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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 274,
For the Week ending April 2, 1881.

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OUR DEEP SEA FISHERIES.

Among the important items of the Sundry Civil Appropriation Bill of the late Congress was one granting $103,000 for the construction of a sea-going steamer for the use of the U. S. Fish Commission. The vessel is designed for purposes of deep sea exploration, and will be constructed under the supervision of Professor Baird.

A considerable amount of good work in this direction was done last summer with the little Fish Hawk during an interval of forced inaction in the work of fish hatching, for which she was specially designed. Taking advantage of spells of settled weather the Fish Hawk made three runs to the edge of the Gulf Stream, spending twelve hours on each occasion in deep sea work, but not daring to stay longer because of the unfitness of the little craft to endure rough weather. To do the work properly would require a properly equipped sea-going vessel, such as the appropriation provides for. Accordingly Mr. Copeland, naval constructor of the Lighthouse Board, has planned a vessel in which are embodied all the requirements of a staunch sea-going boat, as small as the service will permit, but able to do any work of the kind required, and at the same time fitted for the hydrographic service of either the Coast Survey or the Navy Department, when no longer needed by the Fish Commission. The proposed vessel will be about 200 feet keel.

The method of deep sea research proposed by Professor Baird will embrace determinations of temperature and the depths of currents; the collection of objects from the sea bottom and from the water at all depths, from the surface down; and the collections of samples of water at various depths for chemical and microscopical investigation. The temperature investigations, he thinks, will be of very great importance, as the distribution and migrations of fish are largely influenced by variations in the temperature of the water inhabited by them.

Among the problems to be solved by these investigations is the cause or occasion of the recent abandonment of the waters north of Cape Cod by the menhaden. Some 2,000 men in Maine were engaged in the menhaden fishery, and the capital invested by them approached $2,000,000. The hopes of this industry depend upon the discovery of the cause of the change in the habit of these fish, and whether the change is likely to be permanent.

The disappearance of mackerel from the Gulf of St. Lawrence is instanced by Professor Baird as another problem, the solution of which requires the use of a sea-going vessel. If the Commission can determine the probability of a continued absence of the fish from the Gulf before the next convention is held to consider the value of the Canadian fisheries to the United States, the impending negotiations will be greatly simplified.

The Commission also hopes that by the thorough scientific study of the habits of our coast fishes, to be made possible by the new steamer, it may be possible to establish general principles by which the fishermen may know each year at what points to meet the incoming schools of mackerel and menhaden, and thus save weeks of fruitless search for them.

INDEX OF UNITED STATES PATENTS.

One of the most conspicuous, at the same time one of the most commendable, of the acts of the Forty-seventh Congress was the passage of House bill No. 5,066, appropriating $10,000 to be expended under the direction of the Commissioner of Patents in the preparation of a classified abridgment of all the letters patent of the United States.

Such a work has long been needed, both in the Patent Office and out of it. Indeed for lack of it the efficiency of the Office has been materially diminished for many years; while an incalculable amount of wasted time and thought and money is traceable to the inability of inventors to discover what previous investigators have accomplished, or where they have failed, in the same lines of effort.

Last year more than 7,000 applications for patents, many of them representing, no doubt, years of patient investigation, were rejected for lack of novelty. A large part of the labor and cost which such reinventions entailed might have been saved, and many other more successful efforts might have been facilitated, had our inventors been furnished with the knowledge locked up in the Patent Office awaiting the key which is now provided for. And the 7,000 disappointed inventors represent probably but a small fraction of those who, during the past year, were engaged in more or less fruitless efforts to advance the useful arts.

