ence between this and Fig. 15 being that the ring is made double to receive an unmounted lens.

Fig. 17 shows a Bunsen burner, formed of a common burner, having a surrounding tube made of wire wound in a spiral, and drawn apart near the top of the burner to admit the air, which mingles with the gas before it is consumed at the upper end of the spiral.

Fig. 18 represents a connector for electrical wires, which explains itself. The part with a double loop may be attached to a fixed object by means of a screw. Another electrical connector, shown in Fig. 19, one part of which consists of a spiral having an eye formed at each end for receiving the screws which fasten it to its support; the other part is simply a straight wire having an eye at one end. The connection is made by inserting the straight end in the spiral. To increase the friction of the two parts, either of them may be curved more or less.

A microscope stand is shown in Fig. 20. The magnifier is supported in the ring *o*. The ring, *p*, supports the slide, and the double ring, *q*, receives a piece of looking-glass or polished metal, which serves as a reflector.

Fig. 21 shows a set of aluminum grain weights in common use. The straight wire is a one grain weight, the one with a single bend is a two grain weight, the one having two bends and forming a triangle is a three grain weight, and so on. Figs. 22 and 23 are articles now literally turned out by the million. It is a great convenience to have one of these inexpensive little corkscrews in every cork that is drawn occasionally, thus saving the trouble of frequently inserting and removing the cork screw. The cork puller shown in Fig. 24 is old and well known, but none the less useful for removing corks that have been pushed into the bottle, and for holding a cloth or sponge for cleaning tubes, flasks, etc.

Fig. 25 shows a stand for test tubes. The wire is formed into series of loops and twisted together at *r* to form legs. A very useful support for flexible tubes is shown in Fig. 26. It consists of a wire formed into a loop and having its ends bent in opposite directions to form spirals. A rubber tube supported by this device cannot bend so short as to injure it. Most of the articles described above may be made to the best advantage from tinned wire, as it possesses sufficient stiffness to spring well and at the same time is not so stiff as to prevent it from being bent into almost any desired form. Besides this the tin coating protects the wire from corrosion and gives it a good appearance.

THE STEAM BOILER SMITH.

Among the large number of notable machines inspected at the works of the Barrow Shipbuilding Company during the recent visit of the Institution of Mechanical Engineers, few created greater interest than the flanging hammer made by Messrs. Campbells & Hunter, Leeds (England), and illustrated herewith.

Flanging is a favorite method of dealing with certain joints in boilers of all kinds in these days, and the inclination is to a still further adoption of this effective operation; and although the flanging of flues has been done by machines specially constructed for that particular purpose, the bulk of flanging operations has been performed by hand, and no machine of a comprehensive character has been introduced before this.

In Fig. 1 we illustrate the operation of flue flanging. Here a flanging block, with separate anvil, is mounted upon a swiveling slide, upon which it can be moved as required. This block has a projecting angular face in front, upon which is carried an adjustable roller or rollers for taking the end thrust of the flues, plates, etc. On each side of the roller carriage are two wrought iron arms, and two others on each side of the anvil block, each arm having a small runner at the outside end; these arms keep the flue square, and the runners assist it when being turned round. For turning the flue round when flanging, two chain barrels with ratchet motion and sufficient chain are provided; these barrels are fixed in frames upon the foundation plate, one on either side of the flue; the chain is given a lap around the flue and is wound on to the empty barrel as it unwinds from the full one, or the flue can be revolved easily by hand. Flues up to four feet in diameter can be done at one heat, and so accurately finished that the leveling block is not required, and although they may have been out of truth before, when flanged they are perfectly circular. The flues of the steamship City of Rome were all done by the machine at the above named works.

