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THE "SCIENTIFIC AMERICAN"—WHAT IT HAS DONE AND WHAT IT EXPECTS TO DO.

What might seem egotistical in an individual—a talk solely about himself—is pardonable in a newspaper, in placing before the public its claims for support and patronage, and the proprietors and publishers of the SCIENTIFIC AMERICAN would certainly prove themselves far superior to the ordinary weaknesses of mankind could they suppress all expression of gratification at the splendid and growing success of their journal.

The increase in quantity and variety of its contents, secured by contributions from the most popular scientific writers of the day, has been amply repaid in increased popularity and enlarged circulation; and our promise to maintain our paper at the very head of all papers of its class published in the world, has been kept, not only to our own satisfaction, but to that of our readers, as our numerous correspondents daily testify.

It has been the aim of the publishers rather to lead the minds of readers into new, suggestive, and profitable channels of thought, and to open the way for new applications of useful discoveries in the arts, than to dwell, at the risk of self-repetition, upon worn-out and thread-bare topics. To this end the foreign and home scientific publications have been ransacked for additions to useful knowledge, and the condensed results of these researches are weekly laid before our readers.

Our mechanical descriptions and illustrations are highly valued at home and abroad, and the most important are constantly reproduced in foreign engineering and scientific publications, and full credit given to their source.

Wherever the English language is spoken or read, our paper finds its way; and our advertisers are constantly surprised by letters of inquiry from distant and out-of-the-way places, from which they had no thought of patronage.

Our correspondence columns have been ably sustained, and the discussion of the single topic of balancing cylinders, etc., in the present volume, is worth more to any mechanic than the price of subscription.

Of the editorial department, we need only say, that the extensive copying of its articles sufficiently indicates their practical and scientific value, while their suggestiveness is shown by the correspondence, inquiries, and inventions they call forth.

Thus much for what we have already done. A word now in regard to the future conduct of the paper.

We are approaching the end of the volume and the end of the year, and our subscribers may rest assured that our motto is still "Excelsior." There is to be no retrograde movement. We shall advance with the general advancement of the pe-

riod. And while we shall, in future, perhaps pay more attention to matters of general scientific interest, we shall do this in such a popular style, that all our readers shall be interested, and without lessening the practical character of our eminently practical journal.

While we are thus laboring to our utmost to make the SCIENTIFIC AMERICAN a necessity to every individual desirous of a reliable and thorough record of scientific and mechanical facts and progress, we are sure our legion of friends will continue their efforts to extend its influence and circulation. The best assurance that a subscriber can give of his satisfaction with our paper is the name of a new subscriber won by his solicitation. It is only by increase of circulation that we can increase our scope and variety of matter; and subscribers, who now get more for their money than any other paper in the world gives, will get still more for all the increase of our subscription list effected by their aid.

BEE-ROOT SUGAR—HOW THE WAR IS LIKELY TO AFFECT THE MANUFACTURE IN FRANCE.

As we have anticipated, the production of beet-root sugar in Europe is likely to be very largely diminished. In view of this prospect prices are advancing, and as the proportion of beet-root sugar in the world's consumption is a very large percentage of the entire aggregate, it is probable that for some time to come high prices in all kinds of sugar will be the rule.

The recent terrific hurricane in Cuba has probably done serious injury to the cane-growing regions, and the news has at least temporarily stimulated the market.

The Department du Nord, in which the German forces are now operating is one of the richest of the beet-producing regions of the earth. The effect of the campaign upon the sugar industry is thus described by a resident of the North of France:

"What is the result to us? Why, ruin. In my pays no less than twenty-two beet-root mills were to have been set in motion this year. They are built—they are ready, but we have no workmen, and no coals. The young men who were exonerated, and who had drawn good numbers—who had, in short, settled to industrious lives, thinking that the State had no further military claims upon them—are drafted off absolutely like *les moutons de monsieur!*"

In England the effect of this has been to stimulate efforts to introduce the beet-root sugar manufacture into that country, and the English journals are at the present moment discussing the subject with vigor. A prominent journal, hitherto of decided free-trade proclivities and antecedents, admits that but for a rigid protective policy there would never have been a beet-root sugar industry anywhere. The admission, however, is salved over by the expression of a doubt as to whether, after all, the "game was worth the candle," and this concession to a protectionist policy is made with ill grace and wry faces.

