Charbonnet having thus to make her way alone. She managed at length to reach a mountaineer's hut. Here, acting upon her instructions, a party of men discovered Ponta and brought him safely back. The remains of Captain Charbonnet were recovered on the following day. Two days later Signora Charbonnet and Signor Ponta were sufficiently recovered to be removed to Turin.

Natural History Notes.

Discovery of an Egg of the Æpyornis.—A large specimen of the egg of the fabled "roc" of the "Arabian Nights," or *Æpyornis*, as the extinct gigantic bird of Madagascar is called, has recently been secured by Mr. J. Proctor, of Tamatave and London. It was discovered by some natives about twenty miles to the southward of St. Augustine's Bay, on the southwest coast of Madagascar. It was floating on the calm sea, within twenty yards of the beach, and is supposed to have been washed away with the foreshore, which consists of sandhills, after a hurricane in the early part of the year. The child-like longshoremen of the antipodes, thinking that the egg might have a value, showed the unusual piece of flotsam about, with a view to the sale of it, and it thus came into the hands of Mr. Proctor, who has brought the curiosity to London. The egg, which is whity-brown in color and unbroken, is a fine specimen, 33½ inches by 28 inches, and an even higher value is placed upon it than upon the egg of the great auk, which lived within the memory of man. The Brobdignagian proportions of the egg are better demonstrated by comparison with the eggs of the ostrich and crocodile. An ostrich's egg is about 17 inches by 15 inches, and the contents of six such are only equal to one egg of the *Æpyornis*. The measurements of the egg of the crocodile are normally 9 inches by 6½ inches. It would require the contents of 16½ emu's eggs to equal the contents of this great egg, or 148 eggs of the homely fowl, or 30,000 of the humming bird. The last egg of the kind disposed of in London sold for £100, though cracked.

A Plant with Anomalous Position of Flowers.—In the *Journal de Botanique* for July 1 and 16, Mr. Hua describes, as a new genus, a plant from west tropical Africa, in which the flowers are borne along the midrib on the back of the leaf. This anomalous position of the flowers is only of rare occurrence, appearing in a few almost or quite monotypic genera, such as the Japanese *Helwingia* of the Araliaceæ, the saxifragaceous *Phyllonoma* of the New World, and *Polycardia* (Celastrineæ) from Madagascar. The common lime recalls, in a small degree, the same phenomenon, the stalk of the inflorescence adhering to the lower part of the bract and appearing to spring from the middle of that organ. Tropical West Africa boasted already two genera with epiphyllous flowers, both belonging to the family Bixineæ, and *Mocquerysia*, the new one established by M. Hua (named after its discoverer, M. Mocquerys) resembles these in some points, and is placed by its author in the same natural order.

Fishes at High Temperatures.—Dr. Lawrence Hamilton has recently forwarded to *Natural Science* some interesting statistics that he has collected in reference to the existence of fishes in water of a high temperature. Some of the cases are very striking. Spallanzani, it appears, observed river carp living at a temperature of 106° F., and exhibiting no signs of uneasiness, though at 109° they began to struggle, and died at 116° F. Dr. John Davy (1835) showed that the bonito had a temperature of 99°, while the water of the Mediterranean, in which it was, had only a temperature of 80°. Saussure stated that he found eels in the hot springs of Aise, in Savoy, at a temperature of 113° F. In 1882, Dr. Davy found that water at 85° F. killed trout by convulsions. A trout and a minnow were put in water at 70° at night, which by the next morning had sunk to 67°, when the trout was dead, though the minnow had not suffered. A salmon parr at 80° became convulsed and torpid, dying at 84°. Several fishes were deposited in water at 53° F.; the temperature of the water was gradually raised, and none showed signs of failing vitality till the thermometer rose to 82°, when the perch became prostrated, roach succumbed at 82½°, salmon at 83°, minnow at 85°, gudgeon at 85½°, dace at 86°, tench at 88°, and carp at 91°. Brandy restored all the fishes except the dace, which died.

In India fishes at noon day in their natural water remain in health at 92°; at 4 P. M., 86°; and at 6 P. M., 82°. Gunther states that cyprinodonts live in briny springs even at a temperature of 91° F.

Sir Emerson Tennent collected the following observations, which seem to require further proof or verification:

In the hot springs of Ceylon, living carp, *Nuria thermoicus*, at 114° F.; members of the perch family, the *Apogon thermalis*, and the *Ambassis thermalis*, in water at 115° F.; a roach, *Leuciscus thermalis*, at 112° F.

In a hot spring at Pooree (in the province of Bengal), with the thermometer in the water standing at 112° F., carnivorous fishes have been discovered, which would indicate that these must have found and fed on living prey at the same high temperature. Further accounts, moreover, declare that in hot springs in Barbary, in North Africa, living fishes have been taken in water at 172°, while in Manila (one of the Philippine Islands) in water marking 187° F. While traveling in South America, Humboldt and Koupland stated that they saw fishes thrown up alive from a volcano in water at 210° F., but this is, of course, an absurdity which nowadays, it is to be hoped, no one will believe.

Rudiments of a Pouch in Placentals.—If ordinary placental mammals have evolved from pouched animals like the modern marsupials, rudiments of the pouch ought certainly to be recognizable in some of them. Dr. H. Klaatsch has just made the interesting announcement that such rudiments can actually be observed in most placentals. Something of the kind has already been found in the lemurs, and one author has supposed that rudiments of the pouch can also be detected in the sheep. The detailed account of Dr. Klaatsch's extension of the evidence will be awaited with interest.

Color Assimilation among Fishes.—We already know a good deal about this, says Mr. James Hornell, in *Natural Science*, especially among the flat fishes; so the following instances but go to swell an already long list. Still, these are so striking as to be worthy of permanent record.

Two tanks were used for experiment, one with dark background and bottom, well shadowed; the other bright, with a white mottled sand bottom. Several of the marine stickleback (*Gasterosteus spinachia*) were placed in each. To sum up the result briefly, those in the dark shadowed tank remained practically unchanged in color, but those in the light colored tank had in greater or less degree lost their brightness and intensity of coloring. The beautiful gold bronze luster so characteristic of these sticklebacks was lost, and the backs were mottled black and white, contrasting strangely with the nearly unbroken yellowish black of the dorsal surface of their friends in the dark tank.

In the dark tank had also been placed a number of wrasses (Labridæ), and these showed fading all round, most marked in the bright greens and scarlets. As these colors are usually in combination with brownish marking, the fading of the bright hues meant a close approximation to the brown appearance of the bare conglomerate forming the rockwork of the tank. One fish especially beautiful at first (of a most brilliant scarlet and brown) faded to a dirty combination of pale olive green and brown, scarcely recognizable had the fish not been marked in a distinctive manner at the beginning of the experiment. The whole of these color changes were effected within the remarkably short period of a week.

It may be that these instances of color assimilation carry the key to the problem of color variation or rather mimicry in the prawn *Hippolyte* (*Virbius*) *varians*.

Plaice (*Pleuronectes platessa*) have also shown rapidity of color change much more marked than I was prepared for. Some that were placed in a large shallow tidal pond where the color of the bottom varies considerably and where a portion is often in deep shadow, show change from a uniform gray to a well marked and intensely dark blotched appearance within a few seconds. Indeed, it is quite chameleon-like, so quickly is the transformation effected. In ordinary tanks, where the light and color of the sand are stable, the plaice soon take the exact coloring requisite, and retain it without alteration so long as they remain in the particular tank.

The Sense of Smell in Fishes.—It is well known that the sense of smell in fishes is very keen, and that all use it more or less in feeding, whether or not sight aids them in the process. Some further experiments on the subject have been made by Mr. Gregg Wilson in the Plymouth Marine Biological Association, and the following observations from his recent report to the British Association will be read with interest:

"So far as I could determine, fish that are not *very hungry* habitually smell food before taking it. The pollack seems usually to be ready for a meal, and on almost all occasions when anything eatable is thrown into the tank in which it is swimming it rushes toward it and bolts it. It does not hesitate to take stale food or food that has been steeped in strong smelling fluids; and time after time I have been amused to see its too-late repentance, after it had swallowed clams that had been saturated with alcohol, chloroform, turpentine, etc. It is only when it is satiated with fresh food or disgusted with what is nauseous that it takes the precaution to smell before eating. On the other hand, various fish that are equally keen-sighted, and habitually recognize their food by the use of their eyes, are more prudent. The whiting (*Gadus merlangus*), for instance, appears to pay much more attention to smell, and, as a rule, turns about and withdraws on approaching within a few inches of high-smelling objects that the pollack would take without hesitation. Even whiting, however, cease to be delicate if they are very hungry, and if other fish are present to compete for the food that is thrown to them. In such circumstances bait that is very distasteful may be taken by even the most cautious of sight feeders; and likewise, in such circumstances, a quite smell-less artificial bait may be successfully employed. Where large shoals of fish are, there are likely to be many that are very hungry, and the consequent keen competition will lead to hasty feeding by sight alone; and hence it is probably that lead baits are successfully employed in cod fishing in the Moray Firth and off the Northern Islands, while they are of no avail among the scanty fish further south.

"It may be said that in these cases the fish actually *search* for their food by sight alone, and merely test the quality of what they have found by smelling it; and Bateson quite recognized this. But more is possible, *habitual sight-feeders can be induced to hunt by smell alone*. The pollack, which is such a pronounced sight-feeder that it will take a hook baited with a white feather or a little bit of flannel and trolled along the surface, is yet able, when blinded, to get his food with great ease. Several blind specimens in the Plymouth tanks were carefully watched by me; and I had no difficulty in deciding that it was by smell alone that they found their food. Their conduct was exactly such as was seen in the smell-feeders, to which I shall presently refer.

"Again, the cod (*Gadus morrhua*), which Bateson puts among the sight feeders, is generally believed—and with good reason, I think—to feed more by night than by day; which suggests that it, too, not only tests its food, but actually hunts by smell.

"Lastly, in this connection, I would state the results of my experiments. I worked with a number of fish, and always with the same success, but I shall here refer only to one case—that of the dabs (*Pleuronectes limanda*). That they were sight-feeders was evidenced by their behavior when I lowered a closed tube full of water, and with a worm in the middle of it, into the tank; time after time they bumped their noses against the glass at the very spot where the worm was situated. That they could also recognize the smell of food, apart from seeing it, was demonstrated in various ways.

"First, if instead of a closed tube, as in the last mentioned experiment, one open at the bottom was used, after a short interval the nosing at the part where the worm was seen ceased, and *the lower end of the tube*, from which, doubtless, worm juice was diffusing, was vigorously nosed. If, again, instead of putting worms into a tube, I placed a number of them in a closed wooden box with minute apertures to let water pass in and out, there was a similar excitement produced, and the dabs hunted eagerly in every direction. When water in which many worms had lain for some time was simply poured into the tank through a tube that had been in position for several days, and by a person who was out of sight of the dabs, the results were most marked. In a few seconds, hunting began, and in their excitement the dabs frequently leaped out of the water, apparently at air bubbles, and, on one occasion, one even cleared the side of the tank, which was about two inches above the water, and fell on to the floor of the aquarium. Yet there was nothing visible to stimulate this quest."

Peroxide of Hydrogen as a Disinfectant.

The disinfecting properties of peroxide of hydrogen have long been known; but considerable additions have recently been made to our more exact information as to its bactericidal action. Its hygienic importance, especially in regard to its action upon bacteria in water, has been shown by the interesting experiments of Van Tromp and Altehoefer, to which reference was made in a recent number of *Nature*. According to the former, an addition of peroxide of hydrogen in the proportion of 1 part in 10,000 parts of the water, when shaken up and allowed to stand for 24 hours, is usually sufficient to sterilize a water. Altehoefer, however, found that, to insure sterility, it was advisable to use larger quantities—viz., 1 part in 1,000 parts of the water. Experiments made with waters purposely infected with cholera and typhoid bacilli, respectively, showed that in both cases these organisms were destroyed after 24 hours by this proportion of peroxide of hydrogen. Altehoefer, moreover, specially mentions that he found this addition in no way interfered with the dietetic value of the water; and he recommends its application for household purposes as a protective measure during any epidemics of typhoid fever and cholera. Traugott also testifies to the innocuous character of this material, even when swallowed in large doses. Care must, however, be taken that it is as pure as possible; moreover, it is important that the sample should be freshly prepared, as its strength and consequently bactericidal action is reduced when preserved for some time.

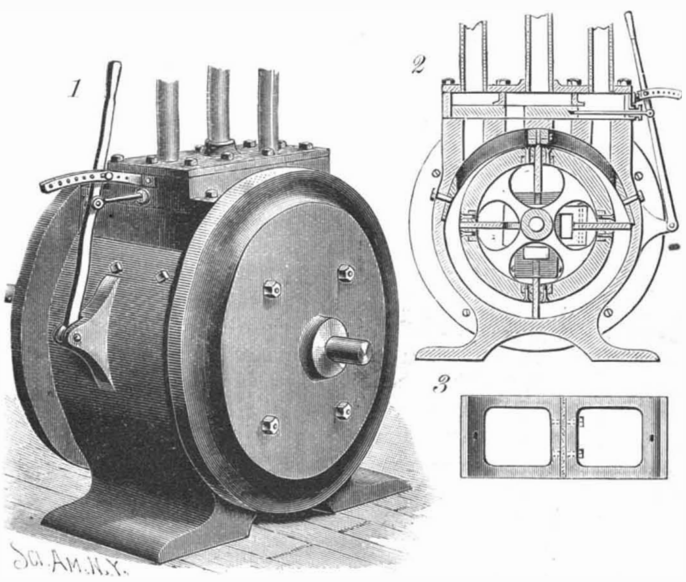
How Many Bees Make a Pound?

This question is answered in a recent number of the *American Apiculturist*. Careful weighing shows that an ordinary bee, not loaded, weighs the one five-thousandth part of a pound, so that it takes five-thousand bees, not loaded, to make a pound. But the loaded bee, when he comes in fresh from the fields and flowers loaded with honey or bee bread, weighs nearly three times more, that is to say, he carries nearly twice his own weight. Of loaded bees there are only about 1,800 in the pound.

An ordinary hive of bees contains from four to five pounds of bees, or between twenty thousand and twenty-five thousand individuals; but some swarms have double this weight and number of bees.

AN IMPROVED ROTARY ENGINE.

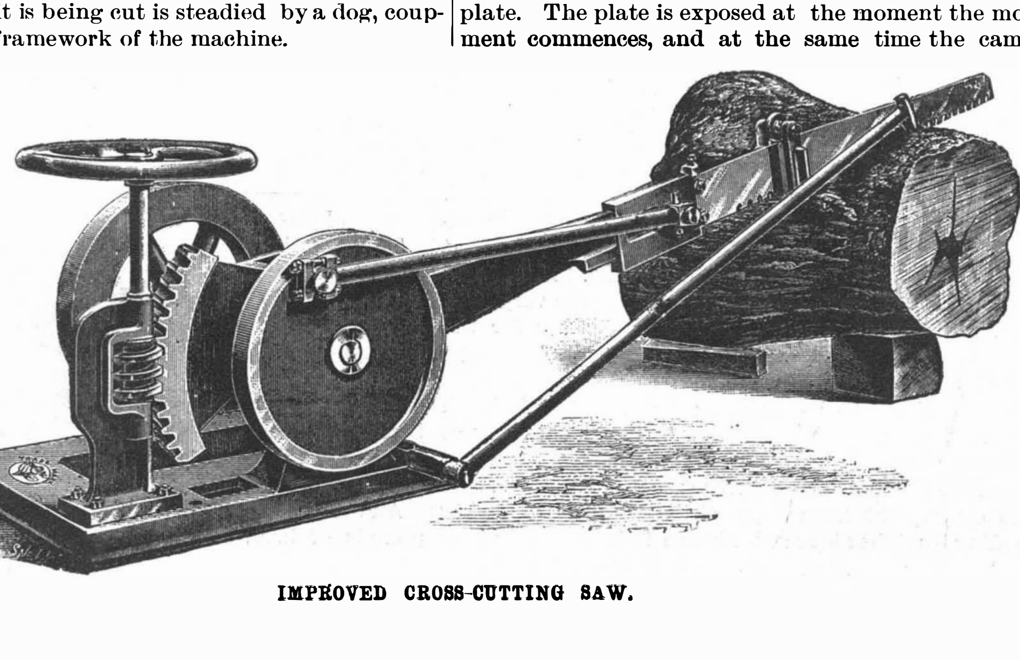
This engine, recently patented by Mr. O. E. Morse, of Dillon, Montana, is designed to utilize the steam to the fullest advantage, and the engine is readily reversed by simply shifting the lever to change the position of the slide valve. Fig. 1 is a view in perspective and Fig. 2 a side sectional view. On the driving shaft, within the cylinder, is secured the hub of a wheel containing a series of four pistons fitted to slide in the rim of the wheel, the opposite pistons being connected in pairs at their inner ends by a slotted frame through which the shaft passes, so that the pistons have free radial movement, one moving inward as the other moves outward, and *vice versa*. The outer ends of the pistons engage the inner surface of part of the cylinder and part of an abutment in the cylinder, an inverted plan view of which is shown in Fig. 3. The abutment is preferably made in two parts, bolted at their outer ends to the cylinder, and connected with each other at their inner ends by bolts and intervening packing strip, and the abutment serves to press an outermost piston inward, so that its opposite mate slides outward into contact with the peripheral inner surface of the cylinder. In the abutment are two openings into which lead four ports opening into a steam chest containing a slide valve having a single port adapted to connect with the two inner ports, the side ports connecting with compartments from which lead the exhaust pipes. The valve stem of the slide valve is pivotally connected with a lever adapted to be locked in any desired position on a segmental arm. As shown in Fig. 2, the slide valve port admits steam through only one of the live steam ports of the cylinder, and the exhaust takes place through the exhaust port at the right, but when the engine is reversed, by swinging the lever outward, the slide valve is shifted to close one of the live steam ports and open the other, and the exhaust then takes place through the exhaust port at the left.



MORSE'S ROTARY ENGINE.

IMPROVED CROSS-CUTTING SAW.

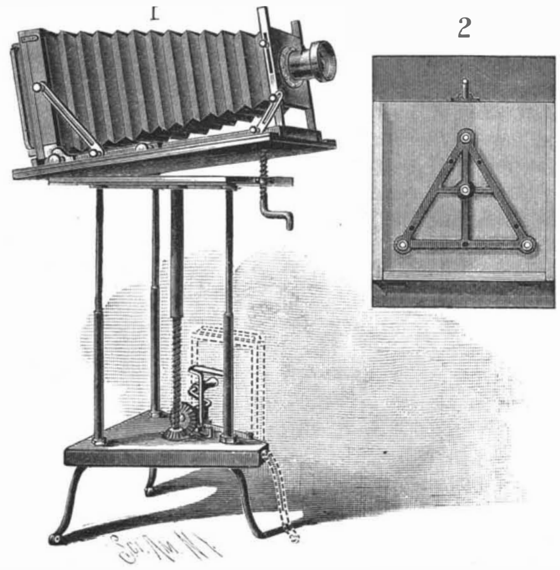
The cross-cutting sawing machine which we illustrate on this page, from *Engineering*, has been constructed by Messrs. F. W. Reynolds & Co., Southwark, London, S. E. As will be seen, it is belt-driven, and can accordingly be worked by any portable engine, thus allowing trees to be cut to length in the forest in which they are felled. The saw is fixed at one end of a cross-head working in guides. This cross-head is driven by a connecting rod which couples it to a disk crank as shown. The saw is long, and when driven at the rate of 150 double strokes per second, will cut through a log 4 ft. in diameter in from 7 to 8 minutes. It cuts on the return stroke only, and the feed is given by the worm and sector shown behind it in our engraving. The timber while it is being cut is steadied by a dog, coupling it to the framework of the machine.



IMPROVED CROSS-CUTTING SAW.

A READILY ADJUSTABLE CAMERA STAND.

