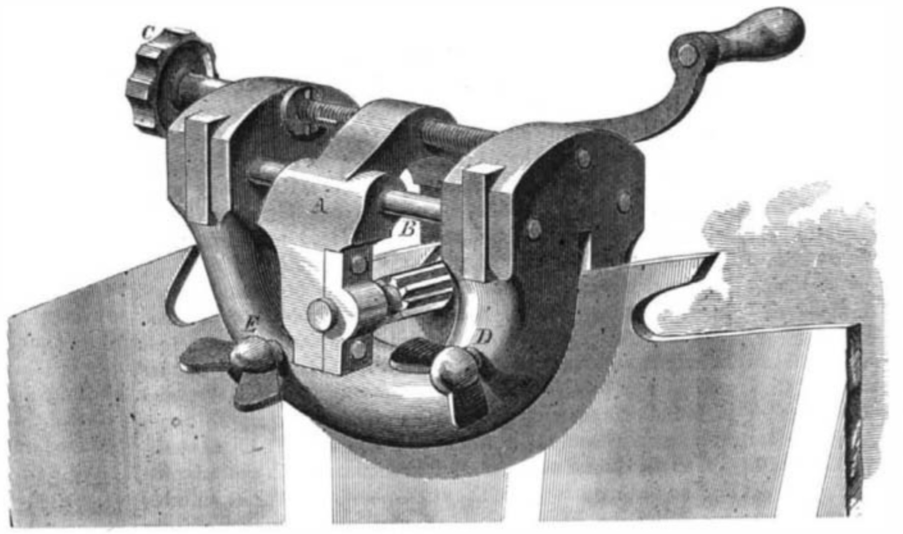
IMPROVED SAW GUMMER.

The inventor of the device illustrated in the annexed engraving states that, after an experience of eighteen years in using various kinds of saw gummers, as the result of such experience, he has produceu the present machine, which he believes to be the best yet invented. It is a very strong apparatus, as will be seen from the heavy semicircular iron frame with which it is provided, the ends of which are cast solid. The cutter is journaled in the carriage, A, which slides on guides, B, and is fed to its work by the hand wheel, C. The cutter is rotated by the crank shown. The thumbscrews, D and E, hold the gummer upon the saw.

It is stated that any gullet can be started without filing or without danger of breaking the cutter by slacking the thumbscrew, E, on the lower part of the frame, until the circle of the cutter is formed.

The same is done to direct the cutter toward the center of the saw and to make a large gullet, the feed screw being operated during the turning of the crank. The screw, D, then holds the gummer upon the blade, and at the same time serves as a center about which the instrument works. There are no boxes liable to get out of order, and the bearings can be easily Babbitted. Finally, the inventor claims that the saving in cutters alone will soon cause the device to pay for itself.

For further particulars address Mr. Walter B. Noyes, Three Rivers, P. Q., Canada.



NOYES' IMPROVED SAW GUMMER.

SPAR TORPEDO WARFARE.

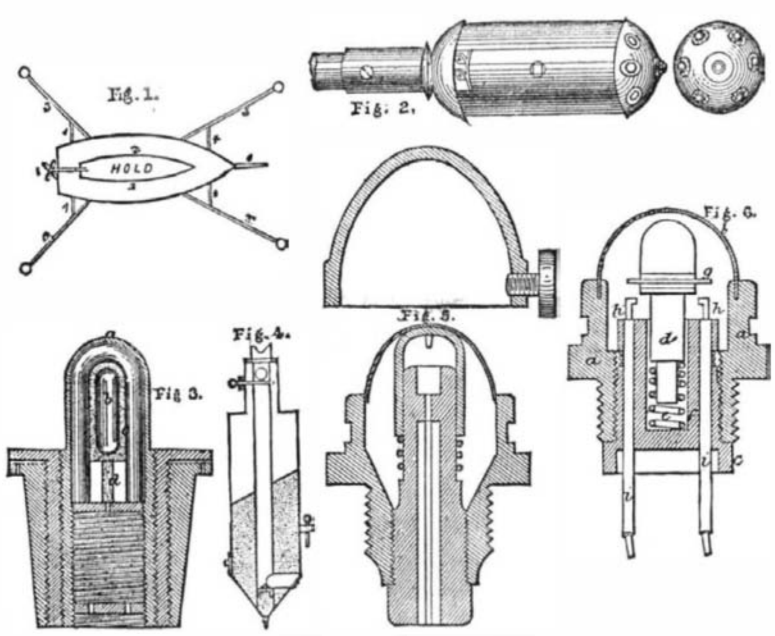
Mr. A. Sedgwick Woolley, Associate and Secretary of the Institution of Naval Architects, England, recently read before that society an able *resumé* of the torpedo system of attacking the enemy's vessels, by means of boats specially constructed for this submarine warfare, which carry their deadly bombs on the ends of spars, extending usually from the bows of the boat. We give a condensed abstract of the paper, illustrated by a series of engravings selected from the pages of *Engineering*:

