## 

R. S. B., of Ill.-The best chemists regard it as settle that nitrogen forms a part of steel. Nitrogen and carbon co
to form cyanogen, and steel is considered a cyanide of iron.
J. B. F., of Conn.-" Anastatic Printing" is a term which has been used for printing with plates of zinc, prepared by etching and transferred copies of prints. A printed sheet of an engraved pon all the parts but those contawing the printer's ink, The acts pon all pressed smoothly upon a flat zinc plate, and is allowed the mainfora short period. The acid in the paper attacks and etches Il the rinc surface except those portions covered with the ink of the print, which being protected, are left in relief. The plate of ginc is hen washed with a solution of gum in weak phosplhoric acid, which wets only the portions that have been etched. A roller containin ithographer's ink is now passed over the plate, when the raised parts containing the transfer print take up the ink from the roller, while he etched portions are not elfected. A sheet of paper is now laid upon the $z$ inc plate, which is run into the press and an impression taken. It was anticipated at one period that this system of print hig would, in a great measure, supersede that of lithography with prepared stones, but such hopes have not been realized. We hav seen several very legible but somewhat coarse maps produced b nastatic printing.
G. W. C., of N. Y.-You will find full information respect ing the examination of engineers for the navy, the amount of the alaries, and a great deal of other usefur information about the American navy, on page 198, Vol. IV., present series of the Scien tific American. The Board for examining candidates for Navy Enfineers commenced a session on the 4 th of this month at the nav yard, Philadelphia.
M. C., of Pa.-Soluble glass would not answer, we be lieve, for coating the inside of petroleum oil liable to crack off when the barrels are rolled
C. L. D. G., of Me.-Three pounds of salt and half a pound of white copperas (sulphin G. Q. J., of Mass.-A knowledge of elementary chemistr would be a great advantage to you in practicing the art of varnish making. Misspratts Chemistry is not yet completeil: it is a very be a good work for you to study. A little essential oil, especially oil be a good work for you to study. A little essential oil, especially oil moldy
M. C. I., of C. W.-It is generally estimated that 5 -horse power will drive one run of mill-stones ; though at the Metropolitan Mills in this city it takes just 10-horse power to each run with the bolting machinery, \&c. Thirty-three thousand pounds of water per minute falling one foot gives 1 -horse power. Hence if the fall was 7 feet it would take $4,714 \mathrm{lbs}$., per minute, and with 10 feet $3,300 \mathrm{lbs}$. As your wheel would waste from 10 to 50 per cent of the power, the proper allowance must be made for this. An ordinary overshot wheel generally yields about 70 per cent of the whole power of the
E. S., of N. Y.-Fulton's first war steamer was provided with appliances to discharge steam and hot water into the vessel or an enemy, and thus convert it into a huge stewing.pan.
S. (.) \& Bros., of Ohio.-We are not acquainted with any other method of tempering the steel mold boards of plows to preven operation. Cover the surface with a paste of flour and salt, heat the mold boards slowly and carefully up to a low red heat, and then dip c.untiously into cold water or oil. Some makers of steel plows keep r.ultionsly into cold water or oil.
their modes of tempering secret.

Muley Saifs.-A correspondent desires to obtain infor mation respecting the best length of pitman for muley saws. Dif ferent opinions and practices prevail among sawyers respecting the length of pitman the length of strok. The experce of practica sawyers given to the public, would be of general benefit and lead to
the adoption of more uniform and correct proportions in mill gearing