How the war will affect, if it affect at all, this infant industry with us, it is hard to say. If prices should be greatly stimulated it may temporarily assist in the development and prosperity of the establishments already in operation, but can we think, not permanently influence the manufacture one way or the other.

SHAD VS. BLACK BASS.

An important and interesting discussion has recently been conducted in *Forney's Weekly Press*, in which all pisciculturists, sportsmen, and even the general reader ought to be interested, since it intimately relates to the stocking of our rivers with fish. The controversy may be said to be that of Shad vs. Black Bass, in which Black Bass has been called upon to show cause why he should not be laid under perpetual injunction not to enter the waters of the Delaware.

The plaintiff in the case brought numerous witnesses on the stand to prove the ruffianly and predatory character of the defendant, and to show that his entrance into the peaceful waters of the Delaware, would result ultimately in the extinction of that branch of the Shad family now inhabiting and holding peaceable possession of the said Delaware River, as the powerful Black Bass race were known to be of so warlike a disposition, and so prone to kill and devour the infants of the Shad family, as also the infants of all other honest, peaceable, and innocent fishes; that the two races could not live together in the same waters, consistently with the welfare and peace of the commonwealth; and that the superior prowess of the said Black Bass, his heirs, and assigns would enable him and his descendants to drive out and destroy all members of the house of Shad from their present habitation.

The principal witness on the part of the plaintiff was Dr. Slack, of Troutdale, the extensive and well-known pisciculturist, who testified as follows:

"The black bass is one of the most voracious of our fresh-water fishes. Breeding rapidly, and, it is said, guarding the nest in the manner of our common sunfish, it can bid defiance to any other denizen of our waters. Even the pike will disappear in waters in which the black bass has been introduced. It frequents the upper portion of rivers above tide water, and its food is almost entirely young fishes, of which one bass will destroy an immense number.

"Now, what will be the effect of the introduction of this fish in the Delaware river? Certainly our young shad have already too many enemies without our having recourse to a new and extremely dangerous one. Frequenting, as I have said, the upper portion of our river, they will certainly en-

counter the young shad in their descent toward the ocean. It has been asserted that they will not inhabit the same waters as other valuable fishes.

"In opposition to this statement, I would say that on the evening of October 10, 1870, Mr. Williams, of Upper Black Eddy, while seining the river for rock-fish, captured a bass of two pounds weight, which had probably escaped from the Schuylkill. At that date, as is well known, the river was filled with young shad on their downward trip. I must therefore state that I oppose in toto, as do many of our oldest and most experienced fishermen, the introduction of black bass or any other carnivorous fishes into the Delaware, believing that such introduction would seriously affect, if not totally destroy, the shad fisheries of that river."

The Commissioners of the State of New Jersey concur in the opinion of Dr. Slack, who is himself one of the Commissioners. They say:

"We decidedly object to the introduction of black bass into the Delaware river, believing it will be detrimental to the shad fishing interests. This is our honest, unbiased opinion, and as such we have never hesitated to express it."

On the other hand, a man who signs himself "Fisherman," believes the bass will not interfere with the shad to their detriment. He says, in addition to this opinion, that the principal cause of the fall off in shad is the unrestrained pouring in of refuse and filth from the drains of coal oil refineries and the like into the creeks, and thence to the rivers. Whenever a freshet has occurred in the Schuylkill the river is poisoned to such a degree as to kill the shad and other fish in great numbers. Stop the filth and you need not fear the bass. On the other hand, he has fished considerably on the Potomac river where bass and other fish, even more voracious are abundant, and yet the shad fail not to increase in that river ten times as fast; perch and rock-fish are at the same time a hundred times more abundant, millions upon millions of eels swarm its waters (than whom no fish in inland waters is more predatory), and catfish are considered refuse at the fisheries on account of their great numbers. They predatory, and yet they all thrive. Let the proper authorities prevent the cause of the disease and all will go well enough, but until then all will be in vain."

