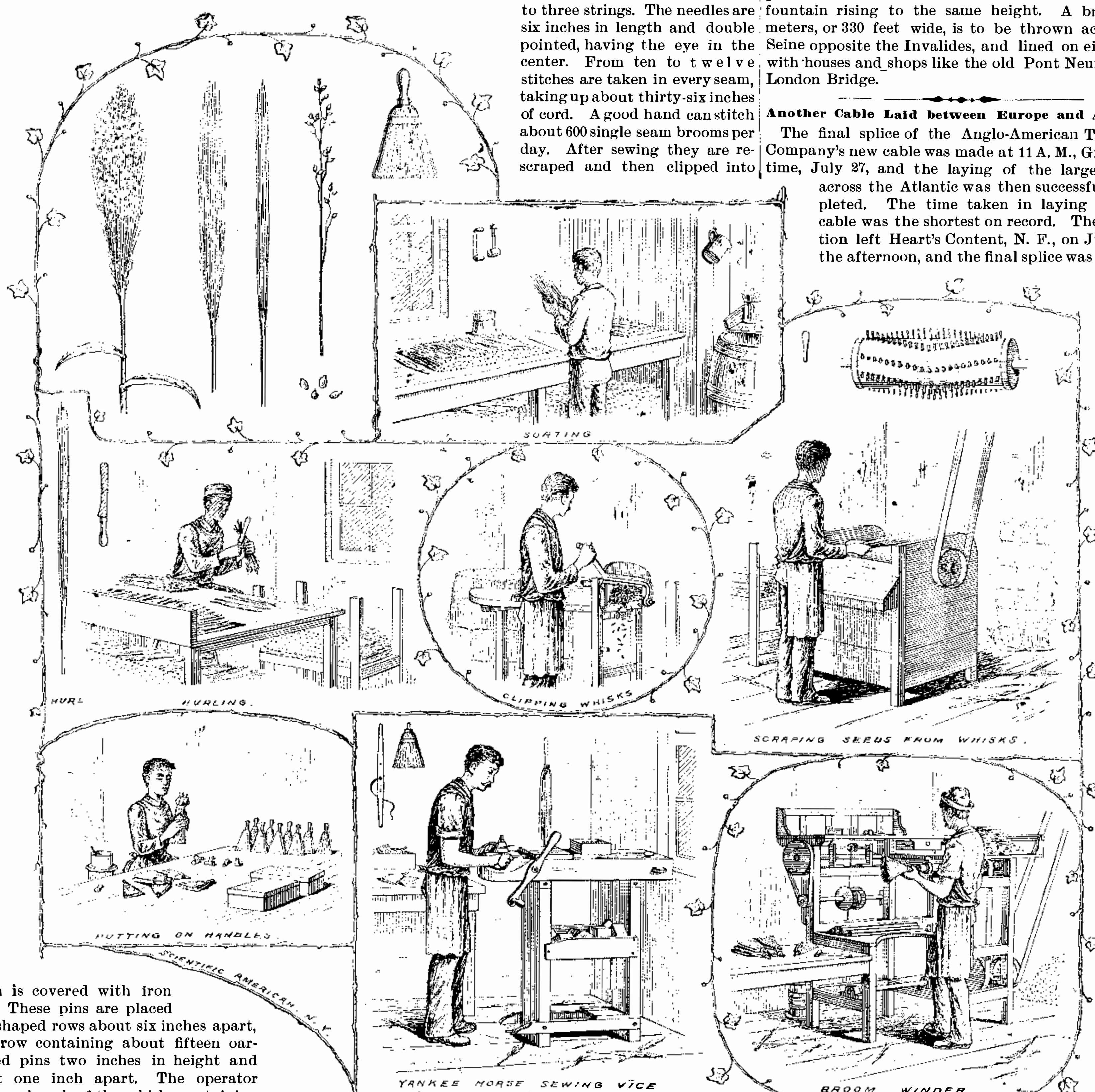
**MANUFACTURE OF WHISK BROOMS.**

Broom corn, from which brooms are made, comes principally from the Western States. The seeds are sown in May or June, about one foot apart, in rows. In about three months' time the stalk reaches to the height of from eight to twelve feet; the top ends, which contain the whisks, are then ready for cutting. The stems are first bent over about one foot below the whisks and then cut off and packed into wagons and carted to the barns to be scraped and dried. After drying it is packed into bales weighing from 250 to 400 pounds each and shipped to the broom manufacturers. The first operation is sorting or selecting the stock, the finest and greenest being used for the best brooms. After sorting the material is scraped. The scraper consists of a circular revolving cylinder nineteen inches in length and twelve inches in diameter, the surface of which is covered with iron pins. These pins are placed in V-shaped rows about six inches apart, each row containing about fifteen oar-shaped pins two inches in height and about one inch apart. The operator presses a bunch of the whisks containing the seeds against the revolving cylinder, the teeth of which, traveling at the rate of 350 revolutions per minute, tear through the material, scraping off the seed from the whisks. If the material is old, having lost its green appearance, it is dyed. The stalks are then clipped off and the whisks made of an even length. The best and straight whisks, which is called hurl, grows in the center of the stalks. It is kept separately from the rest and is placed on the outside when forming the brush. The next operation is winding or forming the brooms. A circular piece of wood about three inches in length and about three-quarters of an inch in diameter is fastened into what is called the broom barrel. Connected to the machine is a reel of No. 22 iron wire, the end of which is tacked to the circular stick in the barrel. The operator then takes a quantity of the poorer quality of the whisks and places them around the stick, starting the machine in motion, which causes the barrel to revolve, which, in turn, wraps the wire tightly around the whisks to the stick. After two or three turns of the wire has been taken the shoulder of the broom is then formed by putting a bunch of the material on each side and wiring and tacking them down as before. The hurl is then fastened on the outside in about the same manner. The rough edges are then trimmed with a knife and the broom sawed off from the barrel. A good hand can form about 150 brooms in about ten hours. The brooms are then taken to the sewing vise to be stitched. A broom is fastened securely in the jaws of the vise, the top part projecting above about three inches. The operator then takes a flat