

THE BESSEMER PROCESS IN AMERICA.

One of the most important improvements in the mechanic arts that has been made in this country is the Bessemer process of making steel. Iron is our most abundant and valuable metal; it performs an essential part in all the arts and in nearly all the operations of life, and if we were deprived of it the numbers and condition of mankind upon this earth would be materially changed. When the Bessemer process was first announced it seemed to us that so radical a reform in the methods of working iron was destined to produce great results, and we have taken pains to spread before our readers full accounts of every step in the progress of the invention, with illustrations of the apparatus employed.

It will be remembered that on a trial of interference at our Patent Office, between Mr. Bessemer and William Kelly, of Eddyville, Ky., it was decided that Mr. Kelly was the prior inventor, and a patent was accordingly issued to him on the 20th of January, 1857. Subsequently, on the 12th of July, 1859, a patent was granted to Christian Shunk, of Canton, Ohio, who claims to be the very first inventor of the Bessemer process in the world. Mr. Shunk has obtained several reissues, and, when we last saw him, seemed full of determination to enforce his claims.

A wealthy firm of iron manufacturers in Troy, N. Y., Messrs. Winslow, Griswold & Holley, have obtained rights under Mr. Bessemer's patents in this country, and have commenced the manufacture.

Mr. Holley, an educated and able civil engineer, visited England, and learned the process from Mr. Bessemer. At the last meeting of the Polytechnic Association, Mr. Holley read a long paper on the Bessemer process, giving the same statements that have already appeared at length in our columns. He, however, presented one fact that is new and interesting. In erecting the works at Troy, several minor improvements were made, and one of considerable importance; that is, the use of a cupola furnace in place of a reverberatory for melting the iron. As one pound of coal will melt two pounds of iron in a reverberatory furnace, while it will melt from eight to thirteen pounds in a cupola, the change effects a material economy in the manufacture.

This prompt effort to effect improvements in the process and apparatus, suggests the long series of inventions which are, doubtless, destined to accompany the development of this great manufacture in this country. We hope that in this development our American inventors—those who have already secured patents, and those who hereafter may secure them—will receive the full share of profits to which they are justly entitled.

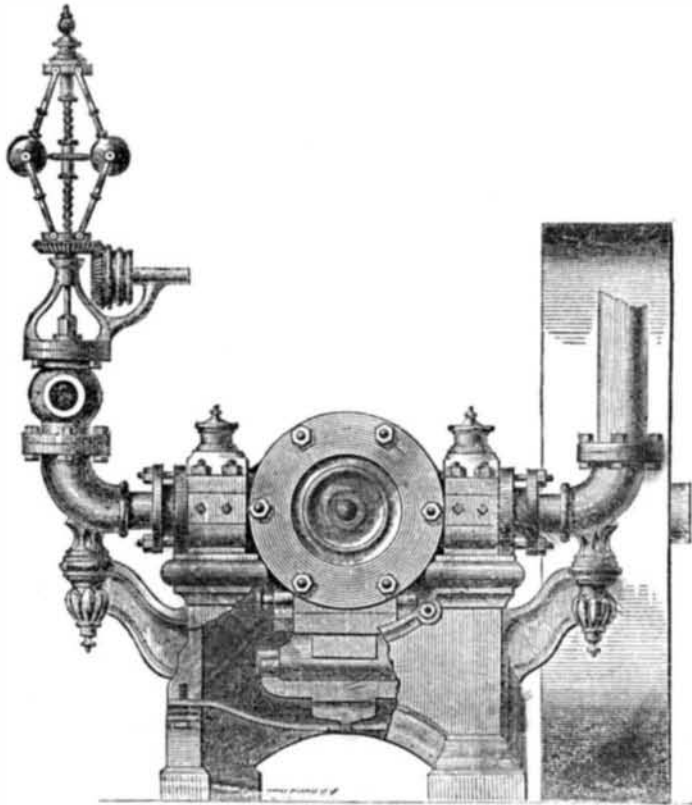
EXHIBITION OF GRAIN DRYERS AND SEPARATORS.—TO MERCHANTS.

On the 13th inst. several machines for drying and separating grain were exhibited at the Produce Exchange building, in this city.

