closing the objective. In fact, as soon as the pressure at *n* ceases, the electric light is extinguished at *m*, and consequently the operation is interrupted.

Fig. 6 shows the general arrangement of the apparatus. A represents the small battery open; B, the same closed; and D, the laryngoscope; *a* and *b* are the conductors, and *c* and *d* the tubes through which the cold water circulates. This latter is derived from a small reservoir, C, placed a little above the apparatus, and circulates through the tubes during the whole time the operation is being performed. The small camera, which is shown of actual size in Fig. 3, is not represented in Fig. 6.

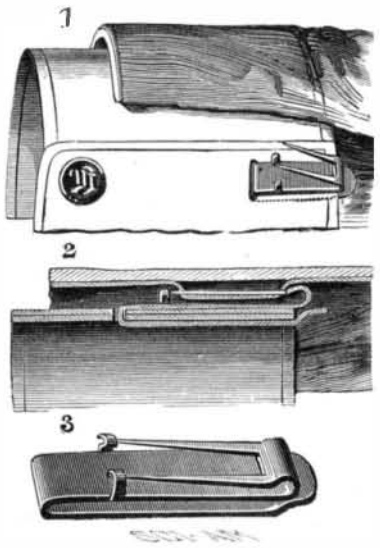
In the construction of this apparatus I am convinced that I have, in the simplest manner, and by electric processes, solved the problem of photographing the larynx, and that I have rendered a service to pathologic science. Many affections of the larynx, in fact, become modified from day to day, and it is of interest to have an apparatus that permits of following and controlling these pathologic modification, step by step.—*Theo. Stein, M.D., in La Lumiere Electrique.*

Construction of Observatories.

In the construction of buildings devoted to the purpose of astronomical observations, the most important requisite is to provide against the effects of vibration on the apparatus. Any contact with the floor or other portion of the building would not fail to produce, upon the slightest movement, concussions which, multiplied by the magnifying power, would render the telescopes useless. The mode of adapting the building for its peculiar use is by rendering it independent in all its parts of the piers upon which the instruments are fixed. The foundations of the latter are also laid as deep as possible, in order to obviate the effects of vibration from external causes, against which, however, it is not always practicable to guard, the mere tread of a foot passenger being often sensible to an observer using a powerful telescope at a considerable distance.

AN IMPROVED CUFF FASTENER.

This invention relates to a device essentially different from cuff fasteners heretofore introduced, for it is not intended to fasten the cuff to the shirt sleeve or band, but to the lining of the coat sleeve, so that when the coat is removed the cuffs remain attached to it, and they may always be adjusted to give the desired show beyond the end of the coat sleeves, regardless of the length of the shirt sleeves. The construction and application of the fastening will be readily understood by reference to the accompanying illustration, Fig. 1 showing it attached to the cuff, with the fastening pins ready to adjust on the coat sleeve, Fig. 2 showing the hold of the pins on the sleeve lining, and Fig. 3 the simple device itself, made of folded flat spring metal. This device, as will be seen, can easily be made to form a positive lock with the two rear button holes of the cuff, and the back or free end of the lower spring leaf is made to form a stop to prevent the cuff from slipping unduly backward after the fastener has been adjusted.



FAY'S CUFF FASTENER.

The above invention has been patented by Mr. James J. Fay, 42 North Sixth St., New Bedford, Mass.

The Armored War Ship Useless.

A French marine officer argues in the *Nouvelle Review* that the armor-clad ship is as completely obsolete as the old three-decker, and in any future war no iron-clad should venture to put to sea till all her opponent's torpedo boats had been destroyed. For this reason no more money should be spent on the construction or keeping up of armor-clad vessels, and even those in progress should be abandoned. The best type of boat is one almost invisible, and quicker than the largest sea-going vessels. France possesses several that have proved themselves very successful, but should have at least 400.

Those existing are registered at 46 tons, and carry coal for 1,000 miles at medium speed. In case of need they could steam 22 knots per hour, are armed with four torpedoes, and cost $35,000 each. Ten vessels somewhat larger are now being constructed. The best type of sea-going torpedo boat should be about 131 ft. long or less, and about 12 ft. wide; she should be manned by 15 to 18 men, should carry provisions for 12 to 15 days, and coal for 1,500 to 2,000 miles. She should be able to steam 22 to 25 miles an hour, and be armed with six or eight torpedoes and one machine gun. The cost would be from $60,000 to $75,000. As a great nation's fleet should not consist entirely of torpedo boats, however, a concession is made in favor of vessels auxiliary to them, but it will be the part of the torpedo boat in case of war to sweep all vessels of the enemy whatever from the surface of the ocean, both iron-clads, cruisers, transports, and merchant vessels, and this mission it will perform without let or hinderance. The fleets of transports, packed with troops, will fall an especially easy prey.

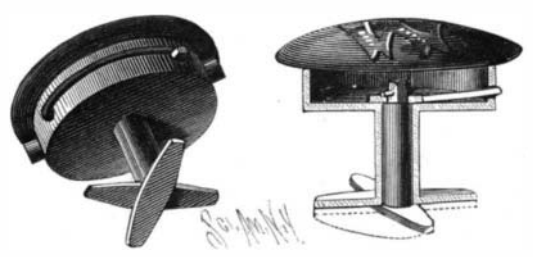
RIBBLE & SAMMIS' BABY CARRIAGE.

Modern Miracles.

People who suffer will fly to anything for remedy—even to patent pills, spiritualism, and pilgrimages. Referring to the methods resorted to for curing the crippled and sick, *The Graphic* (London) says that at Fecamp 150,000 quart bottles from a so-called holy spring are sold yearly; at Lourdes the retail business in water is twice as large, and the grotto is hung with the crutches of hundreds of people who are said to have come lame and to have gone away jumping. In some cases these cures have been quite genuine, for a strong nervous excitement will unquestionably do wonders. Not long ago, a man who was suddenly seized with delirium in one of the London hospitals leaped up, and began slashing at the patients in the beds all around him with a knife. One patient, who had been lying helpless for days under a stroke of paralysis, as it was believed, got so frightened that he recovered the use of his legs, and bounded down stairs with most gratifying agility. A man endowed with strong will power may exercise ascendency over weak willed folk, and cause them very rapidly to shake off a nervous disorder.

IMPROVED SLEEVE OR COLLAR BUTTON.

The illustration herewith shows a novel device for sleeve or collar button, which has been patented by Mr. Joseph Wall, of Greenville, Miss. (Lock Box 109.) From the cap is a tubular downwardly-projecting stem, with a crosspiece at its lower end; within this tubular stem is an inner stem, having also a cross-piece at its lower end, and at its upper end a spring arm that engages with a notched lower edge of the cap. The working of the spring arm in the side of the cap, with the notches where it rests at either end of the slots in which it works, may be readily seen by the engraving, the dotted lines in one view also showing the arrangement of the cross-pieces before and after insertion, the device making a button which can be inserted easily and rapidly, and will be held securely in place.