oval-shaped steel needle threaded in the center with fine linen cord or silk and passes it through the brush, securing the end. The cord is then wrapped tightly around the outside of the brush and the needle pushed through back and forth, each stitch passing over and under the outside cord, which is drawn taut, securing the whisks and giving shape and form to the broom. Brooms are sewed with from one to three strings. The needles are six inches in length and double pointed, having the eye in the center. From ten to twelve stitches are taken in every seam, taking up about thirty-six inches of cord. A good hand can stitch about 600 single seam brooms per day. After sewing they are re-scraped and then clipped into sizes. The ends are then sheared and curried to free the brooms of surplus seed. The handles, which are made of bone, ivory, wood, etc., are then glued on and the brooms stood up to dry. They are then packed into boxes and are ready for market. Twenty hands can turn out about from 75 to 80 dozen brooms per day. The green stock is the best for broom making, it bringing from five cents to six and one-half cents per pound by the ton wholesale. If too ripe, the color of the material being reddish, the stock loses in value about three cents per pound. The sketches were taken from the plant of F. H. Bookhop, New York City.




**MANUFACTURE OF WHISK BROOMS.**

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IT is estimated that the yearly passenger trips on ferryboats between New Jersey and New York number 70,000,000; that the total for all New York ferries will exceed 170,000,000; that the number of boat trips equals 1,800,000, and the number of teams carried 5,000,000. This immense traffic is carried on with remarkable safety.

**Paris Exhibition of 1900.**

Thirty-six projects for what is called the Clou, or main attraction, of the Paris Exhibition for 1900 have been sent in to the special sub-committee. The well known engineer, M. Armengaud Jeune, proposes the offering of handsome prizes for solutions of the three problems, transmission of sight to a distance, chromophotography on paper, and electric lighting without focus, by cold light with the aid of electric undulations of great frequency. M. Flammarion, the astronomer, proposes a shaft showing the various geological epochs with their inhabitants, and also an arrangement by which the spectator would witness the revolution of the earth as if from the surface of the moon. M. Trouve, the electrician, advocates a luminous cascade falling from the upper platform of the Eiffel Tower and also a luminous fountain rising to the same height. A bridge, 100 meters, or 330 feet wide, is to be thrown across the Seine opposite the Invalides, and lined on either side with houses and shops like the old Pont Neuf and old London Bridge.