## Money Received

At the Scientific American Office on account of Patent Omce
1861 :-
D. C. S., of Comn., $\$ 53$; L. S., of N. Y., $\$ 10$; R. L., of Mass., $\$ 20$ A. A., of Ohio, $\$ 20$; F'. L. H., of Vt., $\$ 40$; G. J., of N. Y., $\$ 20$; J. M O., of N. Y., $\$ 20 ;$ J. B. B., of Cal., $\$ 20 ;$ L. A. B., of N. Y., $\$ 20 ;$ W
S. M., of N. Y., $\$ 45$; I. G. S., of N. Y., $\$ 20$; G. F., of N. Y., $\$ 40$ C. Van H., of Mass., $\$ 25$; C. MeW., of Cal., $\$ 30$; E. т. \& J. H., N. Y., $\$ 22$; J. J. K., of Ill., $\$ 15$; W. R. P., of Olio, $\$ 15$; S. \& P., o
Conn., $\$ 15$; T. W., of Ill., $\$ 15$ J. M. F., of Ill., $\$ 15$; W. M., of Conn., $\$ 15$; T. W., of Ill., $\$ 15$; J. M. F., of Ill., $\$ 15$; W. M., of
Mass., $\$ 20$; J. P. R., of Iowa, $\$ 25$; L. B. L., of Cal., $\$ 30$; C. H. B., ot Mass., $\$ 30$; T. J. P., of Pa., $\$ 15$; A. W., of Pa., $\$ 15$; C. L. N., o N. Y., $\$ 15$; S. \& R., of N. Y., $\$ 30 ;$ W. H. A., of Conn., $\$ 15$; C. B. of N. Y., $\$ 15$; E. F., of N. Y., $\$ 15$; J. E., of Conn., $\$ 25$; J. G. W.,
of N. Y., $\$ 250$; J. L. L., of N. Y., $\$ 15$; W. M., of Ohio, $\$ 25$ W. W., of $\mathbf{N} . \mathrm{Y}_{\mathrm{Y}}, \$ 25$; II. J. P., of N. Y., $\$ 25$; T. J. W., of England, $\$ 70$ C. $\&$ M., of N. Y., $\$ 30$; W. O. L., of N. Y., $\$ 25$

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Pat ent Offlce from Aug. 2s, to Wednesday, Sept. 4, 1861 :
J. C. C., of Conn.; C. McW., of Cal.; N. B., of Ky.; G. A. R., of
Germany ( 2 cases); C. \& M., of N. Y.; J. G. W., of N. Y.; Germany (2 cases); C. \& M., of N. Y.; J. G. W., of N. Y.; C. A. W. of Mass. ; L. B. L., of Cal.; J. P. R., of Inwa; G. F., of N. Y.; C. L.
of Ohıo W. M., of Mass.; W. M., of Ohio; E. P. R., of N. Y. of Ohıo W. M., of Nass.; W. M., of Ohio; E. P. R., of N. Y. (2 cases); J. H. S., of N. J.; C. I. B., of Mass. ; L. T., of N. Y.; C Van H., of Mass.; J. W. II., of N. S.; W. P., of N. Y.; T. J. W., of
England (2 cases); W. O. L., of N. Y.; H. C., of England; O. B., of England (2 cases); W. O
Ohto; H. J. P., of N. Y.

## New Books and Periodicals Received.

The Union Forever. - We have received from the pub

 Together with Pinportant Documenis, Ex tracts trom Remark ahl,
Speches, \&c., \&ce." This is a ery good current history of the war, in
conventent form for preservation.