WALL'S SLEEVE OR COLLAR BUTTON.

A WRITER from Fiji remarks that when flocks of terns and other sea fowl rest upon the sea in great numbers the water becomes smooth, and there is "not a ripple to disturb them." This is ascribed to oil emitted by the birds.

IMPROVEMENT IN RUNNING-PART OF BABY CARRIAGE.

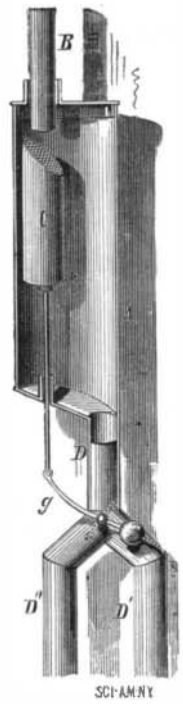
The great variety in which coaches for the little ones are now furnished shows that the makers have kept pace with that progress which has given us railway sleepers and palace cars. The illustration herewith shows a recently patented invention in this line, whereby the running gear is so arranged that the front wheels of the carriage may be turned to either the right or left, as desired, by the person who is guiding it from the rear. The device to effect this consists of a lever pivoted on the back handle, and extending by a right angle to a pivot in a loop hung from the rear axle, so that by slightly moving the hand on the handle the lever will cause the front axle to turn on its axis, to change the direction of the carriage, as represented in the illustration. This invention renders much easier the running of baby carriages, especially in the larger sizes, adapted for two children. The patent therefor has been issued to Messrs. H. M. Ribble and J. W. Sammis, and those who wish further information in relation thereto should communicate with Mr. Harry M. Ribble, P. O. Box 276, Dover, N. J.

The Biggest Gun Yet.

Preparations are making at Woolwich Arsenal for the proof trials of an enormous gun that is now in process of construction at Elswick, and will be delivered a few months hence. It will weigh 110 tons, and have a carriage of 90 tons, the total weight of 200 tons, being considerably in excess of previous undertakings. The gun will be a breech loader, and have a bore of 16 inches. Its length will be 43 feet 8 inches; but its extreme diameter at the breech will be only 5 feet 6 inches, and it will have a very elongated chase or barrel tapering down to 28 inches, with a slight swelling at the muzzle.

AUTOMATIC CUT-OFF FOR CISTERNS.

In the device herewith illustrated, which has been patented by Mr. John S. Heaton, of Shelbyville, Ky., provision is made for first using falling rainwater to wash off the roof and carry away dirt and impurities, after which the current is automatically turned to the cistern, the water not needing straining after the roof has been washed by the rain first coming down. In our engraving, A represents a sort of diminutive reservoir receptacle, considerably larger than the inlet pipe, B, from the roof; C is an upright cup, with slanting wire covered top, immediately under the inlet pipe. D is the outlet pipe, connecting with the waste pipe, D', and the cistern pipe, D''. The water, striking the inclined top of the cup, C, on first entering, is largely diverted to pass through D', taking with it the leaves and other foreign matter which may be carried along from the first washing of the roof; but when a certain quantity of water has entered the cup, the additional weight causes it to fall, reversing the valve connected by the arm, *g*, with the rod of the cup, and turning the stream into the cistern pipe D''. The weight on this valve should be always more than that of the cup empty, but it can be so adjusted as to pass off more or less water as desired through the waste pipe before turning the pure or clean water into the cistern. When the water ceases to enter the apparatus, the cup will gradually be drained of its contents, and raised by the action of the weight, when the automatic valve will again adjust itself to shut off the first coming water from the cistern, as at starting.



Division of Power.

The old time notion of one immense central engine to furnish power for an entire large establishment is getting out of date. The change is to independent engines for each department, so that one may be stopped for repairs, or from slackness of work, while another may be run without carrying the load of the connecting shafting and pulleys. This is true economy, for sometimes the requirements of a really large establishment may be met by the power of a small engine—perhaps twenty horse power—serving for an establishment that requires in its entirety not less than one hundred and fifty horse power. It is best, also, that the steam should be furnished by independent boilers, and not from one battery of central boilers. In short, the change demands, for convenience and economy, the existence of separate engine and boiler plant for each department, the whole to be connected if required.

Climate and Health.

Dr. Poore lately delivered a lecture on "Climate in its Relation to Health" at the Society of Arts. He began by alluding to the fact that the crew of the Eira enjoyed excellent health in the Arctic regions under conditions which, in this country, or still more in the tropical countries, would be considered most mal-hygienic. The reason probably was that in the Arctic regions putrefaction and allied changes were impossible, owing to the cold and dryness, and the diseases dependent on putrefaction were also impossible. Attention was drawn to the fact that most of the diseases which were fatal in tropical countries were connected with putrefaction and decay, and, as instances of this, malarious diseases, yellow fever, and cholera were brought forward.

Since putrefaction depended upon the access of minute organisms to the putrescible matter, and since these organisms were found in the atmosphere as well as in the soil and water, a study of the floating matterin the air became most important. The air has been systematically examined in Paris and Berlin, and especially at the Observatory of Montsouris in the former city. Among floating bodies in the air were to be found spores of fungi, pollen, grains of starch, alga, etc., besides mineral matters of great variety. Miquel, by means of cultivation experiments, had been at great pains to estimate the number of bacteria and allied micro-organisms in the air, and the result of his experiments has shown a striking connection between the density of population and the number of bacteria in the air.

Thus, in each cubic meter of air there were found at the following stations the bacteria in number as follows: In the high Alps the air was pure, absolutely free from bacteria; on the Lake of Thun, at an elevation of 560 meters, 0·8; near the hotel of Thun, 2·5; in a room of the hotel, 60; in the park at Montsouris, 760; and in the Rue de Rivoli, 5,500. The largest numbers found were in the hospitals, where each cubic meter of air contained as a minimum 5,500, and as a maximum 28,000. In order that bacteria and other microbes may flourish, a suitable soil is necessary. Raulin's experiments with *Aspergillus niger* were explained. Raulin found that he could grow a uniform amount of aspergillus on a given area of a liquid of definite composition. This liquid contained, among other things, one fifty-thousandth part of zinc, and if the zinc were omitted, the crop of aspergillus fell to one-tenth of the normal; and if one one-million-six-hundred-thousandth of nitrate of silver were added, the fungus would not grow at all. This showed the importance of mineral ingredients in the composition of the "soil," and this fact helped in some measure to explain why it was that people seldom had the same fever twice. The reason being that the first attack exhausted the blood of something which was necessary for the growth of the organism upon what the fever depended.