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**Another Cable Laid between Europe and America.**

The final splice of the Anglo-American Telegraph Company's new cable was made at 11 A. M., Greenwich time, July 27, and the laying of the largest cable across the Atlantic was then successfully completed. The time taken in laying the new cable was the shortest on record. The expedition left Heart's Content, N. F., on July 15, in the afternoon, and the final splice was made on the morning of the 27th, or less than twelve days. As the Irish shore end was laid in less than two days, the total time taken was inside of two weeks, a most remarkable achievement when it is considered that this cable is of the heaviest type ever laid.

A curious coincidence in connection with its completion is the fact that the final splice was made on the anniversary of the day on which the first successful cable was landed at Heart's Content in 1866, twenty-eight years ago; and not only the same date, but on the same day of the week.

The new cable is laid between Heart's Content and Valentia, Ireland. This cable has a larger conductor than any cable ever laid. It contains 600 pounds of copper per nautical mile. This increase of copper in the conductor means a proportionate increase in the speed of transmission. The new cable has, therefore, the greatest capacity of all long cables. It is consequently a valuable addition to the telegraph facilities between America and Europe.

### The Building of a Battleship.

Albert Franklin Matthews describes in an article, "The Evolution of the Battleship," in the July *Century*, the great shipyards of the Cramps, where our monster sea dragons are hatched out. Mr. Matthews says:

THE CRAMP SHIPYARD.

"The Cramp shipyard has nearly a quarter of a mile of water front. Along this frontage are ships in various stages of construction, some on the stocks and some in the water, illustrating almost every step in the building of a vessel. Here, near the entrance to the yard, is an acre or more of punching machines, enormous contrivances that, as they close their jaws, with their ungainly teeth bite out holes for rivets in the plates and frames as easily as a farmer's wife takes out the core of an apple. Over there is a steel checker-board frame into which big pins are set in a curve. Against the pins stalwart sledge swingers, half naked, bend the cherry red frames and plates, as they are slid out of the furnace, into the shapes they must assume for use in the vessels. Here is a great row of blacksmith forges. Over there is a building where a dozen monster boilers are in construction, and where a traveling crane lifts and moves them as easily as a hotel porter does big trunks. Here are big ship engines, some set up and some taken down. Here are foundries where manganese bronze screws are cast, and where brass and iron are fashioned into a thousand forms. Here is the great mould loft where every line in the ship is laid down, and from which wooden counterparts of the vessels are made before the steel construction begins. Here are the wood-working shops, the gun factory, the great store house, and there is the floating derrick that can pick up a seventy ton boiler, move it 300 feet, lift it high in the air, and place it in a ship in thirty minutes, with as careful an adjustment as a watchmaker uses in fitting a movement in its place. And here are 5,000 men employed in various capacities — machinists, woodworkers, moulders, and perhaps most noticeable of all, riveters in sets of three, one man to hold a big sledge against the red hot rivet, and two, one a right-handed worker and the other left-handed, to pound it until it becomes a part of the ship. So the work goes on until after about two years the ship that existed only in specifications becomes a living thing.

"In putting this ship together the same methods are used as in a merchantman. The keel is first laid on big blocks, arranged at intervals of about three feet, on an incline of about five-eighths of an inch to a foot, so as to give the requisite pitch in launching. The Paris had an incline of half an inch to the foot, but for the battleships, which are shorter and nearly as heavy, a steeper incline is required. After the keel is laid the two frames in the center of the boat are put up, and then others fore and aft follow until the stern post and ram are fixed into place. The plates on the sides are riveted on, and it is not until the hull is half finished that we notice a radical difference between it and the hull of the merchantman. Then we catch the first glimpse of the protective deck. This is a turtle-back of steel, from three to four inches thick, reaching from side to side, and in most naval vessels from bow to stern. At the sides it extends about three feet below the water line. Below this deck are the engines, boilers and a spare steering apparatus. If a shot could get through the sides of the vessel it might kill men—that is to be expected in warfare—but it must pass through this sloping inner deck of steel before it can disable the vital parts of the vessel. It is this protective deck that makes valuable the cruisers that at present constitute the main strength of our navy. A shot might go through their pasteboard sides easily, but it would be a long time before the engines would be disabled in an engagement. It is on this protective deck that the steel fort of the Indiana rests. From the ends of the redoubt this protective deck runs fore and aft, to bow and stern, and if all this frail part of the vessel were shot away, the ship could still float and fight.