R. Heneage's Patent Grain Dryer, made by W. H. King, of Buffalo, N. Y., was among the number, and is an ingenious machine. An octagonal tower has in its axis a vertical rotating shaft, which carries a series of horizontal, circular, metallic disks, perforated with small holes. The grain is poured gradually upon the center of the upper disk, when it is carried by centrifugal force to the edge, and thrown off; it is caught by a tunnel of wire gauze, which

conducts it to the center of the disk next below, when the process is repeated, each disk being provided with its tunnel. The grain is thus separated and exposed freely to the current of air which ascends perpetually through the tower.

Bodge's Grain and Seed Separator was also shown in operation. This compact and efficient machine was illustrated and described on page 278 of our last volume. A few quarts of mixed grain and seed were poured into the hopper, and the handle was turned two or three minutes, when the seed was found completely separated, each kind in its proper receptacle—oats in one vessel, hay seed in another, peas and corn in another, large wheat in another, small wheat



MESSRS. BROWN'S ENGINE.—SEE FIRST PAGE.

in another, and, finally, the refuse wheat and chaff in another. The separator was very perfect in its operation, and the machine attracted much attention from the large crowd of grain dealers present.

MISCELLANEOUS SUMMARY.

THE engines of the *Bellerophon* English iron-clad were guaranteed to make 70 revolutions per minute, with a pitch on the screw of 22 or 23 feet. With all the boiler power it was impossible to get more than 58 revolutions, but at this velocity it was stated that the "drag" of the screw was so great the contract could not be complied with. It is, therefore, proposed to put in "another screw," which means a finer pitch, we suppose, when the required velocity will be had.

A MANUFACTURER FINED FOR MAKING FALSE RETURNS.—The Gloucester *Telegraph* states that a manufacturer in Manchester, Mass., has been heavily mulcted for making false returns of the amount of his business. An investigation showed conclusively that some eleven monthly returns did not show a true statement of his business, and he was assessed \$1,200 extra, to cover the deficiencies, and fined \$1,200 for making fraudulent returns.

THE operations of the Naval Academy at Annapolis have been resumed, under the superintendence of Rear Admiral D. D. Porter, assisted by a large number of young naval professors. There has also been added to the professorships a Professor of Steam Engineering, in the person of Chief Engineer W. W. Wood, United States Navy, under whose instructions the naval cadets are to be taught steam engineering.

THE New England States pay about fifty millions a year to the Government in internal revenue taxes. Of this amount Massachusetts pays nearly thirty millions, which shows the wonderful prosperity of that State.

"HARPERS' WEEKLY," of Oct. 14th, contains a picture entitled, "The attempted escape of Doctor Mudd from the Dry Tortugas," sketched by a passenger on board the steamer. In this engraving the Doctor is represented as having crawled into a rifled gun, and is detected therein by his heels sticking out. There are no rifles in existence a man can crawl into, so the passenger on board has taken some liberties with the fact.

BUFFON combined plane glass mirrors only 6 inches by 8 inches, and with 40 set on fire a tarred beech plank, 66 feet distant; with 98 at 126 feet, with 112 at 138 feet, with 168 at 200 feet; and he melted metals at 30 or 40 feet.

THE middle of the center arch of Southwark Bridge rises one inch in the heat of summer, and the effect of a gleam of sunshine on the Britannia Bridge is immediately perceptible.

THE resistance of the air to a cannon ball of 2 pounds weight, with a velocity of 2,000 feet per second, is more than sixty times the weight of the ball.

FEET WASH.—The feet of some persons naturally evolve a disagreeable odor. Wash them in warm water to which a little hydrochloric acid or chloride of lime has been added.

IN dry air at 32° sound travels 1,090 feet per second, and one foot more for every degree of the thermometer.

A FIBER of silk a mile long weighs but 12 grains, so that there are 583 miles of fiber in a pound avoirdupois.

THE magnesium light is found to be sufficiently active to determine the combination of hydrogen and chlorine.

SILVER can be beaten into plates of which 110,000 make an inch, and drawn into wire of the 13th of an inch, sustaining 137 pounds.

VEGETABLE ivory may be colored almost any shade of purple by the more or less prolonged action of concentrated sulphuric acid.

M. AUPIN has determined the presence of silver in the water of the Dead Sea; a tun of the saline residue contains seven grains of the precious metal.