The illustration represents a metal telescopic stand, which can be readily knocked down to be shipped, and the only tool needed in setting it up is a hand wrench. It has been patented by Mr. John H. Green, of No. 604 Pine Street, Ishpeming, Mich. The triangular base piece has three permanent legs, two of them having casters to facilitate moving the stand, while a socket is provided in which may be inserted another leg having a caster, as shown in dotted lines in Fig. 1. Tubular standards near each corner of the base piece are adapted to receive depending guide rods whose upper ends are affixed to a carrier plate, a bottom plan view of which is shown in Fig. 2. Centrally in the base piece is vertically supported a coarse screw cut rod adapted to be rotated by a crank and bevel gear and pinion, the screw engaging a nut in a guide tube centrally dependent from the carrier plate, whereby, on turning the crank, the carrier will be raised and lowered, a pivoted locking arm being swung into engagement with the bevel gear when the carrier has been raised to the required height, and is to be locked in fixed position. A leaf with ledges or flanges on three sides, and adapted to support the camera case, is hinged on the upper surface of the carrier plate, the leaf being raised as desired, at the edge opposite the hinges, by means of an adjusting screw having a crank handle. As will be seen, with this improvement, the camera may be quickly raised or lowered, as necessary to suit the height of the person or object to be photographed, and the case or lens readily adjusted to any desired degree of inclination. Frame pieces on the base piece are adapted to support a plate-containing box, as indicated in dotted lines in Fig. 1, while the operator is adjusting the camera.



GREEN'S CAMERA STAND.

Photographing the Vibrations of Tall Buildings.

Professor Steiner, of Prague, has perfected a method of accurately measuring bridge and floor vibrations by the aid of photography. His process is a delicate one, and is an application of the chrono-photographic process of M. E. J. Marey, of the Institute of France. He uses little glass balls, and these are strongly illuminated, either by a solar ray, or by an electric arc light, or a magnesium light.

These balls give upon a photographic negative a clear and well-defined point. To register vibrations one of these glass balls is fixed at the poiut to be examined, and the photographic apparatus is then so set up that the image of the ball falls on the right edge of the plate. The plate is exposed at the moment the movement commences, and at the same time the camera is turned from right to left on a pivot. The negative then shows an undulating line which is the vibrations of the ball point in amplitude and duration.

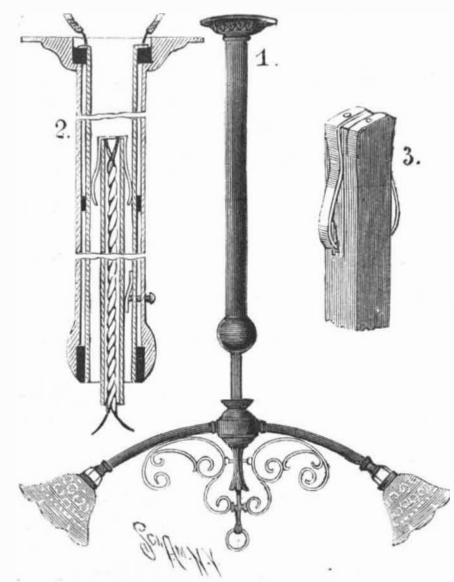
To obtain a scale with which to read this undulating line, a second ball is suspended to a fixed point, to which is given a known rate of oscillation. The position of these two balls is such that their images coincide in a state of rest, and a comparison of the trace of the second ball as printed upon the line of the first on a negative gives the number of vibrations of the latter in a given time.

It is possible then to place near the first ball a fixed scale brilliantly illuminated like the ball itself, and as this scale appears on the negative the amplitude of the oscillations can be measured at a glance. The measurements may be made either directly upon the print or from an enlargement made in the usual manner. To avoid the practical difficulty of making the images of the two balls coincide at the beginning of the operation, Professor Steiner says a pendulum may be made to oscillate before the source of illumination of the ball.

The ball of this pendulum will pass before the light at regular and determined intervals and the undulating line on the negative will be broken at distances corresponding to the duration of an oscillation of the pendulum. It is not important that the camera turns upon its axis with a uniform motion, and the speed of turning is likewise of little importance. The relations of the curves traced by the two balls will always remain the same. It is suggested that an apparatus of this kind would be useful in studying the vibrations of the floors of buildings resting for some years on iron beams, especially when these floors are submitted to the rhythmic shock of dancing.—*Le Genie Civil.*

AN EXTENSIBLE ELECTRIC LIGHT SUPPORT.

This improvement, patented by Mr. Alvin Rivenburgh, of Greenfield, Iowa, consists of a tube containing strips of conductive metal connected with the wires of the house circuit, a tube of insulating material sliding therein, and having contact springs contacting with conductors leading to the lamps through the sliding tube. Fig. 1 shows the electrolier complete, Fig. 2 being a transverse section, and Fig. 3 the top portion of the sliding tube. The hole in the main tube is preferably rectangular, and the metallic strips in its opposite sides are flat. The springs contacting with the strips, on the upper end of the sliding tube, are insulated from each other and connected with the wires extending down the inner tube and leading to the lamps. Additional strips of insulation are inserted in the walls of the main tube to prevent the springing of the metallic strips, and, to hold the sliding tube in any desired position, a spring and a set screw which may be made to bear upon it are arranged in the side of the main tube.



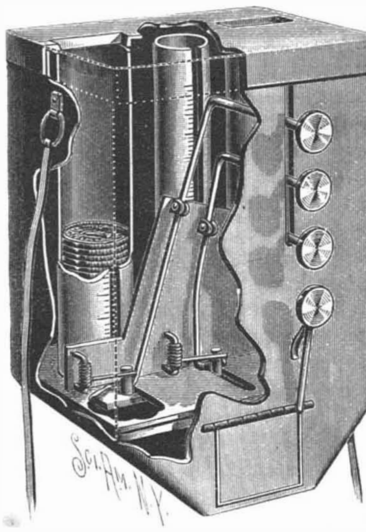
RIVENBURGH'S ELECTROLIER.

Artificial Diamonds.

At the Academy of Sciences, M. Moissan announced recently that, in continuing his researches on the synthesis of the diamond by means of the electric furnace, he has just obtained two compounds well worthy of attention. These bodies are silicide of carbon and boride of carbon. They are of excessive hardness, and cut rubies, steel or diamonds. M. Berthelot asked M. Moissan if in the researches made previous to his own on the subject of artificial diamonds, chemists had not sometimes mistaken for diamonds very dense compounds similar to those to which reference had just been made. M. Moissan replied that he believed errors of the kind might easily occur when analysts are not exactly acquainted with all the characteristics of diamonds. By only bearing in mind their density and property of cutting all other gems, errors may frequently have been made. But, being at present aware of the characteristic of diamonds to burn in oxygen, and to produce four times their weight of carbonic acid, it is now difficult to confound them with any other body.

A COIN HOLDING AND DELIVERING DEVICE.

A convenient means for carrying assorted pieces of money, and delivering the coins one by one as required, is shown in the picture, the device being adapted for suspension upon the person by means of a strap, or to be fixed in position for store use. The improvement has been patented by Mr. Ernest Berrini, of Seattle, Wash. The case has a forwardly inclined, hopper-like bottom, with an outwardly swinging door, an upwardly extending key or lever, by which the



BERRINI'S COIN HOLDER AND CHANGE MAKER.

door may be opened, terminating in a finger piece, the key being normally pressed outward by a spring, which also holds the door closed. In the removable cover of the case are slots, through which coins may be passed to the coin tubes, which are removable, and any desired number of tubes may be used. Each tube has a vertical slot on one side, through which the coin may be seen when the tube is removed, and at the side of the slot is a graduated scale, by means of which the amount of money in the tube may be determined without counting. Beneath each tube is a slide moving horizontally between two base plates, each slide having a hole of the same diameter as the bore of the tube, so that the bottom one of the coins placed in the tube will drop into and occupy the hole in the slide and lie flatwise on the lower base plate. Each slide is normally pressed back beneath the tube by a spring, but when a slide is moved forward by pressing upon the key connected with it, it carries with it a coin, which is dropped into the hopper, from which it may be removed by pressing upon the lower finger piece. Upon a plate at one side of the tubes are fulcrumed tilting keys connected with the slides, and whose upper ends are bent outward through a slot in the case, where they terminate in finger pieces, which should be appropriately marked to indicate the denomination of the coin in the tube with which they are respectively connected. When the device is arranged for use in a store, a bell crank adapted to sound a gong is connected with the key by which the door in the hopper is opened, thus giving notice when the door is opened or any money is withdrawn.

Ebonite Packing Rings.

The pistons of the high pressure air compressors of the pneumatic tramway of Bern are packed with ebonite rings, which, like cast iron rings, fit in grooves, and are pressed against the cylinder sides by a double brass spring. Pistons thus packed are said to be tight, to last from three to four months, and to be cheap, and there is no wear of the cylinder sides.

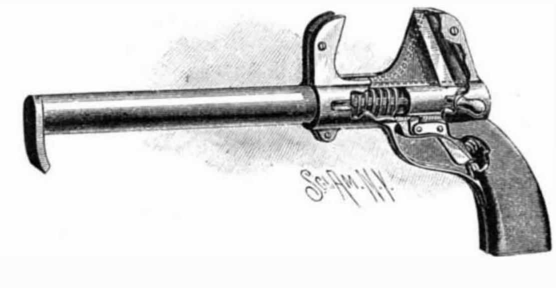
A QUICK AND SURE CHICKEN BEHEADER.

The illustration shows a device for severing the head from the body of a chicken by simply pulling a trigger, without torturing the chicken or trying the nerves of the sensitive. The improvement has been patented by Mr. J. C. Denham, editor of the *Journal of Agriculture*, 1120 Pine Street, St. Louis, Mo. The barrel of the implement incases a main spring, and at its rear end is clamped by a breech block having upwardly extending flanges, forming guides for the knife, the flanges being recessed in the center to afford space for placing the neck of the chicken, and the beheading knife sliding across this space between the flanges. The knife is inclined, and its lower end slides in a slot in the top of the barrel, where it is secured to a sliding plunger, to which one end of the main spring is attached, the other end of the spring being secured to the barrel. In the front end of the barrel is a cushion, against which the extended shank of the plunger strikes, absorbing shock and limiting the forward movement of the plunger and knife. The plunger and knife are pulled back against the tension of the spring by handles on the sides of the plunger, the handles projecting through side slots in the breech block and barrel. A notch in the bottom of the plunger receives a pawl on the front end of a curved trigger, by which the knife and plunger are held in a rearmost position when the device is to be used. A depending hook or flange on the front end of the barrel may be hooked upon some object to facilitate pulling back the plunger, or to steady the implement when it is used. When the neck of the chicken is placed in the space provided therefor, and the trigger is pulled, the plunger is instantly released and the knife drawn rapidly forward, the cut being effected with certainty, neatness, and dispatch.

NEW FIRE ALARMS.

A few years ago we described the fire alarms that were being put in service in the streets of Paris. It was a question of an alarm upon a column, due to Mr. Petit, and in which a button pressed by a person asking for help actuated a bell and a clockwork that gave a signal at the engine house along with the number of the alarm brought into play. While offering decided advantages, this system was defective in some points. The firemen always had to proceed to the alarm whence the signal came in order to ask exactly where the fire was, and they did not know its nature.

So, while installing the Petit apparatus, the fire department, and particularly its eminent engineers, Commandant Krebs and Captain Cordier, set about to find something better. The ideal was to be able to permit the public to telephone to the engine houses all the details of the location, extent and nature of the fire. Unfortunately, the practice of telephony is still unfamiliar to many persons, and consequently what was necessary was an absolutely automatic apparatus that would attract the attention of the station by a bell, making known to the person calling that the indications given were understood. A very ingenious apparatus, due to Mr. Digeon, has been under trial for some time,



DENHAM'S CHICKEN BEHEADER.

and, having proved successful, has been rapidly put in service in a large number of quarters.

As to external aspect, this new apparatus differs but little from the Petit system. Like it, it comprises a square box painted red, mounted upon a column in the shape of a lamp post. The alarm and telephone, inclosed in the box, communicate, through wires running to the interior of the column, with two cables coming from the central station through the sewers. Let us walk around the apparatus: Here is the door, into which is set a small glass. At the top of the door we read: "In case of fire, break the glass and then cry out distinctly in the mouthpiece of the telephone the nature of the fire, the street, and the number" (Figs. 1 and 2). The normal type of alarm is provided with a small hammer like a door knocker, which permits of effecting the breakage of the glass, but this has been removed, since it gives rise to mistakes. Let us strike hard, as another inscription tells us to, and, according also to these same instructions, the door will open and reveal the mouthpiece of the telephone placed in the interior. This opening, in fact, reveals itself to us at the bottom of the box, surrounded by the inscription in exergue: "Mouthpiece of the telephone." The directions are intelligently multiplied throughout the apparatus, and the most excited person cannot fail to see them. When the door opens, a ringing occurs that attracts the attention of passers-by and points out jokers. If we take a look at the enameled iron plate at the bottom of the box, we see that, as soon as the ringing ceases, we must shout in the telephone the fire that it is necessary to fight, and repeat this information until a roaring sound is heard, and which signifies that the firemen have started. After following these instructions to the letter, we can leave the apparatus, whose door remains persistently open. There is nothing more simple than all this, even for a child.

When a person breaks the glass he bears at the same time upon a metallic plate that swings upon a horizontal hinge above, and this motion disengages the bolt of the door, which opens through the pressure of three springs. A very simple play of levers frees the alarm bell, which is analogous to that of the old apparatus; but, at the same instant, this opening of the door sets in motion

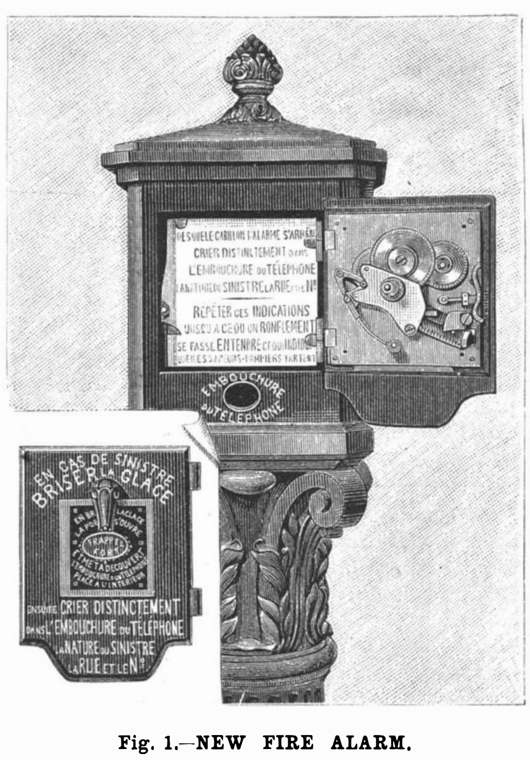


Fig. 1.—NEW FIRE ALARM.

Fig. 2.—MANEUVER OF THE APPARATUS.

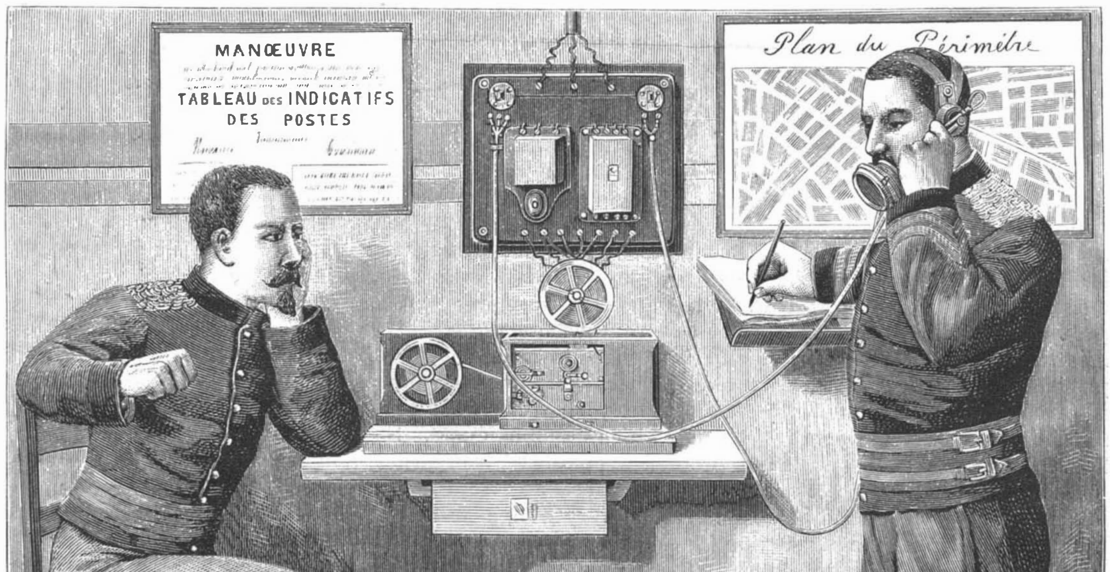


Fig. 3.—RECEIVING APPARATUS IN AN ENGINE HOUSE.

the automatic transmitter of the indications of the letter of the alarm and of the name by which it is recognized. This transmitter, which is not very complicated, comprises, in the first place, a cam wheel carrying three times upon its circumference, in Morse characters, the indicating letter, and secondly, a motive weight whose card is wound around the axis of the wheel, and causes it to make an entire revolution when the door opens. The play of a lever is controlled by the cams. At rest this lever communicates with the ground through a movable arm and a special spring. Every passage of a cam lifts a tappet and brings the lever in contact with a special screw for a greater or less length of time, according as it is a question of a dot or a dash. The circuit is completed by the earth, and a Morse receiver located at the engine house inscribes a dot or a dash, and finally the letter (or rather the letter three times) characteristic of the alarm.

At the engine house, at the moment at which the first emission of the current occurs, as a consequence of the opening of the door of the box, a bell is heard to ring to call the foreman. At the same time, through an original mechanism that we cannot describe, the Morse receiver is freed automatically, and inscribes the indicative of the calling alarm. After the triple inscription of the letter A (- —), if it is a question of the apparatus of Chateau-des-Rentiers Street, the fireman unhooks his telephone, and this movement interrupts the bell of the alarm. The person who is calling knows then that he can signal the fire in the telephone. At this moment a pin fixed upon the cam wheel has lifted the movable arm, made it tilt, and put the telephone in circuit. The fireman inscribes the indications given, and when they are very clear he depresses a special lever, introduces the current of the battery upon the line, and, thanks to an interrupter, the telephone of the alarm renders a sound announcing to the person interested that the firemen are apprised (Fig. 3).

All the maneuvers are, therefore, very simple. But the Digeon apparatus has other advantages. It permits notably of keeping the men who have started for the fire in communication with the house, in order to ask for re-enforcement, for example. In fact, every alarm is provided at the side with a door that is opened with a special key and exposes a jaw into which are introduced the wires of a movable telephone and a Morse key to effect calls. We must not omit to mention particularly the movable telephone that is employed in this case. It is due to Commandant Krebs, like the one that is arranged in the alarm. It is a question in both cases of a remarkable magnetic transmitter. The vibrating plate is 98 millimeters in diameter in the stationary apparatus and 77 in the movable. For the latter, it is coupled with the Ader receiver mounted through a slide upon the junction rod.

Let us say further that Mr. Digeon has devised a low priced alarm designed for private houses. It is of wood, is fixed against a wall and is wound up through the opening of the door. Besides, the telephone is accompanied with two receivers that permit of communicating with the engine house. These apparatus can be connected gratuitously with the municipal system.

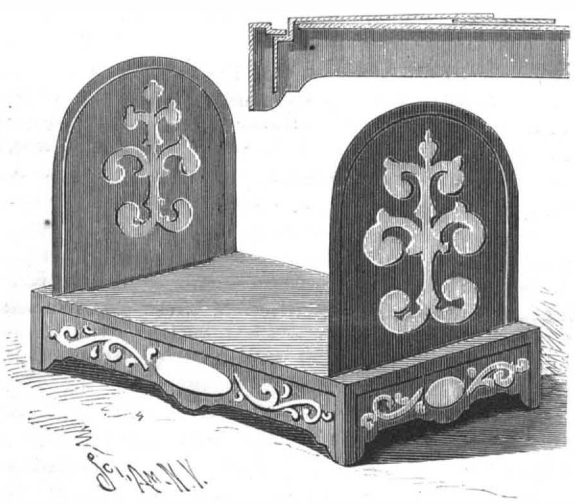
It is opportune at the moment in which Paris is thus improving its fire service, to remark that Brussels, our closeby neighbor, possesses a very remarkable installation of electric alarms. Forty bureaux of communal administration are subscribers to the telephone system. There are fifty automatic electric fire alarms connected with twelve receiving stations. Twenty-one telegraphic stations connect the police offices and stations with the central office, and at the latter there end eighteen telegraph lines coming from the police stations of the seven faubourgs. It is necessary to add to this thirty-seven microphone and eighteen telephone stations putting the services of the external administration in communication with the City Hall. It will be understood that these are so many stations capable of serving to send out alarms of fire.—*La Nature.*

Determining the Densities of Gases.