LAUNCHING DAY.

"So the building goes on until the launching day comes, and two broad ways are built against the bottom of the vessel, and the keel blocks on which it has been resting are knocked away. In the launch of the Indiana Mr. Nixon ran a row of electric lights beneath the bottom of the vessel, adding another innovation to the details of American shipbuilding. Each launching way consists of upper and lower planking, between which is spread thousands of pounds of the best tallow. At the bow of the boat these upper and lower planks are clamped together, and when all is ready they are sawed apart and the vessel starts. The upper part of the ways slides into the water with the vessel, and the lower part with the smoking hot tallow remains stationary. A launch in these days is so smooth and soon ended, rarely occupying more than twelve seconds from start to finish, that one scarcely realizes its difficulties. Three things are absolutely necessary: It must be on time, when the tidal water is highest; it must be of smart speed, so as not to stick on its downward journey to the water; and it must be accomplished without straining. So complex a thing is a launch that the careful engineer in charge is able to estimate the strain on every part of the vessel for every position it occupies, at intervals of one foot, on its way down the incline. There is one supreme moment. It is when the vessel is nearly two-thirds in the water. The buoyancy of the water raises the vessel and throws its weight on its shoulders. Here is where the greatest danger of straining comes, and should the ways break down, the vessel would be ruined, a matter of nearly $2,000,000 in a ship like the Indiana when it was launched."

### Intra-Coastal Canals.

Professor Lewis M. Haupt, Consulting Engineer of the Trades League of Philadelphia, presents in the *New Science Review* an article which emphasizes the position taken by the *Review of Reviews* for June as regards the importance of constructing interior canals along the Atlantic Coast. He says: "Probably nowhere in the world do there exist so great physical possibilities or so imperative commercial necessities for a deep water canal as along the Atlantic sea-board of the United States. This coast line, from Cape Cod to Florida Reefs, is a succession of sand bars, dunes and islands, inclosing large bays, sounds and navigable streams, and having comparatively few inlets where deep-draught vessels may safely penetrate this *enciente* of sand, and find a safe refuge from storms. The great risks to maritime property are shown by the reports of the Life Saving Service, which state that for the year ending June 30, 1893, the value of the vessels risked between Capes Cod and Hatteras was $2,825,765, while their cargoes aggregated $962,375, making a total of $3,788,140. The number of disasters during the year was 214, and the value of the property destroyed was $1,146,395, while that saved was valued at $2,641,741—so that 29 per cent of the property risked was lost. The greatest number of disasters (66) occurred that year in the Second District, which embraces the coast of Massachusetts, and the next largest number was on the coast of New Jersey, where there were 47 wrecks.

"From New York Bay to the Delaware Capes, 170 miles, there are no harbors of refuge, and even the Delaware Breakwater is no longer available for deep-draught vessels, while to the coasters it has proved very disastrous, for within a period of eighteen months no less than fifty vessels have been wrecked within its shelter.

"This is but one of many good reasons for the immediate opening of a capacious interior water-way along this coast. A more convincing and practical one, however, is the economy which would be effected by the great reduction in distance between our populous centers of industry. Thus the Cape Cod Canal, which is projected to connect the waters of Buzzard's Bay with Cape Cod Bay, at Sandwich, and is about 9 miles long, will reduce the distance between Boston and New York from 398 to 250 miles, a saving of 140 miles, or 35 per cent. The canal across New Jersey, from the Raritan Bay to the Delaware River, 34 miles long, would reduce the distance from 273 to about 90 miles, effecting an economy of 183 miles, or over 67 per cent; while the enlargement of the present Chesapeake and Delaware Canal, with a 10 feet draught and a length of 14 miles, would reduce the distance by water between Philadelphia and Baltimore from 430 to 112 miles, a saving of 318 miles, or 74 per cent.

"Thus it will appear that by the reconstruction or enlargement of 57 miles of canals, the present outside distances between these populous centers could be reduced from 1,101 to 452 miles, a saving of 60 per cent. This in itself would be an ample justification for the expenditure of a very large amount of capital to secure the result, but the physical conditions of the country which would be traversed by these canals is such that the actual cost of construction would be comparatively small. The estimated cost of the New Jersey link is $12,500,000, while the Delaware enlargement could be completed to tide level for $5,000,000, with the improved machinery now available.