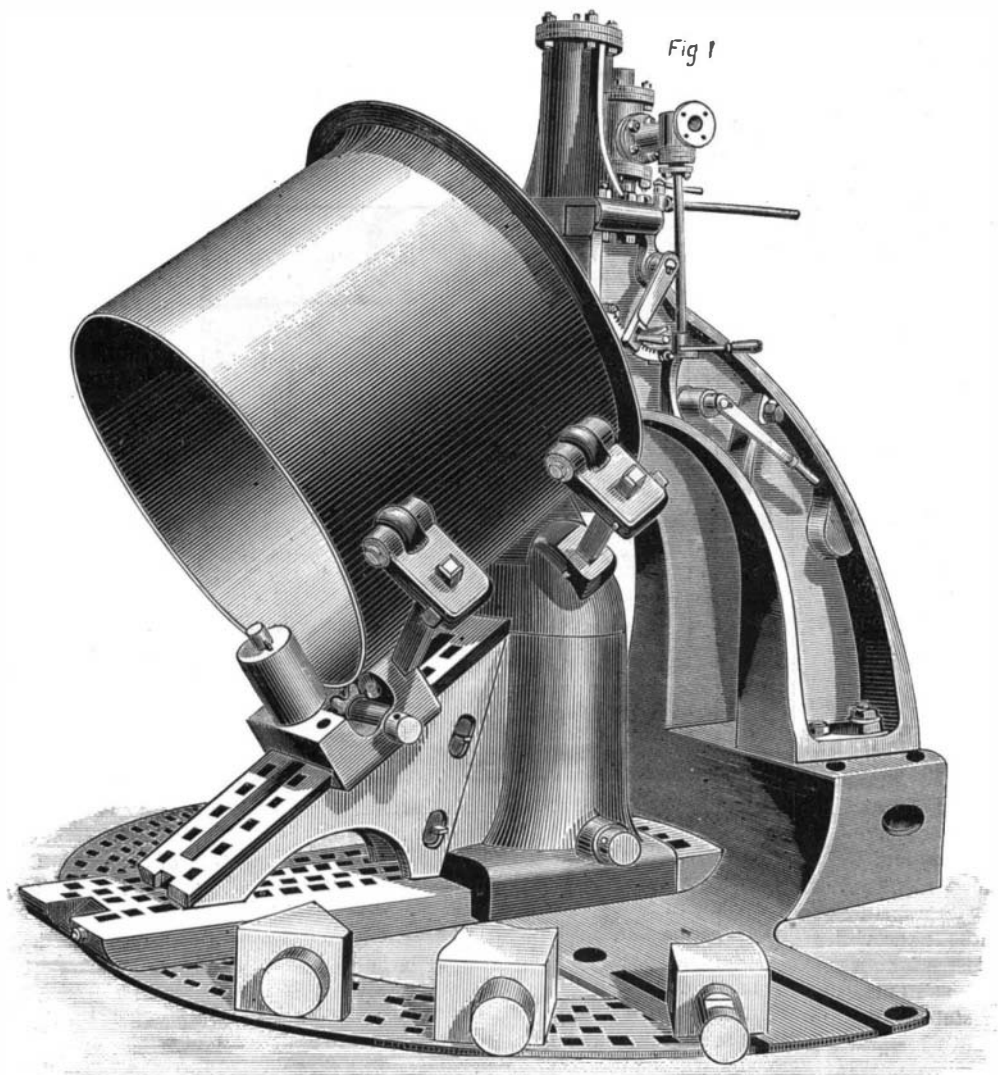


Fig. 1.—FLANGING HAMMER.