Spar torpedo launches are being so generally adopted at present into the service of all foreign nations that a short sketch of the origin and history of this form of submarine warfare may be interesting, before discussing the merits and demerits of the plans now in vogue.

The first idea of an offensive attack by means of a boat, specially constructed to carry a torpedo, seems to have originated with Captain David Bushnell, of Connecticut, about the year 1775, but it had little in common with the boats now used for the same purpose. This boat, an account of which was read by the inventor before the American Philosophical Society, in 1798, was only intended to accommodate one person, who sat in a watertight chamber capable of containing sufficient air to support him for thirty minutes, and who could cause the vessel to descend and ascend at will, by letting the water into a chamber below him, or expelling it therefrom by means of two brass force pumps, at the same time letting fall about 200 lbs. of the lead, by which the vessel was ballasted, at the bottom. An attempt was made with this boat to blow up the English 64-gun ship Eagle, during the campaign of 1776; but the operator, from some reason or other, was unable to fix in the screw, and had to desist from the attempt.

The next step in the same direction was made by the celebrated Fulton, who proposed a similar diving boat to the French Government about the year 1801, and made several successful experiments in the harbor of Brest, blowing up a small vessel by means of a torpedo, which he placed under her bottom. In this boat Fulton seems to have employed a screw, operated by a crank, as a means of propulsion. The French Government, however, would not adopt his invention, and Fulton forthwith withdrew to England, in 1804, where, under the assumed name of Francis, he obtained the support of Mr. Pitt. A commission was appointed to examine into and report upon his invention, which they at once pronounced to be impracticable. Fulton then returned to America, where he also gained the ear of the minister, and had a commission appointed; but he met with great opposition, and was so unfortunate in his experiments that he gave up the attempt to introduce a system of torpedo warfare in order to turn his attention to steam navigation, which he may be said to have introduced into that country. It may be remarked, however, that, during the course of his torpedo experiments, he developed the first notion of the torpedo steam launches of to day. This idea, which never got beyond the state of a model, consisted of a vessel of 300 tuns, shown in Fig. 1, with sides 6 feet thick, designed to be cannon-proof, and musket-proof decks six inches thick. She was to be propelled by a scull wheel, and was intended to carry two torpedoes on each side, fixed on the end of spars 96 feet long, supported by guys from the masthead.

It was not, however, until, during the civil war of America, the Southern States, being overpowered by the force and resources of their adversaries, resorted to a most extensive employment of torpedoes, that the power of this species of attack was developed.