It is reported that Lieut. M. F. Maury, who ran away from the National Observatory at Washington in 1861, has migrated to Mexico.

A PLAIN glass mirror reflects 5,352 of 1,000 rays—the quicksilver reflects two-thirds.

FIVE THOUSAND men (infantry) in two ranks, and formed in line, extend a little over one mile.

SPENT tan is sometimes substituted, with excellent results, for charcoal in blasting powder.

THE disease which has been attacking the cattle of England has appeared also among the sheep.

THE trial between the *Winooski* and *Algonquin* was renewed on Tuesday the 17th inst.

It is said there will be no transit of Venus till December 8, 1874, and no other till 2004.

THE part of the spectrum where the greatest heat prevails is found to be the center of the yellow.

DR. RICHARDSON states that catarrh is induced by ozone.

A PLATINUM wire of the 13th of an inch will suspend 274 pounds.

A CUBIC inch of mercury at 62.30 degrees weighs 3,425.35 grains.

WATER heated in a strong closed vessel has melted lead at 612 degrees.

SEA water is both salt and bitter at the surface, but only salt in its depth.

THE organ was invented by one Ctesibius, a barber, of Alexandria, about 100 years B.C.

A CONVEX lens burns at 25 feet under the surface of the sea in a diving bell.

TIN wire, the thirteenth of an inch in thickness, sustains 34.7 lbs.; a lead wire but 23 lbs.

SOLID carbonic acid sinks the spirit thermometer to 162° Fah. below zero in two minutes.

THE ascending power of a balloon with hydrogen gas to one filled with coal gas is as 15 to 11 nearly.

Negative Slip.

This peculiar action of the screw has been noticed to a great extent in the trial of the New English iron-clad ship *Bellerophon*, and the *Times* thus speaks of the phenomenon:—

The trials of the *Bellerophon* have resulted in one of the most extraordinary phenomena ever developed since the introduction of steam. For three days in succession this ponderous ship has been steaming about at the entrance to the Thames and Medway under circumstances for which all the science of the day vainly attempts to account, and which baffles those who have designed, built, and put engines into the ship, no less than the nautical gentlemen who had charge of her during her trials. In technical language, the phenomenon in question is denominated "negative slip," but in common parlance it is spoken of as a case of the ship overrunning the screw, which, in this instance, has occurred to an altogether unexampled degree. We may state the case in the simplest manner to the general reader by saying shortly that, although throughout the trials of this ship, while the screw propeller which drives her has been itself advancing with a speed barely, if at all, exceeding $12\frac{1}{2}$ knots per hour, the ship herself has been speeding through the water at a rate of $13\frac{3}{4}$ knots. If a phenomenon of this nature had occurred with a light vessel, constructed with exclusive regard to fleetness, it would obviously have been a singular circumstance, but for it to happen with an iron ship of war of the stoutest construction, covered with the most ponderous armor ever yet applied to a sea-going ship, is a most unexpected and unaccountable circumstance. The engines put into her are designed expressly to revolve rapidly, and the ship was taken down the river on trial with the understanding that the screw would have turned round about 70 times per minute, thus developing 6,000 indicated horse-power. Instead of this, to the astonishment and disappointment of everybody on board, and of no one more than the engine-makers themselves, the drag of the four-bladed screw was found to be so great that not even 60 revolutions could be secured, even when all idea of using the steam expansively was abandoned, and it was allowed to rush with full force into and through the cylinders. A great waste of steam was thus, of course, occasioned, and, consequently, scarcely 5,000 horse-power, instead of 6,000, was developed. The wonder is that under such circumstances the high speed of $13\frac{3}{4}$ knots was attained, and the fact that it was the best possible guaranty that a speed of more than 14 knots will be secured in this remarkable ship when the full power of her engines has been developed with a different screw. The peculiarity of the screw at present applied to the ship is not limited to the number of its blades. Each of these four blades is formed with two surfaces standing at an angle of inclination to each other, in order that each half of it may impart a different velocity to the water, somewhat upon the principle of the differential screw propeller invented many years ago by Professor Bennett Woodcroft, of the Great Seal Patent-office. The *Bellerophon's* screw really has eight blades, in fact, arranged in four pairs, and as the diameter of the whole is no less than 23 feet 6 inches, the drag which it puts upon the engines must be truly enormous.