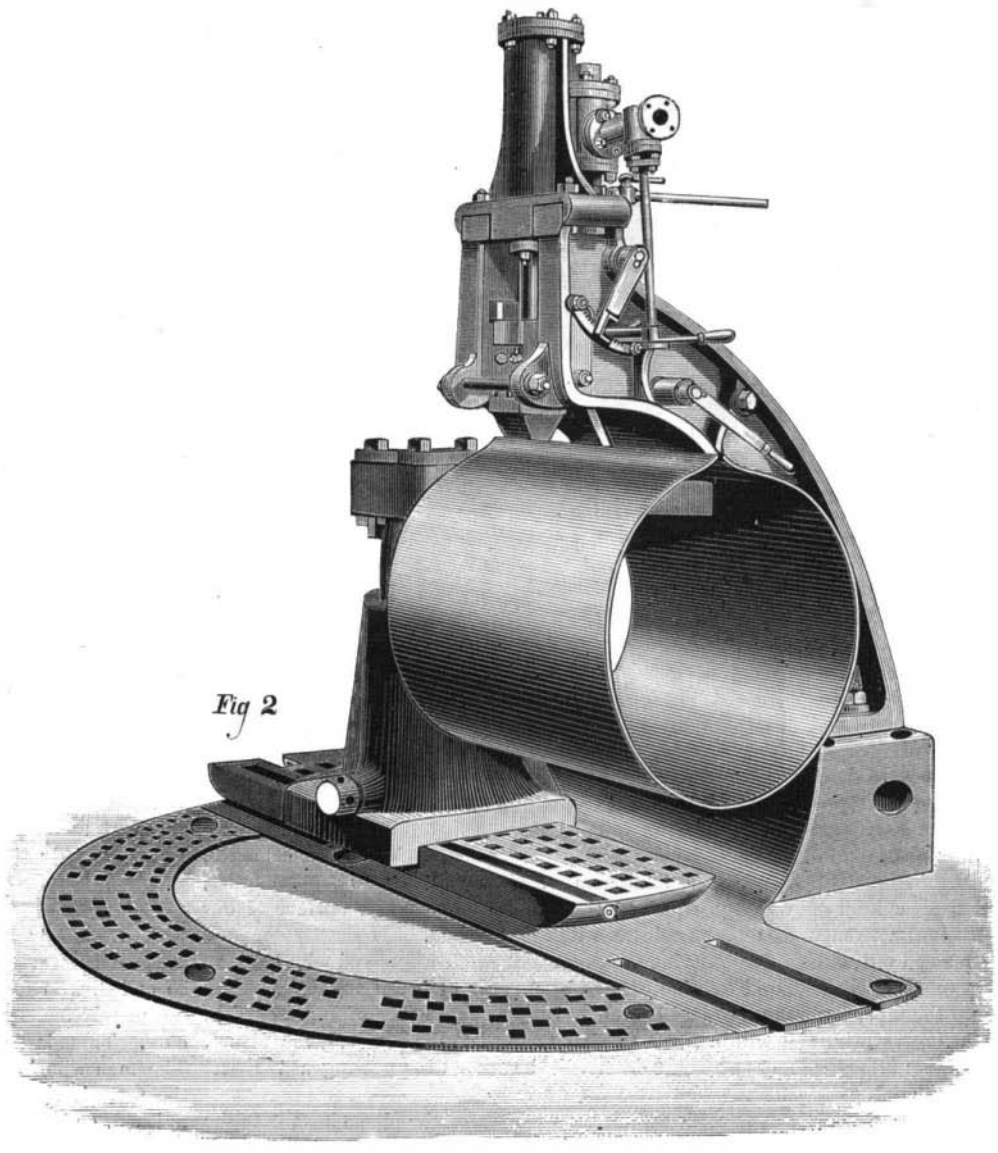


Fig. 2.—WELDING HAMMER.

The anvil block is arranged to admit a variety of anvils for flanging end plates up to fifteen feet in diameter, tube plates, dished crown plates, etc., and for setting back the bottoms of vertical fire boxes, and the guide block will admit heads to suit.

In Fig. 2 we illustrate the machine as used for welding purposes. In doing this work a welding block is mounted on the long slide; this block carries a welding bar, upon which saddles may be fitted for different diameters. The block and bar carrying the flue are traversed along the bottom slide, and as much length as can be heated may be welded at once. The usefulness of the hammer has been further developed by the Leeds Forge Company in the manufacture of their well known Fox's corrugated flues, the diameters of which at the ends are reduced upon it prior to flanging.

By the foregoing operations it will be seen that the machine covers a great range of work of a kindred character where the easily-regulated blow of the hammer is necessary for the varying conditions of hot iron.—*The Engineer.*

Manual Labor vs. Machinery.

A fear seems to have taken possession of many minds lest by the inventive genius of man machinery might be produced capable of accomplishing so much as to remove the necessity for manual labor, and, as a consequence, lest they themselves should be unable to gain a livelihood. So widely have these views been imbibed, even by men of apparent intelligence of a comparatively high order, that they have advocated in strong terms, upon the rostrum and elsewhere, the desirability of not only banishing new machinery, but inventors also. This opposition has made the path of those who possessed sufficient enterprise to lead them to devise new methods, and new apparatus to effect the same, not only unpleasant, but generally unprofitable; whereas if mankind had been more fully endowed with wisdom and brotherly love a very different state of affairs would have existed.

The cry that "the rich are growing richer and the poor are growing poorer," as the result of the introduction of new machinery is not true. In fact, the use of machinery is constantly improving the condition of all classes; and the advance that has been made by the masses toward a higher civilization the last half century is simply wonderful, and is due to the development of the inventive genius of man. That there is not an equitable distribution of the products of the farm, the mine, and the manufactory cannot be denied. But where does the fault lie? Not with the machinery either of old or new design.