A recent number of *Nature* contained the following notice of a convenient modification of the hydrometer method of determining the densities of gases, devised by M. Meslans, whose apparatus is described and illustrated in the *Comptes Rendus.* It consists of two hollow spheres hung to the arms of a balance. Each sphere, which is made of glass, aluminum, or gilt copper, hangs in a separate compartment, the suspending thread being introduced through a hole in the lid. The compartments are inclosed in a box, and surrounded by water in order to keep them at equal temperatures. They are at first filled with air to determine the position of equilibrium. The gas of which the density is to be determined is then introduced through a long tube immersed in the water, and enters one of the compartments, having previously been dried. It is passed through in a slow and continuous stream; and if its density differs from that of air, the equilibrium of the balance is disturbed. The weight necessary to re-establish equilibrium is noted, and the density calculated according to a simple formula. Thus the density of a particular gas is found by a single weighing; and by keeping the current continuous, variation in its density is easily observed. A fairly high accuracy is attainable, depending upon the sensitiveness of the balance and upon the perfection of gauge of the spheres. One important application of the apparatus is that for determining the density and composition of the products of combustion in furnaces. The scale of the balance is graduated so as to show at a glance the percentage of carbonic acid, and hence the degree of efficiency of the furnace in question. This percentage, which is about 21 theoretically, never exceeds 18 in practice, except in gas generators. In a great number of works it varies between 6 and 8. The apparatus is being applied to the study of the various methods of heating. Another application is that by which the presence and percentage of marsh gas is indicated. With spheres of 1 liter capacity and a balance sensitive down to 0·5 milligramme, it was found possible to detect 0·1 per cent of methane in the air of a mine.

A METALLIC BOOKCASE.

The illustration shows a simple form of bookcase or stand adapted to rest upon a bureau, desk or table, and contain a set of works or books of reference in frequent use, the number of volumes being regulated by the length of the stand. The improvement has been patented by Dr. James Stimson, of Watsonville, Cal. In its simplest form the base may be formed of a single piece of metal and struck up with a die, a single piece of metal also forming each of the end pieces. Near each end of the base is a transverse slot, along the outer edge of which the metal is sunk or depressed to form a step or recess, as shown in the small view. The clamping arms forming the end pieces are essentially L-shaped, but with a stepped angular portion connecting the horizontal and vertical portions, the arms



STIMSON'S BOOKCASE.

when not in use folding down upon the base and upon each other, enabling the stand to be compactly folded and stored away. In use, the upper members of the arms are brought to a vertical position, as shown in the large view, the inner members then engaging the under face of the base.

Fire-Resisting Glass.

An interesting test of fire-resisting materials and construction was recently carried out in Berlin, under the auspices of the fire brigade and the insurance companies of the city. The idea of the tests was mooted as far back as 1889; but there was considerable difficulty in arranging for a series of "fires," which were intended to be as "natural" as possible, and yet should not be dangerous. Finally, the municipality gave the experimenters the use of an old warehouse for their purpose; and this building, having been fitted up to represent various types of fire-resisting structures, was duly set on fire. Care was taken to subject the exhibits to the temperatures, irregularities of heating, sudden shocks by falling weights or jets of water, etc., which generally occur at conflagrations; and it was found possible to take fairly exact observations. Among the most satisfactory results obtained were with the fire-resisting glass made by Messrs. Siemens, of Dresden. The assessors declare it to be most suitable for any skylight or window necessary in a division between separate risks, as it will resist a temperature of 1,300° C. for half an hour and more; bearing all manner of shocks and strains without suffering appreciable damage. Care is required in fixing this glass, however, as the iron frames generally used for the purpose buckle under heat, and show, between the glass and iron, openings through which flame can pass. Some of the so-called fireproof floors made of iron girders and concrete came to speedy grief in these tests; while iron and brick floors stood very well, as did the "Monier" construction (as to which reference has been already made in the *Journal*). As regards fire-proof doors, nothing stood better than double oak covered with thin sheet iron, between which and the wood there should be a layer of asbestos cloth. Seeing how many warehouse fires are propagated through windows, the assessors attach great importance to their demonstration of the capability of Siemens glass for withstanding flame.

No Oxygen in the Sun.

At the recent annual meeting of the five academies in Paris, M. Janssen read a paper on his observations at Mont Blanc Observatory on September 14 and 15, as to the absence of oxygen in the solar atmosphere. This discovery, he said, revealed a fresh harmony in the constitution of the universe.

"We already knew the chief features of the constitution of the sun and the admirable conditions realized for insuring both the abundance and the durability of the radiation diffused by it over the planets surrounding it. We knew that this incandescent surface of such a slight thickness which surrounds the sun and in which resides this virtue of radiation renews itself by reserves of heat drawn by it from the central mass. We also knew that this radiating surface is protected from contact with the icy celestial space by several gaseous envelopes. Among these envelopes or atmospheres the uppermost and doubtless most effective as to protection is the so-called corona, which in total eclipses produces the splendid phenomenon of the 'glories' and of the crown. This atmosphere is mainly composed of hydrogen, the lightest and most transparent of known gases. The chief function of radiation, the very purpose of the central orb, is thus insured by this transparent and protecting atmosphere. But we now see that by a not less admirable arrangement the body which might some day jeopardize this function has been carefully excluded. Thus science as it advances constantly reveals to us new laws and harmonies in the constitution of the universe."

Prizes for Electrical Inventors.

It can hardly be doubted, says the *Electrical Review*, that there will be a good number of American competitors for some of the following named prizes which are offered by the French Society. A prize of $2,280 will be made in 1898 for the discovery that is most useful to French industry. A prize of the same amount is given every three years by the society (the next award will be made in 1895) to the person making the most useful industrial discovery. The Henry Giffard prize of $1,140 is awarded every six years (the next award will be in 1896) for services of signal value to French industry. The Metzen's prize of $95 is awarded every three years (the next award will be in 1896) to the discoverer of a valuable chemical or physical application in electricity, ballistics or hygiene. The special prizes for 1894 are: $380 for a motor whose weight is not less than 50 kilogrammes per horse power; a prize of $570 for an apparatus that shall decrease materially the smoke of furnaces, especially those under boilers; a prize of $190 for a heavy oil engine; a prize of $570 for a steam engine consuming at the maximum speed, under average load, seven kilogrammes of steam per horse power per hour; a prize of $570 for the discovery of a substance that can be substituted completely for gutta-percha in at least one of its applications, or for work that will continue to develop the production or improve the cultivation of the gum. The following prizes are to be awarded in 1895: A prize of $380 for a small motor designed for use in a shop located in a house; a prize of $380 for the preparation industrially of ozone and means for its application; a prize of $380 for an apparatus or a process which shall make it possible to measure or determine the insulation of the different parts of an electric installation while the current is on; a prize of $570 for investigations which shall contribute to the discovery and application of the best means in domestic and general product for the purification of drinking water. Competitors must submit their proofs by the 31st of the December preceding the year on which the prize will be awarded.

Hydrogen.

An interesting example of the capacity of some of the oldest and most hackneyed chemical reactions for improvement is supplied by a communication of Mr. John Ball, of the Royal College of Science, South Kensington, to the *Chemical News*, upon the preparation of hydrogen by the ordinary zinc and acid laboratory apparatus. Mr. Ball states that he has recently observed that, by the addition of a few drops of a solution of nitrate of cobalt to the acid and zinc, the rate of evolution of hydrogen is enormously accelerated, especially at the beginning of the reaction. The effect is the same with either hydrochloric or sulphuric acid; and a couple of drops of solution of nitrate of cobalt will suffice for a large quantity of acid. The action does not seem to have been noticed before; and it should be useful in the rapid preparation of hydrogen in the laboratory. Most, if not all, of the cobalt salt is quite unaltered. There appears to be a very thin film of cobalt deposited on the zinc, which probably acts with the zinc as a voltaic couple; but the amount of cobalt deposited appears to be too small to weigh. There is no particular virtue in the cobalt in this regard; a solution of a nickel salt exerts a similar action.

ELECTRIC LAUNCHES AT THE COLUMBIAN EXPOSITION.

(*Continued from first page.*)

boat. All the electrical parts except the switch are protected, so that there is no possible danger of shock, and there is no report at the Exposition of any mishap of this kind. The boats are operated by a heavy current at low pressure, so that there could be no harm even were it possible for a full charge to be received. No boat could be much more easily managed and be more free from possibilities of mishaps, such as explosion or escape of steam or oil. In addition, the launches are clean and free from all noise, smoke, ashes, and other disagreeable features.

The greatest test the launches had during the period of the Exposition was on Chicago day, when 622 trips, each trip of three miles, were made by the fifty boats. Six of these boats averaged fifty miles each, while twenty of them averaged over forty miles, carrying on each trip about forty people. These long runs did not by any means consume the stored energy, as an experimental test made some time ago on one boat at a speed of a little over five miles an hour demonstrated that it had a storage capacity of making ninety miles at that speed on one charging. Very few accidents have occurred to any of the launches, and nine out of ten have been caused by the propeller becoming entangled in wires or other debris in the bottom of the lagoons, and thus springing the shaft or bending the propeller blades. One bunch of wire is shown in the office of the company that was gathered up by a propeller that would require nearly a bushel basket to contain it. The batteries have proved highly efficient. No embarrassing or costly breakdowns have occurred, and during the entire period of the Exposition there have been only about 14 per cent of renewals in spite of the steady and uninterrupted work that the launches have been called upon to perform.

An economic feature of the electric launch that has been demonstrated at the Exposition is the fact that the instant the motor stops the expenditure of energy ceases, and after a boat has lain idle for many days its maximum power is to be had upon a moment's notice and without any waiting to fire up and get up steam. By placing the motor and storage batteries low down, they aid to properly ballast the boat, and at the same time they provide nearly 50 per cent more space to accommodate passengers than is to be had on the ordinary steam or naphtha launch of equal size.

The question of a proper kind of signal came up for consideration before the Exposition opened. At first an electric whistle was used which was a French invention. This was a device in which a diaphragm was caused to vibrate by electric energy, but it was more expensive and did not give as much volume of sound as the simple air whistle operated by a hand pump, which has been used on each one of the boats of the fleet during the Exposition.

The Electric Launch and Navigation Company is to be congratulated upon the success these launches have attained. They have been one of the most attractive features at the Exposition, and they have more than fulfilled the expectations of them. The contrast between these launches and the gondolas, which have also plied on the lagoons, was so marked that a syndicate of Italians purchased a launch in September and forwarded it to Venice with a view to introducing these boats in the "City of the Doges." Such an innovation is startling, and yet this syndicate is so certain of its proving a success that it has taken an option of twenty-five launches of the World's Fair fleet, with the privilege of purchasing more if it wishes.

Under ordinary circumstances, boats finished as beautifully and equipped as completely as these Exposition boats sell for $2,700, without extras, but most of this fleet has been disposed of at $2,000 apiece.

The following extract from the report of the engineer in charge shows that the cost of maintaining an electric launch of average size is less than six cents a mile. The report does not include the month of October. If it did, it would be still more favorable.

Believing that a concise statement of the actual work and operating cost of these launches will be of deep interest to the electrical fraternity, since the launches are operated under novel and severe conditions, the writer presents the following data, which are computed from records carefully kept from the beginning of this unique business enterprise:

APRIL 13 TO OCTOBER 1, 1893.

Mileage and Passenger Traffic.

Passenger trips of three miles each	47,787
World's Fair special launch trips	6,750
Special trips of regular launches	1,220
Trial trips	270
Experimental trips	180
Total number of trips	56,207
At three miles per trip, total miles	168,621
Average miles per launch to October 1	3,122
The total number of days the 54 electric launches have been in service on the lagoons of the World's Fair is	6,594
Therefore the general average of miles per launch, per day, is	25·57
Minimum miles, per launch, per day	14
Maximum " " " "	37½
Maximum miles, one launch, one day	54
Total number of passengers carried from May 1 to October 1	801,000
Maximum passengers carried in one day by one launch	464
Maximum number of people carried by one launch for one round trip	40

Operating Cost.

Average cost per launch, per day, for charging, at 3 cents per electric horse power	55½c.
Average cost per launch, per day, for care and repair of shafting, propellers, 54 motors, 162 packing boxes, 3,524 storage batteries, including labor for charging, 54 controllers—all the above being gone over every 24 hours	43c.
Renewals of batteries, per launch, per day	41c.
Renewals and repair material for all else, per launch, per day	9c.
Total cost per launch, per day	$1.48½
Average cost per launch mile for labor and material, exclusive of office expenses	5⅞c.

When it is understood that already the launches have run on an average four times the number of miles a launch owned by a private individual would ordinarily cover during a regular season, and that, as all who have been connected with this glorious Fair will vouch for, the operating expenses are decidedly heavier than under ordinary circumstances, it will be acknowledged that the cost per launch mile is exceedingly low. Judging from the experience of six months with the fifty-four launches, the writer believes the expense can and will be, in the near future, brought down to as low a figure as three cents per electric launch mile where at least thirty launches are operated under like conditions—less World's Fair extra expenses. Though the electric launches have carried over 801,000 passengers, not a single accident has occurred, and it was exceedingly rare that a boat had to be towed in, except through injury to the propeller or shaft by the floating and sunken debris in the lagoons of the World's Fair.

Fluorine.

The "Demonstration of the Preparation and Properties of Fluorine by Moissan's Method," by Mr. Moissan's assistant, Dr. Meslans, was the popular event of the proceedings in the chemical section of the recent meeting of the British Association, and is described by *Engineering* as follows: Some years ago Mr. Moissan isolated fluorine, which so far had baffled all attempts at separation, and in a measure remained a hypothetical element. Dr. Thorpe, of South Kensington, failed in the repetition of these experiments, which were doubted by some chemists. At the request of Professor Emerson Reynolds, Mr. Moissan, regretting his inability to come himself, sent over his assistant with the full plant, which was exhibited. Mr. Meslans contented himself with demonstrating, making brief rémarks in French, and converted all doubters, if any were present, into enthusiastic believers. Fluorspar is decomposed in a platinum retort by means of sulphuric acid, and the anhydrous hydrofluoric acid, dried and purified, brought into a U-tube for electrolytical decomposition. The vessels and tubes are of platinum; the stoppers of fluorspar. The hydrofluoric acid is an insulator, and resisted all electrolytical attacks until Fremy suggested the addition of a fifth of fluoride of potassium. The U-tube stood in a cooling vessel of about a quart capacity, containing condensed methyl chloride, which reduces the temperature to —23° Cent. As soon as the current of 70 volts and 25 amperes was turned on, minor explosions were heard, and fumes began to issue from the fine platinum tube through which the fluorine was to escape into the air. It did so; and, although it did not appear so vicious as it has been described, soon set the crowded audience coughing and longing for fresh air. Nobody was any the worse for it, however. As the fluorine at once decomposes, with the moisture in the air, into hydrofluoric acid and ozone, these two substances were practically what was smelt and felt; ammonia was passed round instead of eau de Cologne. The experiment had to be temporarily interrupted after some minutes, as the stock of methyl chloride gave out; Mr. Meslans had been experimenting the day previous. The low temperature is necessary on account of the high volatility of the hydrofluoric acid. As, however, some of the potassium salt, carried over by the violence of the reaction, stops up the discharge tube, which is the size of a clay pipe stem, Dr. Meslans was constantly applying his Bunsen to heat the tube. Iodine at once combined with the fluorine under explosion; sulphur burned with its well known blue flame; phosphorus as in oxygen; silicon and boron glowed like burning coal; carbon itself would not catch fire. It does so under proper conditions. On the motion of Sir Henry Roscoe, the thanks of the association were conveyed to Mr. Moissan by wire. Dr. Thorpe said that Mr. Moissan had been kind enough to examine his apparatus, which he had sent over to Paris; but that he, however, had not been able yet to repeat the experiment. On the request of the president, he gave a summary of the properties of the now fairly settled refractory element. It attacks everything—even the platinum-iridium electrodes. As to its appearance, even Moissan can hardly speak, as it cannot be brought into transparent vessels, and fumes so badly. It seems to be a greenish-yellowish gas, like chlorine. Its atomic weight Moissan has determined by filling two exactly equal platinum jars with nitrogen, and replacing in the one the nitrogen by fluorine; since the atomic weights of nitrogen (14) and fluorine (19) do not differ much, however, this determination is not very reliable. Mr. Meslans also exhibited one of Moissan's latest products, uranium carbide obtained in his electrical furnace. This is a dull blackish mass, which, when shaken in the stoppered bottle, sparks most energetically; the carbide, or its combustion product, has a peculiar smell.

Freezing Fish.

Science has conquered nature and has demonstrated that to preserve fish it is not necessary to salt them. Freezing is the thing in the future, and Sandusky, Ohio, is the place where the first attempt has been made to carry on the business in a general way. Frozen fish are taking an important place in commerce and in the cuisine, and as the industry becomes more general the demand for salt fish will probably drop off to a great extent.

About three years ago A. J. Stoll, a fish commission dealer in Sandusky, began to experiment with freezing fish, and soon found that the invention of the ice-making machine would be his salvation. Last year he completed his scheme and now he has a plant in full operation, employing twenty-five men and a capacity of freezing and preserving twenty tons of fresh fish each year. In a year Mr. Stoll expects to double the capacity of the plant.

The method used is very simple, yet interesting. The fish are unloaded from the schooners and placed in the dressing vats, where the refuse matter is removed and the fish sorted and graded according to the species. This is only done with the larger fish, but the small ones are not mutilated. The fish are placed in pans made of metal that will not rust, being placed in layers and the pans carried to the cooler. This cooler is a sort of a vault filled with pipes arranged in tiers and compartments like the shelves of a pantry, and made to fit so perfectly that no space is wasted. These pipes are filled with freezing fluid and the temperature is kept at zero. From here, after freezing twenty-four hours, the pans are removed to the preserving vaults, where they are placed on pipes arranged as in the first mentioned vaults.

Just step in once, after standing around in the hot sun of a July day. Of course overcoats are neglected in the summer, but in two minutes you discover yourself in the atmosphere of the Arctic regions, and, glancing at a thermometer, you will see the mercury registered at eighteen below zero. A massive door is opened and before your eyes is a big stack of block wood—no things are what they seem, for you find the wood very cold. It is the fish that will be distributed to your market man, perhaps many years hence, and the meat is so frozen that when emptied from the pans the fish appear like chunks of wood, and are so solid that they must be thawed several hours before the fish can be separated.

It has been demonstrated already that flesh kept frozen at such a low degree of temperature will remain perfect for a period of years, and it is believed that the fish may be preserved ten years, and then be turned over to the fish dealer fresh as the day they were caught.

Brine is circulated by the pumps through every foot of the pipes, and returns to the tank for cooling for redistribution in the space of one minute. The Sandusky plant cost $25,000.—*Detroit Journal.*

Interesting Rail Tests.

In tests conducted at the Watertown arsenal it has been found that old steel rails when submitted to a bending test in which the head of the rail is put in tension and the base in compression, will invariably fracture, making a clean break across the rail, while if the same rail is turned over and the head put in compression it will bend without fracture. Again, if before conducting a test, about 1-16 in. of metal is planed off the head of the rail, there will be no fracture, no matter which part of the rail is in tension. But if, in planing this head, care is not taken to remove 1-16 in of metal from the corners as well as the top of the head, the rail will fracture as before. The explanation of the matter is that a thin layer of metal on the head of the rail has been greatly hardened by the contact and pressure from the wheels passing over it, and fractures when put in tension. When once started, the fracture, of course, extends entirely across the rail. If this hard material is removed, the fracture cannot make a start, and the head of the rail is as good as the base.

