

lifeboats should have these requirements: (1) Buoyancy sufficient to insure that the boat be manageable, when, in addition to the number of persons and additional dead weight (if any) she is intended to carry, she is filled by a sea. (2) The fittings or appliances by which such buoyancy is obtained to remain efficient under all circumstances of climate and temperature, as well as under exposure to sun, weather, and salt water. (3) Fitness for use as an ordinary ship's boat. (4) Strength. (5) Durability. (6) Lateral stability, or resistance to upsetting on the broadside. (7) Relief of water to the outside level. (8) Cheapness. (9) Simplicity of structure. (10) Lightness. It will be seen at once how different are the conditions from those of a shore life boat, and how the ordinary boats of the Institution would fail to comply with them, especially with requirements Nos. 3, 8, 9, and 10. Self-righting is not considered as essential; in fact, boats in an open sea are far less likely to be upset than in the heavy breakers near the shore. The council of the Society of Arts has awarded two gold medals, one to Messrs. Woolfe & Son, for their wooden boats, and one to Messrs. Hamilton & Co., for their iron boats.

Messrs. Woolfe & Son's lifeboat was 25 feet long by 7 feet beam, was built of wood, and had end and side compartments of the proportions recommended by the committee. There is no special peculiarity in the shape of the boat, except that she is very flat-floored; the top of the air cases being flat and level with the thwarts, they afford additional accommodation for passengers. With the crew on board and the water admitted to the outside level, this boat has a freeboard of 20½ inches, and with fifteen additional passengers the freeboard is reduced to 12 inches. It takes eight men to stand on the gunwale to bring it awash. The air cases are easily removed, thus rendering the boat available for service as a cargo boat. The seas breaking into her are ejected to the outside level by means of two plug holes in the bottom, the remainder being baled out after the plugs are again inserted.

Messrs. Hamilton & Co.'s metallic lifeboat is a counterpart of Messrs. Woolfe's boat, having the same length and breadth; and the proportions of the air cases are identical. The two points of difference between Hamilton's and Woolfe's are in the material (one being built of galvanized corrugated iron, and the other of wood) and the means of ejecting the water. The two plug holes, 3 inches in diameter, are placed in the center of the boat, and a watertight bulkhead is fixed on each thwart, on opposite sides of the plug hole, see Fig. 12. Each of these bulkheads is furnished with a simple flap valve, opening inwards. In the event of the boat shipping a sea, she is turned head to wind; and as the bow rises to the waves, all the water contained in the forepart of the boat passes through the valve in the foremost bulkhead, but cannot pass the second one, consequently the water is heaped up in the space between the two bulkheads. As the bow falls again the valve closes, and the water in the center would be higher than the outside level if the plugs have been left in; on withdrawing them it would fall to the level of the sea. The same process is repeated as the stern rises, and a few movements of the boat are sufficient to free her from water, with the exception of about one inch in the bottom. The larger the central space, the more rapid will be the discharge of water; but on the other hand, the greater will be the residuum left in the boat.

Messrs. Lamb & White's lifeboat was the first real ship's lifeboat that was ever adopted, and has undoubtedly done a great deal of good service. A cross section of it is shown by Fig. 5. It is built of two thicknesses of plank, with prepared waterproof material of an adhesive nature interposed. The whole of the internal work, comprising the watertight compartments, bulkheads, and decks, is of the same construction.

Combe's cork and cane lifeboat, Fig. 13, is composed of two baskets, placed one inside the other, and secured to a deep wooden keel, the space between the baskets being filled with cork. No provision is required for the ejection of water, which passes freely through the basket work and between the cork, the bottom of the inner basket or floor of the boat being above the outside sea level. One of the best features of this most ingenious invention is the mode in which the stability of the boat is increased by the water being retained on the windward or elevated side, and discharged on the leeward or lower side. This is effected by leaving a central space in the bottom, extending fore and aft, which is not filled with cork, and by lining a portion of the bottom of the boat and the sides of this central water space with a waterproof material, by which means the water is retained on the side which is lifted up, and its weight acts as ballast on the side where it is wanted, and tends to right the boat. One great advantage of this form of construction is its lightness, a boat, 25 feet long, 8 feet beam, and 3 feet 4 inches deep, only weighing one ton.

THE ST. GOTHARD TUNNEL.—It appears, from a recent report made to the Swiss Federal Council, that at the close of June the contractors had completed nearly one seventh of the whole distance of nine miles, 2213 feet. The progress made during July was about evenly balanced, but the advance on the Goeschenen side was rather more rapid than that effected on the Airolo side.

SMOKING BY CLOCKWORK.—A new toy, lately patented, consists of a figure of a dandy with a cigar holder in his mouth. In the pedestal there is a small bellows, operated by clockwork and spring. A small cigar is lighted and placed in the holder; and when the spring is set in motion, the dandy puffs away, as natural as life, until the cigar is consumed.