INSTRUCTIONS ABOUT EUROPEAN PATENTS, With a Synopsis of the Patent Laws of the Various Countries.
american inventors should bear in mind that, as a general rule, any invention which is valuable to the pat entee in this ountry is worth equally as much in England and some other fureign countries. Four patents-American, English, French nd Belgian-will secure an inventor exclusive monopoly to his discov facilities of business and steam communication are such that patent can be obtained abroad by our citizens almost as easiiy as at home. The majority of all patents taken out by Americansin foreign countrie re obtained through the Scientilic American Patent Agency w have established agencies at all the principal European seats of gov ernment, and obtan patents in Great Britain, France, Belgium, Prus sia, Austria, Spain, \&c., with promptness and dispatch.
It is generally much better to apply for foreign pate simultane usly with the application here; or, if this cannot be conveniently done, as little time as possible should be lostafter the patent is issued s the aws in some foreign countries allow patents to any one who firs
makes the application, and in this way many inventors are deprived o ralid patents or their own inventions.
Many valuable inventions are yearly introduced into Europe from the
United State, by parties ever on the alert to pick up whatever they can lay their hands upon which may seem usetul.
Models are not required in any Eurue
Models are not required in any Europlean country, but the utmos
Mare and experience is necessary in the preparation of each case. GREAT BRITAIN.
Patents for inventions under the new law, as amended by the act of Oct.1, 1852, and now in operation, include the United Kingdom of right to make, use, exercise or vend. This is conceded to the inventor right to make, use, exercise or venc. This is conceded to the inventor
or the introducer for a period of fourteen years, , subject, atter the pat
ent 1 g granted, and the tirst expenses paid, tor a government tax twice
and ent 1 granted, and the tirst expenses paid, to a, government tax twice
during tis existence-once withint hree years, and once again wuthin
oen There is no provision in the English law requiring that a patented
 quished its right to grant patentstor any of its colonies each colony
being permitted to regulate nts orn patent system. it antent has
been previously taken out in a forelgn country, the British patent will being permitted to regulate tis own pait
been previously taken out in a foreign coot
expire with it.
Patents in France are granted for a term of fifteen years, unless the invention has been previously secured by patent in some other coun ry; in such case, it must take date with and expire with the previous patent. After the patent $\mathbf{s}$ issued, the French government require
the payment of a small tax each year so long as the patent is kept alive the two years' time is given to put the invention npatented into practice,
It should be borne in mind that, although the French law does not require that the applicant should make oath to his papers, yet if a pat
ent should be obtained by any other person than the inventor, upon
proof being adduced to this effect before the proper tribunal, the pat ent would be declared illegal. BELGIUM.
Patents in Belgium are granted for twenty years, or if previonsly patented in anothercountry, they expire with the date thercof. The working of the invention must take place within one year from date
of patent; but an extension for an additional year may be obtained on led to take out patents. ${ }^{\text {pen }}$ NE
Patents are granted by the Royal Institute of the Netherlands to natives or foreigners represented by a resident subject, which extend to a preriod of about two years, within which time the invention must
be brought into use, and upon payment of an additionaltax, a patent
will be granted to will be granted to complete its whole term of fifteen years. Unless
hese conditions are complied with, the patent cease. prussia.
Applications for patents in Prussia are examined by the Royal Poly echnic Commission, and unless there is novelty in the invention, the applicant's petition will be denied; and if it is granted, the invention
must be worked within six months anterward. A resp, ite hnvever, ot
sis ix additional months may be obtaineit,
or it can be shown.
Austrian patents are grantedfor a term of fifteen years, upon the payment of 1,000 florins, or about $\$ 500$ in American currency. This sum, however, is not all required to be pald in advance. It is usual to
pay the tax for the thrst five yearsupon the deposit of the papers, and Phay patent must be worked within itstirst year. The Emperor can ex-
tend the patent and privilege of working by special grant. In order to
to tend the patent and privilege of working by special grant. In order to
obtain a patent in Austria, an authenticated copy of the original Let. ters Patent must be produced.

SPAIN.
The duration of a Spanish patent of importation is five years, and can be prolonged to ten years; aud the invention is to be worked within
one year and one day. one year and one day.
To obtain a Cuban patent requres a special application and an extra RUSSIA
Since the ciose of the Crimean war, considerable attention has been given to Russian patents by Americans. Russia is a country rich in or certan kinds of improvements. The present Emperor is very liberaliy disposed toward inventors, and as an evidence of the interest
which hetakes in the progress of mechanic arts, we may state that
we have had visits from two distinguished Russian sremens, spocially we have hat his Emperor to examine Amdrican inventions.' As Rest
sent out by
sian patents are expensive, and somewhat diflicult ontain, we do no Cake it upon ourselves to advise applications; inventors must judge for
themselves; and this remark applies not only to Russia, but also to all other foreign countries. CANADA.
Patents of invention are granted only to actual residents of Canada and British subjects. Under the general Patent Law of Canada, an American oannot procure a patent for his invention there. The only way
in which he can do so is by virtue of a special act of Parliamen $t$, which is n which he can do so is by virtue of a special act or Parliamen t, which is
very di ficult, uncertain, and expensive to obtain. Several zealous
riends of reform in Canada are working earnestly to bring about a re iprocal law, but their efforts have husfar pr BRITISH INDIA.
The date of the law, Feb. 28, 856 ; duration of a patent, fourteen years. Invention must be worked within two years from date of petition. Privilege granted only to the original inventor or his authorized
agent in India.

Duration of patent, from five to ten years. Invention must be worked withn one year from date of grant. Careful examination made before granting a patent.

Duration of patent, ten years; and in case of foreign patent having been previonsly obtained, an authenticated onpy of said patent mus be produced. Invention must be worked within six mouths from date of grant.
sardinia.
Duration of patent, from one to fifteen years. Patents for five year r less must be worked within one year, and all others within two NORWAY AND SWEDEN.
Duration of patent, three years, at le:ast; fificen at most, according or the nature and importance of the invention. latents for foreign
inentions not to exceed the term granted abroal, and to be wouko within one, two or four years.