Notwithstanding the facts stated by "Fisherman" go to show that various kinds of predatory fishes may inhabit the same waters in company with those less formidable, and without the total extinction of the latter, and notwithstanding the facts he states are familiar to all sportsmen, it is nevertheless a fact, that numerous instances are on record of the extinction in streams of weaker fishes by the introduction of more powerful ones, and the great diminution of the numbers of certain fishes from this cause is a fact of which every neighborhood almost has its legend. If the authorities are wise the bass will be excluded from the fair waters of the Delaware, as in point of value to man they are incomparably inferior to the shad, although their being "game fish" renders them more desirable to those who fish only for amusement.

THE PRINCIPLE OF BRACING.

Very few mechanics understand the true principle of bracing, but they may readily discover it by performing a very simple experiment. If four bars of wood be joined together by pins in the form of a square, each corner being joined by a single pin, it will be found that the square thus formed may be altered to the form of a rhombus, by an exertion of force only sufficient to overcome the friction of the pins and the inertia of the bars. If three bars be joined by pins at the corners to form a triangle, it will be found that not the slightest change in form can be produced except by the rupture of the bars or pins, or such as is due to the elasticity of the materials.

If any number of bars more than three be joined in a similar manner to inclose an area, no matter what may be its shape, that shape may be altered without rupturing the pins or bars. The triangle is then the only figure, the shape of which cannot be altered without breaking or stretching the sides. For the alteration of the form of a triangle involves the lengthening or shortening of at least one of its sides, while the alteration of form in any figure having more than three sides may be made without any change in their length.

To secure the greatest possible rigidity then, the sides should, if made of homogeneous material, be equal in length and size, for, as elasticity will always admit some flexure, that side will stretch most which has the greater length. But an equilateral triangle cannot have a right angle, and hence is not practical in bracing under ordinary circumstances of construction where the corners to be braced are mostly right angled.

The next most rigid form would be to have the two legs of the triangle terminated by the brace equal, but this involves, in calculating the length of the brace, the use of the square root of 2 as a multiplier—a cumbersome decimal. Carpenters, for the most part, adopt the plan of laying out the legs of the right angle in the ratio of three to four, then the proportional length of brace will be five of the same denomination of length. This is a very convenient rule, depending upon the fact that the square root of the sum of the squares of three and four is five, and another fact that the hypotenuse of a right-angled triangle is equal to the square root of the sum of the squares of the other two sides. This gives sufficient stiffness for ordinary purposes, but where very heavy strains are to be sustained it is better to make the brace cut off equal distances on the post and beam.

The principle of bracing might be advantageously employed in many cases where it is not at present used. We were once much pleased with a very light, yet strong, ladder, which owed its strength in great measure to a series of wire

braces extending from a flat ring around the middle of each rung, to the side pieces, and tightened by a nut and washer. This ladder, though much lighter than ordinary ones of equal length, was yet more rigid, and was free from the springing of ordinary ladders under the step. A good tension brace is oftentimes more effective than those which offer resistance in both directions, and this form of bracing is becoming more and more used in modern bridge building, and in the construction and setting up of machines. But with these, as with the other class of braces, it is true that the nearer equal they can be made to the other sides of the triangles of which they form the third sides, the more rigid will be the structures they are designed to strengthen.

PYROTECHNIC MIXTURES.

Lieutenant Harder, of the Artillery Corps, recently presented to the Physical Society of Frankfort the following table of mixtures for producing colored lights. As they are founded upon practical experience, we copy them for the benefit of our readers:

1. White light: 8 parts saltpeter, 2 parts sulphur, 2 parts antimony.
2. Red light: 20 parts nitrate of strontia, 5 parts chlorate of potash, 6½ parts sulphur, 1 part charcoal.
3. Blue light: 9 parts chlorate of potash, 3 parts sulphur, 3 parts mountain blue (carbonate of copper).
4. Yellow light: 24 parts nitrate of soda, 8 parts antimony, 6 parts sulphur, 1 part charcoal.
5. Green light: 20 parts nitrate of baryta, 18 parts chlorate of potash, 10 parts sulphur.
6. Violet light: 4 parts nitrate of strontia, 9 parts chlorate of potash, 5 parts sulphur, 1 part carbonate of copper, 1 part calomel.