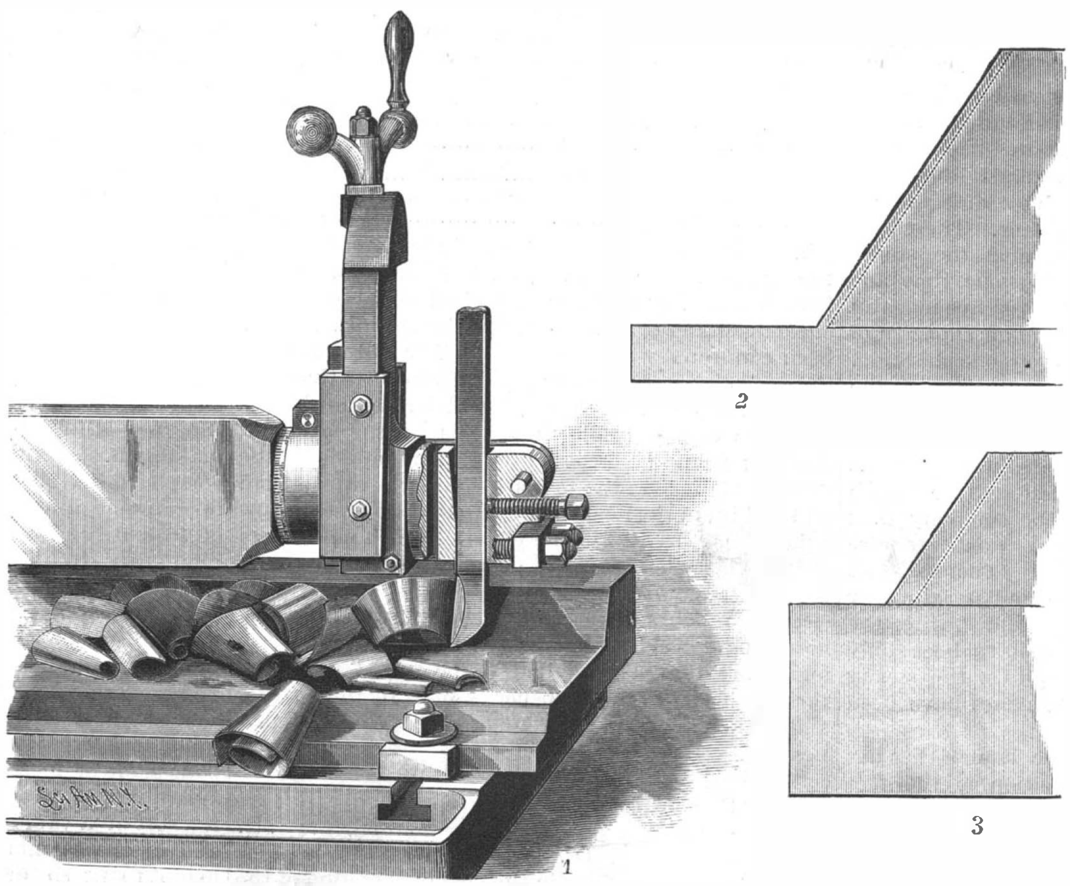
WE are indebted to Mr. J. N. Knowlton, manager of the Steam Whaling Company, San Francisco, for the information that the reported sailing of one of the company's vessels to a point further north than Greely's expedition reached is incorrect. The furthest north the company's ship made was between 72° and 73°.

IMPROVEMENTS IN SHAPERS.

Among notable exhibits at the World's Columbian Exposition at Chicago there was an improved shaper, which attracted attention in consequence of the enormous chips of metal which it cut from iron and steel. To the casual observer the machine does not appear to be different from the ordinary shaper, but to the mechanic who is used to tools of this kind it is a matter of surprise to see a shaper remove from a solid block of iron such chips as are shown in Fig. 1. This engraving is a truthful representation of the machine doing actual work; and Figs. 2 and 3 show respectively a very wide but comparatively thin chip and a narrower and much thicker chip, the first being one-sixteenth of an inch thick and one and three-fourths inch wide, the other being one-eighth of an inch thick and one inch wide.

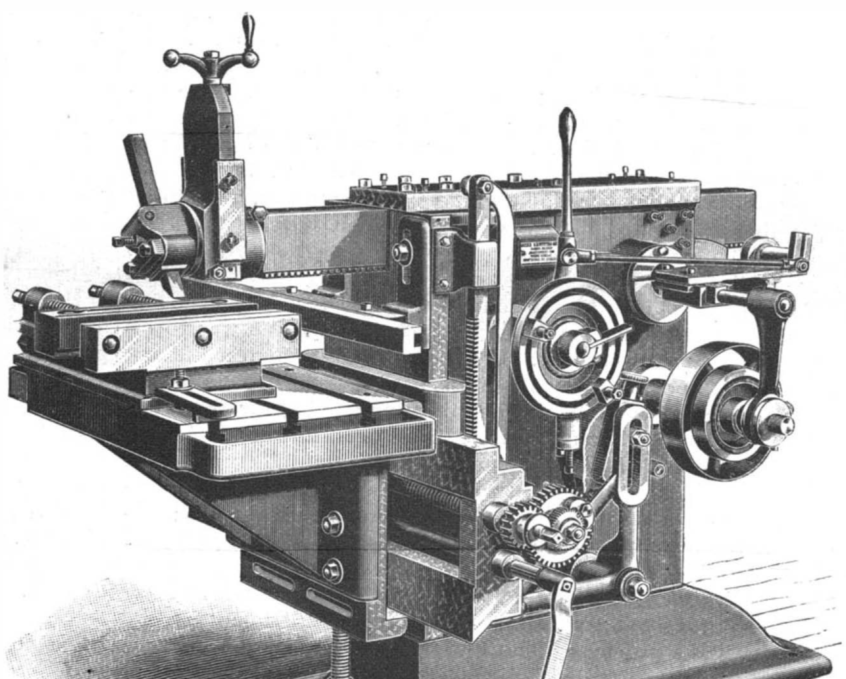
The explanation lies in the fact that the tool does its work with a drawing cut. This insures great steadiness in the moving bar of the cutter, and as the tool holder is arranged, it also secures great rigidity and firmness in the holding of the tool without the necessity of heavy clamping devices, as the tool practically clamps itself as it is drawn forward. The up and down and cross feeds are not materially different from those of other shapers, and the cutting bar is moved by reversible gearing, with a quick outward movement and a slow return. By making use of the drawing cut instead of pushing the tool, less pressure is required in clamping the work and all chatter of the tool is avoided.

This machine is made by the Morton Manufacturing Company, of Muskegon Heights, Michigan, who also make other machines on the same principle.



1 2 3

HEAD OF THE MORTON SHAPER SHOWING HEAVY CUT.



THE MORTON DRAWING CUT SHAPER.

The Loss of H. M. S. Victoria.

The vessels upon which we now rely for bearing the brunt of the fighting in a future naval war, which are styled by the imposing title of battleships, may, it appears—at least some of them—be sunk almost in a moment by a blow which is much less heavy than an enemy might be expected to give in action. Enormous sums are spent in providing armor to protect them against gun-fire, but the structure upon which this costly armor is placed is apparently so frail that a mere touch suffices to send the whole mass to the bottom.

We have always understood that the division of a warship into separate watertight compartments was so minute and complete that she would be safe against sinking, even if many of these were damaged. The Victoria could, however, hardly have been sunk quicker if there had been no division at all into what are called watertight compartments. Sir E. J. Reed, whose knowledge and capability of judging cannot be seriously questioned, named twelve other battleships in the House of Commons that he asserted would have the same fate under similar circumstances. We know of nothing which gives reasonable ground for supposing that Sir Edward Reed is wrong; but, whether he be right or wrong, it is not only the duty, but the interest, of the Admiralty to have this grave question inquired into by an independent and impartial committee of qualified judges. We would like to know why the numerous watertight compartments of the Victoria failed so completely to serve the purpose for which they were devised, *i. e.*, to keep the ship from sinking when injured below water. Was it because, as has been often stated, her stability is so small that the filling of one or two of these compartments is sufficient to overcome the floating power of the remainder? Or was it a question of watertight doors being left open, or not acting when attempts were made to close them? Captain Bourke's evidence before the court-martial shows that all was tight in the engine room and boiler rooms, and the water was all confined to the fore side of the boiler room bulkhead. It appears, therefore, that the watertight doors were very soon closed, although they may have been open before the fatal blow was given.

Lord Armstrong stated in his recent speech at Elswick that the loss of such a ship "calls for very grave reflection as to the policy of devoting so large a proportion of our naval expenditure to the construction of those mighty vessels called battleships." We agree with Lord Armstrong upon this point, if it be the fact that our battleships are in reality so frail and unreliable as the sinking of the Victoria would indicate. It would be absurd to glory in their "might" if it rested upon such an insecure basis as that. There is little, however, at present upon which to form a definite opinion upon the question, and no sign of the necessary information being furnished. We desire to know whether it be not practicable to build a battleship in watertight compartments so that no single blow would send her to the bottom; whether the Victoria was not believed to be so constructed, and whether she was so constructed in fact; whether other of our principal battleships are in the same case with the Victoria; whether the watertight doors were thoroughly efficient, and were capable of being readily closed from a safe position above water; and what is the best to be done in order to make existing ships satisfactory in these respects, if they be not satisfactory now, and would be in danger of meeting the fate of the Victoria under like circumstances.—*Engineering.*

A COAST gun built by Krupp, when being tested at the Meppen proving grounds recently, threw the projectile 65,616 ft., or nearly 13 miles, the gun having an elevation of 44 deg. The projectile weighed 474 lb.; the charge of powder 253 lb.; giving an initial velocity of 2,099 ft. It is estimated that the projectile reached an altitude of 21,456 ft., and its flight occupied 70·2 seconds. The Krupps have had a drawing made showing the flight of the projectile relatively to Mont Blanc, from which it is evident that it would be possible for the gun to fire over the mountain from Pre St.-Didier.

Tuberculosis and its Prevention.

Dr. Anderson, the medical officer of health of Dundee, delivered an interesting address recently, so says the *Lancet*, with the view of quickening public interest on this important topic. After referring to the history of our knowledge of the specific germ and of the manner of its propagation, he mentioned the fact that tuberculosis had been calculated to cause one-seventh of the total mortality of the human race. It was remarkable that, notwithstanding this important fact, little practical interest had been taken in the matter by the state, local authorities, or individuals. An assumed theory of its unavoidable nature seemed to lie at the root of this baneful fatalism. Dr. Anderson maintained that all tubercle bacilli were derived from predecessors of the same character, and pointed out the facility with which this bacillus adhered to moist surfaces and propagated itself under insanitary conditions such as prevailed in the overcrowded houses of the poor. He also mentioned the opinion, held by bacteriologists, that the expired breath of those suffering from the disease was comparatively innocuous, while their sputum swarmed with bacilli, and on evaporation and desiccation was apt to become a fruitful source of infection. Hence the paramount necessity for a systematic destruction of the sputum, disinfection of apartments occupied by those suffering from tuberculosis and disinfection or destruction of articles of clothing likely to retain the germ. Referring to the large mortality from tuberculous disease, Dr. Anderson mentioned, as an instance of public apathy in the matter of its prevention, the fact that very few people applied for disinfection of material after death from this cause, in comparison with the numbers of those who took such precautions in the case of the various fevers. Passing to the subject of the disease in cattle, he pointed out the large mortality among these animals from this cause and also the relation of milk supply to infant mortality from tuberculosis. The proportion of deaths from this cause in children under five years of age in Dundee was found to be 1 in 11. All these facts pointed to the necessity for the householder to safeguard his own interests. Dr. Anderson concluded his instructive address by mentioning in detail the preventive and disinfectant measures necessary to secure the highest possible immunity from the scourge.

Our Birds are Leaving Us.

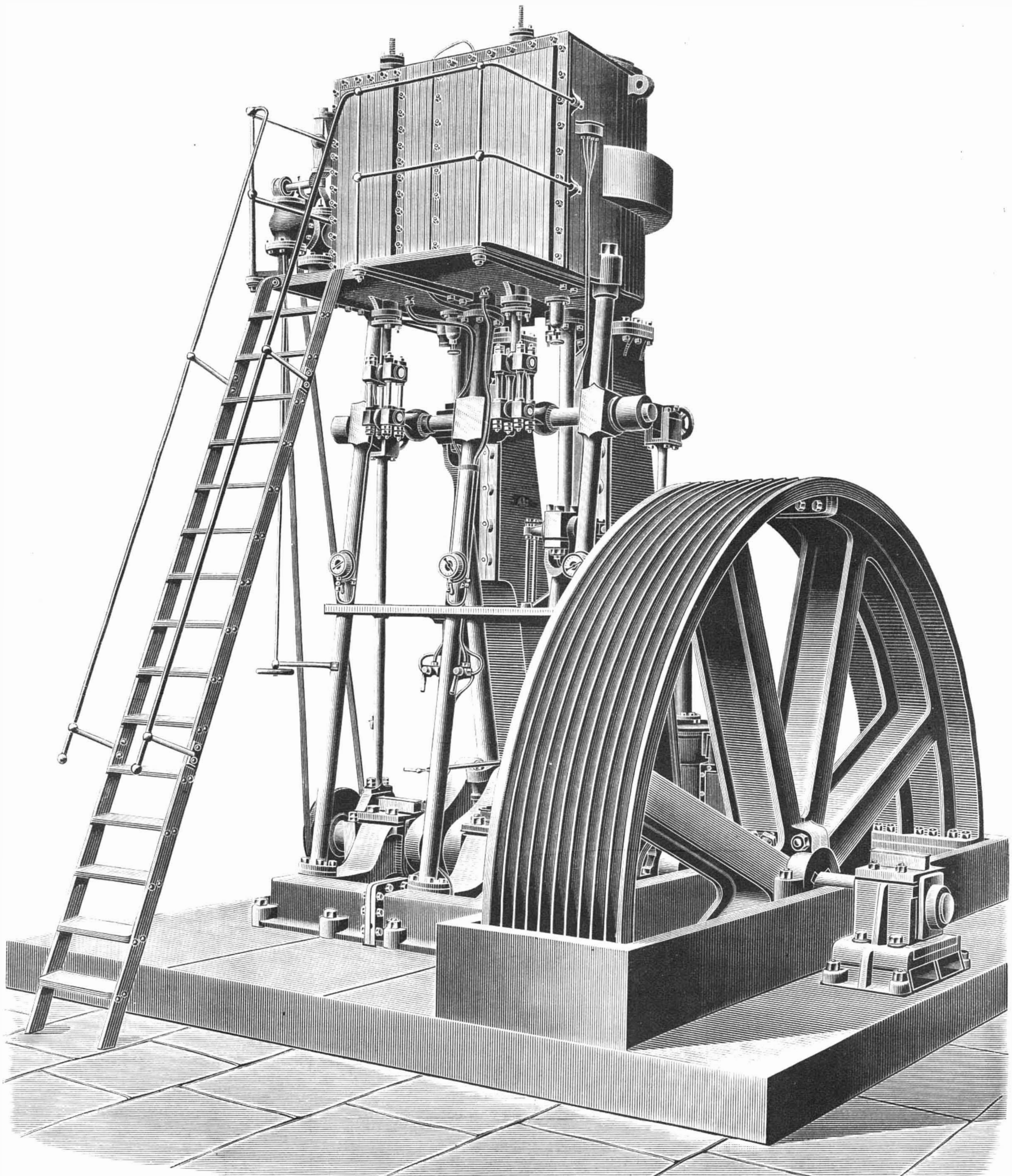
In *Harper's* Susan Fenimore Cooper sings a gentle dirge over the departure of the birds from our forests and hedgerows. Selecting a typical region in the Northern Alleghanies, she shows how the birds have gradually become silent, first the great white pelican on the mountain lake, then the beautiful wild swan, and finally even the myriads of wild pigeons. This last bird is one of the most curious examples of the sudden destructive blows to whole species that man's presence can give. Seemingly one of the most numerous and prolific of birds—flocks estimated to be 240 miles long have been seen in this century—it is now practically a thing of the past.

And as for the songsters, and the smaller feathered tribe:

"The friendly red-breasted robins, the beautiful bluebirds, the gay, musical goldfinches, those charming song birds the wrens, the gorgeous orioles, the purple finches, the dainty greenlets, the pretty cedar birds, the merry gold crests, and their cousins the ruby-crowns, those dainty sprites the humming birds—these and other bird families never failed in past years to bring joy with them to our lawns and meadows. Many of them are now rare visitors. The sturdy robins are much less numerous than they were formerly."

FOUR HUNDRED HORSE POWER MILL ENGINE.

The engines which we illustrate below are of the inverted marine type, and are designed for driving cement and other mills, shop machinery, and for general land purposes. The chief advantages claimed for this type of engine over the ordinary horizontal land engine are economy in floor space occupied and greater balance of working parts. In the engine illustrated, this latter point has been especially studied, the cranks being placed opposite to each other, instead of at right angles, as usual. The engines are designed to develop four hundred horse power, the cylinders being 19 in. and 33 in. in diameter by 48 in. stroke. The fly-wheel is 16 ft. in diameter, and weighs 12 tons. The makers are Messrs. Ross & Duncan, Whitefield Works, Govan, Glasgow. We are indebted to *Engineering* for our illustration and the foregoing particulars.



FOUR HUNDRED HORSE POWER COMPOUND MILL ENGINE.

A Stereoscopic Lantern.

Anderton's stereoscopic lantern, recently shown at the Pall Mall Exhibition, and demonstrated at one of the technical meetings of the P. S. G. B., is the most notable novelty that the lantern world has seen for many years. It has long been possible, in an experimental way, to show lantern pictures in stereoscopic relief by throwing the images from two lanterns through red and blue glasses respectively, and viewing them through opera glasses or spectacles in which the glasses are red and blue. This system has one or two disadvantages that have prevented its practical use. The throwing of the images on the screen side by side necessitated great straining of the eyes in looking at them for any length of time; but the worst disadvantage is the loss of light through the colored glasses. In Anderton's lantern the two images, which may be made from any stereoscopic negatives, are thrown upon the same part of the screen, so that there is no trouble in seeing them. Looked at in the ordinary way with the naked eyes, they appear as a blurred, out-of-focus picture, in which the subject may be but barely distinguishable, for they are thrown from lanterns with prisms in front of the objectives to polarize the light, and as the slides are the two halves of a stereoscopic picture they could not be made to coincide, even if it were desirable. The prism used to polarize the light is placed horizontally in one lantern and vertically in the other. Practically either image is only visible when viewed by the naked eyes, or through a prism held parallel to the original prism through which it is thrown. Thus, when one looks at the blurred image on the screen through a prism held horizontally or vertically, one image is plainly seen and the other is practically invisible, and when a glass is used containing a horizontal prism for one eye and a vertical prism for the other, each eye sees one image only, and the stereoscopic effect is given by the blending of the two. The illumination is very good, the image from the two lanterns seeming about as well lighted as the ordinary projection from either one of them. The stereoscopic effect, from good slides, is perfectly startling. The glass used by Mr. Anderton for viewing the images is like a very short opera glass on a handle, and with two small prisms suitable for his purpose cannot be a very expensive instrument.—*Practical Photographer.*

Reduction in the Price of Aluminum.

The Aluminum-Industrie-Actien-Gesellschaft, of Neuhausen, in Switzerland, owing to the increase of its dynamo capacity to 4,000 horse power, and some improvements in the processes employed, enabling it to increase largely the production of aluminum, announces that the price from January next will be 45 cents per pound. It must be remembered that, owing to the low specific gravity of aluminum, if equal bulks, not weights, of the different metals are taken, this price is really lower than that of copper as recently as 1890, and is less than that of tin at the present time. At present, 75 cents a pound is the ruling price for aluminum.

IT is now pretty well understood that the contemplated race between the champion English and American locomotives, that were exhibited at Chicago, will not take place. Our British cousins decline to join in a contest in which they know, beforehand, they would come out second best. No. 999, of the N. Y. Central, is said to have made the rate of 112½ miles per hour, and no locomotive as yet produced in England has come up to that scratch.

The La Grange Dam.

Stanislaus County, Cal., will soon have the highest overflow dam in the world.

It is called the La Grange dam, and is being constructed for the Modesto and Turlock Irrigation Districts. Its location is in the canyon of the Tuolumne River, three miles from the town of La Grange. Work on the project was commenced in June, 1891, and has been prosecuted continuously ever since. A force of 200 men has been employed on the work, the total cost of which will be $600,000.