A New Engine of War.

A trial of dynamite shells, under the auspices of the Senate Military Committee, took place March 12, on the banks of the Potomac, about half way between Georgetown and the Chain Bridge, Washington. The District authorities refused to permit the trials within the corporation limits of Washington, on account of the destructive concussions which were among the results of the preliminary trial a few days before at the Navy Yard. Four shots were fired with six inch shells, carrying eleven pound bursting charges of nitro-gelatine, which contains about ninety-five per cent of pure nitroglycerine. The range was 1,000 yards, and the target was a perpendicular ledge of solid trap rock on the south bank of the river. The first shell struck near the eastern margin of the ledge and exploded by concussion, shattering the face of the rock for the radius of about thirty feet, and carrying away several tons of debris, which were hurled for hundreds of yards up and down the stream. The second shell struck nearly in the center of the ledge, exploding as before. It opened a cavity on the face of the ledge about twenty-five feet in diameter, and excavated a pit or crater about six feet deep. Some of the fragments of rock from this explosion were hurled half a mile, one piece, weighing nearly twelve pounds, being thrown clear across the canal, and lodging near a farm-house adjoining the Georgetown reservoir. The other shots were similar in their effects.

A large concourse of people assembled to view the trial, among whom, in addition to several officers of the army and navy, were the military and naval attaches of the German, French, and Italian legations, and the Russian Minister in person. The trial was regarded as a success in every respect, and as a conclusive proof of the destructive powers of the six inch shells. The next test in the series will be made in a few days with eight inch shells carrying thirty-five pound charges of nitro-gelatine. It is possible that, in view of the effects of the six inch shells carrying only eleven pound charges, the local authorities may refuse permission to fire thirty-five pound charges anywhere in the vicinity. If so the next trial will have to be made at Fortress Monroe or Sandy Hook. According to the *Herald's* correspondent, the members of the foreign legations present manifested great interest in the trial, particularly the Russian Minister and the German military attache, who took copious notes of the proceedings. Some of the military and naval experts present expressed the opinion that any one of the shells fired to-day would have completely wrecked any unarmored ship afloat, and seriously racked the strongest iron-clad. The safety of the system of firing seems to be assured by the two trials that have been made, the shell leaving the gun in every instance as safely as an ordinary powder charge shell could do.

Agricultural Machinery Abroad.

One year ago a circular was issued from the State Department, Washington, and sent to all the United States Consuls, requesting a statement from each relative to the mechanical and agricultural industries of the several countries in which they are located.

The circular stated that much of ultimate success in trade depended upon the proper initiatory efforts made to a clear understanding of the wants and requirements of the several countries. A report on agricultural machinery in the several districts represented by consuls has just appeared. We take from it a few extracts:

Bremen.—Mr. Gillcox, the Vice-Consul at Bremen, reports that wonderful advances have taken place during the past ten years in the manufacture of agricultural implements in Germany and France and Sweden, but that Germany has excelled in this respect all other countries on the Continent. The general demands are for the cheaper finished goods of the class used in the United States thirty or forty years ago, and while the Germans are making great progress, it is a mistaken idea to think that they will buy our goods at the high prices they are sold for at home.

Russia.—The extraordinary cheapness of their own make of agricultural implements, the poverty of the people, and their near proximity to Germany, England, and Austria, give the latter countries great advantages which the United States does not possess. Moreover, the system of long creditswhichis universal throughout Russia would be a great bar to our trade, and be attended by great risk. The McCormick's and Johnstone's reapers and mowers have a fair sale in Southern and Central Russia. Owing to the tendency which prevails in this and the neighboring countries to imitate good imported articles, the Consul-General recommends that trade marks should be registered, and inventions patented, before the introduction of our machines.

South Russia.—Consul Paul, of Odessa, says that in that part of Russia, self-raking reapers, of both American and English make, are used to a considerable extent, and that the American reapers have the preference, and are driving the English reapers out of the field, and that American mowers and horse rakes are used extensively, but of the latter, many German imitations are being brought into the country.

Germany.—Vice-Consul-General Hogue,of Frankfort, reports that American machinery has been introduced only to a very limited extent, though such implements as hay and manure forks have been introduced to considerable of an extent, and give satisfaction. The plow-making establishments in Southern Germany turn out from thirty to thirty-five different kinds of plows, to suit all kinds of land to be plowed. Imitations of several kinds of American plows are made in Berlin. The "American Eagle" plow is made there in exact accord with the original. The same authority says of hay rakes that the teeth are imported from the United States, and the other parts copied from the ordinary American rake. Mr. Hogue recommends a prominent exhibition of our wares at some central point, Frankfort probably being the best, believing, he says, that a market would be found for them, if our manufacturers should combine and establish such an exhibition. Mr. Hogue closes his report by admonishing persons to secure patents on their articles before their introduction into Germany, otherwise cheaper and inferior goods will be produced which will injure the reputation of the American article.

Consul-General Brewer, of Berlin, reports that there are a number of establishments in the latter city engaged in the manufacture of agricultural machinery, one of which (H. F. Eckert's) employs nine hundred men. He manufactures wagons, thrashing machines, clover mills, fanning mills, machinery for cutting and preparing beets for sugar making, stills for making whisky from potatoes, horse rakes and plows, the latter on a very large scale, some of which are exported. It was represented to Mr. Brewer that they were then filling an order for four hundred plows for South America, a field our manufacturers of agricultural implements, and other machinery, ought to occupy. Mr. Brewer refers to the wonderful genius of the German mechanic for imitating the works of others, and refers especially to the vast number of the Wheeler & Wilson, the Singer, and other sewing machines, of well known manufacture, which are exposed for sale in the stores of Berlin.

Bavaria.—Consul Harper, of Munich, does not think it an easy matter to introduce agricultural machinery into Bavaria by the usual methods employed, but recommends that a number of manufacturers of different lines of agricultural implements combine, and send out a reliable and efficient person to visit the principal towns of Germany, and exhibit the articles he has to sell. An exhibition is held about the 1st of October every year in Munich, which is largely attended by people from the surrounding country.

At these exhibitions machinery is shown in operation, and a collection of agricultural machines and implements are displayed. Mr. Harper thinks it would be advantageous to our manufacturers to attend these exhibitions with their implements.

Brandenburg and Pomerania.–Consul Kiefer, of Stettin, gives an interesting account of the products of this part of Germany and the customs of the people. Agricultural machinery is made in great quantity in a number of the large cities. He mentions one establishment in Mannheim, who sold more than ten thousand cutting and thrashing machines in a single year.

And regarding prices, he states that a three horse power steam thrashing machine with portable engine, and freight paid to any railroad station in Germany, can be had for 3,625 marks ($862). Large machines, such,for instance,as steam thrashing machines,are often bought in company by a number of persons; they are also rented by the hour to farmers of small means. It may not be known to some of our readers that it is the custom in Germany for women as well as the men to work in the fields. According to Consul Kiefer, it requires four men and eight women to work a steam thrashing machine successfully.