Dite of law, March 31, 1854. Careful examination made ly compe. tent persons previous to issue of patent, which, when grauted, extends fourteen years. Imported inventions are valid according to dura ion of foreign patent. It would require from twelve to eightem Palrises holding foreign patents secened through ont agency will be
otified irom time to time of the condition of their cases. general remarks.
While it is true of most of the European countries herein specifiect, While it is true of most of the European countries herein specified,
hat the system of examination is not so rigid as that practised in this country, yet it is vastly important that inventors should have their apers prepared only by the most competent solicitors, in order tha hey may stand the test of a searching legal examination; as it is a mmon practice when a patentee finds a purchaser for his invention or the latter to canse such examination to be made before he will ac ept the title.
ery unsafe to entrust a useful invention to any other than solicitor of known integrity and ability. Inventors should beware of peculators, whether in the guise of patent agents or patent lowkers they cannot ordinarly be trusted with valuable inventoms.
 AMERCAN, and during this time they have been entrusted with somene of
he most important inventions of the age and it is mather of par

 mong the oldest and most reliable Patent
hey williave no connection with any other.
caution.-It has become a somewh

 arties, a nd thus be detrauded of their rights. It is mach siff for in
entors to entrust their cases to the care of a competent, relialile algen $t$ lome.
Fexs.
Fezs. - The fees required by us for the preparation of foreign appli-
ationsare not the satuc in every cast; as, in some instimets, when that

 respecting the expulises ot obtainug foreign patents.
All letters shoullit be addressed 0 Messrs. MUNN \& CO., No. 37
Park- ow, New York.

## CHANGE IN THE PATENT LAWS.

## NEW ARRANGEMENTS--PATENTS GRANTED FOR

 SEVENTEEN YEARS.The new Patent Laws, recently enacted by Congress, ar ow in full force, and promise to be of great benefit to all parties who e concerned in new inventions.
The duration of patents granted under the new act is prolonged $t$ eventeen years, and the government fee required on filing an appli cation for a patent is reduced froin $\mathbf{\$ 3 0}$ down to $\mathbf{\$ 1 5}$. Other changes

The law abolishes discrimination in fees required of foreigners, ex eeptin reference to such countries as discriminate against citizens of he United States-thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, th njoy all the privileges of our patent system (exceptin cases of designs on the a bove terms.
During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been
 confidence reposed in our Agency by the Inventors throughout the ntry, we would state that we have acted as ggents formore that IFTEEN THOUSAND Inventors: In fact, the publishers of this per have become : dentifed with the whole brotherhond of Inventor d Patentees, at home and abroad. Thousands of Inventors o whom we have taken out Patents have addressed to us most flattering stimonials for the services we have rendered them, and the weait which has inured to the Inventors whose Pate the SCIENTIFIC MERICAN, would amount to many millions of dollars 1 We would tate that we never had a more efficient co ps of Draughtsmen and pecification Writers than are employed at p esent in our extensiv flices, and we are prepared to attend to Patent business of all kinds the quickest time and on the most liberal terms.

## Rejected Applications.

We are prepared to undertake the investigation and prosecution of re ected cases, on reasonable terms. The close proximity of our Wash ington Agency to the Patent Ofice affords us rare opportunities for the xamination and comparison of references, models, drawings, docu ments, \&c. Our success in the prosecution of rejected cases has been
very great. The principal portion of our charge is generally left de. endent upon the final result.
All porsons having rejected cases which they desire to have prose ated are invited to correspond with us on the subject, givirg a hrif history of their case, inclosing the omicial letters, \&e.

## Testimonials.

The annexed letters, from the last three Commissioner of Patents, we commend to the perusal of all persons interested in obtaining Pat ents:-
Messrs. MONN \& Co.:-I take pleasure in stating that, while I held
 doubt that the public confidence thus indicated has been tully deserved
as I have always observed, in all your intercourse with the Ollice, $\begin{aligned} & \text { marked degree of promptness, skill und fidelity to the interests of your } \\ & \text { employers. } \\ & \text { Yours, very truly, }\end{aligned}$ CHAS, MASON.
Immediately after the appointment of Mr. Holt to the office of Post
master-General of the United States, he addressed to us the subjoined very gratifying testimonial:-
Messrs. MUNN Mf Co.:-I affords me much pleasure to bear estimony
to the able and efficient manner in which you have discharged your to the able and efficient manner in which you have discharged your
duties of Solicitors of Patents while I had the honor of holding the ofice
of Commmissioner. Your business was very large, and you sustaine of Commissioner. Your business was very large, and you sustained
(and, Ioubt not, justly deserved the reputation of enery, marked
alinity and uncompromising fidelity in performing your prof essional
engagements.