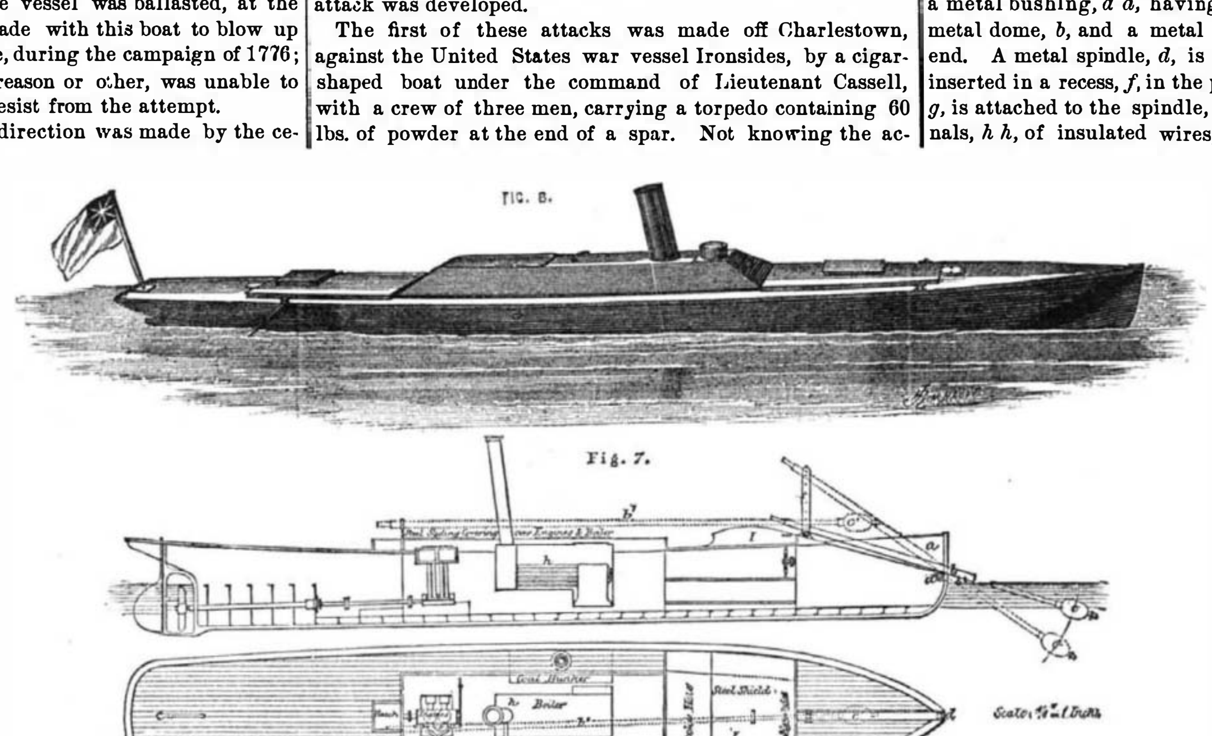


VARIOUS TORPEDOES.

The first of these attacks was made off Charlestown, against the United States war vessel Ironsides, by a cigar-shaped boat under the command of Lieutenant Cassell, with a crew of three men, carrying a torpedo containing 60 lbs. of powder at the end of a spar. Not knowing the action of the explosion, and thinking that their boat would probably be sunk by it, her crew jumped overboard before ramming. The explosion, though severe, failed to effect any hole in the bottom of the Ironsides; the boat was also uninjured, and was found drifting, half full of water, by her engineer, who climbed into her, made up his fires, and steamed back safely to Charlestown. The next attempt was also made off Charlestown, with a plunging boat, against the United States steamer Housatonic, which was sunk by the explosion, the torpedo boat, however, going down as well. This boat had already drowned sixteen men during the trials made with her in Charlestown harbor, the last time going down with a crew of nine persons, and not again appearing till she was fished up and put in order; and a fifth crew of six persons, under a Captain Dixon, undertook the attack on the Housatonic. She was propelled by means of a screw worked by a crank, which required the six men, sitting three and three opposite each other, to turn it.

The confederate ship Albemarle was sunk by a torpedo launch, commanded by Lieutenant Cushing. The launch, however, was also sunk by the explosion; and out of a crew of fourteen persons, only two saved themselves by swimming. Both sides were employed in preparing special spar torpedo boats when the war terminated. Just before the close of it, however, a remarkable attack was made, in the James River, on the merchant vessels which had brought supplies to Grant's army, by the confederate fleet of three ironclad rams and seven gunboats, all armed with torpedoes, fixed on the end of spars, 30 feet or 40 feet long, which projected from their bows, and could be raised or lowered by a tackle. This fleet was stopped by a boom, and two of the ironclads got aground, where they remained all night, under fire from the banks; but although their torpedoes were completely riddled with rifle shot, not one was exploded, as it so happened that the fuses were in no case struck. The Southern States had throughout employed percussion fuses, which were exploded on contact, the shape of their torpedoes being cylindrical with hemispherical ends, into which seven fuses were inserted, as shown in Fig. 2; these fuses (shown in Fig. 3) consisted of a cap of lead, *a*, containing a glass tube, *b*, filled with sulphuric acid, and surrounded with a mixture of chlorate of potash and white sugar, *c*, communicating with a primer, *d*, of mealed powder; on contact, the lead cap being crushed, the glass bottle was broken, and the sulphuric acid ignited the chlorate of potash and sugar, and fired the torpedo. The danger of a torpedo, furnished with these fuses, being exploded by contact with any floating log of wood or boom, before reaching the enemy's ship, and the extreme caution required in handling it, led the Federals to adopt a torpedo made as shown in Fig. 4, which could be detached from the spar, and having an air chamber provided to keep it nearly vertical when so detached, a tube being placed in its center, at the upper end of which an iron ball was kept in position by a pin; this pin was released by means of a rope, leading into the boat, and dropped on to a cone of fulminate.