Saxony.—Mr. Dubois, Consul of Leipzig, says the most popular of the American machines which have been introduced into that country are the mowers, horse rakes, and hay forks. American machines they prefer to the Saxon make, for the reason that they are lighter, and they believe them to be constructed of better material. Mr. Dubois mentions a peculiarity of the Teuton in his fondness for the color of red; this color it is said predominates in the machine factories of Germany. But the first wish of the German farmer is to have his machine made of the best material. In small implements the farmer prefers solidity, which he concludes will insure durability.

Mr. Dubois thinks the inventive talents of the Germans are improving very rapidly, and cites a Saxon genius who has made forty inventions (almost as many as our Edison) during the past three years, seven-tenths of which have proved practicable and of value.

In a future number we shall give extracts from the consular reports of other countries, believing our machinery manufacturers are interested in what is going on abroad in the several industries in which they are concerned at home.

Sending Logs Down Nevada Mountains.

The *California Architect and Builder* gives the following graphic account of the mode adopted in Nevada for getting logs to market. A chute is laid from the river's brink, up the steep mountain to the railroad, and while we are telling it, the monster logs are rushing, thundering, flying, leaping, down the declivity. They come with the speed of a thunderbolt, and somewhat of its roar. A track of fire and smoke follows them—fire struck by their friction with the chute logs. They descend the seventeen hundred feet of the chute in fourteen seconds. In doing so they drop seven hundred feet perpendicularly. They strike the deep water with a report that can be heard a mile distant. Logs fired from a cannon could scarcely have a greater velocity than they have at the foot of the chute. The average velocity is over one hundred feet a second throughout the entire distance, and at the instant they leap from the mouth their speed must be fully two hundred feet per second. A sugar pine log sometimes weighs ten tons! What a missile! The water is dashed into the air like a grand plume of diamonds and rainbows, the feathery spray is hurled to the height of a hundred feet. It forms the grandest fountain ever beheld. The waters foam, and seethe, and dash against the shore. One log having spent its force by its mad plunge into the deep waters, has floated so as to be at right angles with the path of the descending monsters. The mouth of the chute is, perhaps, fifteen feet above the surface of the water. A huge log hurled from the chute cleaves the air and alights on the floating log. You know how a bullet glances, but can you imagine a saw log glancing? The end strikes with a heavy shock, but glides quickly past for a short distance; then a crash like the reverberation of artillery, the falling log springs, vertically, into the air, and with a curve like a rocket falls into the water, a long distance from the log it struck.

Plating Small Pieces with Brass.

Dip them in a solution of six grammes sulphate of copper and six grammes chloride of tin dissolved in one liter of water. Or dip them in a solution of nine and one-quarter grains sulphate of copper and nine and one-quarter grains chloride of tin dissolved in one and three-fourths pints water.

A Railway School.

The Baltimore and Ohio Railroad Company has taken a step toward the practical solution of the vexed apprenticeship question, the outcome of which will be watched with the greatest interest. The company has a business-like way of grappling with such subjects, and thus far its efforts—for instance, in establishing an insurance association for its employes—have been crowned with remarkable success. An order has been issued establishing a technological school at Mount Clare, Baltimore, "for the promotion of a higher course of instruction for the apprentices than that now pursued," with the view of affording the young men in its employ opportunities for obtaining a liberal technical education far superior to those enjoyed by the employes of other railroads. All apprentices are embraced under the following general designations, and graded into three classes: the first or junior class of apprentices, the second class or cadets, and the third or senior class of cadet officers. The company bears the expense of the education of the apprentices and cadets, and in consideration thereof expects the privilege of availing itself of their services, at fair salaries, for at least three years after their graduation. From the day of their admission to the school, the apprentices and cadets are to receive pay as follows: The apprentices, 70 cents per day in the first year, 80 cents in the second, 90 cents in the third, and $1 per day in the fourth year; the cadets $1 per day in the first year, $1.12½ in the second, and $1.25 per day in the third year; and cadet officers, $1.50 per day in the first year, $1.75 in the second, and $2 per day in the third year. In their appointment to the school, preference is to be given, other things being equal, to the sons of employes who have been killed or injured in the company's service; and free tuition is given to those only who are sons of employes having been in the service of the company for five consecutive years. They must pass a board of examiners as to proficiency in elementary studies and soundness of health, and are subject during the years of study to rigid discipline and frequent examinations. The exact scope of the school and the service for which its pupils are to be trained are not clearly defined; but it is evident from the long courses that the places to which they may aspire after their training are high indeed. We do not believe that any attempt is to be made to carry the standard up to that of our technical colleges, the evident object being to fill the gap that the virtual abolishment of the apprenticeship system has made. There are few companies, of course, whose operations are so extensive as to allow them to follow the lead of the Baltimore and Ohio Company, should it score the success that its prestige in such matters makes reasonably certain. Much, however, can be done by association of firms and individuals engaged in the same business in the same district.—*Engineering and Mining Journal.*

The New Washington.

Washington was laid out mathematically, to begin with. It was mapped on a grand plan; and strange to say, it has finally been realized. Its success results wholly from external causes. Left to itself, Washington would have sunk long ago in its primeval mud, and future generations would hardly have known that such a city had once stood there. It has no elements of independent commercial prosperity. A single act of Congress, trundling the capital to some other part of the Union, could sweep Washington into nonentity. It is a political and social center. It is the home of the government. This, and this only, has made it possible to make it what it now is—one of the finest cities in the Union. The original plan on which it was projected has needed little or no revision. There is not a crooked street in the city. The streets, marked in one direction by letters and in another by figures, run at right angles, while its twenty-one broad avenues, named after as many States in the Union, cross these squares diagonally, converging at various centers as the spokes of a wheel fit into a hub.

