SCIENTIFIC MUSEUM.

Elementary Mechanics.

STEAM.—A cubic inch of water will produce a cubic foot, or 1,728 cubic inches of steam; and this steam will heat 6 cubic inches of water from the atmospheric temperature to 212°, to effect its condensation. Hence six times the difference of temperature, or fully 900° Fahr., are employed in giving elasticity to steam. 100 cubic inches of steam at the standard pressure, 30 inches, weigh 14·68 gr.

General formula to calculate the general power of an engine: Let a horse-power be equal to 150 lbs., raised 13,200 feet per hour, or 396,000 lbs. raised one inch per minute.

Let d=diameter of piston in inches,

p=pressure per square inch in piston,

$2s$=number of strokes made per minute,

l=length of the stroke in inches,

and h=number of horses required to do the work of any engine.

$\therefore (d^2 \times 7854 \times p \times 2s \times l)$ the whole power.

Then $\dfrac{d^2 \times 7854 \times y \times 2s \times l}{396{,}000} = h$

Whence d, p, s and t, may be easily found as required—[Mech. Mag.

HORSE-POWER OF STEAM ENGINES.—The English rule for a cylinder 48 inches in diameter would be founded on two assumptions; the first, that the speed of the piston would be 220 feet per minute, and the second, that the surplus pressure on the piston would be 7, or 7·1, or 7·3 lbs. per square inch. The practice, we believe, varies within these limits, hence

$$\frac{48^2 \times 7854 \times 220 \times 7{\cdot}1}{33{,}000} = 90 \text{ horse-power}$$

The Scotch rule takes the actual speed of the piston per minute, and the mean pressure per square inch, and then employs 44,000 lb., as the divisor on the gross, instead of 33,000 lb. on the net or surplus power of the steam.

The effect of this rule is an allowance of 25 per cent. of the gross power for engine resistances and friction.

Under the given conditions $14 \times 33{,}000 \div 44{,}000 = 10\frac{1}{2}$ lbs. is the surplus steam pressure taken, instead of 7·1 lbs., the assumed pressure by the English rule.

To calculate the pressure which a steam engine boiler will bear without bursting:—Multiply the tenacity of the metal (which, if it were in one piece, would be about 60,000 lbs., or 6-7 that of good wrought-iron, but, as it is rivetted together, call it only 30,000 lbs.) by the thickness of the boiler, and divide it by half the diameter in inches. The quotient will be the number of pounds it will bear on every square inch without bursting. No material should be loaded with more than one-third of the greatest strain it can support.

GENERAL PROPORTIONS OF STEAM ENGINES.—The air-pump and condenser are usually made of the same size, being equal to one-half of the area of the cylinder and one-half of the stroke, or one quarter of the content.

The steam and eduction pipes, and all other pumps and valves, are one-fifth of the diameter of the cylinder.

The water required for condensation is from 3 to 3½ gallons per minute for every horse-power; and, for the supply of the boiler, ten gallons per horse-power per hour.

With these proportions, the piston should travel at the rate of 200 feet per minute.

Table of the Elastic Force of High Pressure Steam, calculated by MM. Dulong and Arago:

	Atmos.		Atmos.
212 Fah.	1	374·00 Fah.	12
233·96	1n	380·66	13
250·52	2	392·86	15
263·84	2n	398.48	16
275·18	3	403·82	17
285·08	3n	408·92	18
293·72	4	413.96	19
301·28	4n	418·45	20
308·84	5	422·96	21
314·24	5n	427·28	22
320·36	6	431·42	23
326 26	6n	435·56	24
331·70	7	439·34	25
336·86	7n	457·16	30
341·96	8	472·73	35
350·78	8n	486·59	40
358·88	10	491·14	45
367·34	11	510·60	50

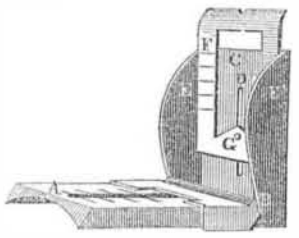
One square foot of surface of steam-pipe will warm 200 cubic feet of space.

Southern Manufactures.

The Mobile Tribune says, "Messrs. I. D. Spear & Co., founders, have just completed two twenty-five horse-power engines, which, for strength of construction, finish, and perfection of movement, are equal to any work of the kind ever made in Northern or Western foundries. The same firm has also finished two sugar-mills, kettles, and all other apparatus, for Tobasco, Mexico."

P. B. Cahoon, of Kenosha, Wis., has raised a specimen of pie-plant, the leaf of one of the stalks of which measures three feet and one inch across by three feet long, exclusive of the stem, which is thirteen inches in circumference. Another stem was about one and a half feet long by six inches in circumference.

Adjustable Rifle Sight.



This engraving is a view of an adjustable sight for rifles, registered by Henry Maling, of London, and described in the Practical Mechanics Journal, from which we have selected it, as something of interest to our people.

The base plate, A, fits into a grooved or slotted bed on the top of the gun's breech, and to this plate is hinged at B, the thin plate, C, having a slot, D, formed through its centre. The sides of this plate are turned over, as at E, and a thin metal plate, F, is fitted to move vertically between the two sides of the plate, to which it is connected by the rivet-pin, G, which is capable of sliding up the slot, D. The aim is taken through the angular notch on the upper edge of the sliding-plate, F.