"As the tonnage now afloat on the waters from Long Island Sound to Chesapeake Bay amounts to over $70,000,000, of which a large percentage would be greatly benefited by the creation of these connecting links, there would seem to be no question as to their financial success; and the dense population tributary to this highway of commerce is a sufficient guarantee to the statistician of an ample revenue from the existing and rapidly increasing traffic of this canal."

THE official full power forced draught trial of her Majesty's ship Ferret, built by Messrs. Laird Brothers, of Birkenhead, has been conducted with satisfactory results. The mean speed on the measured mile was 27·62, the maximum speed attained being 28·4 knots. The speed for the three hours was 27·51 knots with 175 pounds steam and 361 revolutions. The Ferret is the first of the new class of 27 knot torpedo boat destroyers, her displacement being 258 tons. No. 97 **Torpedo Boat, built by Laird Brothers, Birkenhead,** on her three hours' full power trial, made six runs on the measured mile, as follows: Steam, 170 pounds; revolutions, 363; speed, 23·71 knots; and I. H. P., 1,690. The speed for the three hours, 23·35 knots, was well maintained. The contract speed is 23 knots. This vessel is 140 feet long, with a displacement of 115 tons.

### The Subways of a Great City.

Mr. J. J. Waller, in *Good Words*, gives an account of the Parisian sewers, illustrated by diagrams of the interior of the sewer. The main sewers are 11 feet high and 16 feet broad, and are constructed of solid masonry covered with cement. Workmen are continually working on them, and the water only rises to the sidewalks after a very heavy rain fall. The sewers contain two water mains, as well as telegraph and telephone wires, and tubes for compressed air. "This ingenious system sprang from another embodied in a contract granted in 1881 by the Municipal Council of Paris to the Pneumatic Clock Company, who were given permission to place their tubes in the sewers on condition that they erected a given number of clocks in the public places of the city, and undertook to keep them to the time furnished daily at noon by the Observatory. The clocks are worked from a central office by the compressed air, and constitute a great public convenience. After twenty-five years from the date of the contract they will become the property of the city. As a set-off the company received a concession to establish and keep their pipes in the sewers for fifty years, for the purpose of distributing compressed air as a motive power throughout the city. A very wide use is made of so advantageous a system, for it obviates the purchase of an engine, saves space, time and trouble. All that is needed is a meter and the proper connections with the compressed air tube, then a turn of the tap, and the machinery is in motion."

The sewers are also used to accommodate the pneumatic tubes by means of which the carte telegrams are conveyed from one end of the city to the other. The convenience of having the telephone wires in the sewers is very great. There are thousands of miles of these connecting 244 post offices, as well as hundreds of private subscribers in every part of the city. Any subscriber in any part of Paris may be heard with ease in the General Post Office in London, and a whisper can be heard over the telephone in Paris, with the result that the hard swearing that goes on over the London telephones is almost unknown. The sluice carriage is run along the ledges of the sewers, while a tongue scrapes the side and bottom clean. The sewers are lighted with lamps, and not only is every thoroughfare inscribed on enamel plates, but every house which is connected with the sewer is also numbered. As many as fifty tourists a day go down the sewers in the tourist season to ride in the tourist car or sail in the gondola. The Paris Council has decided upon adopting the system of drainage which is in vogue in English towns. They are to spend thirteen million dollars in adapting the sewers to take all the sewage which at the present time is stored in cesspools. They are also going to spend ten million francs more in improving the water supply and the means of distributing it. One of the sewers passes under the river by means of a siphon 170 yards long and three feet in diameter. This is kept clean by inserting a wooden ball on the left bank of the Seine which almost exactly fills the tube. The pressure of the stream carries the ball down, and then, being of lighter specific gravity, it rushes to the surface, carrying before it everything that may have settled in the siphon.

### Another Great Fire in Chicago.

The embers of the burned Exposition buildings at Chicago had not been wholly extinguished when another conflagration took place in the lumber district. This was on August 1. An area equal to nearly fifty acres was burned over. An enormous amount of lumber was consumed. Among the great establishments destroyed were that of S. K. Martin Lumber Company, Blue Island Avenue and Lincoln Street, known as the largest lumber yards in the country, 35,000,000 feet of lumber and the offices consumed; loss, $700,000. Perley, Lowe & Co., lumber dealers; yards adjoining Wells, French & Co.'s foundry, 15,000,000 feet of lumber, chiefly soft pine, destroyed; loss, $300,000.

