# Scientific American.

**MUNN & COMPANY, Editors and Proprietors.**

PUBLISHED WEEKLY AT
**NO. 37 PARK ROW (PARK BUILDING), NEW YORK.**

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☞ "The American News Company," Agents, 121 Nassau street, New York

☞ "The New York News Company," 8 Spruce street.

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☞ Messrs. Trubner & Co., 60 Paternoster Row London, are also Agents for the SCIENTIFIC AMERICAN.

VOL. XVII., No. 14....[NEW SERIES.]....*Twenty-first Year.*

NEW YORK, SATURDAY, OCTOBER 5, 1867.


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(Illustrated articles are marked with an asterisk.)



## MECHANICAL POSSIBILITIES AND IMPOSSIBILITIES.

Our readers are aware that we have latterly—after having, time and again, discussed such subjects—refused to occupy our columns with conjectures on such mechanical improbabilities as perpetual motion *et id omne genus*. This course has subjected us frequently to adverse criticism and indignant protests from those who believe their own theories rather than well-established facts and natural laws. We have now before us two well written letters which charge us with proscription and old fogyism, pursuing a dog-in-the-manger policy, etc., because we refuse to ventilate ideas which even a superficial knowledge of natural laws would show to be erroneous. It is our interest as well as our intent to note, discuss, and, so far as may be, encourage all well-directed attempts at new discoveries and improvements; but it is no less our duty to refuse to promulgate error.

That progress has been made in a direction which from our ignorance of natural laws seemed to have been closed is undeniable, but that progress was rendered possible only by the necessary addition to our knowledge of those laws. Again, the capabilities of mechanism have been underrated and this has compelled such men as Dr. Lardner to deny the possibility of crossing the Atlantic by steam, and to ridicule other attempts which have proved successful. These mistakes and misjudgments are simply consequences of our ignorance of powers we had no adequate means of estimating.

But when an attempt is made to nullify and render inoperative the plainest and best established laws of mechanics, it would ill become those who profess to make those laws their study to encourage efforts which can end only in failure. There are certain laws which not only regulate and direct, but govern the action of bodies. The attempt to abrogate the laws governing gravitation, inertia, friction, resistance of media, etc., must necessarily prove futile. Some of their effects may be neutralized or modified by bringing other forces into action, but inventions which depend for success on overcoming the action of natural mechanical laws are useless and the time spent on them is wasted.

As our knowledge of these laws is extended and our conception of their relations developed undoubtedly many attempts now unsuccessful may become accomplished facts. Aerial navigation, now apparently impossible, may be in the future *un fait accompli*. There appears to be nothing thoroughly hostile to its accomplishment in natural laws; we lack only the proper apparatus for sustaining, propelling, and guiding a ponderable mass in and through the ærial ocean.

That a motive power may be discovered much cheaper, less cumbersome and dangerous, and still as capable of use under all circumstances as the steam engine is not impossible. Nothing in nature's laws would seem to contravene this result, but as yet we have failed even to approach it. All efforts toward these or other ends which are conducted in accordance with well-known laws, and all efforts to further ascertain the relations of those laws are legitimate subjects for endeavor and encouragement; but misguided attempts to contravene the plain laws of nature ought not to be sustained by those who really desire the well being and advancement of their race.

## ARE OUR FEET PROPERLY CLOTHED?

It is somewhat surprising that, with all our boasted improvements, we have not as yet produced a proper covering for the feet. Barbarous people, if their climate admits, go with bare feet, or wear sandals covering only the sole, or slippers with just enough of upper to retain the sole on the feet. We, however, encase the whole foot, and a portion of the leg, in a material almost impervious to air and moisture, and generally uncomfortably hard and rigid. The color and polish of our boots are directly calculated to attract the sun's rays; and the enamel on patent leather, and the blacking on ordinary calf skin, tends to harden and solidify the substance, closing the pores and making air-tight cases for a portion of the body, which exudes more perspiration than any other, and is subjected to greater strain.

Our boots in summer parboil our feet in a warm bath, and in winter freeze them in an icy envelope. It is doubtful if wet feet are, in themselves, very conducive to disease, some medical men to the contrary notwithstanding; but cramped confinement of the feet, in an icy cold envelope, generated by perspiration and chilled by the external atmosphere, thus shutting the prisoned feet up almost air-tight, is as unhealthy as it is uncomfortable.