Mr. T. Moy writes to the *Mechanics' Magazine* as follows:—

The recent trials of the *Bellerophon* have proved that this vessel, with a four-bladed screw, has what is called negative slip. While the screw advances at a speed of $12\frac{1}{2}$ knots, the vessel goes at the rate of $13\frac{3}{4}$ knots; and, as this phenomenon remains unexplained, I will venture to offer an explanation which I have long believed to be the true one. It is quite certain that no paddle-wheel steamer ever went even so fast as the wheels revolved, and therefore all slip with paddle-wheel vessels is positive. This being the case, negative slip can only arise from some peculiarity in the propeller. The four-bladed screw of the *Bellerophon* acts as an ordinary screw is supposed to do in driving the vessel forward, and a cylinder of water is driven aft by its action as a screw; but it acts also as a fan, driving outward a quantity of water by its centrifugal action; and, the vessel being in motion, this extra quantity of water comes from forward of the screw, and entering near the center is driven outward at right angles to the screw shaft. The more blades the propeller has, the more fanlike

is its action, and *vice versa*. I think that an ordinary fan worked like a screw propeller would produce some motion on a vessel; it would at least be an interesting experiment.

Referring to the negative slip of the *Bellerophon*, "X," in the *Times*, says that he has experienced it considerably in large steamers with four bladed screws, and the reason he assigns for it is that the screw propels a larger body of water from it than is required to overcome the resistance of the vessel in passing through the water at the same speed as the screw, and that the vessel must therefore pass through a greater space of water than is due to the travel of the screw to supply the superabundance of water thrown backward by it. This, of course, involves an increase of speed of the vessel in proportion to the increased quantity of water required to supply the screw.

Manufacturing Items.

AMERICAN THREAD.—Willimantic is thoroughly busy just now, in common with all manufacturing places. The Linen Company, whose threads are of world-wide reputation, employ 1,200 hands, putting up four thousand dozen of spools a day. They have just built a new mill 250 feet long and five stories high, and sub-let several small factories to tributary manufactures. Mr. A. B. Burlleson is superintendent. The Duck Co. employ 50 hands, make 30,000 yards of warp a week, and pay \$900 tax per month. The Dunham Co. make 11,000 pounds of thread a week for the Linen Co., employing 50 hands and paying \$900 a month as tax. The Hop River Warp Co. do business on the same scale. Mr. W. C. Jillson is agent for these three concerns.

COTTON MANUFACTURES.—There are five cotton mills at Holyoke, Mass., including a spool cotton mill of 18,432 spindles. The number of cotton spindles is 78,240; the quantity of cotton consumed, 1,275,582 pounds; value of stock used, \$1,569,238; number of yards of cotton cloth made, 5,049,141; capital invested, \$1,740,000; number of hands employed, 945. In the spool cotton mill 315 hands are employed, and 457,706 dozen spools made, worth \$503,476; capital employed, \$600,000. The Holyoke Machine Works employ 60 hands, and make \$50,000 worth of work on a capital of \$30,000. The four paper mills use 1,966 tons of stock, worth \$491,655, and make 55,284 reams of writing paper and 1,073 tons of other kinds, employing 330 hands and a capital of \$290,000.

WIRE CLOTH.—The Clinton (Conn.) Wire Cloth Company, under the management of C. H. Waters, Esq., are now making, by patent power looms and the latest improved weaving machinery, wire cloths of every kind, finish and mesh, and far superior to any made by hand looms. Their patterns are of all textures, from the delicate wire gauze, to the galvanized fence, protecting our houses from musketoos and our gardens from intrusion. Wire fencing is made a specialty by them, being coated with a thick wash of zinc. In all their manufactures the wire is subjected to so great a strain in weaving, that all stretch is taken from it, and a perfect mesh is formed, in connection with a level surface. Their cloths, which are of standard worth, are furnished to the trade at less prices than when produced by the old methods.

RAG BOILERS.—At the Fort Pitt Boiler Works, there are in process of construction two rotary cylinders, for the use of the Pittsburgh Paper Manufacturing Company, whose mills are to be located at Brighton. These cylinders are each 6 feet in diameter, and 22 feet long, and are being made of iron three-eighths of an inch thick, joined with three-quarter inch rivets. They are to be the receptacles of rags, and as they revolve receive a constant volume of steam, which, with the motion, converts the rags into pulp, which is discharged into another vessel preparatory to being made into paper. The iron of which these cylinders are being built was subjected to a tensile test of 60,000 pounds to the square inch.