One of the most distinguishing features of the new Washington is literally a superficial one. It is the finest paved city on the continent. And this, for the reason that it is without heavy traffic to destroy its smoothly laid floor of concrete. It was in 1871, if I mistake not, that Pennsylvania Avenue, which had a few cobble stones stirred into its mud, like plums in a pudding, was finally paved with concrete from the Capitol to the White House. The concrete floor has extended itself in every direction, until now the capital is a vast national roller skating rink. It is, above all things, the paradise of bicyclists. We meet them on every square, speeding over the smooth, hard pavement with the most alluring ease. They are much used by messenger boys, who ride with their hands in their pockets, as if they were a part of the machine. The Herdic and the hansom cab have also invaded the national capital. So smooth and unbroken is the pavement that it is easier riding in a Herdic than in a street car. The middle of the street, being as hard and even as a floor, is so much better than the sidewalks, which are largely paved with brick, that pedestrians in the quieter by-streets often desert the sidewalks for the asphalt. The boy in New York or Boston who "cuts behind" a wagon finds it to his advantage to hold his feet up. But the Washington boy drops his feet upon the ground, holds them close together, and clinging to the strap of the tail board, is dragged along as if he were sliding on the ice. While this exercise polishes the pavement, it stimulates the local shoe trade.—*Rev. S. J. Barrows, in Christian Register.*

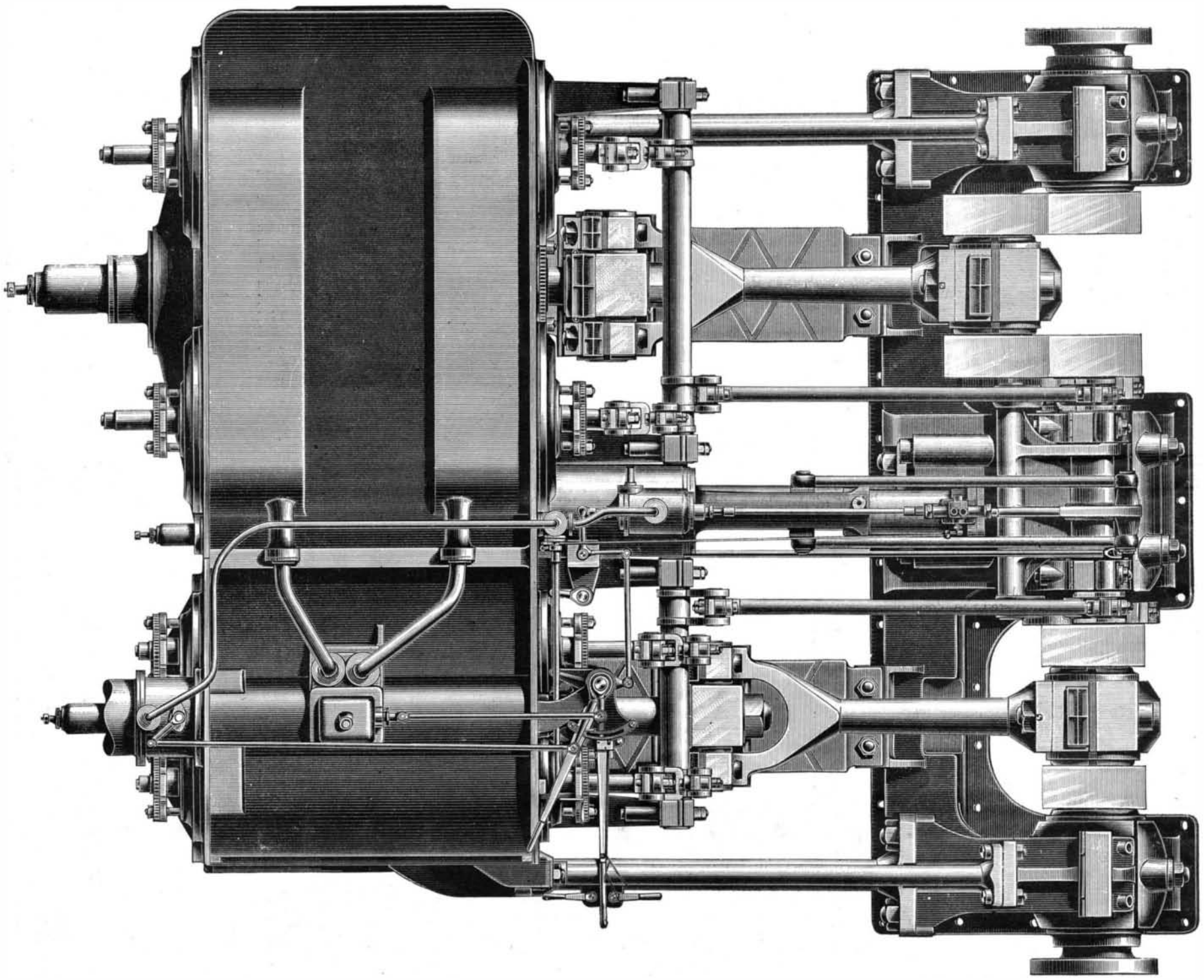


Fig. 2.—COMPOUND TWIN SCREW ENGINES (7,700 I.H.P.) OF THE ITALIAN RAM ETNA.

Caraway Seed.

A correspondent in *The Grocer* (London) estimates the product of caraway seed to reach 150,000 bales per annum. He adds: The chief centers of consumption are all the northern parts of Europe and the United States. Chief among all as consumers are the manufacturers of essential oil in Mid-Germany; one establishment of this description alone swallows up between 20,000 and 30,000 bales annually.

It may also be not known that the common Windsor soap owes its scent to the oil of caraway seed. Besides its employment as seed, the caraway fills a useful place in the general economy of husbandry by producing a fodder plant which is relished by cattle, and serves a great deal to sweeten less palatable food. In some parts of Germany it is to be found on every meadow along with other grasses.

Ichnenmonidæ.

Dr. David W. Flora, of Newyago, Mich., sends us the following interesting particulars:

The SCIENTIFIC AMERICAN of January 31 contains an article on "The Mason Wasp," which brings to mind some observations made twenty years ago. On the half grown, wrinkled body of a "tomato worm" hung fifty or more little oblong pearl colored balls about the size of small rice grains. Placing the mass under observation, about three days thereafter a little lid or cap was raised from the larger end; out came a fiery, active, dark bluish-green fly. I was able readily to place it in the large family of *Hymenoptera*, and very soon saw enough of its habits to class it according to Cuvier as a member of the *Ichneumonidæ*. A few days after the advent of the little fly, I saw one alight upon the half grown body of a tomato worm, and in spite of its squirming, sputtering of green saliva, and striking out with that formidable "horn," our plucky little one kept on striking its stinger, or *ovipositor*, deep into the body of the worm, at every stroke depositing an egg. Some ten or twelve days thereafter there was an eruption all over the skin of "Mr. Worm." The surface seemed alive with little worms, which were larvæ of the ichneumon fly.

Instead of seeking some other spot in which to pass the "pupa" stage, it fastened a thread to a hair or spiracle of the "worm skin," and then and there proceeded to spin itself a cocoon. These threads were so fine that, when magnified 2,500 times they were not much larger than No. 30 sewing thread. Under the magnifier I saw the cocoon completed in about two hours and our larva retire from sight, to reappear after fourteen days as already described.

Baron Cuvier says: "They are so called from the Egyptian ichneumon, which was supposed to deposit its eggs in the entrails of the crocodile, which the larvæ afterward devoured.

