only file establishment in the country where the steel for the files is manufactured on the premises. Hitherto all the steel that had been used for American-made files was imported from England. It therefore affords us pleasure to make a record of the enterprise of the Whipple File Manufacturing Company.

On page 22, Vol. XIV. (old series) of the SCIENTIFIC AMERICAN, we gave a very full description of the processes and operations involved in the manufacture of files by hand; and we said:—"It seems reasonable that machinery might be constructed to cut files as well, in every respect, as can be done by hand." This opinion has now been confirmed, although at the time it was penned, many practical file-makers with whom we had conversed, believed that a machine could not be made to put the same burr edge upon files, as a skillful hand-cutter. We also said in that article, with respect to the steel:—"Our steel comes from England, while the Sheffield file-makers manufacture their own steel, and are thus enabled to meet rivals in every market in the world. Until we make our own steel (and we do not see why we should not do it), our toolmakers must labor at a great disadvantage in competing with those tools which come from abroad." This suggestion has met with consideration, and the results are indeed gratifying.

THE PRESSURE PRODUCED BY GUNPOWDER.

Professor Barnard, of Washington, has communicated to *Silliman's Journal* an article on the pressure produced by burning gunpowder in a cannon, in which he shows that the several experimenters differ very widely in their results; some stating the pressure at 7,000 or 8,000 lbs. to the inch, and others at more than 200,000. Professor Barnard objects to all of the methods pursued by the different experimenters, and then remarks that we finally have an investigation which leaves nothing to desire—the investigation made by Messrs. Bunsen and Schischkoff. These eminent chemists analysed all of the substances resulting from the combustion of gunpowder, and calculcated the pressure which they would exert if confined in the space occupied by the powder before it was burned; taking into account the specific heat of the several substances. Professor Barnard remarks that the powder was burned under the pressure of the atmosphere only, and expresses the opinion that the result would not be materially varied by that circumstance.

The best chemists in this city assert, on the other hand, that the burning of gunpowder under the pressure of the atmosphere only, affords no criterion whatever of the effects which would be produced by burning it behind a heavy shot in a cannon. By confining the powder, the heat would be far more intense, and this intense heat would cause an entirely different class of compounds to result from the combustion; thus destroying the foundation of the calculations.

We will also suggest another objection to this investigation. The specific heat of the several products varies with the temperature, and at the high temperature in question has not been ascertained.

Captain Rodman's plan of measuring the pressure of the gases resulting from the combustion of gunpowder in a cannon would seem, at first thought, to be unobjectionable. This plan has been illustrated in the SCIENTIFIC AMERICAN. It consists in boring a hole through the wall of the gun and screwing into this hole a hollow cylinder fitted with a solid piston, the outer end of the piston being of diamond form. When the gun is fired, the pressure of the gas drives the end of the piston into a sheet of pure copper to a depth varying with the pressure. The piston is afterward forced into another piece of pure copper to the same depth by means of a press, the force of which may be measured, and the pressure of the gas is taken to be the same. It has been objected to Rodman's method that the inner end of the piston not being in contact with the powder, the gases would acquire a very high velocity in passing outward through the hole in the wall of the gun, and would strike the piston with a force far exceeding their pressure. It seems to us that there is force in this objection.

Captain Rodman found a pressure, in one instance, as high as 180,000 lbs. to the square inch, and it has been objected by Mr. Fisher, of this city, that such pressure would crumble the cannon to dust—the power of cast-iron to resist a crushing strain seldom if ever exceeding 120,000 lbs. to the square inch. The reply to this is, that the pressure does probably crush the iron within the scope of its influence; but, as the pressure is only momentary, it is exerted only upon the surface—causing an enlargement of the bore. Captain Rodman says that the pressure ordinarily produced in a cannon would blow the gun to pieces if it were not instantly relieved.

As the objection raised by Professor Seely and Professor Everett to the investigation by Bunsen must be as familiar to that eminent chemist as his A B C's, we cannot help suspecting that there may be some error in our account of his inquiry. It will be seen, however, by an extract in another column, that the President and many Fellows of the Royal Society are of opinion that the subject has never yet been properly and thoroughly investigated. Bunsen's calculation gave a pressure of 65,000 lbs. to the inch, and there is no reason to suppose that his method would make the pressure any less than it really is. We invite the attention of our men of science to this interesting subject.

OUR SUBSCRIBERS.

At the commencement of this volume of the SCIENTIFIC AMERICAN we made an appeal to our friends to aid us in extending its circulation. The response to the appeal has been most noble and gratifying; and to all those valued friends we return for their kindness our warmest thanks. Our paper is not large enough to publish the names of all, as we would like to do; we therefore select only those who have taken the trouble to get up large clubs:—