Mrssrs. Munk \& Co.:-Gentleman: It gives me much pleasure to say that, during the time of my holding the onlice of Commissioner of Pat
ents, a very large proportuon of the business of inventors before the Pat ent, Oince was tran sacted through your a agency, and that I have ever
found you faithful and devoted to the interests, of your clients, as well found you taithfila and deroted to the interests of your clients, as well
as eminently qualififed op perform the duties of Patent Autorneys with
skill and accuracy. Very respectfully,

The Validity of Patents.
Persons who are about purchasing Patent property, or Patentes wh are about erecting extensive works for manufacturing under their Pat ents, should have their claims examined carefully by competent attor neys, to see if they are not likely to infringe some existing Patent, be Patents, after careful examination into the facts, can be had for a reasonabie remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention nd being informed of the points on which an opinion is solicited
urther particulars, address MU NN \& CO., No. 37 Park-row, New York.

## The Examination of Inventions

Persons having conceived an idea which they think may be patent be, are adit ith fuld skion, an nbmilully , hind and a reply written , MUNN \& CO. No. 37 Park wow, Ne York

## Preliminary Examinations at the Patent Office

The advice we render gratuitously upon examining an invention does not extend to a search at the Pater $t$ Olfice, to see if a like invention ans been presented there, but is an opinion based upon what knowledge Offce. But for a fee of $\$ 5$, accompanied with a model or drawing and escription, we have a specialsearch made at the United States Paten Office, and a report setting forth the prospects of obtaining a Paten sc., made up and mailed to the Inventor, with a pamphlet, giving in structions for further proceedings. These preliminary examinations Washington, by experienced and competent persons. Over 1,500 o hese examinations were madelast year through this Omice, and as easure of prudence and economy, we usually advise Inventors to have preliminary examination made. Address MUNN $\&$ CO., No. Park-row, New York.

Caverts.
Persons desiring to file a Caveat can have the papers prepared in the hortest time by sending a sketch and description of the invention The government fee for a Caveat, under the new law, is $\$ 10$. A pam hiet of ad aicergans New York.

## Foreign Patents.

lyengaged in the preparation and securing ot Patents in the various European countries. For the transaction of this business, we have ofices at Nos. 66 Chancery-lane, London; 29 Boule ard St. Martin, Paris; and 26 Rue des Eperoniliers, Brussels. We think we can safely say that thref. fourtus of all the European Pat ents secured to A merican citizens are procured through our Agency.
Inventors will do well to bear in mind that the English law does not Inventors will do well to bear in mind that the English law does not
limit the issue of Patents to Inventors. Any one can take out a Patent there.
Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the re quirements of different Patent Offices, \&c., may be had gratis upon ap plication at our principal oflice, No. 37 Park-row, New York, or eithe of our Branch Omices.

## Extension of Patents

a uable Patents are annually expiring which might be extended and bring fortunes to the households of many a poor Inventor or his family We have had much experience in procuring the extension of Patents na, as an erid our surs in this that, in all our immense practice, we have lost but tico cases,
were unsuccessful from causes entirely beyond our control.
It is important that extension cases should be managed by attorneys of the utmost skill to insure success. All documents connected with ruth exhibited in the papers is very liable to defeat the application Of all business connected with Patents, it is most important tha extensions should be intrusted only to those who have had long expe rience, and understand the kind of evidence to be furnished the Paten enice, and the manner of presenting it. The heirs of a deceased Pat
entee may apply for an extension. Parties should arrange for an aplication foran extension at least six months before the expiration of the Patent
For furtherinformation as to terms and mode of procedure in ob taining
It would require many columns to detail all the ways in which the nventor or Patentee may be served at our ofices. We cordially invite all who have anything to do with Patent property or inventions to cal at our extensive omices, No. 37 Park-row, New York, where any ques Ions regarding the rights of Patentees, will be cheerfully answered. Oommunications and remittances by mail, and models by express
prepaid), should be addressed to MUNN \& CO., No. 37 Park-row, New York.