We regret to say one of the finest electrical establishments was also lost, that of Siemens & Halske Electric Company of America, manufacturers of dynamos, motors, and electric machines of all kinds, 1166 to 1182 South Wood Street, works completely destroyed; loss, $800,000.

Wells & French, manufacturers of car wheels, freight and refrigerator and street car works, from Wood to Paulina Streets, destroyed, including south casting foundry, wheel foundry, patterns, freight cars, and lumber; loss, $300,000.

Many other establishments were consumed.

The aggregate losses are placed at between two millions and three millions of dollars. Such great calamities have a disastrous effect upon the general industries of the country.

### Character in the Engineering Profession.*

BY ISHAM RANDOLPH.

In constructive engineering, during the year 1892, although much has been done, few works in America have risen to a dignity commending national attention. With the most conspicuous of these our own members have been associated in a distinguished manner. The Mississippi, "Father of Waters," makes a rift in our continent which commences not far from British territory and works southward through sinuous convolutions more than three thousand miles to the gulf. Beginning at Brainerd, in the far North, the ever-widening stream is spanned, time and again, by railroad and highway bridges, until the Eads structure is reached at St. Louis. Between that and the gulf, for many years, the only communication between its opposite shores was by marine conveyance, but now there is another noble structure connecting Tennessee and Arkansas, at Memphis. This majestic structure adds one more notable achievement to the record of our distinguished member, George S. Morison.

On September 3 a notable event transpired in the Desplaines Valley, near the classic village of Romeo. Ground was officially broken and rocks rent by the official discharge of an electrical battery, for the great combined drainage channel and ship canal, which is to restore that connection between the great lakes and the Gulf of Mexico which those who read the earth's history, as recorded in the book of geology, tell us existed long before there was any other method devised for keeping the chronicle of great events. To make this event possible, our past president, L. E. Cooley, has given up his best years to ceaseless research, ill-requited labor, and often brutal criticism. Never was there a more notable example of what one persistent man can do to mould public sentiment and force legislative action. As the chief engineering executive of this great enterprise, we recognize another of our past presidents and most valued members. During this year, as if by magic, vast and magnificent structures have reared their majestic proportions within the domain of the people of Chicago known as Jackson Park. Civil engineers have supplied the grand arches and ribs of steel which made it possible thus to excel in vastness every building enterprise which earth in its unnumbered centuries has borne upon its bosom; and architects have taken these giant skeletons and covered and veneered them with counterfeited marbles in dignified and fair proportions, until the work of these brother craftsmen strikes wonder, admiration, and awe into the hearts of all beholders.

The night is wearing on and I must yield the floor to others, but not until I have addressed myself to the young men of our organization—the forceful, hopeful, earnest contingent, who strain the eyes of imagination dipping "into the future, far as human eye can see," striving to draw aside the curtain which hides "the vision of the world and the wonder that shall be." Young men, I feel as if I had a right to speak to you, because my sympathies are so strongly with you, and because it seems but yesterday that I, too, was young; but on from the yesterday of my youth the resistless force which drives the flying chariot of time has forced me to the past meridian of life. And from that vantage ground I speak to you to-night. You have joined battle with the forces of the world, you stand shoulder to shoulder with the men who are grappling with the raw materials of the universe and moulding and shaping and framing them to fit the multiform needs and uses of earth's myriad inhabitants. Some of you come armed cap-a-pie for the contest, others face the battle with an equipment but little better than the shepherd's sling and the few smooth stones from the brook. To the one class I would say, be not too confident. To the other, be not cast down by the scantiness of your preparation.

In what I am about to say I would not be understood, for one moment, to underrate the value, the vast advantage, of a thorough scientific and liberal education. Few men have coveted more earnestly than I the possession of just such an education, and few have attained worthy results with more labor than it has fallen to my lot to endure in prosecuting my life's work, because I lacked this equipment for its duties.