"In Europe alone, there are more than 1,650 species of this family, and there are more than 6,000 species already known."

What a conservative influence this host of insects must exert upon the vegetable kingdom! Every species has many varieties, and this myriad host wages perpetual warfare upon the caterpillars and larvæ of the Lepidoptera generally.

This tiny insect cannot carry away bodily the great bulky tomato worm, nor even the smaller larvæ and spiders which the mason wasp does to feed its young, but it provides for its progeny by depositing the egg in the large succulent bodies of other insect larvæ, there to hatch and feed.

But so skillfully does the young ichneumon feed that neither the digestive nor ganglionic system of the victim is injured. Only the chyliferous vessels are sucked dry. Something like the fable of Prometheus, only the liver and vital organs are spared.

Our vast lumber interest is under obligation to the Ichneumonidæ. It seeks out by some subtle sense the location of the "wood borer," and with its long flexible ovipositor deposits its eggs in the body of that larva. I have seen it pierce the seasoned hickory wood nearly two inches to reach this matrix for its young.

From the description of the "mason wasp" given in the article referred to, and from my own study of its habits, I think it ought to be classed with the ichneumon family.

To make a "rope of sand" is conceded to be a feat impossible to accomplish, and the mud wasp in my opinion is not more likely to build its cell of sand, as stated in the article referred to. I have invariably seen them make their lump of the best, most tenacious blue yellow or other colored clay, of which they built their cell.

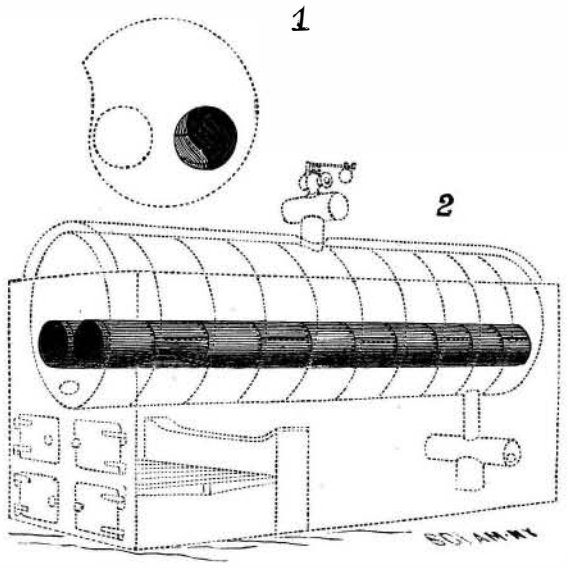
Red Ants.

The following by Prof. C. V. Riley will be of interest to housekeepers:

The small red ants are undoubtedly the most troublesome of the insects infesting houses, and to destroy them or even to keep them in check appears to be nearly a hopeless task, owing to the countless numbers of specimens and the remarkable persistency they exhibit in their attacks. All that can be done is to carry on an incessant and untiring warfare against them by means of liberal and frequent applications of pyrethrum powder, kerosene or kerosene emulsions, hot water, naphthaline, etc. Shallow dishes half filled with sweetened water and placed at suitable places will also attract multitudes of ants, which may be easily destroyed from time to time. Should the hole by which they enter the house be discovered (a matter of no small difficulty and sometimes even impossible), they can be more readily kept out by a good dose of kerosene poured across their path. A sponge saturated with sweetened water will soon teem with them, and if repeatedly cast into hot water when charged with the ants, will help materially to abate the nuisance.

A BOILER EXPLOSION AT CINCINNATI, OHIO.

The boiler at the Cincinnati Sheet Lead and Pipe Works recently exploded, doing no damage to the property and causing no loss of life; it is somewhat of a curiosity, as a great many attribute the cause to shortness of water, the usual scapegoat in such cases.



A BOILER EXPLOSION AT CINCINNATI, OHIO.

The boiler is shown in Fig. 1 by dotted lines, except the flues, and part of the bottom, which were damaged. The appearance of the collapsed flue from the end is shown in Fig. 2.

The boiler was 42 inches in diameter and 26 feet long, with two 15 inch flues, and was made of ¼ inch plates.

The furnace was under the forward end of the boiler, the frame passing for 26 feet under the boiler and for 26 feet back through the flues, 52 feet in all; the right hand flue collapsed at the second or third ring from the front and upward; it also split along the under side of the longitudinal seam.

The theory of many was, at first sight, that the water became low and the flue then collapsed, of course by becoming overheated.

An examination into the whole conditions will show, I think, the true cause; the boiler was very old, and the flues according to modern practice very large; a defect occurred at the seam in the flue, gradually increasing till it so far weakened the sheet that it gave way along this seam, and the flue collapsed at this point, when, of course, the water went out (indeed, this may have been leaking out all night, the accident occurring at 10 A. M.); the boiler being empty, or nearly so, the bottom sheets would become heated and bulged, as shown.

If the boiler had been short of water, and the flues collapsed from that cause, it would have done so at the rear end of flue, and on the top, and also both flues would have been damaged.

This must, I think, be classed among accidents from a defective flue. A. R. P.

Indefinite Cost of Electric Lighting.

It has always been a difficult matter to get anything like a reliable estimate of the cost of electric lighting. The conditions of the problem vary according to the source of power, the number of lamps in use, the average time they are burned, etc., etc., so that electric lighting may prove to be economical in one mill or workshop, and more expensive than gas in another. Still it would be possible, no doubt, to ascertain the average cost of producing a certain amount of light under ordinary conditions, if the lighting companies were disposed to furnish the public with such information. That they do not want to do so was shown in the recent Electric Light Convention in Chicago. A committee had been appointed to ascertain the relative cost of producing the light by water power and steam power, but on second thought the Convention determined that it would be unwise to publish the figures. The committee was therefore discharged before any report was presented, and this for the avowed purpose, the *Phila. Ledger* thinks, of keeping the public in ignorance of the cost of electric lighting. It is doubtful whether such secrecy pays. It gives rise to the impression that the profits on present rates are enormous, and so encourages the formation of rival corporations.

PRACTICAL STUDIES OF MAN'S LOCOMOTION.

Our readers already know about the Paris Physiological Station,* and some of the experiments that have been performed there, and they have been enabled to see, by means of a series of instantaneous photographs, how we analyze the complicated mechanism of walking, running, and leaping, and how motions so rapid that the eye can scarcely seize them are fixed in a sort of diagram which faithfully reproduces their least details.

Such experiments, which are interesting to the physiologist, whom they permit to understand the mechanism of motion better and better, have, in addition, from a practical point of view, a utility that it will perhaps be not without interest to give prominence to.