Correspondence.

Practical Mechanism.

To the Editor of the Scientific American:

I have carefully read Mr. Joshua Rose's essays on practical mechanics, and also the controversy upon hardening and tempering tools. Mr. Rose is elucidating a perfection of workmanship not attained by one experienced mechanic in a hundred. It is an easy matter to run a lathe; but to get the utmost attainable duty out of it is quite another thing, and this Mr. Rose shows exactly how to do. I have worked in shops where the work was let out by the piece, and have found innumerable cases where one man in a particular branch, with the same tools, did much more work than others. How is this? It is done by little, fine points in the manipulation of the work and the tools, which only a few succeed in perceiving. For instance, in one essay Mr. Rose says: "So much side rake may be given a tool that it will feed itself without the aid of any feed motion; for the force required to bend the shaving (in heavy cuts only) will react upon the tool, forcing it up and into the cut; while the amount of bottom rake, or clearance, as it is sometimes called, may be made just sufficient to permit the tool to enter the cut to the required thickness of shaving or tool feed, and no more; and it will, after the cut is once begun, feed itself, and stop itself when the cut is over." Such a tool as is here described is the very perfection of a tool for heavy cuts; there is absolutely nothing beyond it, that is, provided always that it is forged and hardened as Mr. Rose directs. Not a "wrinkle" has he omitted.

Mr. Hawkins says that "if a tool be dipped at the lowest temperature at which it will be hard at all, it will be harder when ready for use than if dipped at any higher temperature, if required to be drawn in temper at all." A tool for ordinary work, such as shown by Mr. Rose in his Fig. 6, treated by either of these methods would be utterly worthless for the work assigned to it by Mr. Rose, that is, running 36 or 27 feet a minute with a feed of 20 or 25. Nine out of ten expert workmen discard the feed motions of small lathes and feed the tool by hand, when doing short work, because the feeds are so fine as to prevent getting out a satisfactory amount of work. The employer of a fine feed is incapable of judging of the merits of a tool, since his practice never puts a tool to a full test. "The temper of a tool, made just hot enough to harden at all," is altogether indefinite, and practically useless. Mr. Rose gives special instructions for taps, etc., and he gives the colors in combination (as patent lawyers say) with the conditions; so that, both being observed, the result is uniform and correct. What result may be obtained by other conditions is another thing. I know of no better plan than Mr. Rose's, and I do not believe there is one in use. Mr. Hawkins appears to have varied his conditions, and his results have therefore become varied and indefinite in consequence. The latter says in one place that a workman may dip a chisel too little, and the chisel will be soft; in another place he may bungle and make it too hard, and that this is an everyday shop practice: "an unprofitable shop experience," he calls it. He afterwards says that the chemical action which produces the colors in tempering is a subject not, in his opinion, beyond the American mechanic's capability to comprehend. The capability to comprehend is as undisputed as the fact that it is foreign to the whole question. No mechanical motive, no fair motive called forth, such a remark. I do not believe that it is American shop practice to make the blunders Mr. Hawkins charges, but I do believe that, were such a deplorable state of things true, the first duty of American mechanics would be to learn to heat and dip a tool properly, so that the chemical action of tempering, whether it be oxidation or carbonization, may be put into proper operation, without which considerations of time, color, etc., are all valueless.

Greenpoint, N. Y.

W. H.

The Plague of Locusts.

To the Editor of the Scientific American:

The grasshopper or locust plague of the Western States is an evil which threatens the entire country, and steps should be taken to stop it. In order to do that, we must get at the cause of it. Every acre of land producing wild or cultivated vegetation supports its equivalent of animal life; and when the balance of power is violently disturbed, it will revenge itself. When a man steps on the teeth of a rake, the handle will rise up and strike him. If we destroy on the plains one kind of animal life, another kind will spring up which we cannot destroy. Millions of buffalo have been killed for sport, and millions for their hides or tongues. Every one who sees a buffalo shoots at it. If it does not fall then, it lingers with the wounds till death relieves it. Every one who has crossed the plains knows that few are the spots which are not dotted over with decaying and decayed carcasses. But the greatest slaughter of animals is done by poisoning the wolves and coyotes. Each hunter spreads poisoned bait over a large track of country, and every morning rides round to take the skins; and each dead animal left to rot is in turn a bait to slay thousands of vultures, crows, ravens, hawks, and birds of all kinds, forming a carpet of their feathers for yards round each carcass. It is no wonder, then, that the hoof of the buffalo and the sharp bill of the feathered tribe disturb not the egg of the locust, as it lies near the surface of the ground, waiting for the warm, dry days to come, that it may be hatched out and fly.