Let the reader look back with the aid of proper books of reference to the condition of things fifty years ago. At that time it was beginning to dawn upon the minds of the most progressive that steam railways were a possibility; but everything for the next ten years was in the crudest possible condition, no more like the comfortable railways of to-day than a two-wheel springless ox cart is like a modern pleasure carriage. Then travel was slow and tedious for all classes, rich

or poor. Now the rich, and the poor as well, may travel five hundred miles comfortably in twenty-four hours. Then the mails were weeks in going and coming where days will now suffice. Then telegraphs were unknown, but now any one may send a message to a friend hundreds of miles away for a few cents, and get an answer almost at once, whereas it formerly required several days if not weeks for a message to go and come. These and hundreds of other improvements that have been inaugurated are open to the use and benefit of all, and have greatly lessened the most arduous work of the laboring man, while the necessity for his services is in no wise less now than formerly. In fact it may be truly said that the day laborer can now enjoy many things that the wealthiest men half a century ago could not obtain. In looking at the facts that history presents, no man of a sound and candid mind can honestly deny that, whatever of seeming or *temporary* disadvantages may have fallen upon manual labor, by the introduction of machinery, all have been enabled to reap great advantage. The conclusion must, therefore, be that the introduction of new and improved methods of production should be encouraged, and that there is no real ground of warfare between manual labor and machinery, demagogues to the contrary notwithstanding.—*New York Mercantile Journal.*

Mechanical Progress.

It is an interesting feature of our times to note the rapid progress which has been made in manufacturing ingenuity and scientific skill in the production of substitutes for expensive or scarce raw materials and articles in general demand. It cannot be controverted that art is fast invading the domain of nature. Chemistry is enabling us to replace animal and vegetable dyes, and to form artificial gems or creditable imitations of them, which, as ornaments, answer every purpose. Mineral oils replace animal and vegetable ones for illuminating purposes, and the electric light is slowly superseding the use of noxious and costly gas. The expensive and dangerous whale fishery need no longer be pursued, nor the African deadly jungle penetrated for ivory. The sea tortoise no longer lures the adventurous sailors, nor are the ostriches of the desert hunted at the sacrifice of health and often of life itself. These genuine products have been so long in universal use as to become necessities of our civilization, unless very similar articles can be ingeniously substituted for them.

Chemistry and science have enabled us to manufacture our own tortoise shell, ivory, and feathers, without the risk of visiting wild jungles and arctic or tropical seas for our supplies. In addition to the above, the *American Cultivator* proceeds to enumerate some of the most successful artificial products which are now extensively manufactured, and which take the place, to a large extent, of more expensive genuine substances. A half dozen available substitutes for whalebone are manufactured. Ivory, so extensively in use, is superseded by celluloid. Piano and organ keys, billiard balls, hand mirrors, and handles of knives and forks, are nearly all made of this ingenious chemical substitute for ivory. In the imitation of tortoise shell, it is made into combs, card cases, napkin rings, and the like; while the pink coral, so popular with jewelers and ladies, is imitated by it to perfection.

Ostrich feathers, ever the court plumes of fashion, and held formerly at prices which only admitted of their use by the wealthy few, are now eclipsed in beauty and durability by the ingenious hand of skilled manufacture. A compound of silk or celluloid, spun glass, and other materials is now so cunningly combined as to be equally desirable with the genuine ostrich feathers, and very close examination is required to detect the original from the substitute. Artificial stone and marble are made to any extent, actually rivaling the originals in strength, beauty, and durability. Artificial alizarine is now substituted for the natural product of madder. It is not much more than one-third the cost of madder as originally supplied from the dye-root. We might, adds the editor in closing his article, find plenty of other similar examples to impress the fact of our subject, namely, the rapid mechanical and chemical progess of the times.

The "Ticker" in Wall Street.

Joaquin Miller relates the following scene familiar to most New Yorkers, but not to those who are less acquainted in the ways of this metropolis or the mysteries of Wall street:

"I went to a broker whom I had met at the Union Club," says Mr. Miller, "and told him what I wanted to learn. He kindly took hold of the tape which continually streams out from the 'ticker,' as the little wheel of fortune is called, which constantly records the rise and decline of stocks, and tried to explain all about it.