Good walkers, good runners, and agile leapers are not only men who are endowed with special aptitudes, or who, by frequent exercise, have acquired muscular strength, but they are also *professionals*, that is to say, by the unconscious work that accompanies every frequently repeated act, they have gradually found a means of managing their forces so as to produce the best effect possible. Although every one has the pretension of knowing how to walk and run, there are, among walkers and runners, virtuosos after their kind, who exert no useless stress, and who regulate the rhythm and length of their step according as the stretch is to be a long one or the gait rapid. These professionals would be incapable of transmitting the secret of their skillfulness, since they know it not themselves, having scarcely reflected upon the acts which they perform, after a manner, mechanically. But this secret may be taken by surprise. For this purpose, I propose, as soon as fine weather sets in, to submit the motions of remarkable walkers and runners to photographic analysis. There is nothing rash in discounting the success of these future experiments, for the peculiarities of the improved gaits will certainly reveal themselves in the photographs. Finally, it is allowable to hope that, from the time when the characters of a correct gait shall be well known, it will become possible to teach the principles of walking, running, and leaping, and of all exercises of the body generally, in a methodical manner.

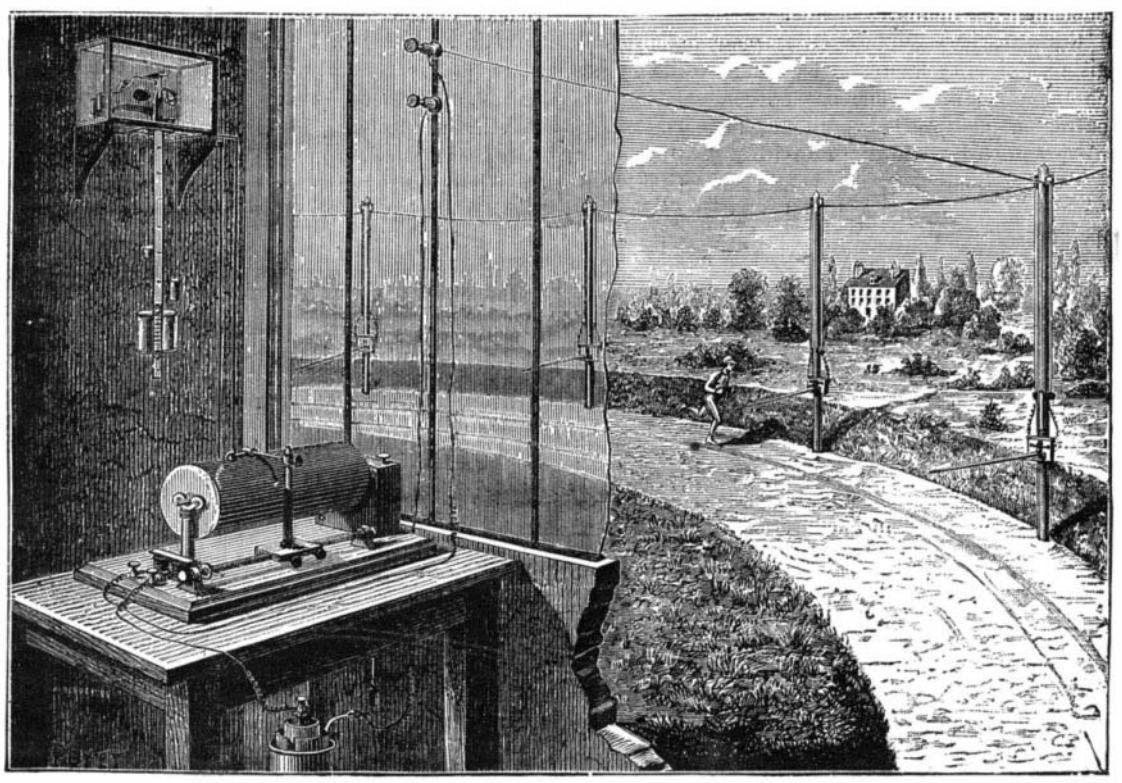


Fig. 1.—GENERAL ARRANGEMENT OF THE TRACK AND APPARATUS AT THE PARIS PHYSIOLOGICAL STATION

From a military standpoint, the question of man's walk is of peculiar importance, but presents likewise special difficulties. As the exercises of the soldier do not address themselves to men of polish, they must be regulated for individuals of medium strength. Experience alone must decide in such a matter, so it is after laborious researches that the length of the soldier's step has been fixed, as well as the rhythm of his walk and the load that he must carry, in order to utilize his forces in the best manner

* See SUPPLEMENT, Nos. 408 and 414.

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ENGINES OF THE ITALIAN RAM ETNA.

The Italian navy is now supplied with several vessels of the most formidable construction and armament. Among others is the ram Etna. The engines of this ship have 7,700 indicated horse power. They are the latest English type of compound engines; the general arrangement will be readily understood by a glance at our engraving. The engines were built by R. & W. Hawthorn, Newcastle-on-Tyne.

To Retin Old Copper.

Take some common clay and mix with it salt and sal ammoniac, say one-tenth part of salt and one-twentieth part of sal ammoniac. Or take the dry clay, pound it up fine, then salt it to taste, as the cook books say, and mix it into a soft paste with strong sal ammoniac water. Spread some of this paste on a piece of old copper, place over a charcoal fire, and heat to redness. If the paste takes off all the old tin or solder, it is all right; if not, make it stronger by sprinkling on more powdered sal ammoniac and salt until it is strong enough. The copper can be cleaned by scouring with salt and sand, and should be dried by being plunged into dry sawdust and rubbed until it is perfectly dry, or the air will form oxide of copper on the surface.

To tin the copper have a dish of powdered sal ammoniac and a bunch of tow—nothing else will do as well. Wet the surface of the copper with ordinary soldering acid, into which a little powdered sal ammoniac has been dissolved. Place the article over a charcoal fire (an old dripping pan with the bottom punched full of holes set on two bricks will do well), and as soon as the copper is hot enough to melt the tin or solder, which is supposed to have been put on, rub over with the bunch of tow, which is to be frequently dipped in the powdered sal ammoniac, and the copper will look as good as new, and perhaps better. If the copper is allowed to get too hot, the tin will look yellow. Do not get in a hurry, but try to have the copper at an even heat, and you will have a good job. If the article has had holes soldered in it, hold over the fire before using the paste, and wipe off the old solder.—*The Ironmonger.*

Water Blasting.