Captain McEvoy, of the London Ordnance Works, invented the mechanical fuse, A, shown in Fig. 5, provided with the safety cap, B; but being afterwards impressed with the advantage arising from the use of electric communication, he invented, in 1871, the plan shown in Fig. 6. This consists of a metal bushing, *a a*, having its upper end closed by a thin metal dome, *b*, and a metal plug, *c*, screwed into its lower end. A metal spindle, *d*, is supported on a spiral spring, *e*, inserted in a recess, *f*, in the plug, *c*; a thin insulated bridge, *g*, is attached to the spindle, *d*, under which are two terminals, *h h*, of insulated wires, *i i*; one of these wires is connected with the battery, and the other, to which is attached the electric fuse, has either an earth or other connection with the battery. When the torpedo, with this closer attached, is projected against a vessel or other body, and receives a shock sufficient to crush in the thin metal dome, *b*, the spindle, *d*, is forced down until the metal bridge, *g*, is brought into contact with the two terminals, *h h*, thus completing the circuit of the electric fluid, and firing the fuse The wires would, of course, only be connected to the battery just before the action of ramming. It is, however, evident that the thin metal dome might be crushed in through some accident beforehand, and that then, as soon as the wires were connected, the torpedo would be fired at once. To overcome this difficulty, there has been substituted for the metal dome, *b*, one made of india rubber, fixed in a peculiar manner, which would always retain its form and allow the spring, *c*, to keep the circuit uncompleted. The torpedo is shaped as shown in Fig. 7, in order to



SPAR TORPEDO LAUNCH.

insure the contact of the fuse with the vessel. The system of firing shown in Fig. 6 is that generally adopted with the torpedoes to be used with the launches which are being at present built for foreign countries. The launches may be divided into two classes, namely, those intended for river service, and those meant for ocean purposes. Fig. 7 represents a river launch similar to those constructed by Messrs. Yarrow and Hedley, of Poplar. The one shown is 45 feet long and 7 feet 6 inches beam, calculated to have a speed of 14 knots, built either of iron or steel, the plating being $\frac{1}{8}$ inch at the keel, and $\frac{3}{32}$ inch at the gunwale.

The draft is 3 feet 6 inches, and the freeboard 2 feet. There is a steel turtle-back shield, *g*, forward, $\frac{1}{8}$ inch full thick, to afford protection to the men and steering wheel, and throw off the water which might come on board from the explosion of the torpedo. The engines and boilers are also provided with steel sliding covers. The boilers are locomotive, with a total heating surface of 140 feet, the barrel plates being of $\frac{1}{4}$ inch. Lowmoor iron throughout, with $\frac{3}{8}$ inches butt straps inside and out, double riveted; and the engines are non-condensing direct-acting, of 55 horsepower, working up to 140 pounds pressure. The diameter of cylinders is $6\frac{1}{2}$ inches and length of stroke $7\frac{1}{2}$ inches. The frames are made of 1 inch angle irons with $\frac{3}{4}$ inch reverse irons.

The spar, *c*, for the torpedo is shipped amidships, and can be run out over a roller. A pocket, *a*, suggested by Captain Davidson, is provided to allow the spar to have a greater depression than in the old plan of running it out over a roller on the top of the stem. Two stanchions, *f*, provided with pinholes, allow of the spar being depressed through an angle of 35°, a noiseless exhaust chamber, *k*, preventing the approach of the boat being heard. In this chamber the condensing is effected against a portion of the skin of the boat, the plates there being increased in thickness. It is surprising what a small effective surface is required to condense the steam in cases where the object is simply to condense it in order to avoid the noise, or to get the fresh water back into the boiler, and not with the object of obtaining a vacuum.