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The tales to be delivered at the rooms of the Society on or befor
Sept.11, 1861. The prenumms will be awarded by the tanding Com Sept.11, 1861. The prennums will be awarded by the Standing corn Her, and paid as soon as a warded
 ioht tor etain the sime at their pleasure, on payment of a fairprice
The thax cot on will be open for public examnation at the Exhibi ion of Vegetables, Fruits and Flowers, to be held by he Society a
Railroad Hall, September 11, 1:61.
C. RTAPLES, Sec'y. Communications upon this subject may be addressed to the Secre-
ary of the Society, or to either of the following persons ast the Speclal
ommitte of the Societyupon Flax Culture, dc.
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His Ex cellency, Wiiliam Sprague, Proridence.
Bailey W. Evars,
Rovert S . Burrough,
Edward IIarris, Wo
Edward Harris, Woonsocket,
Elisha Dyer, Srovidence, Chairman.
Lyman B. Hrieze,
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chant, John Barneart, farmer; E. Van Dorke cordwainer.
Sworn to before John B. Wilbor, Jusice of Peace.

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Scott Russell's Iron War Ships and Batteries.
On page 138 of the present volume of the Scientific American, we directed attention to "improvements wanted" in the construction of iron-plated ships, and we said : "What is wanted is some better mode of fastening iron plates to a ship's side." Since then our London cotemporaries, the Engineer and Me chanics' Magazine, have come to hand, illustrated with engravings of recent improvements relating to this very subject, for which no less eminent a person than Mr. Scott Russell, builder of the Great Eastern, has lately obtained patents. As iron shipbuilding, especially as it relates to iron-plated war vessels, is almost a new art and as it is probable that it will become universal, it opens up a very extensive prospect to inventors for making new improvements.

By thus using the requisite plates of iron to resist shell and shot, they will be found to increase, and not as heretofore, to reduce the strength of the struc ture ; and such protecting plates will not be injured by bolt holes being made through them, in order to their being fixed by bolts to the structure, as heretofore has been the practice. Or, instead of filling the cells with a combination of thick protecting plates of iron and wood filling, the cells may be entirely filled with iron plates of such a thickness as may be required, in which case it may be found desirable to have longitudinal cells only, and to arrange the butts of the filling plates in such a manner that the butts of no two strakes in the same cell are in the same plane, technically called " breaking the joints."
Fig. 2 shows a vertical section of the side of a ship
the skin or plating of the side of a ship, a number of recesses will be formed, each of a depth suitable for receiving a thick protecting plate or plates, at the same time allowing sufficient material to be hammered or bent over the edges of the thick protecting plates. The holding of the protecting plates to the skin or plating of the structure may, by these means, be very advantageously accomplished, and in a superior manner to that heretofore practiced, when holes have been formed in the protecting plates, and also in the frame to receive bolts, thus tending to weaken both the plates and the frame.
Figs. 4 and 5 show two scctions of means of fixing protecting plates to the outer skin of a vessel or of a fortification. In these figures, the outer skin is shown to be of more than one thickness. In some cases,