When out of use, the entire apparatus folds down on the surface of the plate, A, leaving the turned-up notched portion projecting above the band; and when required for use, the sight is elevated by simply pushing forward the small slide in the horizontal groove in the centre of the base plate, which is graduated for the purpose. When a sufficient elevation for a very long range cannot be obtained by this means, the sliding plate, F, is then raised, as shown in our engraving—one side being graduated for that purpose, whilst the top of the corresponding edge, E, serves as an indicator of the amount of elevation.

Recent Foreign Inventions.

COATING AND ORNAMENTING ZINC.—The following are the leading features of a patent recently granted in England to Francis H. Greenstreet, and which is selected by us from the London Mechanics' Magazine:—

These improvements consist in coating and ornamenting zinc or zinced surfaces by means of acids, alone or combined with other matters capable of acting chemically on the surfaces. The solution used may be applied by sprinkling, dabbing, spreading, or marbling; and the surfaces coated are capable of further ornamentation by painting, which may be done with common oil colors. Among the preparations which the patentee recommends for coating and ornamenting zinc or zinced surfaces, are the following:—

1. Muriatic acid diluted with water to a strength of 1·114. The coating produced by this solution is of a light ash color.

2. Chrome yellow, ground fine with soft water, and mixed with preparation 1 to a liquid consistence. This gives a yellowish grey color.

3. The pigment known as "mountain or Saxony green," mixed gradually with preparation 1 to a thin paste, and stirred till effervescence ceases. This produces an iron grey color tinged with green.

4. White lead, ground fine with soft water, and mixed with preparation 1, produces a grey coating. Where expense is not an object, Kremnitz white may be used instead of the white lead.

5. Flour of sulphur ground fine with water and mixed with preparation 1. This mixture gives a yellowish white coating.

6. Butter of antimony may be mixed with the before-mentioned preparations. When used alone it produces a black color, but when mixed, does not affect the color of the preparation with which it is used. It produces a good ground for subsequent painting or other application.

7. Butter of antimony diluted with distilled water. This produces a fine coating, resembling in color India ink.

8. Butter of antimony mixed with spirits of turpentine. This preparation, when applied alone, produces a black color; it may have pigments of different kinds mixed with it, and the effect will then vary according to the nature of the color employed.

The surfaces after having been coated by the means above mentioned, and further ornamented, if thought desirable, should be protected by a coating of varnish. Copal varnish may be used for this purpose; but the patentee recommends the use of wax, or mixtures containing wax, as this substance is an effectual preservative against oxidation, and easily renewed or kept in good condition.

Application of Screw Propellers to Ships of the Line.

Recent experiments with the screw propeller, in the French navy, have settled the question of the superior economy and advantages of uniting steam with canvas in vessels of war. A well-informed correspondent of the National Intelligencer, says the trial-trip of the Charlemagne, which embraced a voyage to the Dardanelles and back to Toulon, via Naples, Messina, Malta, the Piræus, Smyrna, &c., and occupied some two months, surpassed all expectations. The average run, under steam exclusively, was nine knots an hour; the vessel carrying eighty heavy guns. Both the French and English governments have adapted the screw to several of their frigates and line-of-battle ships. The Prince Albert, with a formidable battery of one hundred and twenty guns, may now be driven to any quarter, in defiance of the elements, at the rate of eight or ten knots an hour. Of the one hundred and twenty vessels which the French put in commission this year, seventy-one are steamers. The correspondent says:

"The solution of the practicability of the application of propellers to armed sailing ships, and their adoption in the British and French navies, renders it absolutely necessary that American vessels should be provided also with this additional motive power. A conflict with a French and American seventy-four, the former using both steam and canvas, and our own vessel only the latter, would be a most unequal struggle. The advantage of choosing his position would lie altogether with the Frenchman, and while he could baffle the efforts of his adversary to bring him under his guns, he would be able to rake his decks at will, and attack him on every side. How would it be possible, also, for a frigate to escape such a line-of-battle ship? or when sighted by a hostile squadron, to distance her pursuers, if aided by propellers? Such vessels, besieging a fortress or town, wheeling as on a pivot, and pouring their sixty-gun broadsides from any point, entirely independent of wind and tide, would be the most formidable engines of war ever brought into action. If the lower tier of ports of the Pennsylvania were closed up, and a screw engine adjusted to her now comparatively useless hull, she might be sent to the Mediterranean, where a ship of her size and armament is more than any where else desirable, as a fitting representative of a powerful nation.

Steam of Old.

Dr. Lardner says, that among other amusing anecdotes showing the knowledge which the ancients had of the mechanical force of steam, it is related that Anthemius, the architect of Saint Sophia, occupied a house next door to that of Zeno, between whom and Anthemius there existed a feud. To annoy his neighbor, Anthemius placed on the ground floor of his house several close digesters, or boilers, containing water. A flexible tube proceeded from the top of each of those, which were conducted through a hole made in the wall between the houses, and which communicated with the space under the floors of the rooms in the house of Zeno. When Anthemius desired to annoy his neighbor, he lighted fires under his boilers, and the steam produced by them rushed in such quantity, and with such force, under Zeno's doors, that they were made to heave with all the usual symptoms of an earthquake. The chronicles do not say whether Zeno cowskinned Anthemius or not, but he richly deserved it.

The St. Andrews, N. B., people were delighted, at noon of the 23rd ult., by the sight of the first locomotive ever put in motion in the Province of New Brunswick. This was on the first section of the St. Andrews and Quebec Railroad.

Three blocks of California marble, ordered by the Legislature of that State for the Washington testimonial monument, were nearly ready for shipment at last accounts. One block is of grey marble, with fine black veins running through it; another is nearly black, and the third most beautifully variegated. They are each four feet in length, by twenty-two inches square.