The annals of engineering have hitherto recorded as the highest the Vyrnwy dam, which retains the water supply for the city of Liverpool, England. Its height, from base to summit, is 127 feet, but the La Grange will be two feet higher. Other celebrated dams, such as the Bear Valley, in San Bernardino County, and the Sweetwater, near San Diego, are properly known as reservoirs, and the protection of their basins as retaining walls.

The La Grange is being built by R. W. Gorrill, and will be 360 feet long on top, the plan being curved on a radius of 320 feet. Its maximum height above the foundation will be 127 feet 9 inches. The front face of the wall is made to conform to the curve described by the water in overflowing, and to deflect it into the basin in front of the dam.

The dam is built of "cyclopean rubble," and is a model of solidity. Huge rocks, weighing from six to ten tons, were first laid on the bottom. All their projecting pieces were cut off, and a flat but rough surface was prepared for the lower bed. Before being placed in the bottom, all stones, whatever their size, were scrubbed, and subjected to the action of numerous jets of water under pressure of seventy-five feet.

The process of construction was as follows:

"A level bed was first prepared in the rock and covered with a two-inch layer of cement mortar, which was beaten to free it of air. A large stone was then lowered into position by a steam crane, and was beaten down into the mortar by blows from heavy handmauls. Other large stones were similarly placed, but so as not to touch each other. The spaces left between them were filled with concrete, which was thrust into the narrow spaces with tampers.

"The work within the reach of each crane was brought up from six to eight feet before the crane was moved. In each course the immense stones were laid so as to bind with those in the course below. No horizontal joints passed through the wall, as the top of each course was left with projecting stones and hollows, which permit it to be well bound with the next course. To make the back face thoroughly watertight, the vertical joints were filled with mortar alone, and into this broken stone was forced."

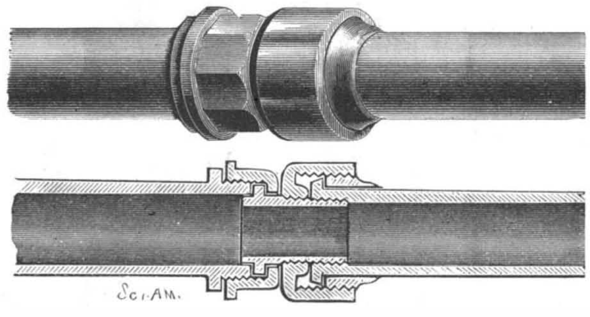
The La Grange dam will distribute water over a territory embracing 276,000 acres. The Turlock district comprises about 198,000 and the Modesto district 78,000 acres. The water will flow over the dam into two ditches. One will be 30 miles long and 100 feet wide, the other 28 miles long and 80 feet wide. The waters of the Tuolumne River will be banked up by the dam in the rocky canyon. A lake will thus be formed four miles long and a half mile wide. An idea of the solidity of the dam may be gathered from the fact that at its base it is 117 feet 9 inches thick, and that of solid stone, forming an indestructible barrier to the lake of water behind.—*Pacific Lumberman.*

Rapid Building.

Chicago has made a new record for rapid building operations by the manner in which work has been pushed on the New York Life Insurance Company's building, now in course of erection at La Salle and Monroe Streets. This building is of the so-called Chicago construction. On July 19 excavation was commenced, and as there had been no cellar under the structure which had previously occupied the site and been torn down, the work was from the surface. In nine days the curb wall was completed. On August 17 the entire foundation had been laid, and on the day following the first iron column was set in the basement. Thirty-six working days thereafter—September 28—a flag waved from the top, announcing the entire completion of the iron framework, and five of the days had been lost in waiting for delayed iron. On October 5, besides the skeleton framework, two stories of granite and three of terra cotta exterior walls had been laid, four floor arches of fireproofing had been set in place, the entire system of steam mains throughout the building set, and the basement floor laid in concrete. Ten days were consumed waiting for cut stone. Thus in ten weeks and one day—sixty-one working days—the entire framework for a building twelve stories in height and covering an area of 80 by 140 feet had been set, and a week later five stories of outer wall, composed of granite and terra cotta, had been laid. For four weeks double relays of men were employed, sixteen hours being counted a day; for the remainder of the time eight hours constituted a day's work. Taking this into account, the work occupied ninety-five working days from the day on which the first dirt was removed from the site. It is expected to have the structure ready for occupancy by February 1, 1894.

A SIMPLE GAS METER CONNECTION.

To save time in setting meters, and afford an efficient and inexpensive connection with the street service pipe and also with the distributing gas pipes in a house, is the design of this improvement, which has been patented by Mr. Albert H. Gindele, of No. 228 Second Street, Jersey City, N. J. On the end of the lead pipe to be connected to a meter is placed an exteriorly threaded sleeve, and the end of the pipe is then upset to form a flange against which the sleeve abuts. A cylindrical junction nut, preferably of brass, screws upon the threaded sleeve, and has a hub-like extension which bears against the flange and also screws upon a thimble screwing into the bore of the lead pipe, the



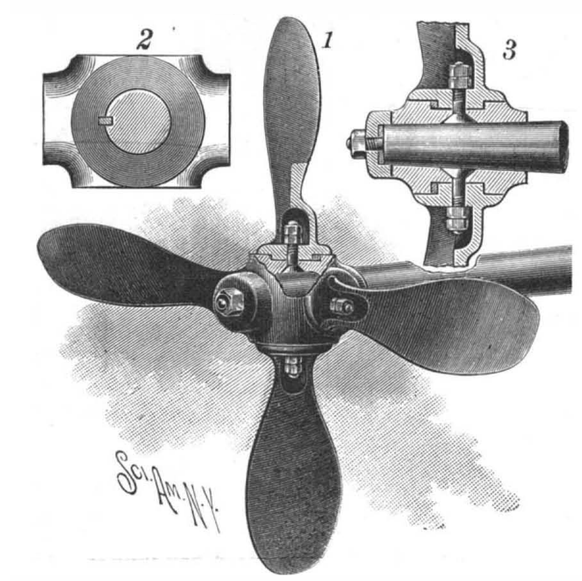
GINDELE'S GAS METER CONNECTION.

thread of the thimble producing a mating thread in the soft metal of the pipe. The thimble also has an external flange which is engaged by and has gas-tight contact with an inwardly radial flange on a union nut of the usual form, the nut screwing upon the end portion of the hollow meter post. The improvement is designed to afford a simple and reliable connection and dispense with solder joints.

SECURING PROPELLER BLADES TO THE HUB.

The illustration represents an improved means of securing propeller blades to the hub, recently patented by Mr. Martin Davies, Jersey City, N. J.

According to this improvement, screw bolts are inserted through the hub from the inner side, and then through the bases of the propeller blades, when nuts are applied to their projecting outer ends. Fig. 1 is a view in perspective; Fig. 2 a horizontal section at one side of the hub; and Fig. 3 is a section through the hub and opposing blades, the heads of the bolts being countersunk in the interior of the radially bored hub and arranged to form part of a smooth hub bearing for the propeller shaft. The hub has four faces, each adapted to receive a propeller blade, and having a circular recess in one wall of which is a feather, the base of each blade having a boss entering the recess, and



DAVIES' PROPELLER.

the boss having a recess to receive the feather. In securing the blade to the hub, the nut is turned down with great force, whereby the blade is securely clamped and fastened in place, but so that it may be removed with convenience and dispatch. This invention has been practically tested in actual use, and its value has thus been demonstrated.

THERE is a bill pending in Congress providing for the issuing of postal fractional currency, in denominations of 5, 10, 25 and 50 cents. This is intended to furnish the public with a convenient form of money for transmission through the mails. It is to displace the postal notes, which are to be withdrawn from sale on January 1, 1894. This fractional postal currency would be furnished at its face value and without the formality now necessary to get a postal note. There are branches of business involving small transactions which would be sensibly aided by such a currency for inclosure in letters.—*Philadelphia Ledger.*

A Steam Carriage for Road Use.

C. L. Simonds, of Lynn, Mass., has made a steam carriage for his own use that will make ten miles an hour. The carriage weighs only 400 pounds and can carry two persons at a time. It has the appearance of an ordinary carriage in front, except there are no provisions made for a horse. The wheels are of cycle make and are four in number. The hind wheels are 43 inches and the front wheels are 36 inches, with rubber tires. The boiler and engine set just in the rear of the seat and give the carriage the appearance of a fire engine. The steam generates in what is called a porcupine boiler, which weighs 100 pounds. The steam is made by naphtha flames from three jets. The naphtha is kept in a cylinder, enough to last for seven hours, and there is a water tank that will hold 10 gallons. There is a pump that is automatic in action directly connected with the engine. The steering part consists of a crank wheel on the footboard, so that the engineer can steer and attend to the engine at the same time. The body of the carriage rests on a cradle and three springs. It is easy riding, and allowance has been made for every movement. The shafts are of steel, and can stand all of 1,000 pounds. Mr. Simonds has given the steam carriage a trial already, and it has proved a success. It started off at a ten-mile gait; there was no noise, smoke or trouble whatever.—*Springfield Republican.*

Photographic Notes.

Photographing upon Fabrics.—Mr. August Villain, a dyer of Aubervilliers, recently communicated to the Societe d'Encouragement the processes that he employs for obtaining photographic prints upon fabrics. He recalled the researches of Messrs. Kopp, Willis, Green, Cross, and Bewan, and the application made by these chemists of alkaline bichromates, chromates of copper and aniline, solution of aniline in benzine, and denitrated primuline. In order to obtain the negatives, the process that has given Mr. Villain the best results consists in sensitizing the fabric with the following mixture:

Water	1,000 parts.
Bichromate of potash	35 "
" " ammonia	15 "
Metavanadate of ammonia	5 "

The fabrics impregnated with this solution are dried in the dark at a low temperature, and exposed to the light under a negative. They are afterward thoroughly washed. In this state they have fixed enough mordant to dye the print in baths prepared with the most varied artificial colors.—*Annales Industrielles.*

Photographing upon Marble.—In order to photograph upon marble there is applied to an unpolished slab of the latter a solution composed of:

Benzine	500 parts.
Spirits of turpentine	500 "
Asphalt	50 "
Yellow wax	5 "

After the solution is dry an exposure to the sun is made under a negative. The developing is effected with turpentine or benzine. The slab is then thoroughly washed, and those parts of it that are to remain white are covered with an alcoholic solution of gum lac. The slab is then immersed in a tincture of a coloring substance soluble in water.

After a short time the coloring material will have penetrated the pores of the stone, which is then removed from the bath and polished. The effects thus obtained are, it is said, very beautiful.—*Annales Industrielles.*

The Snow Sheds of the Union Pacific.

A correspondent of the N. Y. *Observer* says: "With two and sometimes three engines, our heavy train, now divided into two sections, climbed up the giant wall of the Sierra Nevada. We passed through the magnificent scenery of Shady Run, Blue Canyon and Giant and Emigrant Gaps. In running one hundred and seven miles we had climbed nearly seven thousand feet, sometimes over very steep grades. Before we reached the summit, snow sheds began to appear, and soon became practically continuous. It was the month of May, and the mountains were still covered deep with snow. We rode through forty miles of these wooden tunnels, from whose windows we could now and then catch glances of wild wastes of snow-covered mountains, and at other times of forests of pine and fir trees. Without these sheds it would be impossible to operate the road in winter. They are built in the most thorough manner, often upon solid foundations of masonry, and are separated by iron plates into sections, to guard against the spread of fire. There are automatic electric fire alarms in one of the longest sheds, and an engine with a tank close at hand is kept ready to flood any section that should catch on fire. The sheds are patrolled and guarded in a careful manner. Such attention is due not only to the passenger and freight traffic which the road conducts, but to the value of the sheds, which average from eight to twelve thousand dollars per mile. Several miles, where bridges and precipices made the construction difficult, cost as much as thirty thousand dollars per mile."

THE TRIPLE-SCREW WAR SHIP COLUMBIA.

The official speed trial of this our most recently built war vessel took place November 18, a previously attempted trial on November 16 having been given up on account of bad weather, although the engines were said to have worked smoothly, developing more than the power called for by the contract. The course was almost directly north from a point off Cape Ann, Mass., a distance of 43·96 nautical miles, the vessel crossing the line at full speed, making a long turn, and taking another run over the course in the opposite direction. According to the arrangements made, the times of passage over the course alone were to be taken, the time of turning being eliminated, but during the turn no change in engines or boilers was to be permitted, and not a valve or link was to be touched.

The starting line was crossed at 9:54:40, and at 11:49:48 the ship dashed across the finish line, completing the first half of the trial, the average speed having been 22·92 knots. During this run the steam pressure had risen to 158 pounds, and revolutions 136 each on the twin screws and 131 on the midship screw, and the last seven miles were said to have been made at the rate of 25·3 knots an hour. After turning in a circle of about four miles diameter, the run back was commenced, the line being crossed at 12:14:58, with a steam pressure of 160 pounds, the twin screws making 136 revolutions each, and the midship screw 130.

During the backward run there was some priming of the boilers at one time, and the speed between two of the stations on the course dropped to the rate of 21·11 knots, but the total backward run was made at the average rate of 22·71 knots. The mean of the two runs was therefore figured as 22·81, and the builders have earned a premium of $350,000 for attaining a speed of seven quarter knots over that called for by their contract. The naval officers aboard are said to have expressed the highest satisfaction with the performance of the vessel throughout.

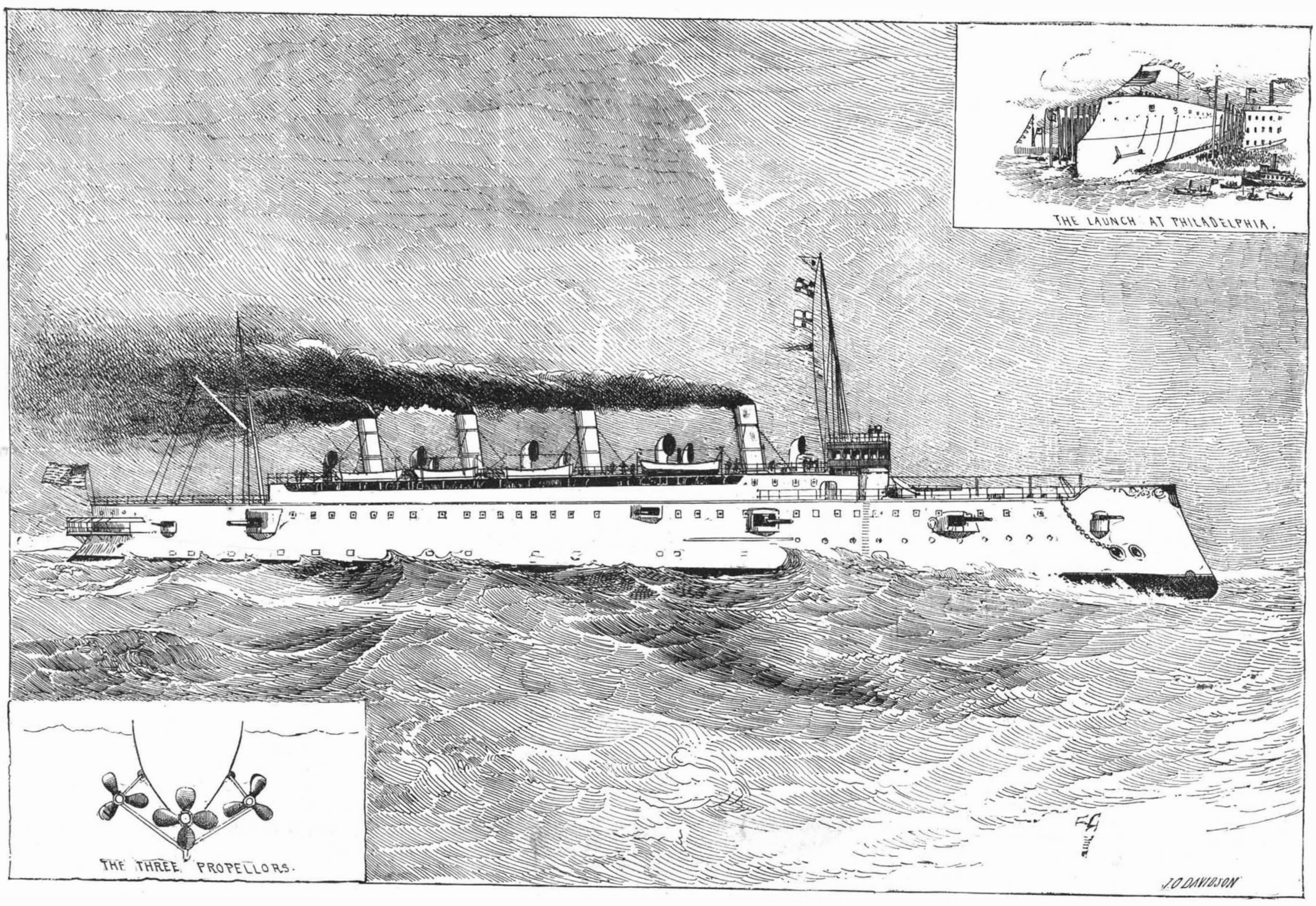
The board conducting the trial consisted of Rear Admiral George E. Belknap, Commodore J. G. Walker, Capt. Edmund W. Matthews, Chief Engineer Edward Farmer, Commodore Philip H. Cooper, Commander F. A. Cook, Lieut.-Commander Joseph N. Hemphill, and Naval Constructor Joseph Feaster, with Lieut. L. L. Reamy as recorder. These officers had also numerous assistants, the total government inspection force numbering no less than 36 officers—13 of the line, 20 of the engineer corps, and 3 of the construction corps of the navy. While the determination of the speed alone required nothing save the accurate marking of time at the passage of certain ranges, and the careful computation and correction of the resulting speed, there were yet a host of subjects concerning which the government officers were deputed to gather numerous and thorough data. Indicator diagrams were taken at close intervals from every engine on board, and from these will be determined pressures, horse power, and other information of great value to the navy department, not only for use in relation to the Columbia herself, but as a guide and assistance in future engine designing. Temperatures of fire rooms, fuel, water, etc., were also carefully noted.

The Columbia is 412 feet long on the load water line, 58 feet extreme beam, 22 feet 6½ inches normal draught, and displaces 7,350 tons. Her power consists of three three-cylinder vertical inverted triple expansion engines, having about 22,000 collective indicated horse power and driving three screws, one on the middle line, as in single screw ships, and the other two under the counters, as in twin screw vessels. This power is calculated to produce a speed of 21 knots an hour, which the contract for the vessel calls for, but the builders will receive a bonus of $50,000 for every quarter knot the vessel makes over the required twenty-one knots. Our engraving is from *Once a Week.*

The engines are in three separate water-tight compartments, the two driving the counter screws being placed abreast the same as in twin screw ships, and the one driving the center shaft just abaft them and lapping each for one-half its width. Steam is supplied by eight four-furnace double-ended boilers. The weight of all propelling machinery, including water in the boilers, is 1,950 tons. The coal supply on her normal displacement is 1,200 tons, but her maximum bunker capacity is 2,200 tons, which will give her at the most economical cruising speed a radius of action of about 16,000 knots.

The application of power through triple screws in large ships is an innovation, and its results in the Columbia are watched with intense interest by the entire civilized world. Essentially and avowedly a commerce destroyer, and not a fighting ship, the armament of the Columbia will be comparatively light.

The Columbia has been in a special degree the work of Engineer-in-Chief G. W. Melville, U. S. N., of the Bureau of Steam Engineering, under whose direction the designing of her machinery was done. When the estimates were made for this ship, the speed fixed was twenty knots, but after the naval appropriation bill was passed, it was found that in conference the speed had been raised to twenty-one knots, and Mr. Melville decided that the ship should have from 20,000 to 21,000 horse power, and at once began to lay out the engines and boilers. It soon became apparent that twin screw engines would not do, because of their size and the fact that they would be very extravagant in the use of steam at the ordinary cruising speed. Besides this the space that could be given up to machinery was restricted, and would not be satisfactory for twin screw engines. Mr. Melville then decided that triple screw engines were the only ones that would do, and at once set about the preliminary design. Through the course of her construction he has watched the machinery carefully, and the success which she has achieved marks a new era in marine propulsion.



THE NEW UNITED STATES WAR SHIP COLUMBIA.