The value of water as an aid to blasting when used in connection with explosives is rapidly becoming recognized in this country, as well as in the larger mines and quarries of Europe. Ordinary blasting with gunpowder in coal mining is done by boring a hole in the face of the coal about two inches in diameter and four or five feet deep. Into this is inserted the powder cartridge, together with the slow fuse, when the hole has been well tamped, filled with any dry refuse rammed in tight, then fired by lighting the fuse. In this operation (and we have described it thus not to show any new ideas connected with it, but for comparison) a very dangerous flame, especially in gaseous pits, is created, and appalling results often ensue; carbonic acid and sulphurous acid gases are generated, very dangerous to miners and to mining properties. When it is desired to blast with water together with gunpowder, the process is conducted by inserting into the bore hole a powder cartridge with the fuse attached as in the ordinary way; next to the powder cartridge is inserted into the bore hole a tube containing water. These tubes must be as large as the bore hole will admit, and of any length convenient to handle, the larger the better; they may be made of any cheap material convenient, cheap thin tin plate, or stout brown paper turned around on a wooden roller, after being well pasted together, the ends closed with corks. The bore hole is now tamped in the ordinary manner, the fuse lit, and the cartridge fired in the usual manner. As a result of this process the following points of excellence, among many others, may be briefly mentioned: the powder, in exploding, bursts the tube containing the water, and, careful estimates show, with increased power or explosive violence, as the rending force is extended through the water in accordance with the well known principles of hydrostatics practically demonstrated years ago by Brahma, over the enlarged interior area of the bore hole, due to the space occupied by the water tube. A much larger quantity of the material to be mined or quarried is thereby brought down or loosened with a smaller quantity of the explosive used. The heat given off by the burning of the powder and surrounding gases converts a larger proportion of the water into steam, the elastic force of which assists in the operation of blasting; the steam and remaining water together extinguish the flame and flash of the powder, and absorb and neutralize the greater portion of the gases and smoke resulting from explosion. It will readily be seen that by this process are met together economy, power, and safety, the system being simple and effective and not attended with anything inconsistent with the well known laws of explosion. It is to be hoped that, in the best interests of humanity, our large and intelligent body of miners and quarrymen will not be slow to adopt an amelioration in the present crude and dangerous processes of blasting which will tend, in no small measure, to render premature explosions in mines a thing of the past, rather than one of almost daily occurrence.—*Coal Trade Journal.*

The Petrified Forest.

The visitor to the petrified forest near Corizo, on the Little Colorado, will begin to see the signs of petrifaction hours before he reaches the wonder; here and there at almost every step in the road, small pieces of detached limbs and larger stumps of trees may be seen almost hidden in the white sand. The road at a distance of ten miles from Corizo enters an immense basin, the slope being nearly a semicircle, and this inclosed by high banks of shale and white clay. The petrified stumps, limbs, and, in fact, whole trees, lie about on all sides; the action of the waters for hundreds of years has gradually washed away the high hills roundabout, and the trees that once covered the high tablelands now lie in the valley beneath. Immense trunks, some of which will measure over five feet in diameter, are broken and scattered over a surface of 300 acres.

THE youngest member of the Cotton Exchange in this city is a youth of fifteen summers, and the oldest a veteran of eighty-two years.

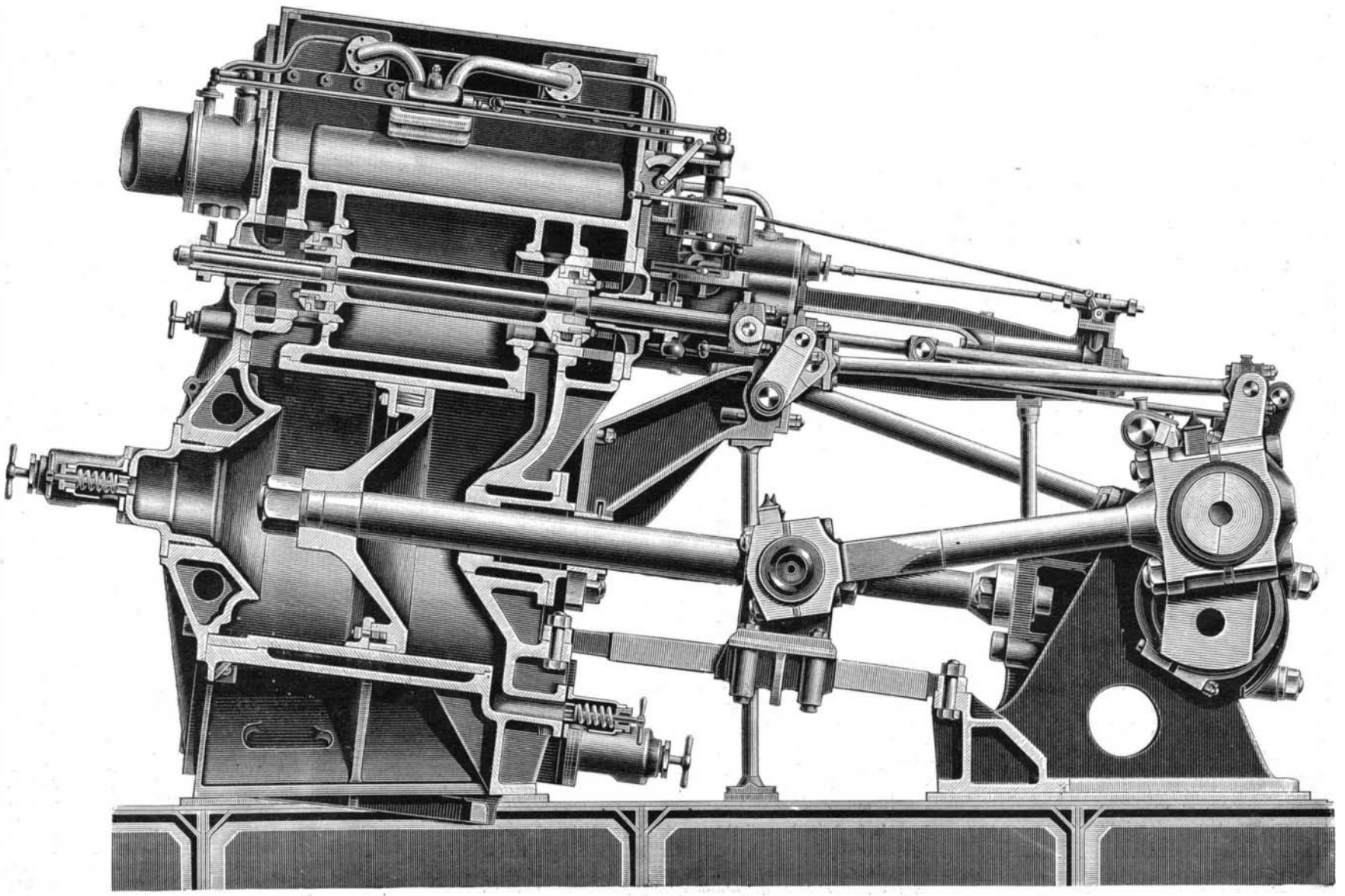

Fig. 1.—COMPOUND TWIN SCREW ENGINES (7,700 I.H.P) OF THE ITALIAN RAM ETNA —[See also page 182.]