A new steam machine has been introduced into the steam saw-mills in Chatham dock-yard, and has been fixed in the millwright's shop, for the present, on trial. It is the patent of Mr. Zarnacott, engineer, Leeds, and is termed a saw-sharpening machine. It is fitted with two patent grinding wheels, suitable for sharpening circular saws up to five feet in diameter, and web saws of any length, without having the teeth

to finish or top with files. The machine seems, from its present working, likely to be adopted by the Government.

The shoe business is reported more active than at any known period. During the past year 3,218,560 pairs of boots and shoes have been made in the town of Haverhill, Mass. The gross value of stock used was \$2,496,260; value of boots and shoes manufactured, \$4,002,787; capital invested, \$704,700. About four thousand hands were employed.

PERCUSSION CAPS.—The American Flask and Cap Co., at Waterbury, Conn., employs 200 hands, and pay a yearly revenue tax of \$25,000. They make 2,500,000 percussion caps per day, which is more than is made by any other manufactory in the country.

A New Car for Carrying Oil.

We were shown recently, at the boiler yard of W. W. Wallace, on Locust street, in the Ninth Ward, a new car, the invention of J. F. Keeler, Esq., for the purpose of transporting bulk oil, which bids fair to become a popular institution when introduced. The car is twenty-five feet in length, by eight in width, and resembles very much in appearance an ordinary box car, with the exception that the bottom or tank is rounded, having the shape of a U. It is constructed of three-eighth-inch wrought-iron plates, firmly riveted together, and well stayed and braced by means of angle irons. The capacity of the tank is eighty barrels. Within two inches of the top plates is a half-inch board roof or top, fastened to the braces by means of bolts, which is so firmly joined together as to prevent, when the car is filled and in motion, the surging of the oil, but which permits it to expand, and thus reduces the quantity of gas, which otherwise would be formed. The tank is filled from the top, by means of two cast-iron pipes, one on each side, and is drawn off from the bottom through two valves, one in each end. The upper portion of the car is of sheet iron, and is intended to be used for the transportation of light packages. The floor of the car rests on sleepers, about an inch in thickness, and is so arranged that the air can pass freely under it in any direction. This will permit the escape of any gases which may penetrate through the iron covering of the tank, and prevent the damage of the goods in the box above. The car will rest on ordinary spring trucks, and when completed will not exceed in weight the box freight cars now in use.—*Pittsburgh Chronicle.*

Balanced Rudders.

The largest iron-clad ship in England has a balanced rudder, and its performance is thus spoken of by the *London Times*:—

The adoption of the balanced rudder on board a vessel of the *Bellerophon* class was, at first, considered to be a doubtful experiment, but the results of the trials made were, in the highest degree, satisfactory. With the helm at port, and the angle of the rudder 32 deg., the helm was put over in four turns by eight men in 23 seconds, and the complete circle accomplished in 4 minutes 30 seconds, and the half circle in 1 minute 50 seconds, with the helm to starboard the rudder was brought to an angle of 37 deg. by eight men in 25 seconds. The value of the balanced rudder in a vessel of the *Bellerophon* class, which is required to steer readily to enable her broadside battery guns to be worked with advantage, will be apparent when, in the case of the *Warrior*, the average time in making the circle is eight minutes. At the close of the experiments with the steering gear, it was decided to abandon the further trials till the following day.

LARGEST VINEYARD IN THE WORLD.—It is said that the Buena Vista Vineyard, in Sonoma County, California, is the largest in the world. It consists of 6,000 acres, with 272,000 vines planted previous to 1865, and 700,000 planted or to be planted this year. Last year the yield was 42,500 gallons of still wine, 60,000 bottles of sparkling wine, and 12,500 gallons of brandy. One hundred men are constantly employed, and double that number during the vintage. There are 8,000 fruit trees, and large varieties of grapes.

If we are ever dependent on America for coal, it would require about 1,200 colliers of the size of the *Great Eastern* to maintain our present supplies only.—*London Engineer.*