Correspondence.

Comparison of Armored Cruisers.

To the Editor of the SCIENTIFIC AMERICAN:

In comparing the United States navy, ship for ship, with those of other powers, I have been greatly impressed with the superiority of the American design over that produced by foreign rivals, until coming to the semi-armored or heavy protected cruiser type; here, on a smaller displacement we have been far outdone by several foreign designers, notably the Armstrongs. To substantiate my argument, let us compare, point for point, the cruisers "Charleston" of our own navy, and the "Esmeralda" of the Chilean navy. In the first place, the "Esmeralda" has been in commission for six years, while the "Charleston" has not as yet been launched; so one would naturally look for a marked improvement in the design of the latter. Such, however, is not the case.

In your issue of December 22, 1900, there appeared a tabular comparison of the "Charleston" and the English "Monmouth," which, when summed up, shows no marked superiority on either side. Instead of using the "Monmouth" as a basis of comparison (English ships being notably under-gunned) let us take the "Esmeralda," and we have the following results:

	"Charleston."	"Esmeralda."
Length on load waterline	424 feet	436 feet
Beam, extreme	66 feet	53 feet
Draft	23 feet 6 inches	20 feet 3 inches
Displacement	9,700 tons	7,000 tons
Coal supply normal	650 tons	550 tons
Coal supply maximum	1,5 0 tons	1,350 tons
Speed	22 knots	23.05 knots
Complement	564	500
Date of completion	1896	——

PROTECTION.

"Charleston."	"Esmeralda."
4-inch belt 197 feet long by 7½ feet wide	6-inch belt 350 by 7
2½-inch deck protection to vitals	2-inch deck
2-inch bulkheads	6-inch bulkheads
Upper and lower casemate armor 4 inches	
4-inch protection to 6-inch guns	
Conning tower and shields 5 inches	4½-inch shields
3-inch hoists	4½-inch hoists
4-inch signal tower	

ARMAMENT.

"Charleston."	"Esmeralda."
Fourteen 6-inch	Two 8-inch
Eighteen 3-inch	Sixteen 6-inch
Twelve 3-pounder	Eight 3-inch
Twelve 1-pounder	Nine 6-pounders
Two 3-inch field guns	Two 3-pounders
Two Gatlings	Eight Maxims
Eight Colts of 0.30	
Torpedo tubes, nil	2 submerged 1 above water

From this table the immense superiority of the "Esmeralda" is at once apparent, for on a displacement of 7,000 tons, which is 2,700 tons less than that of the "Charleston," the Armstrongs, of Newcastle-on-Tyne, England, have produced a vessel of greater speed, better protected, and far heavier armament. The same is true, as pointed out by the SCIENTIFIC AMERICAN of September 2, 1899, in regard to the "Denver" and "New Orleans" classes.

Besides other considerations, the important fact must be borne in mind that several years after completion the "Esmeralda" made a sea speed of over 21 knots, and that easily; whereas, there is the possibility that the "Charleston" may not make her contract speed of 22 knots.

In addition to her regular armament, the "Esmeralda" carries three torpedo tubes, two of which are submerged, while the "Charleston" has none, and judging from the accounts of the German-American war game now being played in England and reported in your valuable SUPPLEMENT, the torpedo would play a very important part in a modern naval engagement.

While the coal supply of the "Charleston" is greater by 150 tons than that of the "Esmeralda," yet this slight difference does not compensate for the 2,700 tons greater displacement of the former.

Apropos of the above discussion, an expression of opinion in your columns as to whether American designers are keeping pace with their foreign competitors would be greatly appreciated by several of your readers of my acquaintance.

DANIEL M. COFFIN, JR.

New York city, January 5, 1903.