Potassium Permanganate as an Antidote.

Schlagdenhauffen and Reeb refer to the fact that J. Antal has found permanganate of potassium act as an antidote to phosphorus, muscarine, strychnine, colchicine, oil of savin, and oxalic acid, when administered to frogs, rabbits, and dogs, with or directly after the poisons, and then proceed to describe the result of experiments conducted by themselves to ascertain the effect of the permanganate upon coronillin, $C_{11}H_{12}O_6$, a poisonous bitter principle isolated by them some years ago from the leaves of *Coronilla scorpioides.* They find that when the salt is placed in direct contact with the glucoside the latter is decomposed, being entirely oxidized, and physiological tests, in which frogs, pigeons, and guinea pigs were used, seemed to prove that the permanganate is a true antidote to the poison when administered within a sufficiently brief time after the latter.—*Journ. der Pharm. von Elsass-Loth.*

Seeing the World's Fair at Home.

Many as were the visitors to the great Columbian Exposition just closed, they included, in fact, but a small percentage of those who would like to have gone but were unable to do so. To the most of the stay-at-homes, however, there will now be offered, for many months to come, opportunities of acquiring a very near and pleasurable acquaintance with the best features of the memorable show, through the means of the excellent magic lantern and stereopticon views taken. T. H. McAllister, of New York, who received an award on his exhibit of magic lanterns and stereopticons, and who has long made a specialty of lantern slide views, has a wonderfully complete and varied collection of such views of the Exposition itself, by means of which one can obtain a most vivid portrayal, not only of the buildings, but a large proportion of the exhibits. One set of these lantern slide views is also accompanied by an original descriptive lecture thereon, in pamphlet form, whereby entertainment and instruction may be given to an audience by one who never visited the Fair.

RECENTLY PATENTED INVENTIONS.

Engineering.

FURNACE.—Wardell Guthrie, Chicago, Ill. Air pipes arranged alongside the furnace, according to this improvement, have openings into the furnace above the fire surface, and the furnace is fed by a screw conveyor in a trough lengthwise and centrally of the bottom, the fuel being fed back and upward as a projecting crank on the end of the screw is turned. The air is fed by force directly on the surface of the fire, as the fuel is fed up from the bottom. A dump or grate, for removing cinders or ashes, is placed at one or both sides of the feed screw.

DRAG FOR STEERING VESSELS.—Louis Boucher, West Superior, Wis. This is a device designed for use only when a ship's rudder becomes disabled, and it is so made that it may be conveniently stowed away and set up in a very short time when needed. The drag is an air-tight cylinder with pointed forward end, in which is a ring, there being annular flanges or fins on the cylinder. Attached to the ring is a chain which connects with two chains, one leading to each side of the vessel near the stern, where the chains are passed around pulleys in the outer ends of projecting beams, and thence over pulley blocks and a central capstan, whereby the drag may be easily moved to one side or the other in the rear of the vessel.

PROPELLER.—Frank J. Leisen, Woodbridge, N. J. This propeller has cylindrical, spirally formed and diagonally opposing exterior surfaces, and hollow interior formed with two pockets, one pocket visible from each side, and both pockets uniting to form a circular opening at the outer end. There are spiral exterior blades or ribs, each rib above a pocket. This improvement has been practically tested in a 16 inch propeller, demonstrating its superiority to an 18 inch fluke wheel, and a 36 inch pattern has been furnished the owners of Yankee Doodle, of Philadelphia, from which a propeller is to be made and given a public trial on that famous yacht.

Railway Appliances.

CAR COUPLING.—Edward N. and Jacob J. Byers, Cameron, Mo. This invention provides a safety attachment for couplers of the Janney type, whereby, should the drawbar be drawn from its proper seat, the device acts automatically to uncouple the loosened drawhead from the opposing car. An uncoupling lever connected with the drawbar has one end located beneath the coupling pin, and a guide is so connected with a fixed support that the lever will be elevated beneath the pin as the drawbar or drawhead is carried outward from the proper position.

PNEUMATIC SIGNAL.—George V. Steeb, Brooklyn, N. Y. The utilizing of air pressure to operate signals or semaphores is the object of this improvement, which provides for bringing the air pressure into action by the passing of a train over the track. The air under pressure is supplied by a pipe from any suitably located compressing source to a cylinder located in a suitable chamber beneath or adjacent to the track, this cylinder being connected with another cylinder in which is a piston, the movement of which operates the semaphore rod, the action being controlled by a valve in a third cylinder, actuated as the wheels of the car pass over inclined planes at the side of the track. The apparatus may also be used to ring alarm bells, move crossing gates, etc.

Electrical.

CARBON HOLDER.—Clark C. Hill, Newport, R. I. This holder is formed of a cylindrical, longitudinally slotted socket with thickened ends, and having near one end a circumferential groove to which is fitted a circular spring. With this improvement the upper and lower carbons of electric lamps may be held in the position of use without the employment of screw clamps or adjusting screws. The sections of the socket formed by slotting may also be made to clamp the carbons sufficiently without employing the circular spring.

ELECTRIC REGULATOR AND SWITCH.—Walter N. Jones, Jr., Petersburg, Va. This is an improvement for use on electric cars, in which the same adjusting devices serve to regulate the current to both the motor and the brake magnets, without allowing the current to be on the motor and the brake magnet at the same time from any inattention or forgetfulness of the motor man. Combined with two concentric rheostats, and two concentric series of segmental plates leading thereto, is a central shaft with insulated metal tubes bearing separate contact arms playing respectively upon the series of plates, the central shaft and metal tube forming two independent paths for the current centrally through the rheostats. The power increases in the motor by the movement of the crank in one direction, and increases in the brake by the mere reversal of the movement of the crank.

Mechanical.

HOOP SAWING AND SHAPING MACHINE.—Ephraim O. Hall, Marshfield, Oregon. This machine is designed to cut two hoops from a round log each time the log is fed to the machine, the hoops being perfectly formed, their upper sides planed, the edges scarfed, and the under side, in the direction of the heart of the log, left rough, the machine requiring but a single attendant. A diagonal saw at the rear of a vertical saw produces a kerf meeting that formed by the vertical saw, a planer being operated in conjunction with the latter saw, while an adjustable planer and an adjustable saw are also diagonally located, the latter saw being held to cut beneath the surface planed smooth by the planer.

HOOP CUTTING MACHINE.—Alban H. Adams, Fort Meade, Fla. According to this invention a roller cutter is applied to an ordinary rotary veneer cutting machine, to score the log or make longitudinal incisions in it, making also perforations between the incisions, so that when the veneer is turned from the log it will fall apart at the places of the incisions, forming a series of hoops, the grain of which runs lengthwise, and which are already perforated to receive the nails. The hoops thus made are especially adapted for use on orange boxes and similar packages.

PRINTER'S FURNITURE.—Jacob C. Wolfe, New York City. The design in this furniture is to present the maximum of bearing surface with the least weight, while it may be quickly and conveniently cast, and will afford a facing of uniform thickness. It consists of a hollow block with top and bottom recessed to form a marginal rib, the bottoms of the recesses inclining from the side ribs to the center of the block, while it has also a longitudinal central wall and transverse partitions forming pockets in each side.

WIRE BENDING MACHINE.—Cyrus M. Suter, Ashton, Ill. This is a machine for making stays especially adapted for placing the strands of wire fences and holding them the desired distance apart. The construction of the machine is such that the operation of forming a stay is entirely automatic, the stays being made successively from a length or coil of wire.

Agricultural.

CULTIVATOR.—August Leineweber, De Witt, Neb. This invention provides an improvement in cultivators of the disk type, and the cultivator shank is carried by and has vertical adjustment in a slide having movement upon the beam, there being a gear connection between the slide and the shank whereby the latter is revolved. Any desired number of cultivators may be placed upon a beam, and the cultivator disks are of peculiar construction, each disk being more or less cupped or rendered concave upon its inner face and convexed upon its outer face.

Miscellaneous.

APPARATUS FOR LIGHTING BUILDINGS.—John W. Davis, New York City. The lighting of interior rooms, basements and lofts, not readily lighted by windows, is the design of this improvement, the apparatus first condensing the beams of light, then carrying them to the desired locality and diffusing them, by a peculiar arrangement of mirrors operated by clockwork. A concave paraboloidal mirror is supported and adapted to travel above a light conduit, a convex paraboloidal mirror being held at the focus of the concave mirror and adapted to throw beams of light through an aperture in the latter, a plane deflecting mirror being held to receive the beams of light and throw them into the conduit.

VEHICLE BRAKE.—Eugene W. Cleveland, Rounthwaite, Canada. This is a strong and simple device, more especially designed for use on portable engines and other heavy vehicles. It comprises a frame on which is a windlass, chains attached to and wound upon the windlass being extended in opposite directions and hooked upon spokes of the wheels of the vehicles.

GLASS STRUCTURE.—Edgar W. Cunningham, Jersey City, N. J. This improvement pertains to an improved construction of skylights and the roofs and sides of greenhouses or conservatories, combining with aligned panels a joining piece of two metal binding strips having straight abutting sides which are soldered together, and parallel flat upper and lower flanges which closely embrace the adjacent opposite ends of the panels, the lower flanges being extended and curved to form a gutter.

SPIRIT LEVEL AND INCLINOMETER.—James P. Famous, Norristown, Pa. This device comprises an adjustable level tube in an elongated level stock, there being a grade indicating slide block at each end and a fixed transverse level tube on the top of the stock, in combination with a swiveling sight tube on the stock. The implement is adapted to determine whether objects are level, plumb, or inclined, and exactly determine the degree of inclination from a horizontal plane, the device being adapted for use in building and engineering work of all kinds.

ROCK DRILL.—William O. Higgins, Kingwood, Ind. This is an implement which may be conveniently worked by hand and easily handled by one man to place it in the desired position. In a suitable upright frame are mounted a vertically movable drill shaft and a driving shaft, an eccentric on the latter operated by a pivoted lever, there being a sliding ratchet wheel on the drill shaft and a pawl pivoted to a centrally pivoted lever, and a link connecting the two levers. The drill is steadily fed downward, to be able at every stroke to deliver an effective blow.

WRITING TABLET AND MANUSCRIPT HOLDER.—Barton W. Scott, San Jose, Cal. This improvement is more especially designed for the use of stenographers, public speakers, type setters, and others, to permit of readily writing matter on a continuous sheet, and conveniently displaying the written matter. The invention comprises a casing having two winding drums for the paper, a main shaft being journaled in the casing and actuating two gear wheels, which are adapted to be geared with the winding drum.

COAL SCREEN.—Frank L. Sackett, Fredonia, N. Y. To facilitate the screening of broken coal for retail purposes is the object of this invention, and the device provided therefor is simple and inexpensive. It consists of an oblong frame, across which the screen proper is stretched, and having an end wall and discharge opening, and whose bottom slides on side bars of the screen, the hopper being adjustable and removable. The device may be attached to the side of a cart or inclined against an upright support.

BICYCLE WHISTLE.—John F. Hylan and Robert L. Sinley, Brooklyn, N. Y. This is a simple and practical device, which may be readily attached to a safety bicycle, and comprises an air pump, to be actuated by the rotary motion of the front wheel, to afford a copious supply of air, and, on the movement of a lever, blow a loud blast on a whistle connected to the pump. The lever is projected below the handle bar, and the blast may be prolonged for as long a time as the lever is held gripped with the handle bar.

THILL SUPPORT.—Adolph Meyerhoff, New York City. A pair of keepers on the thill or pole is provided for by this improvement, and a slide bolt in the forward keeper has a head engaging the keeper, while a chain secured to the rear end of the bolt runs through the rear keeper, and a hook on the running gear engages the chain. The device is very simple and inexpensive, and may be attached to the thills or pole of any vehicle to hold them at the necessary height for convenience in storing, or to hold them up to take their weight from the horse's back.

FOLDING BED.—Hugh Stevenson, New York City. This is an improvement upon a formerly patented invention, according to which, when the beds are folded, the bedding is suspended, both the covers and mattress, to permit a free circulation of air between the covers, that they may be thoroughly ventilated. The present patent provides an improved construction, whereby, when the bed is folded, the covers may be separated and held perfectly straight, the covers and mattress being also so held that the bed may be very easily made up when necessary.

SHOE.—William T. Loyd, Hiawatha, Kan. The sole of this shoe is formed of a single sheet of metal, with a metallic counter, and a flange around the toe and ball, a flexible top toe piece being fastened to the front flange and a flexible lining at the heel. Beneath the ball and heel are also attached plates having serrated flanges, adapting the shoe especially for use as an ice creeper. The shoe is held on the foot by a strap over the instep.

BOX FASTENER.—Thomas Cole, St. Mary's, Mo. A safe and simple fastener, which will permit crates on which it is used to be packed on top of each other and slid about without disturbing the fastening, has been provided by this inventor. The fastening hasps are secured to staples made with spring coils, and the free ends of the hasps engage pins in recesses of the upper face of the lid, the spring tension holding the fastening firm, while the pressing up of the staple loosens the hold of the hasp on the pin.

Design.

SWEATERS.—William T. Pitchers, Godalming, England. Five design patents have been awarded this inventor on this article of apparel. In the first the sleeves and body are ornamented with panels having adjacent angular figures alternately embossed and in intaglio, and in the second are decorative panels of diamond shape, with sunken body and embossed margin. In the third are intersecting figures of serpentine character, with interposed series of ribs; in the fourth, rectangular figures inclose grouped circular figures, and in the fifth the body and sleeves have a surface finish of embossed ribs arranged spirally or diagonally.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5502) H. E. W. asks how to run a 70 volt motor of ½ horse power on a 110 volt circuit. A. Connect your motor across a pair of 12 light leads or larger, and place in series with it a resistance of 8 ohms. For the latter use No. 15 wire, or if you have them, 30 lamps in parallel with each other and in series with the motor.

(5503) J. R. N. says: Suppose a tank at an elevation of 250 feet in height, 10 feet in width, and 15 feet in height, with a pipe attached to bottom of tank 3 inches in diameter, 250 feet in length, perpendiculars. Suppose said tank to be filled with water. How many gallons of water will flow through said pipe per minute and what horse power would be required to keep this tank full of water, there being a constant discharge 3 inches in diameter? A. The pipe will discharge 1,275 gallons per minute and will require 80 horse power to keep the tank full.

(5504) E. A. S. says: Kindly inform me through the columns of your paper of a process for curing small skins, such as squirrel, etc. A. Mix bran and soft water sufficient to cover the skins. Immerse the latter and keep them covered for twenty-four hours, then remove, wash clean, and carefully scrape off all flesh. To 1 gallon of water (hot) add 1 pound of alum and ¼ pound of salt. When dissolved and cool enough to admit entrance of the hand, immerse the skins for twenty-four hours, dry in the shade and rub. Stir the liquor again, immerse the skins for twenty-four hours, dry and rub as before; immerse for twenty-four hours in oatmeal and warm water, partially dry in the shade, and finally rub until entirely dry. This leaves the skin like white leather, and fit for immediate use.

(5505) L. M. asks: What is the best method to preserve pneumatic tires for bicycles from one season to another, that is, to keep them from cracking and keep them soft? A. Wash the rubber tires perfectly clean and dry. Warm them by a stove and rub melted paraffine over the surface with a warm cloth. A very thin coat answers the purpose. If rubber cement can be obtained, such as sold by the rubber trade, a thin wipe of it with a woolen rag over the surface of the tires will keep them in good order.

(5506) S. B. W. asks: What the power of an ordinary man would be equal to in horse power. A. With a horse power equal to 33,000 foot pounds per minute, the power of an average strong man working to the best practical advantage for 10 hours is 4,200 foot pounds per minute. On short spurts can accomplish from two to three times as much, or half a horse power.

(5507) G. W. T. says: In this valley the coal is let down from the openings on the hills by wire cables and large drums and the speed is controlled by iron bands or brakes applied to the outside of the drums. Why is it that the bands or brakes wear faster than the iron plating on the drums? They are all the same kind of iron, and the band reaches nearly around the drum, but the plating on the drums will outwear three bands of the same thickness. A. Brake bands are generally much thinner and have less wearing surface than the drum band; besides the motion of the drum band tends to keep it cool, while the friction on the thin brake band makes it hot, and hot iron wears faster than cold iron.

(5508) G. E. P. writes: Can the simple electric motor described in SUPPLEMENT, 641, be run an hour or so a day by three storage battery cells which are charged the rest of the twenty-four hours by six cells of gravity battery? A. Yes; but you will need eight cells or more of gravity batteries for charging.

(5509) W. A. P. asks: How to hard solder one of those aluminum World's Fair sonvenirs and also how to soft solder on the same. A. For hard solder for aluminum, use an alloy of 6 parts aluminum, 4 parts copper, 90 parts zinc. Use Canada balsam for flux. For soft solder, an alloy of 95 parts of tin, 5 parts bismuth, or 5 parts cadmium, 2 parts zinc, 3 parts tin, using paraffine or vaseline for flux.

(5510) M. W. S. asks: In what proportion should air and ordinary illuminating gas be used in a gas engine to produce the best results? A. The constituents of ordinary illuminating gas vary somewhat in different cities and require a variable amount of air for perfect combustion; 8 to 12 volumes of air to 1 volume of a good quality of gas will produce the best result.

(5511) A. C. McG. says: Will you please inform me what chemicals are used to perform the trick of smoking from two clay pipes, by holding the bowl of one over the other? A. Hydrochloric acid and ammonia are used for this purpose.

(5512) W. W. Brown, Culbertston, Neb., writes: Under Notes and Queries (No. 5356) B. C. W. asks if there is any kind of a flux that can be used better than borax. I have a patent on a flux that will do the work he desires and will be pleased to be placed in communication with him.

(5513) R. E. B. asks: How is the power determined to drive a boat of a given size at a certain speed? This is for small boats of from 18 feet to 40 feet long. A. So much depends upon the lines and build of boats, together with the varying weight of the power, that computation of the power required for stated speed becomes somewhat complicated. The approximate formula is $\frac{V^3D^{\frac{2}{3}}}{C} = 2$ H. P. In which V^3 is the cube of the required velocity in knots per hour, $D^{\frac{2}{3}}$ is the cube root of the square of the displacement in tons, C is a coefficient for the water lines of the boat, which for launches and small steam yachts may vary from 500 for medium lines to 530 for sharp lines. The displacement should be computed for the total load, boat, machinery, water, fuel and persons.

(5514) E. S. McI. says: It is stated by the highest engineering authorities that the passage of impure water through sufficient gravel or sand will remove the impurities and make even sewage water wholesome and well tasting. Can you inform me what value as a filterer have the cinders from anthracite coal taken from under a boiler? A. The statement of engineers may be true in regard to the insoluble elements of sewage, but the soluble salts, urates, etc., have been traced a long way through the waterways of the ground, less through the loams and quicksand, but to an almost unlimited extent through the coarser gravels forming the principal underground waterways. When sewage is filtered through thick beds of material, so as to maintain the nitrifying organisms, which are supposed to be supported by a proper supply of sewage, there are possibilities of potable water being a product of such filtration. Gravel bed surface filtration has been found very efficacious in purifying sewage. Drinking the effluent is hardly to be recommended. Clean ashes from under a boiler should make a fairly good stratum in a filter after the soluble salts of the coal and wood are removed. The ash stratum should be protected by sand.

(5515) J. B. says: I am at present experimenting with a toy balloon. For a certain purpose I would like to have this balloon carry a weight from 3 to 4 ounces. The common toy balloon filled with coal gas has no lifting capacity. What I wish to know is whether this same balloon could be filled with some other kind of a gas, to give satisfaction. If this is possible, please let me know. A. If hydrogen gas were used, it would lift more than the coal gas. But it would require a balloon of say 6 cubic feet capacity filled with hydrogen to lift 4 ounces weight.

(5516) B. S. says: Will cedar or cypress tanks (or leach tubs) for tan liquors last the longest without rotting and how long will they last if well taken care of? A. There is very little difference in the lasting qualities of cedar and cypress for tan bark leach vats.

(5517) C. R. — Clean celluloid collars and cuffs with saleratus and water, using an old nail brush if desired.