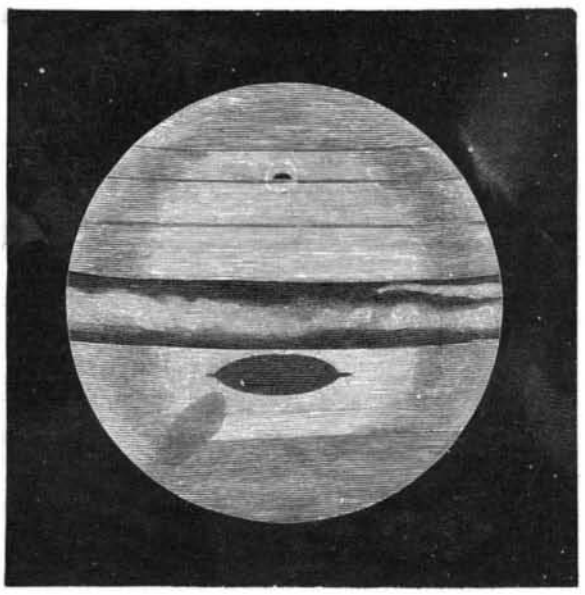
"I found it impossible to get interested. There were about 200 different names of stocks on the list. These were represented by one, two, or three letters, or figures, or some sort of abbreviated word that I could not understand or distinguish, and I was constantly getting confused.

"Around this 'ticker' gathered and grouped a knot of eager, nervous, and anxious men. Ten, fifteen, or twenty at a time would clutch at the tape, as it streamed out with its endless lines of quotations, and mutter to themselves, jabber at each other, swear like pirates, drop the tape, and dash away. Others would dart in, clutch the tape, swear or chuckle, as their fortunes went, wheel about, give orders to their broker to buy or sell, as they prophesied the future of the market; and so it went on all day from 10 till 3, when the battle was ended by the fall of the hammer in the Stock Exchange.

"When I tell you that there are more than 5,000 of these 'tickers,' or indicators, you can form some idea of the magnitude of the business. If we give ten men to each 'ticker,' you have the spectacle of 50,000 stalwart men standiug there holding up a dotted strip of paper, waiting, hollow-eyed and anxious, on the smiles of fickle Fortune. To this 50,000 you may add 2,000 brokers. You must give each broker, at least, 5 clerks, office boys, and messengers, which swell the list 10,000. To this 62,000 you can safely add 200,000 speculators on the outside. So you have a total engaged in this gambling of more than 250,000."

CHANGES ON JUPITER.

Probably never since Jupiter became an object of telescopic study has more attention been bestowed upon him, or a deeper interest felt in the wonderful changes which are



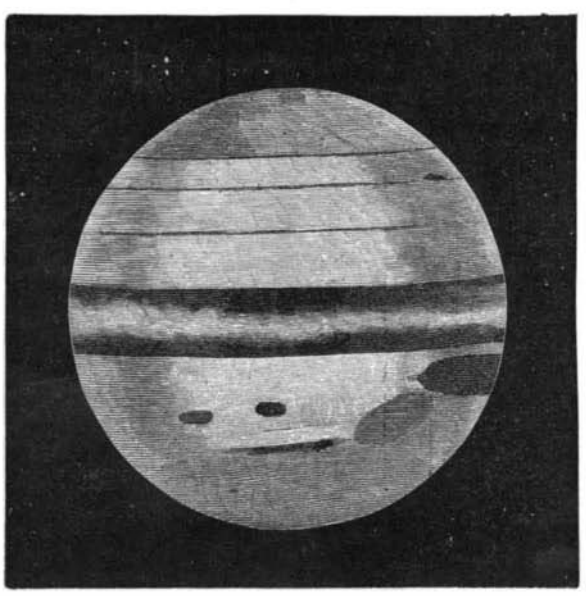
GREAT SPOT ON JUPITER.

constantly being produced on his surface, than has been created by the advent in 1878 of a tremendous "red spot" in the southern hemisphere of the planet. This great marking seems permanent, but how long it will last no one can tell. It would not be astonishing news if some fine night it should be missing.

In October, of last year, the spot was surrounded by a large sea of light extending in all directions, to a distance of some five or six thousand miles. The planet then presented a very beautiful sight, with the great spot like a light red island floating in a sea of liquid light. A large engraving, from a drawing made by me last October, in the *English Mechanic*, vol. xxx., p. 166, shows the striking appearance of the planet during that time.

This year, as soon as Jupiter emerged from the neighborhood of the sun sufficient for good observation, the great red object was sought for. It was found to have suffered no particular change, save that the sea of light surrounding it at one time last year had disappeared.

I have observed the spot on every favorable opportunity this year, and find that its length fluctuates slightly, but its breadth remains pretty constant—about one-eleventh or one-twelfth the polar diameter of the planet. I estimate its mean



SMALL SPOTS ON JUPITER.

length to be about 22,490 miles and its breadth 6,900 miles, covering a total area of about 154,640,000 square miles, which is equal to three-quarters the entire surface of our earth. Its color is a light Indian red.