[At the time of her launch the "Esmeralda" was the most powerfully armored cruiser, for her displacement, afloat, and she undoubtedly shows up well in comparison with our own new "Charleston." But it must be remembered that the 6-inch guns of the "Charleston" are about 20 per cent more powerful than the older type guns of the "Esmeralda;" and as a further offset against the more numerous battery of the "Esmeralda" the American boat carries most of her 6-inch battery behind side armor, whereas, the "Esmeralda" carries her guns in the open. Furthermore, her 4-inch side armor is carried right up to the main deck. Beyond her waterline strip the "Esmeralda" is unarmored. An exact comparison cannot be made until the ammunition supply, the facilities for supplying it to the guns, the nature and protection of the ammunition hoists, the accommodations for the crew, and many other elements of design, not given in the table above, are stated. We never considered that the "Charleston" type was very creditable to our naval designers—not at least in the degree that the "Connecticut" and "Tennessee" are. The omission of under-water torpedo tubes is to be regretted.—ED.]

Shop Practice as Viewed by an Old Subscriber.

To the Editor of the SCIENTIFIC AMERICAN:

In reply to your inquiry in the SCIENTIFIC AMERICAN concerning "Our Oldest Subscriber:"

When I was about five years old, fifty-three years ago, I began to be interested in the pictures in your paper, which was taken by my uncle, Milton E. Worrell, of the machine company of Worrell & Caldwell, of Quincy, Ill. I believe he informed me he subscribed for it in 1847, soon after it was founded. I don't know how long he continued to do so, but he still takes much pleasure in reading them, although eighty years of age.

I commenced to read the SCIENTIFIC AMERICAN at the age of eight, and became a subscriber four years later in 1858, and continued until 1899—forty-one years; since which I have secured it either from the newsdealer of from our city library. I don't believe I have missed reading a single issue for fifty years.

Besides being the most popular mechanical paper printed, I consider it the best educational journal; my wife, daughters, and son read it with nearly as much interest as I do.

I would like to call your attention to the fact that my uncle, mentioned above, is in some respects a remarkable man. At the age of eighty, with hair and beard as white as snow, he is the oldest machinist in the employ of the great Chicago, Burlington & Quincy Railroad system, and runs their big $10,000 planer with four cutting tools at their shops in West Burlington, Iowa, and has not missed a day's work from sickness in ten years.

About five years ago this machine cut off three fingers of his right hand, and he certainly supposed this serious accident would let him out of his job. While he was laid up for repairs the superintendent tried two younger men on his planer without satisfaction, and put him back to work as soon as possible.

He has sufficient property to support him without manual labor, but he is discontented when idle, and proposes to hold his job as long as he is able to give the company satisfaction.

I would explain that he and his partner, William Caldwell, started a small machine shop in Quincy, Ill., about 1843, which gradually increased in size until the beginning of our civil war, when they employed nearly 75 workmen and turned out flour mills complete from the grate bars to hopper boy. They were bankrupted chiefly by their rebel debtors in Missouri.

How things have changed in iron works since then! Now it requires about fifty different establishments to fit out a complete mill; everything has run to specialties, one concern makes the boilers, another the engine, another the shafting, another the pulleys, and so on—down to the pet cocks for draining the water pipes.

And what a revolution in tools and shop practice! In those days all our lathes had timber frames. We had no planers out here; all our flat surfaces, such as engine slides and steam valve faces, had to be chipped, filed and scraped, requiring a terrible amount of skilled manual labor.

Nor had we screw cutters; all bolts up to one inch being cut by hand, and the larger sizes in the lathe.

We had no apprentices, simply "cubs," who started at $1.50 per week cutting screws, chipping castings, smearing finished work with pitch paint and similar light and cleanly labor. At the end of a year he was proud to be advanced to the drill press and common bench work and fifty cents per week increased compensation. Next year he was given plain lathe work at $4.50, and in the fourth year, if he could skillfully run two lathes at once, he was considered to have served his time and was allowed from $7 to $9 per week. Our foreman received $10.50, and he was a fine mechanic and a pusher. We had no additional allowance for overtime, and were only too glad to earn some extra money by working all night or Sunday. But for all this we were a happy and contented crowd. There was a meat shop next door, and we cubs would invest five cents (we had no nickels then) in *a pound* of rump steak and broil it on the end of a sharp stick at noon over the fire under the boiler; they were not so tender, but barring a few cinders when they dropped in the fire, their flavor seems finer to me now than porterhouse at home.