This waste of intellectual energy and useless expenditure of means by a class which could least afford to spare them has been going on for a long generation. In his annual report for 1848 Commissioner Ewbank urged upon Congress the grave need of an index of patents, such as has now been tardily promised. At that time the number of rejected applications did not reach a thousand a year, yet the Commissioner could then justly say of the digest asked for:

"In a pecuniary point of view such a work is most desirable to this Office, to inventors, and the public at large. When made accessible to popular reference it will be the saving of millions. No State paper could surpass it in importance, nor in lasting value. Till it is done a majority of applicants for patents must continue to meet with some disappointment. The only safe rule with them is always to make themselves acquainted with what has been attempted before incurring any serious outlay. They should never presume that their devices have not entered other heads than their own until, by a searching inquisition on every hand, the presumption remains in their favor unimpaired. No better advice than this can be given them. But how are they to follow it? Nineteen-twentieths have few or no reliable sources of information within their reach, and not one in a hundred can afford the expenses of a visit to Washington and a residence there for the purpose of consulting the Office records and library."

For thirty years and more this grievous barrier has lain at the very threshold of invention—thirty years, during which the world has been revolutionized and the scope of human life increased enormously by the successful efforts of inventors. Who can estimate the evil which has directly and indirectly resulted from the long neglect to do justice to the Patent Office, to inventors, and still more to the general public, which, more than all the rest, is to be benefited by the work of the inventor and the highest efficiency of the patent system?

It is to be hoped that there will be no delay in the prosecution of the work of preparing and printing the digest which the new law provides for; and that, when printed, the work will be made easily accessible to every man who may wish to consult it.

THE BARGE SYSTEM ON THE MISSISSIPPI.

Mention was made in this paper recently of the sailing of a fleet of barges from St. Louis with over 10,000 tons of grain (20,847,900 pounds) for export by way of New Orleans. The fleet was towed by the steamer Oakland, which took, in addition to the eight grain barges, a capacious fuel barge. The largest tows last year were as follows: The Iron Mountain and barges left St. Louis, April 10, with 300,000 bushels of corn, or 16,800,000 pounds cargo. The same boat and barges, February 29, with 47,000 bushels of wheat and 210,228 bushels of corn, or 14,392,768 pounds. The D. Gilmore, July 17, with 178,000 bushels of wheat and 30,000 bushels of corn, or 13,860,000 pounds; and the Oakland, August 10, with 230,158 bushels of wheat.

The shipments from St. Louis by barges for European account last year reached a total of 15,717,664 bushels of wheat, corn, and rye. The shipments of the same sort in 1870 comprised only 66,000 bushels of wheat.

The prospect of an extension of the operations of the St. Louis and New Orleans barge line to Davenport, Iowa, next summer has led the *Democrat*, of the latter city, to investigate the progress and prospects of the barge system. It finds that at the close of 1880 there were four lines of towboats and barges engaged in transportation, aggregating 15 boats and 86 barges, with a total capacity in bushels of 4,690,000 and 4,200,000 per month to New Orleans. The boats and barges now building number 1 boat and 24 barges—of the latter, 22 having a capacity of 60,000 bushels each and 2 of 50,000 each, which will increase the total capacity to 6,000,000 bushels. There are now four established barge lines from St. Louis to New Orleans for the transportation of grain for export, and three of them are making the additions referred to above. The four rank as follows in present and building capacity: Mississippi Valley Transportation Company, 7 boats and 49 barges, with a total capacity of 2,520,000 bushels; St. Louis and New Orleans Transportation Company, 6 boats and 50 barges, with a total capacity of 2,550,000 bushels; the Anchor Line Company, with 2 boats and 12 barges, and a total capacity of 500,000 bushels; and the M. C. T. Company, with 1 boat and 9 barges, of 540,000 bushels capacity. The trips of the tows of these lines last year from St. Louis direct numbered 113, and these transported 5,913,272 bushels of wheat and 9,804,392 bushels of corn, including 45,000 bushels of rye. The number of barges to a tow would be about five, and the average cargo of each trip for the year 140,000 bushels.

All this vast trade has been made possible by the improvements of the channel of the Mississippi below New Orleans, particularly by the jetty system at the mouth of the river.