Fireless Locomotives.

It will be interesting to know that fireless locomotives are in constant and successful operation on a city and suburban railway in New Orleans, namely, the New Orleans and Carrollton Railway, under the able management of General G. T. Beauregard, who is a skillful engineer, and yet who is is alive to, and keeps pace with the improvements of the age. This success has been achieved, too, under the most adverse and unpromising circumstances. The road under other running arrangements had become nearly valueless, its stock having gone down to 7 cents; but it is now a paying and valuable road. The road is about six miles in length. From the center to the outskirts of the city it is operated by mule power; there the mule is taken from the car, and the little fireless locomotive is attached, which is accomplished in less time than would be occupied in attaching another mule. The train is then off like a rocket, the driver still on the platform of the car working the engine, managing the brakes, and making change, as usual; there is no other person on the train to attend these duties. The car is started and stopped quicker than when drawn by the mule. The railway (double track) is in the middle of a very wide street, and is a little raised, so that it cannot be crossed by carriages except at the street crossings; thus, being somewhat isolated, high speed is admissible. The locomotive is simply a cylinder of boiler iron, perhaps 3 feet in diameter and 10 feet long, mounted on four wheels, and partly filled with water. The engine—a double vertical—is attached to the end of the cylinder next the car, being within reach of the driver. The cylinder is then filled with steam at a proper pressure, from a stationary boiler at Carrollton, when the locomotive is ready, and it will run to the city and back without care or expense. There is no fire, no ashes, no pump, no danger, and less noise than from the hoofs of horses. The expense of this means of propulsion, General Beauregard assured me, is less than by mules. The cost of the locomotives is $1,250 each, which includes the builder's profit.—*New York Times.*

Responsibility for Employees' Injuries.

It has been established that failing to make reasonable provision for the safety of employees is a negligence employers are liable for; but judges and juries have failed to uniformly determine just what is a "reasonable provision." The nearest approach to the settlement of this matter we find in the court news of a recent number of the Boston *Herald*, in a case in the Supreme Court, of M. F. Avilla *vs.* N. C. Nash *et al.*

"The action was brought to recover damages for personal injuries resulting from the fall of an elevator in the defendants' refinery. At the trial there was evidence that the defendants had given directions to their foreman to forbid workmen riding on the elevator. The court ruled as a matter of law that, if the defendants had so directed the foreman, then, even in case he had not informed the plaintiff, the action could not be maintained against the defendants, for the accident was the result of the carelessness or negligence of a fellow workman, the foreman. The jury returned a verdict for the defendants, and the plaintiffs excepted. The full bench have now sent down a rescript sustaining the exceptions, and have ordered a new trial."

The point turns upon the fact as to whether Messrs. Nash had cautioned their foreman and directed him to forbid the workmen using the elevator.

It is hardly proper to surmise what the results of a new trial will be, but the decision already secured by Messrs. Nash will have an important bearing to all manufacturers, and the case as above cited should be placed in the hands of all superintendents and foremen, that they may be fully apprised of the responsibility they assume in not enforcing a strict compliance with orders for the security of life and limb.

Correspondence.

Hard Rubber Thermometers.

To the Editor of the Scientific American :

In 1852, I noticed the electric properties of hard rubber or vulcanite; and in 1853, I made arrangements with the owners of the patent for the manufacture of insulators for telegraph wire from this substance. The first orders for them were received from California; and as transportation was very expensive on the Isthmus route, they were made very light, weighing but half an ounce each. On arrival they were heated to about 300° Fah., by which they were expanded; and while in this condition, they were placed upon iron pins, to which they were held firmly by contraction.