(5518) F. De T says: Kindly give rule: How heavy should the joist be under a tank holding 18,000 gallons water, 40 feet from the ground, and are 12 x 12 heavy enough for uprights and plates, if properly braced? A If your tank is circular, 15 feet diameter by 15 feet high, the joists should be 4 x 12, 2 feet apart. Uprights and plates 12 x 12 inches.

(5519) F. M. says: Will you please state the difference of cost (used for cooking and furnace heating) against anthracite coal at $4.75 per ton of 2,000 pounds? Oil can be obtained for 5 cents per gallon or less, delivered in the tank. Would not two barrels of oil contain as much fuel as one ton of coal, taking combustion and advantage in controlling the use in consideration? A. The cost of petroleum at prices named is more than twice as much as coal for a given number of heat units for a constant fire. The only advantage in favor of petroleum at the price named is for the intermittent use of heat, such as for cooking in summer and the generation of steam for sudden and special use.

(5520) J. E. L. Co. asks: In a cylinder 20 inches long by 6 inches diameter, with a piston at one end, we find if subjected to 300 degrees, the volume of air will increase about 1/3. I would like to know the expanding force of the air thus heated, or how much will it move the piston and resist one pound pressure to the square inch? A. By heating the air from 60° to 300° it expands approximately 50 per cent, or 1 volume becomes nearly 1½ volumes, and if confined to the original volume it will have a pressure of 6 pounds per square inch, and will push a piston in a continuous cylinder from 20 inches, as above stated, to 27½ inches under 1 pound pressure per square inch.

(5521) W. A. W.—To make heel ball: Hard suet and beeswax, of each 4 ounces, powdered gum, sugar candy, and Venice turpentine, of each 1 ounce, ivory black and lamp black, of each 2 ounces. The coloring matter and sugar must be in fine powder. Dissolve the candy in as little water as possible. Melt the suet and the beeswax and add the sirup and the coloring matter, stir thoroughly, then pour into moulds.

(5522) K. S. asks: Is there any difference between an injector and an inspirator? A. There is no difference in principle between an injector and an inspirator. See an interesting illustrated article on injectors in SCIENTIFIC AMERICAN SUPPLEMENT, No. 356.

(5523) J. M. says: I have a cistern that was sunk in heavy clay, then boarded up with inch lumber, leaving a space of 3 inches behind the boards; into this space I packed soft clay and rammed it down tight as I boarded it up. I thought this would hold water and make an inexpensive cistern. I find that it will not hold water. Is there any way in which I can plaster it up with water lime over the boards to make it hold? Or is there anything you could suggest whereby I can fix it to hold in without going to much expense? The cistern is 5×5 and 6 feet deep. To settle a dispute, will you please say how many feet of timber in a stick 12×12 inches at one end and 24×24 inches at other end and 40 feet long, and give figures showing how to obtain the proper answer? A. You cannot do better than to take out the wood and clay tamping of your cistern and make the bottom and sides of Portland cement concrete, 1 part of cement, 3 parts clean sharp sand, then plaster the entire inside surface with pure Portland cement. Your cistern must be circular. For the taper timber. Rule: To the sum of the areas of the two ends add four times the area of the center and multiply this sum by one-sixth of the length. The piece of timber as stated contained 93·26 cubic feet.

(5524) D. F. V. asks: What would be the temperature at points 10, 20 and 40 feet below surface of ground in ordinary soil and does it vary much winter or summer? Also what force per square inch will air confined at ordinary temperature exert if heated from 300° Fah. to 600° Fah.? If compressed to 15 pounds per square inch before heating, would pressure be doubled when heated? A. The temperature of the earth at from 10 to 20 feet below the surface is nearly the same as the mean annual temperature on the surface. In mid-latitudes from 50° to 60° Fah., according to the condition of the surface soil. The increase of temperature downward is also variable, due to the nature and structure of the soil and rocks, the rate varying from 50 to 65 feet in depth for each degree of rise in the thermometer.

(5525) P. J. L. says: I wish to experiment with a hot water radiator for heating a room, and wish to know what kind of the following metals will give off the most heat, cast iron, steel, or copper, with hot water at 212°. Also, what amount of radiator surface is needed for a room 12 x 12 x 9, both for water and steam, and what quantity of water would radiator hold? What degree of heat would be shown on surface of radiator? Would it be possible to heat a radiator of the required size with a center draught lamp or with a gas burner? A. A copper radiator will be the most efficient in heating surface. Your room will require 12 square feet of heating surface for either hot water or low pressure steam. The capacity depends upon the plan of construction. The outside surface should be from 210° to 211° Fah. A large lamp or gas stove will heat the radiator.

(5526) C. P. asks: 1. How can a magnetized watch be demagnetized? Is there any machine for doing same, and where can I get description of it? A. A strong horseshoe magnet is required for demagnetizing watches. See an article on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, No. 668. 2. What would be the size of the smallest boiler to generate enough steam for working the steam turbine described in No. 17 of this journal, at the rate of 30,000 revolutions? A. A 25 horse power boiler might produce the number of revolutions you mention.

(5527) E. E. asks if it would be possible to read messages that were being transmitted through an ocean cable by inductive means, after grappling the cable and lifting it to the deck of a vessel. A. We think this would be impossible, on account of the use of a very weak current in the cable for transmitting messages and the ability of the metallic protecting covering of the cable to absorb practically all of the inductive impulses.

(5528) P. G. asks: 1. What would be the power of dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, if changed into a motor? A. About one man power, if supplied with sufficient watts. 2. What different connections are made to change a dynamo into a motor? A. No changes are requisite. The size of wire for winding depends on the potential that is available. 3. Would current enough to run a 6 candle power lamp run the above motor? A. It might run it if the motor was well constructed, but with very little power.

(5529) A. B. C. says: I have a motor like the one described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 759, with the exception that the field magnet is of the horseshoe style instead of the consequent pole type, as shown in that paper. It runs finely with six cells of plunge battery. I would like to rewind it for use on a 220 volt motor circuit. Should it be wound series or shunt? What size of wire and how many layers should I use on the magnet and armature? If it could not be wound for that high voltage, could I wind it for 110 volts and run in series with a 110 volt 16 candle power lamp? A. Wind your motor in series, with enough wire to give a safe current at 220 volts. We cannot do the calculation without knowing the size of your motor. If to be used with the lamp, it may be wound with enough No. 26 wire in field and No. 29 in armature to give 110 ohms resistance. In the calculation take the armature as wound in parallel, giving one-quarter the resistance of its winding.

(5530) W. A. M.—For information in regard to sterilizing milk, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 811 and 872.

TO INVENTORS.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 14, 1893,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adding device, C. A. Miller	508,435
Adding machine, T. A. Trent, Jr.	508,450
Air brake slack adjuster, H. Hinckley	508,421
Air ship, E. Pynchon	508,753
Alkalies by electrolysis, process of and apparatus for dissociating salts of, H. S. Blackmore	508,804
Aluminum fluoride, making, W. Ackermann	508,796
Armature core, H. G. Reist	508,637
Armatures for dynamo-electric machines, mounting, E. D. Priest	508,634
Autographic register, G. M. Morris	508,552
Autographic register, Morris & Stokes	508,553
Automatic sight feed lubricator, C. Couse	508,566
Axle box, A. H. Sensenig	508,438
Axle, etc., pivotal, C. A. Bowen	508,499
Axle, vehicle, T. S. Field	508,876
Baby jumper, A. J. Johnson	508,423
Baker's paddle, E. C. Cox	508,411
Baling press, Hackett & McLarty	508,703
Band cutter and feeder, N. O. Westberg	508,855
Band, testing, J. F. Ford	508,609
Banjo or similar musical instrument, J. A. Todd	508,586
Banker's case, A. Y. Andrews	508,394
Basket or receptacle, fruit or vegetable, T. Cogswell	508,408
Battery element, W. Mills	508,551, 508,897
Bearing, J. P. Vallin	508,787
Bearing, ball thrust, N. C. Bassett	508,670
Bearing, vehicle axle, H. Sichelschmidt	508,775
Bed lounge, A. Kulich	508,548
Bedstead, W. H. Harrison	508,517
Bicycle brake attachment, F. T. Snyder	508,490
Bicycle umbrella support, T. N. Heaney	508,418
Billiard games, automatic time check for, C. B. Hopkins	508,473
Bin. See Flour bin.	
Block. See Building block. Paving block.	
Boiler. See Steam boiler. Water tube boiler.	
Boiler brace, A. F. Huston	508,718
Boiler furnace, J. W. Warner	508,790
Boiler tube protector, C. W. Whitney	508,793
Bolt cutter, M. D. Luehrs	508,549
Bone cutting mill, J. Poulson	508,528
Book, record and index, P. Gruber	508,699
Bookbinding press, C. Seybold	508,847
Boring spherical cavities, device for, J. Riddell	508,640
Boring tool, J. W. Batcheller	508,803
Bottle stopper, D. F. Doody	508,509
Box. See Newspaper lock box. Paper box.	
Boxes, etc., material for forming, E. T. Kepner	508,723
Brace. See Boiler brcae. Railway rail brace. Shoulder brace.	
Brake. See Car brake. Electric brake. Railway brake. Vehicle brake.	
Brake beam, H. B. Robischung	508,531
Brick, W. Lenderoth	508,428
Brick or tile structures, system of, D. A. Straw	508,446
Brooms, handle clamp for street or stable, P. H. Lynch	508,522
Buckle, W. L. Braddock	508,675
Buckle, L. B. Prahar	508,752
Building block, W. O. Myers	508,577
Buildings, construction of, E. F. Wells	508,455
Buoy, signal, J. Bigler	508,400
Burial robes, former for, O. E. Seaney	508,846
Burner. See Gas burner.	
Butter extractor, centrifugal, O. Ohlsson	508,744
Button, J. W. Beaumont	508,498
Button blanks, machine for cutting out pearl, C. Workheiser	508,795
Calendar, perpetual, H. L. Weed	508,454
Call and telephone, combined messenger, G. E. Christie	508,563
Can. See Oil can. Sheet metal can.	
Can locking attachment, oil, C. H. James	508,477
Cans, lamp filling attachment for oil, J. C. H. Lynn	508,730
Car and air brake coupling, combined, G. Rohrbach	508,764
Car brake, D. N. Cook	508,409
Car brake, W. J. Devers	508,872
Car coupling, J. E. Ament	508,797
Car coupling, Gay & Finke	508,695
Car coupling, R. D. McGee	508,899
Car coupling, Pitts & Cowden	508,527
Car coupling, G. W. Smillie	508,441, 508,442
Car coupling, C. F. Springer	508,853
Car coupling, F. A. Stevens	508,779
Car, elevated railway, J. L. Pope	508,631
Car fender, A. L. Clarke	508,565
Car heater, E. H. Gold	508,514
Car heating system and apparatus, E. H. Gold	508,513
Car heating systems, trap for, E. E. Gold	508,569
Car life-preserving guard, A. Knoblauch	508,888
Car lighting system, electric, J. C. Henry	508,616
Car platform gate, C. H. Cox	508,815
Car, railway, R. L. Piepenbring	508,835
Car switch, railway, T. A. Remsen	508,837
Car wheel, D. Hazard	508,824
Cars, brake apparatus for electrically propelled, F. O. Blackwell	508,673
Cars, etc., fender for electric, C. N. Homan	508,472
Cars, means for preventing derailment of, Kirchner & Chase	508,480
Cars, removable front for street, P. W. Lupher	508,892
Card waste transmitter, Robinson & Conley	508,487, 508,488
Carriage, baby, H. Lange	508,726
Case. See Banker's case. Packing case. Razor strop case. Show case.	
Casket, metallic, Lupfer & Hiser	508,432
Casting rollers, F. B. Torrey	508,785
Chair. See Dental chair. Rocking chair.	
Chair, W. H. Fauber	508,690
Chicken house, W. H. Putnam	508,529
Chuck, drill, A. Woeber	508,667
Churn dasher, A. Schuyler	508,768
Chute, ash, Stelling & Reetz	508,583
Cigar vending machine, Kletzker & Ranz	508,725
Cleat for electric wiring, F. A. Duggan	508,687
Clock moon dial, E. A. Clark	508,467
Cloth cutting machines, overhead support for conducting wires of, A. K. Thyll	508,534
Clothes drier, H. R. Sheets	508,772
Clutch, friction, Wakefield & Libby	508,663
Coil, reactive, E. Thomson	508,657
Coin-controlled apparatus, R. M. Shaffer	508,848
Collar and hames, combined horse, J. Morrison	508,483
Coloring matter from dye-wood extracts, obtaining friable, P. T. Austen	508,592
Contact apparatus, E. Thomson	508,651
Cooking device, meat, A. Reubold	508,759
Cooking utensil, G. H. Nicholls	508,831
Copy holder, Bramlette & Evans	508,863
Cotton grader and nail arrester, T. D. Ruffin	508,842
Cotton scraper, W. Lum	508,431
Coupling. See Car coupling. Car and air brake coupling. Fire hose coupling. Hose coupling. Steam-tight coupling. Thill coupling.	
Coupling, W. H. Hampson	508,705
Crane, J. Horton	508,476
Crayon or pencil, A. K. Cross	508,469
Cultivator, A. Hodgson	508,712
Cultivator, L. Luppen	508,481
Cultivator, J. Macphail	508,433, 508,434
Current motor, alternating, Kelly & Chesney	508,721
Current transformer, W. H. Hornberger	508,422
Currents, means for regulating multiphase, E. W. Rice, Jr.	508,638
Cut-out, electric, E. Thomson	508,652
Cut-out, safety, O. Offrell	508,629
Cutter. See Band cutter. Bolt cutter. Paper cutter. Twine cutter.	
Cutting gauge and marker, combined, A. A. Waldie	508,453
Cycles, flexible and collapsible mud guard for, M. F. Taintor	508,782
Cyclometer, C. H. Clawson	508,405
Cyclometer actuating device, C. H. Clawson	508,406
Damper governor, G. C. Hicks	508,709
Decorative films, roll for holding and applying, W. H. Coe	508,869
Dental apparatus, rheostat for controlling electrically-operated, J. P. B. Fiske	508,692
Dental chair, T. N. Clark	508,564
Dental impression tray, H. A. Burlingame	508,677
Deodorizing hydrocarbon oils, A. Kayser	508,479
Detector. See Electric current meter detector.	
Die. See Machine die.	
Die, M. G. Fuller	508,694
Direct-acting engine, J. G. Leyner	508,430
Dish drainer, bread board, and cutting board, combined, J. D. Johnston	508,885
Display table, W. Macnamar	508,627
Display tray, F. A. Gruebel	508,700
Distance and altitude instrument, W. H. Pratt	508,556
Dolls, making, Scott & Seymour	508,770
Door bolt, D. D. Reeves	508,635
Door, flexible, F. Jefts	508,720
Door opener, electric, H. T. Johnson	508,518
Draught equalizer, J. W. Steinmetz	508,778
Draining board for bars, E. Neely	508,740
Drapery fastening device, W. P. Miller	508,735
Drawer pull, J. G. Hallas	508,878
Dredging machine, hydraulic, J. W. Sackett	508,766
Drier. See Clothes drier.	
Dust separating machine, W. W. Green	508,611
Earth carrier, J. J. Wishard	508,589
Egg containing cases, apparatus for rotating, J. H. Bowley	508,806
Electric arc disrupter, W. B. Potter	508,632
Electric brake, E. B. Skinner	508,851
Electric circuit indicating apparatus, E. Thomson	508,662
Electric circuits, stand for controlling, E. R. Knowles	508,626
Electric circuits, switch box for controlling, Knowles & Park	508,625
Electric conductor, underground, J. C. Henry	508,613
Electric current meter detector, E. Thomson	508,660
Electric distribution, E. W. Rice, Jr.	508,838
Electric distribution system, W. S. Moody	508,898
Electric distribution system, E. W. Rice, Jr.	508,839
Electric elevator, A. T. Chase	508,680
Electric generator, W. S. Hill	508,880
Electric generators, regulating self-exciting alternate current, W. Stanley, Jr.	508,493
Electric lighting system, E. Thomson	508,647
Electric lighting system, T. A. Willard	508,559
Electric machine or motor, dynamo, E. Thomson	508,658
Electric machines, brush holder for dynamo, E. R. Knowles	508,624
Electric machines, conductor for dynamo, Reist & Fiske	508,636
Electric machines, machine for boring out the standards and field magnets of dynamo, J. Riddell	508,639
Electric meter, E. Thomson	508,661
Electric motors, fluid pressure device for controlling, Parshall & Darley, Jr.	508,630
Electric transformer, E. Thomson	508,655
Electrical condenser, J. F. Kelly	508,887
Electrical contact making device, W. F. Z. Desant	508,871
Electrical distribution system, E. Thomson	508,646
Electrical transformer, A. Ekstrom	508,688
Electrical transformer, E. Thomson	508,650
Elevator. See Electric elevator. Hydraulic elevator.	
Elevator controller, electric, J. P. B. Fiske	508,691
Elevator controlling mechanism, T. W. Eaton	508,510
Emery or corundum wheel, safety, W. S. Shipe	508,773
Engine. See Direct-acting engine. Gas engine. Pressure engine. Pumping engine. Rotary engine.	
Engines, automatic safety stop for, A. J. Bates	508,671
Engines, igniting apparatus for gas, G. E. Hoyt	508,618
Engraving chuck, Eaton & Fargo	508,606
Eraser, blackboard, J. Haggerty	508,704
Ether vapor motor, P. De Susini	508,447
Excavator, F. H. Schulte	508,437
Extension table, R. Mainardi	508,628
Extractor. See Butter extractor. Stump extractor.	
Eyeglass guard, G. Bausch (r)	11,389
Face plate jaw, J. N. Skinner	508,533
Fan motor, W. S. Hill	508,710
Fender. See Car fender.	
Fence, W. N. Lane	508,889
Fence and tightener, wire, C. H. Brunk	508,465
Fence machine, hand, J. H. Pivonka	508,856
Fillet, T. C. Belding	508,399
Filter, J. M. Skinner	508,440
Fire escape, E. A. Couch	508,684
Fire hose coupling, Sackett & Pfetsch	508,844
Fireproof construction, Crittenden & Emery	508,501 to 508,503
Fish net sinker, J. S. Coey	508,681
Floor-cloth, machine for the manufacture of, W. J. Beard	508,463
Flour bin and sieve, G. C. Sherman	508,439
Folding gate, E. Pickett	508,750
Fringe balls to the border of textile fabrics, machine for attaching, R. A. Swoboda	508,645
Fruit washing and cleaning apparatus, D. E. Barton	508,860
Furnace. See Boiler furnace. Ore roasting and calcining furnace.	
Furniture, adjustable support for school, T. R. Roulstone	508,557
Fuse plug, H. C. West	508,665
Gauge. See Cutting gauge.	
Game apparatus, C. C. Moore	508,524
Game apparatus, W. D. Pickens	508,834
Game apparatus, A. M. Quick	508,754
Garbage, night-soil, etc., apparatus for destroying, Engle & Thompson	508,511
Garden tool, combined, S. M. Alexander	508,393
Garment supporting bracket, J. J. Bisel	508,861
Gas burner, natural, H. H. Engelman	508,689
Gas engine, Von Oechelhaeuser & Junkers	508,833
Gate. See Car platform gate. Folding gate. Sliding gate.	
Gate, G. H. Aylworth	508,799
Gate, Jester & Alexander	508,573
Gear, driving, J. F. Guild	508,701
Generator. See Electric generator.	
Glass mould, R. W. Blaze	508,597
Glass rolling machinery, P. V. Peltier	508,748
Glass surfaces, producing colors on, J. C. Duntze	508,873
Glassware, snap for holding, T. C. Steimer	508,854
Glove fastener, W. B. H. Dowse	508,605
Glove fastening, W. B. H. Dowse	508,604
Grain binder's needle, C. Paul	508,745
Grain conveyer, J. Vogt	508,788
Grate attachment, J. S. Montgomery	508,736
Guitar, J. S. Back	508,858
Guitar, lyro, W. Hay	508,543
Gumming and cutting strips, labels, etc., apparatus for, D. W. Collins	508,682
Guns, power mechanism for pointing and training, H. S. Maxim	508,733
Gutta-percha or balata, treating, P. C. Beiersdorf	508,560
Hammock hook, E. C. Grant	508,698
Handle. See Saw handle.	
Hanger. See Hose hanger. Picture hanger. Pulley line hanger. Shade hanger.	
Harness, H. Stout	508,781
Harrow disk sharpener, J. O. Ingle, Jr., et al.	508,719
Harrow for listed corn, J. E. Beach	508,398
Harrow, rotary wheel, Baldner & Sabin	508,536
Hat bodies, machine for uniting nap bats to, W. A. Baglin	508,462
Hay press, J. T. Russell	508,843
Hay rake and loader, C. W. Baird	508,395, 508,397
Hay rake and loader, J. A. Crook	508,817
Hay rake and loader, side delivery, C. W. Baird	508,396
Hay tedder, L. Kissner	508,425
Heater. See Car heater.	
Heating apparatus, B. M. Dunson	508,820
Hedge trimmer, J. T. Phelan	508,749
Hoisting bucket, T. Cogswell	508,599
Hook. See Hammock hook. Tug hook.	