LARGE CRAFT ON THE LAKES.

When the Congressional committee had under consideration last winter the question of appropriation for the improvement of the harbor at Chicago, the *Inter-Ocean* of that city remarked that while eleven feet of water in Chicago River sufficed for the commerce of a few years ago, from fifteen to seventeen feet were needed now, to accommodate craft carrying from 50,000 to 70,000 bushels of grain.

Seven or eight years ago a craft of 600 tons was considered large on the lakes; now Chicago alone owns many that are twice and three times as large. A list printed in the paper mentioned gives the names, tonnage, and values of nearly fifty vessels ranging between 800 and 1,000 tons, and more than fifty having a capacity exceeding 1,000 tons. Of these fifteen propellers are rated between 1,500 and 2,000 tons, and one at 2,082 tons. The values of these vessels range between $60,000 and $125,000. At the same time there were on the stocks at the different lake ports forty vessels of 2,000 tons and over, several ranging between 2,500 and 2,800 tons.

One of the latter, having a carrying capacity of 80,000 bushels of grain, was lately launched at Cleveland. Its dimensions are given as follows: Keel, 255 feet; beam, 38 feet; hold, 20 feet. It is a propeller, employing two compound engines, the cylinders measuring 43 x 48 and 22 x 48 respectively. The two boilers are each 10 feet in diameter and 17 feet long.

Another vessel soon to be launched at Toledo measures as follows: Length of keel, 265 feet; length over all, 278 feet; breadth of beam, 38 feet 9 inches; hold, in shallowest place, 21 feet, in deepest place 24 feet 8 inches. She will be five

masted and will carry 5,500 yards of canvas. Her cost is estimated at $95,000, and her carrying capacity will be, full draught, 140,000 bushels; 14 feet 6 inches draught, from 90,000 to 95,000 bushels of corn. There is a decided recent movement in the direction of iron vessels for the lake service.

WATER SUPPLY OF CINCINNATI.

We are indebted to Charles F. Klayer, Esq., member of the Board of Health of Cincinnati, Ohio, for a copy of a recent report of the Sanitary Committee, made to the Board of Health, on the public water supply of the above city. Most of the city water is taken from the Ohio River, but other sources are made use of, namely, springs, wells, and cistern water. A growing suspicion on the part of the public that the sewage of the city, owing to the rapid increase of population in the vicinity of the pumping works, was injuring the purity of the water, led to the appointment of a committee of examination. The analyses of the water established the unwelcome fact that the sewage of the city seriously contaminates the river water supply. One reservoir however, at Markley Farm, twelve miles from Main street, was found to furnish water of good quality—as good as the Croton water, New York. The report shows that waters exposed to atmospheric air contain naturally about one pound to one and one-half of sewage to the million gallons.

On this basis the general conditions of comparison are as follows:

Croton water, New York City	0·98	lb.	sewage	to the	1,000,000	gal.
Loch Katrine, Glasgow	0·66	"	"	"	"	"
Thames, London supply	0·50	"	"	"	"	"
Mystic River, Boston, Mass.	1·83	"	"	"	"	"
Fresh Pond, Cambridge, Mass.	1·50	"	"	"	"	"
Fairmount, Philadelphia	1·58	"	"	"	"	"
Cincinnati	3·53	"	"	"	"	"

For better water supply for Cincinnati it is suggested in the report that wells might be sunk in the sand beach alongside the river bank at Dayton, Ky., where, by means of 116 tube wells, 20 inches in diameter and 20 feet deep, and a water main 3,000 feet long, a new supply of superior water filtered through the sand to an extent of fifty million gallons daily, can be obtained.

An interesting supplementary report by C. R. Stuntz, M.D., on the analyses and value of cistern water for domestic purposes, the impurities it contains, how it becomes contaminated, etc., is presented. Those who think that cistern water is the only proper liquid for domestic use, may have occasion to change their notions after reading this report, which we give in full in SCIENTIFIC AMERICAN SUPPLEMENT, No. 275. It is accompanied with rules for the proper location and care of rain-water cisterns, which should be read and practiced by all who depend on this system.