For the so-called stars, the ingredients of which are to be stirred in with alcohol, the following mixtures can be recommended:

1. White stars: 9 parts saltpeter, 3 parts sulphur, 2 parts antimony.
2. Red stars: 20 parts nitrate of strontia, 12 parts chlorate of potash, 11 parts of sulphur, 2 parts charcoal, 2 parts antimony, 1 part mastic.
3. Blue stars: 20 parts chlorate of potash, 14 parts carbonate of copper, 12 parts sulphur, 1 part mastic.
4. Yellow stars: 20 parts of chlorate of potash, 10 parts of bicarbonate of soda, 5 parts of sulphur, 1 part of mastic.
5. Green stars: 12 parts of nitrate of baryta, 28 parts of chlorate of potash, 15 parts of sulphur, 1 part of mastic.
6. Violet stars: 9 parts chlorate of potash, 4 parts nitrate of strontia, 6 parts sulphur, 1 part carbonate of copper, 1 part calomel, 1 part mastic.

APPLICATION OF BURNKORFF'S INDUCTION COIL TO THE COPYING OF DRAWINGS.

All draftsmen are acquainted with the simple device of puncturing holes through a drawing for the purpose of obtaining an outline and afterwards transferring the outline by sifting fine plumbago or other powder through the small holes. The fatigue of making the holes by hand is, very great, and M. Cauderay, of Lausanne, proposes to employ the induction coil for this purpose.

A table covered with tin foil is connected with the negative pole; on it may be placed as many sheets of paper as the spark will pass through. The positive pole, consisting of a metal bar, insulated with gutta-percha, can serve as a pencil for copying the tracings. The metal point of the pencil being moved about on the contour and outline of the engraving, electric sparks spring across every time a connection is made, and puncture fine holes through the paper.

It is said to require little skill to guide the pencil, as the ink tracings being good conductors, carry the pencil easily along. In the case of valuable engravings it is better to make a copy with the pantograph and use that for the punching process. The pantograph is connected with the positive pole of the induction apparatus, and it is placed upon a table, one half of which is covered with tin-foil. The drawing to be copied lies upon the insulated half, and the sheets of paper to be punctured are laid upon the tin-foil. The pointer of the pantograph moves around the outlines of the engraving and between the pen and the foil the sparks pass to pierce the paper upon which the outline is to be made. In this way the engraving or original drawing is in no way injured.

Important to Manufacturers.

The law granting to foreigners patents on designs and trade-marks, is of great importance to manufacturers abroad, whose goods are brought to the American market; and it is well they should know that manufacturers in this country who have been in the habit of copying foreign designs in the fabrication of their goods are opposed to this law and will besiege Congress during the winter session for its repeal or modification, so as to discriminate against foreign manufacturers. It is therefore important to manufacturers abroad to avail themselves at once of the law as it now exists. Pamphlets of information furnished free at this office.

Female Type-Setters.

"It is said that there is no hope of there ever being a large supply of female type-setters in the market. As soon as a girl becomes a proficient and valuable compositor some male printer marries her, and that puts an end to her work in the printing office."

No says one of our exchanges, and there is considerable truth in its statement. We have had female compositors in our office for several years, and like them very much indeed. They have proved sober, truthful, and faithful in the dis-

charge of duty. It is true that we have lost some excellent girls in consequence of the greater attractions of matrimony, but what we lost in this way was gained by the man fortunate enough to find so good a partner. We have found it somewhat inconvenient to tolerate much courting in our office, but this intrusion upon business hours done away with, makes us decidedly favor the employment of female type-setters.

LETTERS FROM THE SOUTH.

ATLANTA, Ga., Oct. 23, 1870.

Atlanta—Great Progress—Future—Rolling Mill—The Fair—Climate of Northern Georgia—Marietta and Dalton Railroads—New & Old Ga. R. R.—Athens—Cotton Factories—Augusta and its Surroundings.

Twenty years ago Atlanta was a place of about 2,000 inhabitants. Previous to the war it contained nearly or quite 15,000. Almost totally destroyed by the misfortunes of war in 1864, it has rallied, and the census now gives 29,000 inhabitants. The traveler who looks on the thriving, rushing city of to-day is little disposed to believe that the fires of the war left only 3 business and 300 dwelling houses in the place, yet such is the fact. It truly deserves the name an enthusiast gave it of the "Chicago of the South." It has been much improved by the burning out, as hardly a house or store has been erected that is not of brick, and many new streets have been opened. The influx of settlers is great, as much as 2,000 in six months. What makes the place grow is hard to tell, but it grows, and grows with a solid class of inhabitants—mechanics and their families. It has one of the finest climates in the world. A number of railroad workshops are located here, as are also a large rolling-mill, a paper-mill, and other large manufacturing, while a cotton factory to be run by steam is talked of, and will soon be built. The enterprising Kimball Bros. have it in hand, and they stop at nothing, and everything they touch seems to flourish.