The vast plains, while waiting to be used as the abode of man and his dependents, should not be deprived of their beasts and birds. Every prairie chicken and bird consumes an enormous quantity of insect eggs. The wolf and the

bear feed on the locusts before they can fly. By these agents, clouds of these plagues would be prevented from rising to strike the Western farmer with want and famine. The locust must now be consumed or abolished in some way, or he will possess the land. We must improve the means of gathering them and using them for fuel or fertilizers, and laws must be enforced which will protect the beasts and birds of the wilds. If large brilliant fires were kept burning at night in the line of their flight, they would come to the light, and, getting their wings burnt, would remain.

Chicago, Ill.

JOHN WHITEFORD.

Passage of Gas through Heated Cast Iron.

To the Editor of the Scientific American:

It is generally supposed that the products of combustion will, under some circumstances, pass through heated cast iron. My impression is that experiments, made in Paris several years ago, lead to this conclusion. I remember reading something of the kind at the time, but I have never been able to find an authorized statement of the investigations which lead to this conclusion. Can you put me in the way of finding an account of these experiments? In case you are unable to do this, will you kindly inform me what you think the facts in the case are?

Montclair, N. J.

J. W. PINKHAM.

[ANSWER.—We have heretofore published the reports of experiments to which our correspondent refers, wherein it was claimed that carbonic acid gas, resulting from the combustion of the fuel in cast iron furnaces, will pass directly through the iron plates; and the recommendation was therefore made that wrought iron should be substituted for cast iron in the manufacture of hot air furnaces, stoves, and other domestic heaters. But this conclusion we regard as erroneous, for we think that the quantity of gas that thus passes through the cast iron plates is too small to be ordinarily appreciable. In fact, Dr. Hayes, of Massachusetts, in a note published in the SCIENTIFIC AMERICAN last year, stated that he had conducted a series of special experiments which fully confirm the above view.

We are aware that the escape of gas from our stoves and furnaces is a subject of serious and common complaint. But the trouble is principally due to the badly fitted joints of the cast iron plates, to the improper closing of dampers (thus forcing the gas out at the joints), and also to defective draft in the chimney. It would be difficult to find any cast iron stove or heater in use that is not more or less visibly open at some of its plate or pipe joints, through which gas may, of course, freely flow out. Until some method is invented to seal these openings, the subject of the issue of gas through the pores of the plates, as a sanitary question, will be likely to remain in abeyance.—EDS.]

The Small Engine Question.

To the Editor of the Scientific American:

Some years ago I built a small engine, with a cylinder 2x5 inches, and a balance wheel of 3 feet diameter and 100 lbs. weight. The boiler is 15x36 inches and has fifty ¼ inch flues. It is set horizontally, with the fire box at one end. The fire returns through the upper flues, superheating the steam. The cylinder is on top of the boiler. Fifteen gallons of water are required to charge the boiler; and when the engine is running at 50 lbs. pressure and 300 revolutions per minute, it evaporates about 2 gallons per hour. The amount of fuel is about the same as required by a good sized cook stove. It runs 12 feet of 2 inch shafting, a 6 inch circular saw and cuts 2 inch lumber well; or it runs a wood lathe to turn stuff 6 to 8 inches in diameter. The engine has been run, more or less, for ten years without repairs of any importance, and is in good order now.

Brunswick, N. J.

N. T. W.

To the Editor of the Scientific American.

I have a vertical engine, 2½ inches stroke x 2¼ inches bore. The feed pump plunger is ½ inch x 2½ inches stroke. The boiler is horizontal, 24 inches x 12 diameter, with 12 flues, each 1¼ inches in diameter. Boiler is set in a heavy sheet iron case, with fire box 12x14 inches; the fire passes under the boiler, back through the flues, and over the top of the boiler, and out of smoke stack. No part of the boiler is exposed to the air. The feed pipe passes into the boiler front through the fire, and delivers the water in the back end of the boiler at nearly the boiling point. I have the engine in a boat 16 feet long x 4 foot beam, turning a 14 inch wheel. It makes steam very freely; in fact I run with the door open two thirds of the time. I have run 60 miles in 9 hours with 4 men, burning 48 lbs. of coal. It is the most perfectly working engine I ever saw, large or small.

Manistee, Mich.

N. G. NEER.

The Speed of the Mary Powell.

To the Editor of the Scientific American:

In your issue of September 5, I see you mention that the Mary Powell ran to Piermont, a distance of 28 miles, in one hour. On investigation, I fail to find your statement of the distance to Piermont confirmed. I make it about 22 miles New York city.

L. H. ROSSIRE.

J. FRAUENBERGER, of New York city, has recently patented a composition for producing artificial corals, ivory, and similar articles, made of caseine, mixed in the proportions described, and boiled under suitable heat, with a varnish-like solution of copal in concentrated liquid ammonia and alcohol, to be colored and prepared for the various applications in the arts.