In those days a "jour" machinist was skilled in all the science and could capably fill almost any position in any shop; but how different now! I am of the opinion that this specialty and piece work is working the ruin of our trade.

We have a large new model railroad shop here, employing about two hundred men entirely on piece work. This new style possibly cheapens the cost of common work, as the laborer, who can hardly be called a mechanic, rushes through his pieces simply with the view that they will pass inspection without regard to honest and careful finish, which should be the pride of a capable journeyman.

Besides, this plan is but poor inducement for our sons to enter the trade, where they may be kept at the same job all their lives without any chance of promising advancement.

S. E. WORRELL.

Hannibal, Mo., January 5, 1903.

The Explosion of Stars.

To the Editor of the SCIENTIFIC AMERICAN:

In my letter in the SCIENTIFIC AMERICAN of July 12, 1902, on the explosion of stars I stated that the phenomena such as had been observed in Nova Persei and Nova Aurigæ and other stars had been anticipated more than a score of years ago by Professor Bickerton of Canterbury College. It may interest some of your readers who have not read the "Romance of the Heavens" to know how a grazing impact of two stars must give rise to an explosion. In such an impact the parts standing in each other's way would be swept from the stars and would coalesce and produce an intensely heated mass, and as the temperature would not depend on the mass cut off, it would be exactly the same whether the tenth part or a third be cut from each body; if a small portion is cut off it would be too hot to be stable, and would continuously expand until it became a planetary nebula. A small body with a velocity of one and a half miles a second if shot from the moon would leave it entirely, but it would take seven miles per second for such a body to leave the earth, and three hundred and seventy-eight miles a second to leave the sun.

Heat is the motion of a molecule, and the motion of the molecules of such an impact will average a few hundred miles a second; but hydrogen at the same temperature would move about ten times as fast as the mean of other molecules. Clearly, it would move fast enough to escape the coalesced fragments of the two stars. It may readily average many thousand miles a second, and this should be the pace at which the nebula will expand.

This idea of the formation of a new body by the coalescence of the two grazed-off portions, while the two stars pass on in a scarred condition, is very full of power in the explanation of celestial phenomena. The two wounded suns would obviously rotate and produce a pair of variable stars, and it is a remarkable fact that many variable stars are to be found in close pairs. As the graze of the stars becomes deeper and deeper new phenomena ensue, and there are very few celestial bodies whose genesis cannot be shown to have arisen in impact of some kind or other.

JAMES R. WILKINSON.

Christchurch, New Zealand, November 16, 1902.

German Substitute for Celluloid.

The extensive commercial use of celluloid has caused a great many people to try to find substitutes for, or imitations of, it. In Coburg, a popular imitation has been made by dissolving in 16 parts—by weight—of glacial acetic acid, 1.8 parts of nitro-cellulose, and adding 5 parts of gelatin. Gentle heating and stirring are necessary. After the mass has swollen, it is mixed with 7.5 parts of alcohol (96 per cent), and stirring is continued. The resulting product is poured into molds, or, after further dilution, may be spread in thin layers on glass. As an underlay for sensitive photographic films, the material has important advantages, not the least being that it remains flat in developing.

James Edward Allen Gibbs, the inventor of the sewing machine which bears his name, died recently at his home in Raphine, Rockbridge County, Va. Paralysis was the cause of death. He was born on August 1, 1829. While a young man, the subject of the sewing machine was called to his attention while on a short business trip connected with the erection of some mill machinery which his father had manufactured, and on his return home he thought out the idea of the revolving hook which is the main feature of the Willcox & Gibbs machine. In all he took out twelve patents covering the sewing machine. The village in which he resided was named by him when he returned to it in middle life. The name is from the Greek word which means "to sew."

The greatest and most modern armor plate press in the world has been received at the new works at Homestead. It was built at the Bethlehem Steel Works. The plate has a capacity of 60 tons; and is capable of pressing into shape the heaviest plates expected to be specified by the Navy Department. Some of the bolts of the press weigh as much as 40 pounds each.