The two great wonders of Atlanta just now are the Kimball House, and the new railroad passenger depot. The first is the largest, finest, and most complete hotel in the South, and if kept as well as it is fitted up, will bring many travelers to the place. It was commenced on the 28th of March, 1870, and the brick work was fully completed, and one half the house ready for guests on Oct. 17. This rapidity of construction would seem to make it insecure, but my Northern readers must remember first that Atlanta is a very dry climate, then the warm summer gave an advantage.

The railroad depot is entirely of iron, with galvanized roof, and with a row of brick offices on one side. It is 355 feet long, and 120 feet wide in one span. Its cost was \$135,000, and the work is being done by a Philadelphia firm. It is to contain at least five tracks, to accommodate the five railroads which center at Atlanta.

Just in the city limits is the large rolling mill of Messrs. Scofield & Co. They roll railroad rails and merchant bars. The same firm own a couple of furnaces near Cartersville, on the Western & Atlantic R. R. Previous to the war they only re-rolled old rails; they have since placed the mill in a better location and enlarged it. They employ a large number of hands, and, I am informed, have made it a profitable business.

This is the week of the State Fair, and it has been in progress since last Wednesday. The show of machinery is very good, but nearly every piece of it is from the Northern or Western States. The engine which drives the shafting is from Corning, N. Y., and the boiler one of Root's patent.

The great increase in the use of improved plows and other agricultural labor-savers at the South was very apparent throughout my trip, and it is easy to see the great interest taken in them here. In vehicles the Atlanta manufactory makes a handsome show, fully equal to those from the North. In the line of cotton and woolen manufactures, the latter is creditable, the former almost disgraceful to a State which has 25 cotton factories, and raises so much of the staple. Only five are represented—one of these strictly woolen, another part cotton and part woolen. Two paper mills exhibit their products—the Atlanta and the Pioneer. The factories are the Eagle & Phoenix, Columbus, Chattahoochee, Kemp, and Concord—last woolen.

Dr. Land, a chemist, with Pemberton, Taylor & Co., exhibits for that firm numerous chemicals and perfumes, all manufactured in Atlanta. They are as good as I ever saw.

In stock there is not a great variety, though some very fine. Mr. Peters, of Calhoun, exhibits some fine bloods and crosses. I mention his name, for to him and his neighbor, Dr. Woring, is due much credit for improving the grade of Georgia stock.

The grounds are well arranged, and the buildings of a good character, and the general management of the Fair is very good. The officers of the society are polite and attentive, and but for that nonsensical show called a Tournament, in which a young man was killed, all would have passed off well. Col. D. W. Lewis, the present secretary, held the same position in the first State Society, twenty-five years ago.

At a County Fair which I attended at Dalton, in Northern Georgia, I saw some household furniture manufactured there from native woods, which in every respect would compare favorably with any of Northern make. Here all is from the North. But there is a rapidly growing sentiment here in favor of building up home manufactures, and Northern mechanics who come in and establish such are eagerly welcomed.

Atlanta has four daily papers, all supposed to be flourishing, though one of them said a day or two ago that all put together did not have the circulation one should have. The *New Era* and the *Constitution* seem to take the lead. Besides

these there are two agricultural, and several religious weeklies.

I have spoken of the fine climate of Atlanta, the same may be said of all Northern Georgia. It is invigorating, never intensely hot in summer, or severely cold in winter. From Atlanta to Dalton is high ground, thence the grade descends to the Valley of the Tennessee, at Chattanooga. Dalton is the terminus of the Selma R. & D. R. R., and the commencement of the Ga., East Tenn. & Va. R. R.; the Western & Atlantic runs through the place. Then a railroad is chartered from Dalton to Western North Carolina, and another to Stevenson, junction of Nashville & Chattanooga, and Memphis & Charleston Railroads. As with all other charters in this State, these roads have \$16,000 in bonds per mile as each twenty miles are finished. The soil is good; on the west of the town the rocks are limestone mostly, and the soil likewise, while on the east the primitive rocks and soil prevail. Water power is not convenient, but coal is within fifteen miles by one of the projected railroads. It is now brought from Tennessee. Wood is abundant, cheap, and good. Iron ore is found close to the town.