For hot weather there is hardly any shoe so agreeable as that introduced within the past three or four years, known as the army shoe, and extensively used by base-ball players. It is of heavy canvas and unblacked leather. It is cool and remarkably easy to the feet. The texture of the canvas allows the escape of the perspiration, and the color of the shoe does not attract the heat of the sun.

It would seem that the plan of covering other portions of our bodies with material pervious to air might advantageously be extended to our feet. There is no natural reason why our feet should be so much less sensitive than our hands. They become indurated and deprived of their natural activity by long, close confinement. The people of warm climates, who use their toes as we do our fingers, and the bare-footed school-boy, who picks up and throws pebbles with his feet, show that the foot of the civilized adult in our climate is a much abused member.

A more flexible and porous material for our boots and shoes might save us from many of those terrible annoyances, which, in the form of corns and bunions, make our pilgrimage one of pain.

## THE SWEDISH COAST DEFENSE MONITORS.---A NOVEL CRAFT.

It will not require much thought for any one to see that for a nation with the resources and requirements of Sweden to expend its means in constructing huge, deep-draft and unwieldy iron-clads like the *Warrior*, *Bellerophon*, or *Magenta*, would be to fritter away its energies without adding materially to its means of defense.

The first and, indeed, the only essential wants in the naval line of a country situated like Sweden, are the means of defense from invasion—the means, in other words, of maintaining its independence. When this want has been supplied it will be time to expend money in building naval yachts and broadside iron-clads.

In solving a problem of this character, the first thing indicated is to put the most powerful guns attainable afloat in vessels of small size and light draft, so that they can be maneuvered with ease and safety among the numerous islands and inlets which characterize the peculiar coast of that country. Accordingly, such has been the ideal of Capt. Ericsson in designing the Swedish 15-inch monitor gunboats.

Those of the readers of the SCIENTIFIC AMERICAN versed in naval architecture will, without doubt, agree with us that an iron-clad of only 140 tuns burthen, mounting a 20-tun 15-inch gun, and carrying ammunitions and stores is neither more nor less than a floating gun carriage. Hence a steam motor applied to such an iron-clad must not only be of small power, but must also be an auxiliary for special occasions.

In view of this, as well also as the fact that, in time of war, Sweden cannot depend on a supply of coal, Captain Ericsson has adopted the novel expedient of fitting these pocket monitors with an arrangement whereby the steam engine may be disconnected from the propeller shaft so that the propeller can be turned by manual power.

The hull of these monitors is made of iron and is 85 feet in length, 18 feet wide, and 7 feet deep; the deck as well as the sides of this hull is composed of iron; or, in other words, it is a complete water-tight box. On top of this hull so constructed, a deck of thick solid timber, which, in fact, may be called a raft, is attached without the use of the objectionable through bolts. This deck or raft is 103 feet in length, 20 feet wide, and 2 feet deep, and it is pointed at both ends. The forward end is protected by five inches of solid iron. As will have been perceived by the description, this deck projects some nine feet at each end over the iron hull; this projection at the bow, besides protecting the anchors, as in the *Passaic* class of monitors, is also fitted with a small feathering wheel paddle, the use of which is to trim the gun, the turret being stationary. Of course, as the turret is stationary, these small monitors are intended to fight bow on and to expose the least possible area to the enemy's fire. The turret is oval in form, and is twelve feet wide by nineteen feet long in the direction of the length of the boat. As the turrets are stationary it is not necessary that the pilot house should be placed in the center; accordingly it is placed at the after end of the turret, which position not only allows ample space for hatchways but also places the steersman and commander directly in the rear of the 15-inch gun, and hence he can, by means of the aiming wheel and also with the assistance of the balanced rudder, if the propeller is in operation, aim the enormous weapon accurately, and give the order to fire, or, if need be, pull the lock string himself. The port is quite wide enough to admit the muzzle of the gun and high enough to allow for 10° elevation. It will be closed by a huge wrought-iron port closer, the same as those used in our monitors.

The most marked features in this Liliputian iron-clad are, we think, the aiming wheel and the mechanism for applying the power of the men to the propulsion of the vessel.