In observing the great spot one is impressed with the very rapid rotation of the planet. Should we at any time observe the spot just beginning to appear at the east of Jupiter's disk, it will in two hours have passed to the center of the planet, and two hours later will be seen disappearing at the west limb.

The other prominent markings on the planet have been the two equatorial bands and three delicate narrow lines which encircle the northern hemisphere. But my desire is more to call attention to some new and important changes I have detected.

On the morning of July 25, at three o'clock, I discovered a small but distinct oblong spot in mid-transit, on a parallel of latitude somewhat greater than that of the red spot; this fits neatly in a narrow, delicate light-band, which was also new. I should estimate this small object to be about eight thousand miles in length and probably three thousand in breadth. At the same time I detected a heavy shading extending from the southwest end of the great spot. The new spot so far has been permanent, as I have observed it up to August 18. Observing the new spot on August 1, I found another which preceded it by about fifty minutes; this was yet further south, lying on the south border of the light narrow band; I have failed to detect this last mentioned spot on several observations since, and suppose it has disappeared.

On the night of August 16 I discovered a small, dark, almost black spot in the northern hemisphere of the planet; this was in mid-transit with the center of the great spot; it is remarkable for being in the northern hemisphere, as that part of the planet for the past few years has been singularly devoid of any change whatever.

On the morning of August 18, at three o'clock, I again observed the dark spot of the 16th, and also the small one of July 25; and between the latter and the great spot I detected two new ones, similar in appearance. One lay north and the other south of the narrow band of light. The shading from the great spot on this occasion had assumed a definite form, and was in reality a large, faint, but well defined object attached to the red spot, and almost equal to it in area. There is something remarkable about this shading. It is always best seen when near the east limb of the planet. At 4h. 19m. the great spot was in mid-transit—that is, midway across the disk; it appeared of a light Venetian red color, while the north equatorial belt was a warm purple, with which color also the south band was tinged. The small spot in the northern hemisphere was at the same time in mid transit, appearing almost black, and situated on the north border of the middle one of the three delicate lines crossing the disk. The shading from the great spot was very diffused and faint, while a slight continuation was running from the east end of the spot. Between the two equatorial belts, eastward, was a white glistening spot; east of this the space between the two belts seemed filled with light cloudy masses; above them the northern band was cleft asunder. I had for several days suspected the existence of the new markings, but did not have a fair observation until the 18th.

The two drawings, made with a five inch refractor by John Byrne, of New York, show all the new objects, and will be found pretty accurate representations of the planet at the given epochs. I have so far this year made ten observations of the transit of the great spot across the middle of Jupiter's disk, with the intention of determining the planet's rotation. These records will be continued until Jupiter leaves our evening skies, after which the observations will be reduced, corrected for parallax and velocity of light, etc., so that the planet's true rotation may be determined. I have found the rotation to be, approximately, 9h. 55·2m.

Observing the planet again on the 23d, the small dark spot in the northern hemisphere could not be detected; it has, I suppose, disappeared. The space between the equatorial bands was more decided in outline, and the bright spot in the spacing toned down, while the northern band was faintly cleft as far as the great spot. The belts do not now cross the planet as right lines, but are seen curved away from the large red spot, for the planet is slightly tilted, and we see more of the north pole than of the south.

ED. E. BARNARD.

Nashville, Tennessee.

Winter Employment for Amateurs.

Under the above heading Mr. H. Manfield last week pointed out one of many directions in which the amateur photographer may keep himself profitably employed during the winter months—profitably in so far, at least, as he is not wasting his time. With the permission of the editors I would call attention to another branch, and one more strictly photographic, in which the amateur may strike out for himself an almost entirely new path—not only without interfering with the course of his summer work, but actually supplementing it, while at the same time he is "keeping his hand in" during the otherwise idle months.

I allude to the production of enlargements—a department of photography which, so far as the amateur is concerned, is almost *terra incognita*. I see no valid reason why this should necessarily be the case; but it cannot be denied that it is so, for with, I think, one or two exceptions, I never recollect to have seen an enlargement exhibited which has been the production of an amateur. It may be urged that the facilities offered by commercial enterprise in the matter of enlarging are now so great that it is not worth an amateur's trouble to undertake the work. This I grant in one sense; but I am writing for that class of amateur, properly so called, who follows photography for its own sake, and not merely for the sake of the pictures it enables him to secure. These last are the rewards which crown his labors. The man who buys commercial plates and, after exposing them, sends them to be developed, printed, mounted, and finished, and is content to call the results his own, is not an amateur photographer; he is merely what is termed in the sporting world a "pot-hunter."