The first essential to success in life is the possession of a sound mind; and what is not possible to him who has a sound mind domiciled in a sound body, with a strong will to urge both to highest effort? Take two such men, with equal natural powers, and equip one with a thorough knowledge of the laws of nature and the best methods of turning the forces of nature to account in the work which lies before him ere he can reach the goal of success. Then let both men choose the same goal. Will not the man who knows how reach it long before the man who has to learn how? But the last man will get there, if no infirmity of purpose overtakes him. Then, again, take two men, one with a natural gift for certain lines of work or research and the other with no such gift, but with years of training and discipline to fit him for the work, and the race will not be so unequal as in the first case; when the one reaches the goal the other will not be far behind him, and it is a question which will reach it first. The schools, colleges, and universities, which stand like storehouses of knowledge all over the land, have a mission to mankind which is helpful and ennobling. But whence came our engineers before these temples of learning were reared? What faculty graduated John B. Jervis? Did Benjamin H. Latrobe pass from classic shades to the fields and forests, the rugged mountains and the brawling torrents, where he exercised that skill which gave him his great name? What of Roswell B. Mason? Was he a graduate? E. S. Chesbrough left monuments behind him which made him famous on two continents for his constructive genius while he lived, but can his descendants point proudly to their father's diploma? How many years was James B. Eads coached by professors before he built that gunboat fleet or flung those ribs of steel across the Mississippi, or planted the jetties at its mouth, or conceived the idea of the ship railway? What college trained Thomas U. Walter between the time of his dropping his bricklayer's trowel and his building the capitol of this nation?

I might go on and on, but these proud names will suffice to show that while knowledge is power, it is not all pre-empted by the schools. Take heed then, you young men, who oftentimes feel cast down by the odds you think you see against you. If you have a genuine love for the work which is the daily lot of the engineer, devote yourselves to it, and remember that you have more help than the men before you, who, single handed and alone, wrought out of their inner consciousness the means by which they attained their ends. And now to those of you who have the equipment of varied knowledge, learn to handle it aright, and because you know so much, do not fall into the error of believing that you know it all. The man who reaches that conclusion will not go far before he overtakes confusion and disaster. I have had men under me by whose knowledge I was fairly appalled. They were walking encyclopedias, versed in signs that failed not to the tenth decimal, but so constantly flying off at tangents that they became eccentric to a degree which destroyed their mental balance and they could not be trusted to do common-place, every-day work that pertains to our duties without having an *ignoramus* along to keep them straight. You who have this splendid equipment, learn to use it so that it may be effective. Watch the *practical men*, see where they fail for want of what you possess. Harness your theories for the everyday work of life, and if they are true, your work will be the better for their aid; but if false, you will soon demonstrate the fact, and lean upon the true and cast away the fallacious. As I look upon you all, I read in your faces the laudable ambition to reach success. What is success? How many standards are there? Some unthinking or sordid listener might reply, The accumulation of vast wealth—that is success. Others again will say the attainment of power and position is the goal of our desires. And still others will ask for a good name, with the ability to owe no man anything, and the calm consciousness that in the attainment of these they had wronged no man.

He who gauges success in our profession by the money standard has a low conception, indeed, of the full import of the term. Judged by the measure of accumulated gains, the lives of ninety per cent of the men whose names shine upon the pages of human endeavor have been flat failures. One of our humorists, I think we must credit it to Josh Billings, has said: "It is easy to see what the Lord thinks of money by the people he gives it to." True success is impossible apart from probity and honor, and it is a fact, which must not be lost sight of, that the men who by their ability and skill have placed the engineering profession upon the high plane it occupies to-day have been men of exalted characters. And how are characters built up? Can a fabric of truth rest upon an aggregation of lies? Does honor rear its head above a stagnant pool of immorality? Does integrity come forth from a heart full of dishonest intention? No, my friends; you can no more rear a noble character upon a foundation of unstable or corrupt morals than you could sustain the Auditorium upon the muck and slime of a morass. There is not a man here to-night who has attained to responsible position who cannot revert in thought to not one, but several men, with whom his professional life has brought him in contact, whose failures, utter and complete, were traceable to the absence of character. I have known and loved and yearned over such men as these. I have had comrades who were manly and generous and gentlemanly, gifted by nature with mental ability and re-enforced by the schools, but lacking in some vital element of character. In their training the item of self-control had been left out, passions and appetites dominated their lives, or indolent self-indulgence stayed their hands from every effort worthy of their ability. In offices throughout our land such men as these are eking out miserable existences, cursing fate for their ill-luck, and drifting on helplessly and hopelessly into the oblivion which will whelm them at last. Young men, aim high in all things, but aim highest of all in character. And now the king is dead, but his disembodied spirit hovers near to wish the king a successful, a beneficent and a glorious reign.—*Journal of the Association of Engineering Societies.*

* Extract from address of retiring president, Isham Randolph, Western Society of Engineers. Delivered January 4, 1893.