The British government has expended hundreds of thousands of dollars in experimenting with ironplated vessels, and yet there are many defectsin their great frigates, the Warrior and Black Prince. It re quires practice to develop defects, and inventive genius to provide remedies. Mr. Scott Russell, in the accompanying illustrations, has presented a new method of fastening and plating war vessels. The improvements, he states, are also applicable to floating and land batteries.
They are constructed double, with an inner and outer skin or plating, and the space between the two skins is divided by longitudinal partitions only, or upright partitions only, as may be required, which connect the two skins and produce numerous cells. Suitable angle iron is used in the structure. Into each of these cells, which come near to or above the line of flotation of a ship or floating battery, or which in a land battery is desired to be rendered more or less strong to resist shell and shot, a thick protecting plate of iron, in size suitable to fit into the cell, is introduced. The space between the inner surface of the thick protecting plate and the outer surface of the inner skin or plating is filled with wood, so that the thick protecting plate of iron introduced into the cell will be securely retained in position without other fastenings. The inner as well as the outer skin or plating, as well as the longitudinal and upright partitions, should, when for ships or floating batteries, be made watertight in all parts.
Fig. 1 of the accompanying engravings shows a traverse section of a part of the side of a ship; $a$ is the outer plating or skin of the vessel, and $b$ is the inner plating or skin, and they are shown to be connected by longitudinal partitions, $c c$, and it is preferred that both longitudinal and upright partitions and angle iron should be used ; $d d$ is the protecting plate, there being a filling plate, e e, intervened between the outer skin and the protecting plate, or the surface of the protecting plate may be planed or otherwise formed to fit close to the angle iron and the outer skin; $f f$ are fillings of wood or of any other suitable and comparatively elastic material. In place of using one thick plate of iron in a cell, the requisite thickness and substance may be obtained by introducing two or more plates in like manner to what is above described in respect to a single protecting plate.
or of a fortification wherein protecting plates are employed one over the other, in such manner as to break joint. The plating of the inner and outer skin is riveted in the ordinary manner, and, if desired, these may be applied "through" bolts or rivets, so that the outer skin and inner skin, together with the interposed protecting plates, may be all fixed together, and to the inner ribs or framing of angle iron, whether of $\mathbf{L}$ or $\mathbf{T}$, or other form. In certain cases, upright webs only are used, and the cells are then filled with bars or plates of iron placed with their edges against the inner surface of the outer skin or plating, and the outer surface of the inner skin or plating; these bars or plates may be placed close together, thus entirely filling up the cells, or there may in some cases be spaces left between the bars. These spaces may be filled with cement, wood or other substance desired, and the bars may be of any shape or size that may enable them to add strength to each other and to the general structure.
Fig. 3 shows a section which may either represent a horizontal or a vertical section, according as the angle iron or other partitions are used in a vertical or horizontal direction. $a$ is the outer plating or skin, and $b$ is the inner plating or skin, having between them angle iron partitions; $d d$ are the projecting bars or plates, which are bent so as to fit into and on each other. The edges of the plates or bars, $d d$, it will be seen, comeagainst the inner and outer platings.
Thus, in using two or double angle irons back to back in this way, one will be hammered or folded over or bent in one direction to hold one edge of one thick protecting plate or plates, and the other will be hammered or bent over in the opposite direction, so as to hold one edge of a neighboring thick protecting plate or plates, the other edges of the protecting plate or plates being held in a similar manner by other angle or other irons. Or, by using a single angle or $\mathbf{T}$-iron, the edges of the thick protecting plates being rounded or chamfered at the angle far thest from the skin or plating, that part of the angle or $\mathbf{T}$-iron that projects beyond the thick protecting plate or plates may be hammered or riveted down so as to hold the adjoining edges of two thick protecting plates.
From the above description, it will be understood that by thus using angle or suitably-formed iron on
the requisite plates of iron for protecting a ship or battery from shell and shot are fixed by means of angle or suitably-formed iron fixed to the skin or plating, the projecting ribs of such angle iron being made suitable not only for receiving the desired thickness of protecting plate on either side of each of such ribs, but also to allow of the rib to project beyond the protecting plates on either side.
Fig. 6 shows a section of an arrangement where two angle irons, $c c$, are used back to back, to which the outer skin or plating is riveted; these angle irons extend beyond the protecting plates, $d d$, which may be single plates of considerable thickness, as shown, or two or more plates may be used to make up the required thickness ; $g g$ are other angle irons, which, being riveted on either side, securely hold the whole together.
Fig. 7 shows another section where, in place of using two single angle irons back to back, $L$ or $T$ angle iron may be used; and this figure also shows the use of protecting plating outside of the skin, $a$, as well as the inside thereof, the direction of the inner and outer protecting plates being reversed, and, by through bolts or rivets, the outer and inner protecting plates may be secured to each other ; and to the angle iron, $h$, is a filling plate, when a single thick inner protecting plate is used, such filling plate, $h$, making up for the thickness of the angle iron. The great object is to avoid the injurious effects of having the protecting plates and the structure to which they are fixed perforated with numerous holes for the reception of bolts; and with this object, through bolts are employed as sparingly as may be. Screw bolts may be used, introduced from the interior, the inner surfaces of the thick protecting plates, in such cases, being tapped to receive the screws; the screws, when thus introduced from the interior, should not pass through the protecting plates, so as to appear on the outer surface thereof.
The edges of the other plates may be connected together by means of tongues and feathers formed on their edges, or by means of iron dowels, and then a certain number of through bolts used to tie the whole structure together. This will be understood by reference to Fig. 8, which represents a section of part of a ship or vessel, or of a fortification so constructed or put together.