AMERICAN WATCH COMPANY	Waltham, Mass.
BASSETT, C.	Massillon, Ohio.
BELL, J. W.	St. Louis, Mo.
BLANDY, H. F.	Zanesville, Ohio.
BRADISH, A.	Decorah, Iowa.
COOPER, C. & J.	Mount Vernon, Ohio.
CROSS, C. H.	Pulaski, N. Y.
DUNNELL, J.	Pawtucket, R. I.
DUVINAGE, L.	Owego, N. Y.
FLUKER, F. F.	Provincetown, Mass.
FOSDICK, S. W.	Clinton, Mass.
GARST, JOHN	Dayton, Ohio.
GOODELL, DeB.	Elmira, N. Y.
HALTEMAN, A. K.	St. Louis, Mo.
HAGERMEY G.	Big River, Cal.
HEMINGWAY, H. N.	Des Moines, Iowa.
HILL, C. F.	Hamilton, Ohio.
HOLMES, JONAS	Clayville, N. Y.
HUBBARD, C. S.	Whitneyville, Conn.
JONES, WILLIS	Bridgeport, Conn.
LATHROP, G. W.	Weedsport, N. Y.
LYMAN, T.	Sandusky, Ohio.
McCONNELL, J.	IowaCity, Iowa.
MARSTON, F. J.	Houghton, Mass.
MILLER, E.	Meriden, Conn.
MOSES, W.	Buffalo, N. Y.
NEWCOMER, G.	Meadville, Pa.
NIXON, W.	Adrian, Mich.
ORAHOOD, H. M.	Black Hawk, Col. Ter.
REED & CO., G. W.	Montreal, C. E.
ROBINSON, H. C.	Monmouth, Ill.
SAGER, M. S.	Washington C. H., Ohio.
SHORT, W. A.	Malone, N. Y.
STRUNK, D.	Janesville, Wis.
THOMPSON, C. B.	St. Catherines, C. W.
VAN FRIES, H. S.	Hollidaysburg, Pa.
WARFIELD, G. W.	F to ville, Mass.
WICK, JR., C. B.	Sharon, Pa.

"Yet," we say, "there is room for a few more." Our subscription list is not quite full; and we appeal again to our many thousands of readers to "follow in the footsteps of their illustrious predecessors."

PRESENT STRENGTH OF THE BRITISH NAVY.

The official annual return of the number, name, tunnage, station, and every particular regarding the steam and sailing ships composing the British Navy, together with the horse-power and armament of each, has been published under the authority of the Lords Commissioners of the Admiralty. The total strength of the effective ships of the navy on the 1st of January was 975 of all classes, not including a number doing duty in the various harbors both at home and abroad, the whole of which would be speedily converted into block ships for the defence of the coast, together with a numerous fleet of iron and wooden mortar-boats laid up at Chatham. Of this number there are 72 vessels ranking as line-of-battle ships, each mounting from 74 guns to 121 guns; 42 vessels of from 60 guns to 74 guns each; 94 steamers and other ships, carrying an armament of from 22 to 46 guns each, and the majority of which are of a size and tunnage equivalent to line-of-battle ships; 25 screw corvettes, each carrying 21 guns; and 500 vessels of all classes, including iron ships of great power and tunnage, carrying an armament of from four guns to 21 guns each. Exclusive of the above there is a squadron of 185 screw gunboats, each mounting two Armstrong guns, and nearly the whole of which are fitted with high pressure engines each of 60-horse power. The total number of ships of all classes in commission and serving in nearly every part of the world is upwards of 300, the remainder being attached to the reserved squadrons at the various naval ports, and partially equipped in readiness to proceed to sea whenever their services may be required.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week: the claims may be found in the official list:—

Machine for dressing Slate.—This machine consists of a rectangular frame which may, if necessary, be mounted on wheels for the convenience of transporting or removing the machine from one locality to another. This frame is provided with a fixed knife and also suitable bearings for a lever or sword arm which carries a movable knife. This sword arm is suspended by a spring or springs, so that when in a normal position the movable cutting edge is raised above the lower knife edge, and the two edges resemble a pair of open shears and act in the same manner. A treadle frame is attached by means of a link to a lever, which is upon the same spindle as the sword arm, and the knife edges are brought together by the pressure of the foot of the workman, or, if desired, the machinery may be worked by mechanical power, by applying power to the treadle lever, or the treadle lever may be dispensed with and the power may be applied direct to the sword arm. The spindle of the sword arm is made adjustable to compensate for wear in the cutting edge and other working parts and a gage plate with suitable marks or points, corresponding to the different recognized sizes of roofing slates, is placed on the frame-work, so that the rough slates may be laid in their proper places and adjusted with facility. If desired a double set of shears or cutting edges may be employed, so that two sides of the slate may be cut, trimmed or dressed at the same time, but this will not be found a convenient arrangement in practice. C. E. Amos, of Southwark, London, England, and John Francis, of Penrhyn, North Wales, are the inventors of this improvement.

Skate Fastening.—This invention consists in the employment of revolving cam buttons attached to the sides of the runners and acting upon the ends of the straps which serve to fasten the skate to the foot in such a manner that by turning the cam button after the strap has been drawn tight, the end is firmly clamped between the edge of the slot in the runner, through which it passes, and the point of each cam button and the ordinary buckles or other tedious fastenings can be dispensed with. Geo. P. Schifflin, of New York city, is the inventor of this improvement.

Punching Press.—This invention consists in the combination with the rod or pitman which connects the main shaft of the press with the slide carrying the punch or slide of an adjustable eccentric and clamp in such a manner that by rotating said eccentric the position of the punch or cutter in relation to the work, can be adjusted with the greatest facility and with perfect accuracy, It consists, further, in the arrangement of a slide with triangular guides operating in two jaws cast solid with the stock of the press and held in place by a triangular gib, in such a manner that all the bearing points or surfaces of the jaws and of the carriage can be planed off by one operation and without changing the position of the piece to be planed on the bed of the planing machine, and consequently all these surfaces must be perfectly parallel; and furthermore, the set screws used to adjust the gib