Marietta, on the Western & Atlantic R. R., twenty miles north of Atlanta, is a beautiful town, noted for its delightful climate, especially in summer. The place itself has no manufacturing except two tanneries, which seem to be flourishing. In fact, the whole line of this road seems to abound with good locations for this business. Near Marietta is the Concord Woolen Mill, mentioned as exhibiting at the State Fair. They employ 42 hands, and run 360 spindles and 16 Crompton looms. They get their fine wool from Pennsylvania, and get abundance of coarse from the surrounding country. The superintendent told me that near him on the Nickajack was a fine water power, about three miles from the railroad, that would run 4,000 spindles, and which might be bought cheap.

I consider the line of the A. & W. R. R. as particularly inviting to Northern people, and especially mechanics. Water power and coal are abundant. The best kinds of wood are cheap, and wagon-making and other species of wood-work might be made very profitable. The railroad is now under very liberal management, and Col. Blodgett, the superintendent, is desirous in every way of encouraging the incoming of settlers. Dalton, I think, is particularly a place of promise. It has been proposed to continue the railroad from Bainbridge to Columbus up to Rowe, and thence to Chattanooga; this would open a new and good country to the westward, and perhaps injure Atlanta, but I do not think it will be so extended.

Traveling eastwards from Atlanta, we pass over the Georgia Railroad, which runs through a country that in the hands of good cultivators will be a fine region. It is already improving, especially near the town of Madison. By a branch road I reached Athens. This place is the seat of the State University, the residence of many of the wealthy and educated men of the State. It is probably the most polished town of the State, and is not the less famous for the talent of its men than the beauty of the ladies. And here I may say that the rich mountain air of this Northern Georgia produces that healthy glow and robust form seldom seen in the Southern beauty, the finest types of which are found in this region.

The town itself has but little vigor and enterprise, but there are located in its immediate vicinity five cotton factories, and one cotton and woolen factory in the town. The last runs 4,488 spindles and 78 looms on cotton, and 260 spindles and 6 looms on wool. It is one of the neatest factories I have been in. The Pioneer Paper Mill is also near the town, and a machine shop and foundry, which have a wide reputation for good work, are in the town itself. There are many other water powers unimproved. The Georgia Factory, one of the five, is the first factory ever built in the State, and some say in the South. None of these suffered from the war. The Athens Company's works have been built since 1860. They prefer American machinery.

North of Athens is a country almost unknown. It is rich in minerals, especially iron and gold, and is also a fine farming region. It is being opened to the world east and west by the Air Line R. R. from Atlanta to Charlotte, and another line is to be built from Athens to Clayton, connecting them with Knoxville & Charleston R. R. Cotton grows well near Athens and for many miles above. There are two small cotton factories in this northern section.

The country surrounding Augusta is a cotton-growing region. It is frequently called the Black Belt because it was a section where many slaves were owned, and cotton almost exclusively grown. They are now rapidly learning that they can grow other crops as well as cotton.

Augusta is a place of considerable business, having a large trade from South Carolina, as well as Georgia. The river is navigated to Savannah by steamboats which might be better and run lighter. It has new railroads to Atlanta, Macon, Savannah, Charleston, and Columbia. I believe no new ones are prepared in the State direct to the place, though the Georgia Road is building several branches which will benefit the place.

There is one cotton factory in the city, which has become somewhat famous by large published profits. It should be remembered in looking at these figures that these profits are made not on the actual cost of the factory, but its present capital. It is certainly a well-managed concern, but I doubt if so well arranged or so perfect as the Eagle and Phoenix, at Columbus. This Augusta factory is stated to contain 15,000 spindles and 600 looms. The water power is apparently inexhaustible, but I was informed that the canal will have to be enlarged to meet the increasing wants of this factory. The canal has three levels, and a fall of 45 feet. Several good sites for small factories are for sale. The city has water-works, using river water, filtered and