The Cost of Coal Gas.

Mention has been made in this paper of the evidence given by Mr. Kennedy, in the Philadelphia Gas Trust inquiry, touching the manufacture of coal gas. More recently he has been on the stand again, and, in answer to the question, What should be the cost of gas in the holder? has given the following statement of cost of 1,000 cubic feet of gas of 16 candle power, the price of coal being $4.30 per 2,000 pounds:

Coal	$0.44.9
Labor	.15.8
Lime	.01.2
Renewal of retort settings	.02.2
Disposition of *debris*	.00.6
Water supply	.00.3
Consumption of gas in works	.00 3
Supplies	.00.7
Repairs	.01.5
Contingencies, expenses, and improvements	.06.2
	$0.73.7
Sale of coke at $2.50 for 36 bushels, to be deducted	.11.7
Net cost	$0.62.0

Mr. Kennedy explained that he calculated to make 5 feet of gas to the pound of coal, by adding 10 per cent of cannel coal at $10 per ton, and he credited the coal with 30 cents a ton for the residual products, 20 cents for tar, and 10 cents for ammoniacal liquor.

Dangerous Toy Torpedoes.

A serious explosion in a toy torpedo factory lately took place in Brooklyn, N. Y., caused by the accidental upsetting of a dish containing a quantity of explosive pellets. The building was a two story brick. The walls were blown out and seven persons badly injured. These torpedoes were composed of red phosphorus, chloride of potash, sulphur, and sulphate of lime. A pill of this mixture, the size of a pea, is placed, with a thimbleful of sand, in a bit of colored tissue paper and twisted up. This constitutes a torpedo which, when thrown on the ground, explodes with a sharp crack. The manufacture is very dangerous, and the making or selling within city limits should be prohibited by law. There are plenty of instruments with which boys may satisfy their instincts for making noises without resort to deadly explosives.

French Exhibition of Electricity.

Mr. George Walker, our Consul-General in Paris, was, up to the time of his appointment, connected with the Western Union Telegraph office of this city, and is therefore likely to be more interested in electrical matters than most consuls. Mr. Walker has communicated to our government the decree which the French Government have passed convoking an international congress of electricians to be held in Paris on the 15th of September, 1881, and closes his report as follows:

"While the subject of these decrees will come officially and formally before the Government of the United States through its Minister at Paris or the Minister of the French Republic at Washington, I venture to think that the matters to which they relate fall strictly within the range of those commercial and industrial facts which it is made the duty of consular officers to communicate to the government. In this sense I may be permitted to express the hope that the country which gave birth to Franklin, to Morse, and to Henry, and which is now the home of Gray, of Edison, and of Bell, will not neglect to participate in the proposed congress of electricians, and to impress upon it those scientific ideas in relation to one of the greatest forces which modern discovery has furnished to the world, which have received such a remarkable and rapid development in our own country."

THE REESE CIRCULAR SAW.

The Reese circular saw, it will be remembered, consists of a circular smooth-edged iron plate, which will cut in two, without touching it, a bar of steel placed in front of it and revolving in an opposite direction. The statements which have been made in the American and English papers in regard to this apparatus having been questioned by French writers, Mr. Reese has recently written a letter to one of the latter, Mr. L. Baele, giving his theory in regard to the operation of his saw. This letter, translated into French, was communicated to our contemporary, *La Nature*, from which we again translate it into English. It reads as follows:

PITTSBURG, December, 1880.

L. BAELE, ESQ.:

The interest that scientists are manifesting in my circular saw by reason of its faculty of cutting steel bars without touching them, leads me to call your attention to a much more wonderful phenomenon yet that I have always observed in studying the operation of this apparatus. And allow me to say to you that for this saw, of which I hold the patent, there is paid to me a royalty of $1,000 on each one used. You see, then, that it is really a practical and useful apparatus.