The aiming wheel is placed in an opening four feet, three and a-half inches square, cut in the forward projection. The shaft of this wheel is parallel with the keel, and it is a few inches above the water line. It is clear that by turning this wheel the bow of the vessel will be moved sideways. The resistance which it will offer to the motion of the vessel forward will amount to nothing, as the wheel is made without rims and the buckets are of plate iron only a quarter of an inch thick. As the wheel cavity will be sometimes filled with water, the paddles at the upper part of the circumference would counteract those below were it not that the wheel is fitted with an eccentric feathering movement which keeps the upper paddles horizontal while the lower ones are vertical. This wheel is rotated by men within the vessel by means of winches conveniently placed. This novel instrument has not been adopted without careful experiment.

A full-sized aiming wheel was applied to a raft the same as the raft which forms the deck of the gunboat, and fitted up precisely as it will be in practice, and was operated by the same number of men as will be when devoted to that duty. The efficiency of the apparatus was tested both by the side motion of the raft and also by lifting weights attached to a line which passed over a pulley and was made fast to the raft. The training power was found to be in excess of the force necessary to quickly aim the gun.

With respect to the man-propelling mechanism, we witnessed a trial with it last week at the Delamater Iron Works, Messrs. Mulford & Ripley. We found in the erecting shop at these works the steam machinery of one of these gunboats, erected complete and attached to the propeller shaft, to which a friction brake was attached. This steam machinery was very compact, neat, and elegant in design, beautifully finished, and above all, devoid of anything in the way of "gimcracks." It has the capacity to develop about 40 indicated horse power.

The man-power mechanism is arranged as follows; On each side of the center line of the vessel, and forward of the engines, a row of seats, running transversely, each large enough to accommodate two men, are placed. It is arranged for 30 men.

On each side of the center, between each seat, is placed a vertical lever, pivoted at the lower end; at the upper end an eye is formed through which passes a hickory handle or brake —each vertical lever is therefore pulled by two men. These vertical levers are connected together at their upper ends by light iron rods, and also to cranks (placed opposite to each other) on a transverse shaft, which is attached to the propeller shaft by conical gearing. Thus one half the men pull at a time. The brakes were manned by a party of splendid-looking Scandanavian sailors from the Swedish corvette *Norrkoping* (which is to carry the whole of this new machinery to Stockholm). It was found by the friction brake that they could run off seven and a half net horse-power, and that they could maintain five and a half for many hours. The force is amply sufficient for the purpose intended, which is not for making a long voyage, but for maneuvering in positions which they may be assigned to defend, and as the boats carry sixty days' stores, it will be readily seen that they can maintain their position for that time. The gunboats carry coal for one hundred hours steaming, or sufficient to propel them five hundred nautical miles.

Captain Ericsson has constructed the whole of this machinery at his own cost and presented it to his native country as a pattern to be strictly followed in the building of its defensive fleet of 15-inch monitor gunboats.

## THE PARIS SAFE TRIAL. A FARCE.

Since our publication of the report of the safe trial between Herring and Chatwood, copied from *Engineering*, we have received several communications evidently intended to show—what is not apparent by the trial—the great superiority of the American safe over its English rival. Perhaps this superiority was established at the trial, or if not, possibly it can be so established, and nobody would rejoice more than we at such a triumph of American mechanical skill; but the various reports do not seem to differ in any essential particular from the facts reported in *Engineering*. On the Chatwood safe were used a heavy sledge, slung by brawny arms, large wedges, and crowbars, and on the Herring safe the hand hammers, serrated wedges, and jointed levers of the burglar. The sledge hammer was used on the Herring safe only in opening his internal box in which was placed the block, the object sought, which in Chatwood's safe was contained in the outer case only.

Yet we cannot see what bearing this trial has, after all, on the relative value of either of these safes as offering resistance to the attempts of burglars. Burglars do not come with sledge hammers, and bang and rap away for two or three hours to reduce a structure of mechanical proportions to a mass of old junk. The whole trial was a farce—nothing less—and it was the hight of folly in the commission under whose auspices the experiments were conducted that they did not define the nature of the implements to be used, only allowing each competitor to furnish as expert an operator as he could find.

A test conducted by scientific burglars with the ingenious implements ordinarily used by them, would have been an interesting exhibition, and the result would have been of practical importance to the business community.

As an advertising dodge, which, probably, both exhibitors intended, it may answer their purpose, but the practical result deducible from the trial is not apparent.

The nonsense of allowing three men to bang, and chisel, and hammer for hours to open a safe, is too ridiculous to merit serious consideration.

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