Horseshoe, W. C. Edge........ 508,607
Horseshoe calk sharpener, F. F. Gokey........ 508,903
Horseshoe toe calks, machine for making, T. B. Huestis........ 508,544
Hose coupling, G. Terlinden........ 508,448
Hose hanger, G. A. Tower........ 508,786
House. See Chicken house.
Hydraulic elevator, T. W. Eaton........ 508,470
Ice making plants, signaling and registering device for, A. J. McArthur........ 508,737
Ice, means for cutting, L. Daft........ 508,819
Incubator, E. W. Andrews........ 508,857
Incubator, E. J. Bray........ 508,808
Incubator, J. M. H. Spooner........ 508,492
Indicator. See Speed indicator.
Insulating composition, E. Thomson........ 508,653
Insulation of dynamo-electric machines, protection for the, E. Thomson........ 508,649
Ironing board or cylinder, for ironing machines, S. Barrett........ 508,595
Jack. See Pegging jack.
Jar or bottie receiver, R. Good........ 508,697
Kitchen utensil, E. Hilsher........ 508,711
Knit garment, S. B. & F. F. Lewis........ 508,429
Knitting machine, circular, E. J. Franck........ 508,512
Knitting machines, adjustable support for the cloth-wheels and burr wheels of rotary, E. Vermilyea........ 508,452
Laces, apparatus for pointing and punching shoe, P. Goldstein (r)........ 11,385
Ladder, L. D. Craig........ 508,816
Lamp burner, J. Jauch........ 508,572
Lamp chimney cleaner, Rink & Ruppenthal........ 508,761
Lamp, electric bicycle, G. Mayr........ 508,482
Lamp, electric arc, E. Thomson........ 508,656
Lamps, apparatus for treating filaments for incandescent electric, Burnett & Doane........ 508,678
Lamps, leading-in wire for incandescent, E. Thomson........ 508,659
Lamps, stand for testing electric arc, E. R. Knowles........ 508,623
Lantern, F. Whiting........ 508,496
Lantern holder, C. J. Sonnema........ 508,491
Lantern pinion, A. Junghans........ 508,886
Lantern, reflector, F. A. Smith........ 508,776
Latch, I. J. Gray........ 508,541
Latch and lock combined, A. Linsmayer........ 508,890
Lath machine, sheathing, I. G. Jenkins........ 508,545
Level, spirit, H. O. Risse........ 508,762
Lever and locking mechanism therefor, M. J. Todd........ 508,784
Light. See Search light.
Lighting circuits, branch block for incandescent, A. Swan........ 508,644
Lighting device, hydrocarbon, F. A. Cody........ 508,812
Lightning arrester, E. Thomson........ 508,648
Liquid meter, F. Shippen........ 508,774
Liquids, extracts, and solutions, preparing fermented and distilled, C. Hornbostel........ 508,882
Load lifter and carrier, T. H. Butcher........ 508,866
Locomotive fire kindling apparatus, J. McNaughton........ 508,739
Loom picker strap holder, L. W. Milliken........ 508,550
Lubricator, Mowrer & Jordan........ 508,485
Machine die, A. Vuillier........ 508,789
Magnet coil and manufacturing same, field, Johnson & Haskins........ 508,620
Magnet coils, connector for electro, M. O. Southworth........ 508,643
Magnetic permeameter, Knap & Sprong........ 508,827
Mail bag fastener, J. A. Roosevelt........ 508,841
Manhole cover, Hickey & Norris........ 508,471
Marble, manufacturing artificial, Majewski & Beyenbach........ 508,731
Mechanical movement, A. G. Brewer........ 508,676
Metal tie and nut lock, J. P. Warner........ 508,664
Meter. See Electric meter. Liquid meter.
Mill. See Bone cutting mill. Stamp mill. Windmill.
Mine trap door, Herth & Bonenberger........ 508,879
Mines, etc., recovering lost coal from, R. Y. Mitchell........ 508,523
Mining machine, O. E. Zohe........ 508,856
Mould. See Glass mould. Sand mould.
Mould skim gate, W. A. James........ 508,884
Motor. See Current motor. Ether vapor motor. Fan motor. Railway motor.
Muzzle, J. Heinz........ 508,419
Napping bats and apparatus therefor, forming and sticking, W. A. Baglin........ 508,859
Newspaper holder, W. Schweitzer........ 508,769
Newspaper lock box, E. J. Colby........ 508,870
Newspaper wrapping machine, L. C. Crowell........ 508,567
Nut lock, H. P. Brown........ 508,402
Nut lock, Harmon & Faber........ 508,823
Nut lock, W. M. Reed........ 508,757
Oil can, T. Schirrmacher........ 508,767
Ore roasting and calcining furnace, R. C. Greer........ 508,542
Packing case, E. A. Turner........ 508,451
Panorama, balloon, C. G. Rodeck........ 508,763
Paper box, J. J. Hoffman........508,570, 508,571
Paper boxes, machine for making, C. R. Bannihr........ 508,594
Paper cutter, rotary, H. L. Mellor........ 508,576
Paper tubes, machinery for the manufacture of non-pasted, A. E. Decoufle........ 508,505
Paper winding shaft, J. H. Baker *et al*........ 508,801
Paring fruit or vegetables, machine for, E. J. Lewis........ 508,729
Paving block, H. Brunson........ 508,537
Pegging jack, G. O. Bjorkander........ 508,862
Pencil, addition, A. M. Grubbs........ 508,417
Pencil holder, G. W. Washburn........ 508,791
Pencil sharpener, A. Fornander........ 508,693
Pendulum escapement, S. Riefler........ 508,760
Pendulum, mercurial compensation, S. Riefler........ 508,530
Piano action, J. F. Conover........ 508,813
Pianoforte action, J. Greener........ 508,416
Picture hanger, F. Gaisser........ 508,540
Pie fillings, preparing, Brewster & Abell........ 508,598
Pile fabrics, machine for smoothing and polishing, F. Bartels........ 508,802
Pile, iron or steel, A. Hooven........ 508,881
Pipe threading machine, F. W. Smith, Jr...508,581, 508,582
Planing machine, J. S. Graham........ 508,516
Planter, corn, L. C. Evans........ 508,568
Plastic material, manufacturing articles of, West & Whipple........ 508,494
Plow, sulky, S. E. Calif........ 508,811
Pocket or bag, hanging, I. A. Margesson........ 508,893
Postal note, E. A. Curley........ 508,601
Pot. See Teapot.
Potato digging machine, G. Wragg........ 508,460
Press. See Baling press. Bookbinding press. Hay press.
Pressure engine, fluid, R. A. Parke........ 508,525
Printing machine, W. M. D. Turton........ 508,535
Printing press web feeding device, J. L. Cox........ 508,814
Printing show bills or similar articles, F. G. Annison........ 508,497
Profiling machine, G. E. Hunter........ 508,716
Pulley line hanger, H. Reichwein........ 508,758
Pulping engine, G. Miller........ 508,734
Pump, air, W. C. Whitacre........ 508,495
Pump, duplex rotary force, I. P. Lambing........ 508,574
Punch and stamp, combined ticket, W. S. Eiseman........ 508,821
Quicksand, method of and apparatus for handling or controlling, C. Horton........ 508,714
Rack. See Rotating rack.
Rail frog, automatic, H. W. Byers........ 508,867
Rail joint, J. Schuler........ 508,580
Rails, apparatus for unloading and distributing, H. W. Byers........ 508,868
Railway brake, electric, A. De Bovet........ 508,805
Railway conduit, electric, A. J. Robertson........ 508,578
Railway, electric, J. C. Henry........ 508,615
Railway, elevated, L. Johnston........ 508,478
Railway motor, electric, E. D. Priest........ 508,633
Railway rail brace, D. Markley........ 508,575
Railway rail splice, A. McHugh........ 508,900
Railway spike, J. L. Gage........ 508,877
Railway switch, V. Cruser........ 508,413
Railway switch, electric, E. M. Bentley........ 508,672
Railway track cleaner, electric, H. O'Connor........ 508,743
Railway trolley, electric, N. C. Bassett........ 508,669
Railway trolley, electric, J. Chase........ 508,538
Railway trolley, electric, S. D. Field........ 508,539
Railway trolley, electric, W. H. Knight........ 508,622
Railways, converter system for electric, C. S. Bradley........ 508,807
Rake. See Hay rake.
Ratchet wrench, M. D. Schaller........ 508,845
Razor strop case, W. F. Smith........ 508,443
Recorder. See Speed recorder. Time recorder.
Refrigerator, Kroenke & Bindewald........ 508,520
Refrigerator weighing and registering attachment, W. B. Dickson........ 508,507
Register. See Autographic register.
Resawing machine, Graham & Kane........ 508,515
Resin, manufacture of, R. L. Etheridge........ 508,608
Rheostat, J. B. Blood........ 508,674
Rocking chair, S. Chambers........ 508,403
Roofing, C. E. Pope........ 508,751
Rotary engine, W. S. Petty........ 508,555
Rotating rack for holding robes, etc., F. G. Wood 508,459
Rubber boot, O. P. Hurd........ 508,619
Safe, E. Meyers........ 508,895
Safe locks, method of and apparatus for controlling and utilizing concussion and applying it to, M. A. Dalton........ 508,902
Sand mould, S. J. Adams........ 508,590
Sash weight, R. S. Judson........ 508,546
Saw, crosscut, B. F. Moss........ 508,484
Saw filing device, G. A. Kennedy........ 508,722
Saw handle, E. Andrews........ 508,798
Scraper, E. J. Davy........ 508,685
Screwdriver, S. S. Hand........ 508,706
Screw machine, automatic, O. P. Briggs........ 508,864
Search light, A. L. Rohrer........ 508,642
Separator, Wheelan & Jessup........ 508,792
Sewing machine, G. H. Colley........ 508,600
Sewing machine, D. Howell........ 508,715
Shade hanger, window, J. A. Thompson........ 508,783
Shaft, structural hollow, Johnson & Stowe........ 508,826
Sheet metal can, F. H. Palmer........ 508,554
Shoulder brace, W. H. Horn........ 508,713
Show case or rack, E. F. Spencer........ 508,445
Show tray for dried fruit, W. R. M. Tortat........ 508,449
Shutter closer and fastener, J. K. Christy........ 508,404
Sifter, ash, Lewis & Ross........ 508,728
Skate truck, roller, C. G. Hoerle........ 508,617
Skating rink, artificial ice, T. L. Rankin........ 508,755
Sliding gate, H. Withey........ 508,666
Slate, drawing, A. K. Cross........ 508,468
Slate dressing or planing machine, T. J. Ruch........ 508,579
Snow sweeper, N. C. Bassett........ 508,668
Soap, manufacturing toilet, T. C. Stearns........ 508,777
Soap suspension attachment, C. A. Breul........ 508,809
Spectacles, M. F. Wickliffe........ 508,457
Speed indicator for shafting, W. F. Dial........ 508,686
Speed recorder, J. C. Henry........ 508,614
Spindle support, J. H. Northrop........ 508,742
Spokeshave, H. D. Lanfair........ 508,427
Stamp, hand, C. H. Burgess........ 508,865
Stamp mill and amalgamator, Carter & Bell........ 508,679
Stand. See Umbrella stand.
Stave bending machine, J. Deters........ 508,506
Steam boiler, D. Rousseau........ 508,532
Steam-tight coupling, L. M. Rouse........ 508,765
Steam trap, M. Hey........ 508,708
Steam trap, R. R. Leitch........ 508,727
Stocking supporter, O. Huff........ 508,883
Stone, machine for sawing blocks of, A. Jeansaume........ 508,825
Stove grate, F. Will........ 508,458
Stove, heating, J. Wilson........ 508,794
Stove or furnace, H. C. Hornish........508,474, 508,475
Stovepipe fastener, A. P. Fedewa........ 508,874
Stump extractor, C. N. Blood........ 508,401
Sugar by synthesis, manufacture of crystallizable, J. E. Pellegrini........ 508,747
Sulky, W. A. Galbraith........ 508,415
Sulky, racing, T. Harrington........ 508,707
Switch. See Car switch. Electric snap switch. Railway switch.
Switch, W. H. Robbins........ 508,840
Switchboard, multiple, M. G. Kellogg (r), 11,386 to 11,388
Switchboard, power station, Rohrer & Mansfield.. 508,641
Synchronism, device for indicating, C. F. Scott... 508,489
Table. See Display table. Extension table.
Table and writing cabinet, combined, J. Danner.. 508,603
Tack driving machine, G. A. Stiles........ 508,780
Tack, plumber's, W. H. Evory........ 508,822
Tacking machine, hand, C. W. King........ 508,547
Tea pot, coffee pot, etc., F. Mann........ 508,828
Telephone, electric, E. Noriega........ 508,830
Telephone transmitter, E. Noriega........ 508,829
Thill coupling, J. R. Mikesell........ 508,896
Thill coupling, J. R. Perkins........ 508,526
Tie. See Metal tie.
Time recorder, workman's, M. M. Zellers........ 508,461
Tire, bicycle, F. White........ 508,456
Tire, pneumatic, Kirk & Hosford........ 508,621
Tire, pneumatic, J. G. A. Kitchen........ 508,724
Tire, pneumatic, C. F. Pease........ 508,746
Tire, rubber, Buck & Volger........ 508,466
Tire, wheel, C. A. Gildemeyer........ 508,610
Tongs for drawing skelps, W. McCracken........ 508,738
Tongs, pipe, H. Alexander........ 508,591
Toy, J. L. Tate........ 508,558
Track sanding apparatus, C. W. Sherburne, 508,849, 508,850
Transformers, cooling, E. Thomson........ 508,654
Trap. See Steam trap.
Trolley lines, construction of, G. Q. Seaman........ 508,771
Tug hook, D. H. Langan........ 508,521
Twine cutter, W. K. Kennard........ 508,424
Typewriting machine type cleaner, A. G. MacGregor........ 508,904
Umbrella, folding, F. M. Hunt........ 508,717
Umbrella frame, A. R. Peppin........ 508,436
Umbrella stand, J. Danner........ 508,602
Valve, J. R. Branden........ 508,464
Valve gear, W. B. Waterman........ 508,588
Valve mechanism, air brake, T. H. Haberkorn.... 508,702
Valve operating device for wash basins, bathtubs, etc., discharge, J. H. Stevens........ 508,585
Valve, steam, J. N. Murphy........ 508,486
Valve, steam cylinder relief, W. H. Bailey........ 508,593
Vehicle brake, P. J. Hanley........ 508,612
Vehicle brake, S. E. Odell........ 508,832
Vehicle, passenger, J. De Witt........ 508,414
Vehicle running gear, W. R. Maxwell........ 508,894
Velocipede car, D. W. Brunton........ 508,500
Velocipede pedal, T. Broadbent........ 508,562
Violin, P. Donnelly........ 508,508
Violin bow, Noble & Street........ 508,741
Vise for milling machines or planers, V. W. Mason, Jr........ 508,732
Wagon running gear, E. E. Henderson........ 508,420
Wardrobe fixture, J. J. Bisel........ 508,596
Warehouse, grain storage, D. R. Bowker........ 508,561
Washing machine, J. Reed........ 508,756
Watch, stem winding and setting, C. H. Bagley... 508,800
Water for bathing, etc., device for mixing hot and cold, J. H. Stevens........ 508,384
Waterproofing and airproofing inflatable textile fabrics, S. Curlin........ 508,818
Water tube boiler, W. Cowles........ 508,410
Weather strip, R. H. Cutler........ 508,504
Wheel. See Car wheel.
Whiffletree, E. J. Smith........ 508,444
Whiffletrees, antirattler for, T. F. McKenna........ 508,901
Windmill, W. B. Collins........ 508,683
Windmill, G. B. Snow........ 508,852
Wire connector, G. A. Trumbull........ 508,587
Wire reel carrier, F. C. Klipstein........ 508,426
Wire ropeway grip, D. A. Byers........ 508,810
Wire stretcher, P. Loudenberg........ 508,891
Wood graining machine, A. Giacomini........ 508,696
Wood surfaces, finishing, M. D. Fernanzo........ 508,875
Woodworking tool, L. S. Crittenden........ 508,412
Wrench. See Ratchet wrench.
Wrench, H. H. Kendrick........ 508,519

DESIGNS.

Bread loaf, C. C. Roes........ 22,882
Corset, W. W. Gould........ 22,883
Corset, D. H. Warner........ 22,884
Hub runner, J. E. Hobbs........ 22,912
Stove, heating, G. O. Bergstrom........ 22,910
Stove, lamp, J. F. Myers........ 22,911
Wall paper, C. Booze........22,885 to 22,909

TRADE MARKS.

Beer, lager, Ruff Brewing Company........ 23,805
Canned fruits and vegetables, Turin Canning and Pickling Company........23,809, 23,810
Cement, English Portland, National Building Supply Company........ 23,813
Cement, German Portland, National Building Supply Company........ 23,814
Cocoa and cocoa butter, prepared, J. & D. Blooker 23,807
Corsets, E. Schweinburg........ 23,804
Fountains, brooders, and incubators for poultry, G. S. Singer........ 23,829
Fruit, pie, W. H. Marvin & Company........ 23,808
Kraut, C. Schopp & Company........ 23,812
Liniments, C. Protextor........ 23,826
Meat and compounds thereof, extracts of, Valentine's Meat-Juice Company........ 23,811
Oils, lubricating, F. Shumpp........ 23,815
Pharmaceutical or dietetical compounds, Farbenfabriken, vormals Fr. Bayer & Company........ 23,823
Pills, plasters, lozenges, and a remedy for coughs, B. A. Hertsch........ 23,824
Plasters, liniments, ointments, medicated candy, and remedies for coughs, cholera, and headache, Wilkins & Beckner........ 23,825
Printing presses, Liberty Machine Works........ 23,828
Paints and compositions for protecting iron structures from corrosion, Wailes, Dove & Company........ 23,817
Paints, vehicle, J. C. Weaver........ 23,816
Remedies, certain named, E. M. Beals........ 23,821
Remedies, certain named, F. P. Cummings........ 23,822
Scouring and polishing preparations, Schulz & Philipp........ 23,820
Soap, L. I. Buroughs........ 23,818
Soda, dissolved washing, A. Stromberg & Company........ 23,819
Suppositories, R. E. Harris & Company........ 23,827
Whisky, P. R. Hentz & Company........ 23,806

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

SIR RICHARD OWEN.—A SKETCH of the life and labors of this great English naturalist, accompanied with his portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **909.** Price 10 cents. To be had at this office and from all newsdealers.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 59. Price 10 cents. To be had at this office and from all newsdealers.

VELOCITY OF ICE BOATS. A COLlection of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **214.** Price 10 cents. To be had at this office and from all newsdealers.

THE MODERN MARINE BOILER.—By A. B. Willits, U.S.N. Description of the principal features of the boilers of the United States man-of-war New York, with a plea to inventive minds for the production of a type of boiler which shall do away with the necessity of the present enormously large and heavy shells, and present a lighter substitute that will perform the duties of both envelope and heating surface conjointly. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **870.** Price 10 cents. To be had at this office and from all newsdealers.

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.

SCIENTIFIC EXPERIMENTS.—DEscription of some simple and easily performed scientific experiments. Foucault's pendulum, exchange of water and wine, the bird in the cage, the five-pointed star, the sum of the angles of a triangle, surface of the sphere, with 6 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 875. Price 10 cents. To be had at this office and from all newsdealers.

THE
SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World
Only $3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of three dollars by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

THE
Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

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

PRINTING INKS.
The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York