My attention having been thus called to the dilatability of hard rubber, several thermometers were made from it. One was made by riveting it to a thin strip of steel, about a foot in length, and one fourth of an inch in width. The bottom of this was held fast, while the top was free to move, and so to indicate the temperature on a graduated arc. This one, now in use, has a range from zero to 90° Fah., and is as sensitive as the common mercurial thermometer. It is well adapted for the ordinary range of the atmosphere, but is not suitable for indicating high degrees of heat, as the rubber softens at about 200° Fah. One of them was made by perforating a thin strip of steel, at intervals of an inch, and placing upon it a strip of rubber compound when in a plastic state. This was coiled, with an intermediate strip of metal, which forced the rubber through the holes. It was then vulcanized in the usual manner; and when cold, the intermediate strip was withdrawn, leaving an open space between the coils. This saved the trouble of riveting, and gave to the rubber an unbroken and smooth surface. The coil is held fast at the center, and the outer end is left free to move. Another thermometer was made of glass and hard rubber, the latter in the form of an arc, being riveted at both of its ends to a glass plate, which formed the chord.

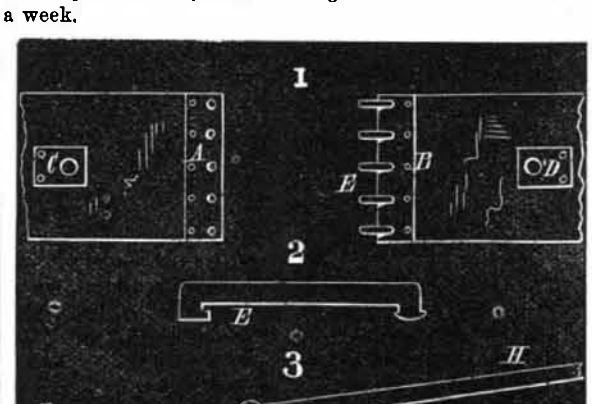
Instruments of this kind are much better than mercurial thermometers for making electric connection with alarm bells to indicate excess of heat.

Boston, Mass. J. M. B.

Coupling Machine Belts.

To the Editor of the Scientific American:

Seeing a query in your issue of March 13 about putting together belts which have to be frequently uncoupled, I send you an illustration of a 6-inch belt, which I have been running for over a year, reversing it from one to four times a week.



In Fig. 1, A, B, C, and D are pieces of No. 16 sheet iron, riveted to the ends of the belt; E E are hooks, shown in the natural size in Fig. 2, riveted to B. After the belt is laid over the pulleys, the hooks, F and G, of the lever, shown in Fig. 3, are placed in the holes at C and D. Now the two ends of the belt are drawn together by the lever, H ; and the hooks, E, are put in their places at A. Then the lever is taken out, leaving the joint finished.

By this method, two men can set and couple a belt in the least possible time, obtaining an effectual joint, which will never allow the belt to run out of true or to reverse.

W. KAPP.

HOUSEHOLD HINTS.—I.

"The melancholy days have come, the saddest of the year," ejaculates paterfamilias as he lugs the stove down into the cellar. There has been for the last twenty-four hours a reeking atmosphere of soap and soda and step ladders and moist scrub women pervading the house. Rest, there has been none for him indoors, and so he has made a virtue of necessity and has worked manfully at taking down the stoves, wrapping them, we hope, in old carpet, and fastening the legs and pipe together so that they cannot escape and hide themselves in ingeniously inaccessible places, as he vehemently affirmed they did, when he found them in the garret and under the coal and in the chicken house last fall. Materfamilias, we trust, has fully perused the recipes we have been publishing for the last six months, and the knowledge thus gained has been practically applied in cleaning the paint and the windows, destroying vermin, and putting the house in "apple pie" order generally. At last it is all over, the rooms are "painfully clean," and the bright sunlight pouring into the open windows is revealing the thread-bare spots in the carpets, and the cracks and knocks on the furniture only too plainly. A high court of inquiry has been held, and the superannuated veterans which have done long and faithful service on the floors, or have survived many a year's hard usage about the rooms, are at last condemned. Then the heads of the family, who, like sensible people, have waited for the high prices peculiar to Mayday to subside, prepare to sally forth on visits to carpet and furniture stores, and paterfamilias figures up his check book or draws his winter's savings from the savings' bank ready to withstand the coming financial strain.