When the bar to be cut is brought near the disk in motion the metal immediately melts, and there escapes a current of sparks of a dazzling whiteness. Yet one's hand may be placed in this stream of molten metal without its being in any way burnt; and the temperature is even but little different from that of the surrounding atmosphere. A sheet of white paper placed therein would not take fire, and would not even be discolored; and it would be the same with a piece of cotton wicking soaked in oil if it were placed in the current not far from the bar to be cut. Besides the drops of molten metal which fall thus to the ground a certain number are projected sideways in all directions. The sparks which thus pass in the atmosphere over a space of more than five feet become rapidly heated and burn like a hot poker. In America it is from France and Germany that we expect the solution of questions of abstract science. What scientist, versed in the study of molecular physics, can give us the explanation of so wonderful a phenomenon? The comparatively cold sparks burn like a hot poker, while the glistening incandescent molten mass will not burn at all, and will not discolor white paper.

The fusion saw is a circular iron disk, 42 inches in diameter and two-tenths inch thick. It is mounted on an arbor like an ordinary circular saw, and put in motion by the aid of pulleys and belts. It is given a velocity of 2,300 revolutions per minute, representing at the circumference a tangential velocity of 25,250 feet. Then the cold steel bar which is to be cut is placed in front of the disk and made likewise to revolve, with a speed of 200 revolutions per minute.

Under these conditions as soon as the bar arrives in proximity to the disk there is produced on its surface a little drop of molten metal, and a few seconds afterward a notch, and this without the disk ever having touched the bar. The rotary motion of the bar facilitates the flow of the molten metal, and the separation of the metal never takes place by contact, but only by melting. All bodies melt, as well known, at a suitable temperature; but is not this temperature a perceptible measure of the velocity of the molecules in their movements in the interior of bodies? So long as this velocity is kept within certain bounds the body remains in a solid state; but if it exceeds these, the molecules then flow off in a liquid state—fusion takes place. Then if, going yet further, we increase the velocity of the molecules we arrive at the gaseous state. Fusion is thus produced, then, without any contact, and the only condition necessary is to bring the molecules up to the requisite velocity. The pressure of the atmosphere perceptibly increases, as you have pointed out in the description of the apparatus, on each surface of the disk, and may even attain during the experiment 1·02 atmospheres. The molecules of air are thrown, in fact, in directions divergent to the velocity of 25,250 feet per minute, and there takes place a certain increase of intermolecular distances at the same time with an absorption of latent heat. The gaseous particles thus projected strike against the bar with the *velocity of fusion*, and under the influence of these multiplied shocks and of the compression which results therefrom, the latent heat, which has become free, is transmitted into the bar of steel, brings the metallic molecules to the velocity of fusion, and in this region the metal flows off in a liquid state.

Some years ago I heard Mr. Tyndall say in one of his lectures, "Temperature is the measure of molecular velocity, as gravity is the measure of matter," and I thought then that it would be possible to make a practical demonstration of this theoretical idea. I was then led to construct the fusion saw, and to my great satisfaction I beheld the little drops of liquefied metal flow off at the velocity of fusion.

In conclusion, I think that this imponderable agent which escapes our senses, and which we call heat, is the same which, in being transmitted through gases, communicates to molecules the velocity which renders them luminous, just as it can bring those of solid bodies to the velocity of incandescence; and when it is obliged to exert its action upon a contracted space it is also that which produces the phenomenon that we attribute to electricity. Yours truly,

JACOB REESE.

American Butter in Ceylon.

