

be both of the same class, round or oval. When oval the longest diameter of one wheel gears into the shortest diameter of the other. Sometimes staggered gears are made by taking several spur wheels and keying them on the shaft so that the tooth of one comes opposite the space of the other.

#### MAN TRAPS AND SPRING GUNS.

It used to be common in England, in former times, to warn depredators off premises by putting up signs reading "man traps and spring guns," thereby hinting at a speedy and terrible fate to the evil-disposed. This practice was at any rate honest; but what shall be said of these persons in modern times who deliberately place man traps where the innocent and unthinking walk headlong into them?

The record of accidents from machinery is daily increasing. In looking over our exchanges it is painful to notice that the majority of the victims are women. Entangled by their skirts they are drawn around shafting and killed instantly. As many as twenty persons have been so killed within the past few weeks. Some of them were young women who ought to have been more careful, but this is no excuse for those who left the snare open. The accidents above alluded to were nearly all caused by shafting. One of them in particular was in a printing-office, where a shaft ran only a few inches from the floor; over this shaft women stepped continually in doing their work, until in an unlucky moment one of the females was caught by her skirts and dashed to pieces.

In these days of the universal adoption of machinery, shafting, pulleys, gearing, and belts are continually running in dangerous places. Children play about them; men and women pass and repass them daily; when suddenly one is taken and the rest left, but the cause of the tragedy is untouched. Men will blow their brains out with guns and pistols by carelessness, there seems to be no help for this, but people may and should be prevented from walking blindly into gears, or being carried around shafts. In a saleratus factory of this city a woman there employed went into the basement a few weeks ago for some purpose, and, being ignorant of the locality, walked straight into a set of heavy gears, running at great speed, and was swallowed up in an instant. After this "accident" it is reasonable to infer that the gearing was boxed up, but what utter recklessness on the part of those who left the wheels in such a condition? Is there not one life charged against them?

When belts run through floors they should be boxed up certainly waist high; a six-inch belt, running fast, will take a man's leg off as quick as a saw; and pulleys that buzz round within an inch of one's nose should also be boxed, or the thoroughfare made in some other direction. Gears must be cased with sheet-iron on the "running side"; wooden boxing shatters, and is liable to get caught and carried in. A man may put his head in the other side of the wheels with impunity. There are many belts now, many shafts at this moment in a condition to catch the first unwary passer by the heels and lay him low. Why not secure them, why not place them beyond the power for mischief? They should be boxed immediately.

#### THE GREAT MECHANICAL PROBLEMS OF THE DAY.

Is the revolving turret or the broadside the best system of making iron-clad ships? Is there practical economy in working steam expansively? Is cast iron, wrought iron, or steel the best material for heavy ordnance? Should large cannon be rifled for elongated shot, or made with smooth bores for balls? Will the pneumatic tube prove a practical system for the general conveyance of passengers? Will steam plowing come into general use?

In the world of mechanical science these are the most prominent problems at the present time, and a vast amount of thought, labor and money is being expended in their solution.

In all inquiries it is well to pause occasionally, and take a comprehensive view of the existing condition of the question, to see what principles bear upon it, what facts have been established, and what yet remain to be determined. Such a view we purpose

briefly to take of each of the great mechanical problems of the day, beginning in this number with the question of revolving turrets.

#### REVOLVING TURRETS OR BROADSIDE SHIPS?

For protecting the face of land forts there is no limit to the thickness of iron that may be employed; if 8 inches is not sufficient to resist the force of any shot, 12 inches may be used, and if 12 inches is not enough there is no objection to the employment of 24. But for a ship that is to float upon the water, the great weight of armor plates imposes a limit to their thickness. If an old-fashioned three-decker were to be plated it would be necessary to make the metal so thin that it would be of no service whatever; but as the depth of the sides is reduced, of course the thickness of the plates may be increased. Consequently broadside armor-plated ships are made with only one gun deck, and even then it is impossible to make the armor plates more than 5 or 6 inches in thickness. A few years ago it was supposed that solid iron plates  $4\frac{1}{2}$  inches in thickness were practically proof against any cannon shot, but it is found that cylindrical steel bolts, and even shells, may be driven through 5-inch plates, and now the thickness is increased to 6 inches.

To reduce the depth of the sides to a minimum, Capt. Ericsson conceived the idea of cutting the vessel almost down to the water's edge, and then raising the guns to a sufficient height to work by placing them in one or more revolving turrets on deck. As the area of the turrets' sides is inconsiderable when compared with that of the whole vessel, the walls of these turrets might be made of any thickness desired, and those on the *Puritan* and *Dictator* are 15 inches thick; though the old monitor turrets, with only 8-inch walls have never been penetrated by any kind of shot.

The prominent objections to turret vessels are the small number of guns which they can carry, and the uncomfortable quarters of the crew below the water line. The answer to the first objection is that one large gun is far more efficient than a whole broadside of little ones, and the soundness of this answer has been very fully confirmed in practice. The closeness of the quarters is remedied by artificial ventilation by means of fans. It is also objected that turret vessels will be poor sea-boats, but the English turretship, the *Loyal Sovereign*, on her recent trial trip, behaved better in a rough sea than any of the broadside iron-clads. This question in regard to our own sea-going monitors will probably be settled by the first trip of the *Dictator* before these lines meet the eyes of our readers.

This is a general view of the present aspect of the great question of broadsides or turret ships. For our own part, while we do not regard the question as absolutely settled, we are now inclined to the opinion that the *Dictator* and the *Puritan* are the most powerful ships of war that have ever yet been launched upon the waters of this globe.