("I don't see nuthin' about Science in all that. What's it got to do with masheens?" interrupted the practical man who happened into our sanctum just in time to hear us read over the foregoing paragraph to ourselves. "Nothing, excellent and anti-theoretical friend," we reply, "nothing about 'masheens' is therein contained; but as to Science, it relates to the science of home, the science of making one's life something more than one "demnition grind" for existence, by—as you will perceive if you continue looking over our shoulder as we proceed with our writing—rendering that home more attractive, more cheerful, and so making for yourself and yours a sanctuary, at the doors of which the cares of labor may be laid aside." He said that it must have cost "an awful lot to polish that 'ere model with the file," from which we inferred that our previous remark was lost upon him, so we resumed our pen, oblivious to his further presence.)

We were about to observe that, before buying furniture and carpets—if we may venture to intrude upon the family discussion which is taking place previous to the exodus to the shops above mentioned—there are several facts well worth remembering, which may assist one in selecting goods, and besides tend to save money; and at the same time there are a few more hints which we have to offer which mainly relate to simple decoration, and which, we think, may result in making the rooms which are to be renovated look perhaps a little more tasteful and pretty. Let us suppose that a sitting room which also does duty for a parlor is to be newly furnished. The walls are now either plain white or else the old paper has been scraped off and new hangings are required. The first question is of a carpet. Some people believe that the English article is the best; so it is we think, as a general rule, so far as colors are concerned, but if durability is considered a first requisite, then the American goods, if of first quality, are fully equal to those of foreign make. A good carpet is thick, pliable, and well woven, and it is better economy to buy a good article like a real Brussels at the outset. Ingrains are now made to go with Venetian borders, but these do not wear equal to Brussels, and besides with the border costs nearly as much. In this city the best body Brussels costs from $1.75 to $2.50 per yard, and the lining (which consists of layers of stout brown paper with cotton batting between, and which saves carpets wonderfully, particularly if the floor be at all uneven), is easily made, or costs when bought 10 cents a yard. For those who can afford a little extra expense, it may be well either to mat the floor or else plane it very smooth, putty up all the cracks, and stain brown, finishing with a coat or two of shellac dissolved in alcohol. Then cover the middle with a large rug, leaving a yard of uncovered space around the walls. Handsome druggets can be bought very reasonably for this purpose; or two Turkish rugs (each about 4x6 feet, such as are sold for $15 to $18 a piece), placed side by side, would be large enough for a good-sized apartment, though costing more than the drugget. These can be easily taken up and shaken, or in summer can be removed altogether, leaving the cool matted or painted floor. Turkish rugs, besides, are like camel's hair shawls; they will accord with any color of furniture or wall, and are almost indestructible by wear.

To return to the carpet: supposing such to be the choice: we should advise the selection of that and the wall paper at the same time. It is a good plan to procure a roll of the intended hangings as a sample, and carry it to the carpet store for direct comparison. This will save many awkward contrasts of color. If a green carpet be decided upon, then a plain paper of a rose tint, or with that shade prevailing, accords handsomely; the same paper goes well with the unobtrusive gray-patterned carpets now very much in fashion. If the walls be tinted French gray, in kalsomine or paint, this shade will suit almost any colored carpet, especially red or crimson. Big-figured papers and huge medallion carpets are abominations only fit for hotels and steamboats. Bright tinted papers may go with a rich-toned carpet, or with one in which the colors are mingled; but we never should select hangings printed with impossible birds and animals, or a carpet covered with gaudy flowers, hideous designs in red and yellow which look like a petrified firework explosion, or incomprehensible and huge scroll work. A neat, small, quiet figure is by far the most genteel and appropriate, while it is much more economical, as none of the stuff is ever wasted in matching.

Before laying the carpet, if moths are suspected, it is well to rub the boards over with turpentine; sprinkling with very dilute carbolic acid, about a tablespoonful to a gallon of water, is also a good precaution. This last should be rubbed over the walls before the paper is put on.

Now comes the matter of furniture. Do not buy the so-called "cottage" stuff. It has no merit save that of cheapness, and our own experience in its use has left us with the firm conviction that glue was too expensive and it was stuck together with gum arabic. A hearty sneeze from a stout person is ordinarily sufficient to completely disorganize the chair he may be sitting on. Besides, it is usually of pine wood, for which bedbugs have an extraordinary predilection. Do not buy veneered furniture, especially if there be furnace