The American Consul at Ceylon, Mr. Morey, deprecates the packing of butter in tin for shipment to warm climates. He states that butter arriving at Ceylon from the United States thus packed has become deteriorated from the corrosion of the tin, or the use of impure salt used in the packing, and that there is not only a loss to the importer, but he implies that it naturally brings a discredit upon the producer and our nation. He says: "The French are sending to the East large quantites of Normandy butter, in one and two pound bottles, with mouths about two inches diameter, glass stoppered, and secured with hard, white cement, so as to be perfectly air-tight. The butter is fresh; but after being packed, about one tablespoonful of white pearly salt, almost impalpably fine and exquisitely pure, is put into the neck of the bottle, and the stopper applied. This butter retails almost unlimitedly at 65 cents gold per one pound bottle, and 55 cents per pound in two pound bottles. As our country has now become famous for its excellent glass, and there can be no question about the conservation of butter in vessels formed of that material, I see no reason why our exporters should not only imitate the French in using it for packing butter, but for cheese also, thereby securing preservation, and a never-failing market for those commodities in this oriental hemisphere."

A New Entozoon in the Ostrich.

A serious plague among young ostriches has been spreading over South Africa during recent years. A *post mortem* examination made by Mr. Arthur Douglass discovered the trouble to arise from the presence of myriads of small thin worms adhering to the coats of the ostrich's stomach. Specimens were sent to Dr. Spencer Cobold, of London, who pronounced them unknown to science, and named them *Strongylus douglassii*. The importance of the discovery may be estimated from the fact that ostriches are worth from $750 to $900 a pair, while the ostrich industry is a source of great revenue to South Africa. The cause of the plague being known some means of destroying the parasite may be looked for.

The Denver Mining Exhibition.

Substantial progress appears to be making toward the establishment of a permanent exhibition of mining appliances, ores and other minerals, at Denver, Colorado, next September. An exposition company has been organized, and forty acres of land have been secured whereon it is proposed to erect a building to cost 250,000. A considerable part of the needed money has already been subscribed.

Mr. Clarence King has promised to loan one set of specimens from the triplicate geological collection which is now being made under his direction. It is intended that this exhibition shall display every natural fact and every artificial process known to mining engineers. It will be distinctly national in its character, but collections, machinery, illustrations, and treatises from abroad will be welcomed.

Lacquers for Brass.

1. Seed lac, dragon's blood, annatto, and gamboge, each 4 ounces; saffron, 1 ounce; wine spirit, 10 pints.

2. Turmeric, 1 pound; annatto, 2 ounces; shellac and gum juniper, each 12 ounces; wine spirit, 12 ounces.

3. Seed lac, 6 ounces; dragon's blood, 40 grains; amber and copal triturated in a mortar, 2 ounces; extract of red sanders, ½ drachm; Oriental saffron, 36 grains; coarsely powdered glass, 4 ounces; absolute alcohol, 40 ounces. (Very fine.)

4. Seed lac, 3 ounces; amber and gamboge, each 2 ounces; extract of red sanders, ½ drachm; dragon's blood, 1 drachm; saffron, ½ drachm; wine spirit, 2 pints 4 ounces.

5. Turmeric, 6 drachms; saffron, 15 grains; hot alcohol, 1 pint; draw the tincture and add: gamboge, 6 drachms; gum sandarac and gum elimi, each 2 ounces; dragon's blood and seed lac, each 1 ounce.

6. Alcohol, 1 pint; turmeric, 1 ounce; annatto and saffron, 2 drachms each. Agitate frequently for a week, filter into a clean bottle, and add seed lac, 3 ounces. Let stand, with occasional agitation, for about two weeks.

7. Gamboge, ½ ounce; aloes, 1½ ounce; shellac (fine), 8 ounces; wine spirit, 1 gallon.

From half an acre of land at Bristol, R. I., Mr. Arthur Codman gathered last year 6,300 pounds (126 bushels) of grapes, some clusters weighing a pound and a half each, and all perfectly ripe. The vineyard contains 550 Concord vines, twelve years old, and kept low and closely pruned. The grapes yielded 580 gallons of wine.