#### TRIAL OF THE 1,000-POUND CANNON.

Since our last mention of the 20-inch gun the carriage has been completed and the gun mounted, and on Wednesday, the 25th of October, this cannon was loaded and fired with the largest charge of powder and the heaviest shot that has ever yet been discharged from any piece of ordnance. The Armstrong gun has been fired with 90 pounds of powder, and a missile variously stated at from 330 to 600 pounds. The 20-inch gun was fired on the 25th ult. with 100 pounds of powder and a solid ball of cast-iron weighing 1,080 pounds.

The gun was first fired with a blank cartridge of 100 pounds. It was then loaded with 50 pounds of powder and a solid shot and fired point blank. The shot struck the water throwing up showers of spray as large as a ship.

For the last trial a charge of 100 pounds of powder was placed below a solid shot of 1,080 pounds, and the gun was elevated at an angle of 25 degrees. At the report the ponderous globe rushed up through the air with a hoarse roar, and sweeping its long ellipse fell a great distance—estimation  $3\frac{1}{2}$  miles—away into the sea.

The report of the gun was not perceptibly louder than that of moderately large ordnance, and the concussion produced no extraordinary trembling of the

earth. There is no doubt, however, that the half tun of cast-iron which this gun hurls forth would have more effect in crushing in the sides or deck of an iron-clad ship than other missile that has ever been wielded by human skill.

We are in possession of facts, and shall soon give to the public full particulars of the trial of a wrought-iron gun of smaller caliber, for which we recently solicited a patent for a well-known engineer in this city. The result will probably far surpass those of any other gun yet brought before the public.

#### THE MARKET FOR THE MONTH.

The prominent features in the trade of the country during the past month are a considerable suspension of cotton manufacture in consequence of the great fluctuation in prices, and a panic in the city of Chicago. Unlike most other cities in the country, Chicago has gone right forward in building during the war, and it is not strange that there should be some unsafe extension of credits among a portion of her citizens. The small effects, however, resulting from the panic there show a stability in the condition of the traders which never existed before the war in any of the towns east of the Rocky Mountains.

By the fall in cotton from \$1 80 to \$1 00, many of our large cotton manufacturing establishments lost so heavily that they have determined to suspend operations till our currency is in a more stable condition. One of the worst evils of a largely inflated currency is its liability to these great and sudden fluctuations which render all business calculations uncertain, and thus exert a paralyzing influence on the industry of the community.

The trade of the country still continues on the cash system. Hardly any merchandise, even dry goods, is sold on a credit of over 30 days. The mercantile community of this country was never so free from the possibility of extensive bankruptcies as at the present time. There is a good deal of talk about a crash when the war is over, but men cannot "fail" to pay debts that they do not owe.

The limited supply of cotton has of course diminished the trade in fabrics made of this staple, but the trade still continues enormous even in calicoes of American manufacture. We are told by one of our domestic commission houses, that a few days since a leading jobber stepped into their store and bought a bill of ninety thousand dollars in the single article of American prints.

The following list shows the change during the month in the prices of the leading staples:—

	Price Sept. 27.	Price Oct. 26.
Coal (Anth.) $\frac{1}{2}$ 2,000 lb.	\$10 00	9 50 @ 11 00
Coffee (Java) $\frac{1}{2}$ lb.	45	45
Copper (Am. Ingot) $\frac{1}{2}$ lb.	47	47 @ 48
Cotton (middling) $\frac{1}{2}$ lb.	1 20	1 22
Flour (State) $\frac{1}{2}$ bbl.	8 30	8 90 @ 9 25
Wheat $\frac{1}{2}$ bush.	\$1 80 @ 2 50	\$2 25 @ 2 60
Hay $\frac{1}{2}$ 100 lb.	1 30	1 30 @ 1 35
Hemp (Am. drs'd) $\frac{1}{2}$ tun.	320 00 @ 360 00	\$320 00 @ 350 00
Hides (city slaughter) $\frac{1}{2}$ lb.	11 $\frac{1}{2}$ @ 12	10 $\frac{1}{2}$ @ 11
India rubber $\frac{1}{2}$ lb.	1 20	1 10 @ 1 15
Lead (Am.) $\frac{1}{2}$ 100 lb.	\$14 00 @ 14 50	\$13 87 @ 14 00
Nails $\frac{1}{2}$ 100 lb.	\$9 50 @ 10 00	9 50 @ 10 00
Petroleum (crude) $\frac{1}{2}$ gal.	39	46 $\frac{1}{2}$ @ 47
Beef (mess) $\frac{1}{2}$ lb.	\$10 00 @ 13 00	8 00 @ 13 00
Saltpeter $\frac{1}{2}$ lb.	24 @ 30	24 @ 30
Steel (Am. cast) $\frac{1}{2}$ lb.	20 @ 24	18 @ 23
Sugar (brown) $\frac{1}{2}$ lb.	15 @ 23	18 @ 21
Wool (American Saxony fleece) $\frac{1}{2}$ lb.	95 @ 1 05	90 @ 1 00
Zinc $\frac{1}{2}$ lb.	20	20 @ 21
Gold	2 00	2 16

#### Binding the "Scientific American."

It is important that all works of reference should be well bound. The SCIENTIFIC AMERICAN being the only publication in the country which records the doings of the United States Patent Office, it is preserved by a large class of its patrons, lawyers and others, for reference. Some complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, i. e., heavy board sides covered with marble paper, and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we commenced on the expiration of Volume VII., to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

The price of binding in the above style is 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, No. 37 Park Row, New York.

VOLUMES III., IV., VII., AND X., (NEW SERIES) complete (bound) may be had at this office and from periodical dealers. Price, bound, \$2 25 per volume, by mail, \$3—which includes postage. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding. VOLS. I., II., V., VI. and VIII. are out of print and cannot be supplied.