### Bathing in Typhoid Fever.

In a note in the *Medical Record* by Dr. William B. Noyes, of New York, he says:

Every new medical text book and periodical accumulates statistics testifying to the brilliant results following the use of cold baths in typhoid fever. The hospitals in which this method is chiefly carried on are almost, without exception, showing a higher percentage of recoveries than ever before under any other plan of treatment.

Why is it, then, that this method is not universally adopted and carried out in private practice? The answer is simple. Easy as it is in a hospital with an abundance of skilled assistance, there is no method of treatment in use so difficult to carry out properly as tubbing in typhoid fever in private families.

It is a very easy thing to slip a rubber blanket under the patient, and raise the two sides and the ends at the foot and head of the bed, nine or ten inches, by a row of pillows, bolsters, sand bags, or simple boards.

The rubber blanket ought to be of double thickness, as large as can be purchased, and special care must be given to the arranging of the corners. When this is done you have the patient at the bottom of an impromptu bathtub, into which you can pour water at any desired temperature, and in sufficient quantity to partially or entirely cover his body.

Only two inches of water would be enough to give a cool sponge bath ten times as efficacious as the gingerly sponging possible under ordinary circumstances, and if the sides and corners are firmly fixed, you can easily make this tub hold all the water you desire. The water may be run from the nearest faucet by a rubber tube. I have found it a simpler and equally successful method to carry it in pails and pour it over the patient, starting with tepid and gradually cooling it down to the desired temperature.

The neatest method, I have found by experiment, is to use a large "watering pot," with a sprinkler, such as is used for watering plants. This is a method which will not commend itself to those who dislike humble and commonplace methods to accomplish something that more complicated and more impressive methods might do.

I believe that this kind of a bath will always be grateful to the patient, and if it is found necessary to use water at a decidedly low temperature, would give rise to less shock than a sudden plunge into a tub filled with very cold water. The effect on the temperature is the same as it would be under the other method with a stationary tub.

The water can be removed, without spilling a drop on the bed, by siphoning with a rubber tube, or dipping with a small pitcher or cup, or sponging. Then the blanket can be dried and left in place, covered by a clean sheet, or, better yet, removed and dried in the sun.

THE resistance of canal boats to traction has been investigated for the Ministry of Public Works of France by M. De Mas, the account of the experiments being given in a two-volume report issued recently by the ministry. It was found that at a speed of 3·28 feet a second the resistance of the 70 odd types of barges ranged anywhere from three to eight pounds per square foot of immersed section. If the resistance at a speed of 5 feet a second with a draught of 3·28 feet (1 meter) is called unity, the resistance with a depth of 4·27 feet (1·3 meters) becomes 1·13, and with a draught 5·25 feet (1·6 meters) becomes 1·27. That is to say, the resistance does increase with the displacement of the boat, but more slowly. Another fact found out was that the resistance may be much reduced by using smooth surfaces below the water line, the total resistance of a wooden barge being diminished from 782 to 551 pounds by covering the sides with oilcloth. The length of the boat was found to have little influence on the traction when the speed was five feet or more a second, but the form of bow and stern was shown to be important, a spoon-shaped bow giving the best results.

### Italian Wages.

The British vice consul at Ancona, in a recent report on the trade of that district, gives an additional instance of the low wages paid in Italian industrial establishments. At the metallurgical works of Messrs. D. Cattro & Co., a firm giving constant employment to over 200 hands, although wages have increased by about 10 per cent in the last three years, the average rates paid per day of 10½ hours are—to boilermakers, 3s. 2d.; iron founders, 2s. 11d.; riveters, 2s. 11d.; turners, 3s. 2d. The works are being enlarged, and accommodation will be provided for building steamships of any size or tonnage. Coal, coke, pig iron, and all materials for boiler making are imported from Great Britain.