Our observation in reference to the hay crop in Connecticut and western Massachussetts is, that, in consequence of the protracted dry weather in June, it will be light. The season opened favorably, but grass in the old fields was much stunted for want of late rains.

PHOTOGRAPHIC ITEMS.

NEW METHOD OF PRINTING.

The photographic world is at present greatly interested in a new method of printing pictures, lately made public by Mr. Joseph W. Swan, of England. On the 5th of April, 1864, he appeared before the London Photographic Sooiety, and made a full statement of his new method, and presented a large number of beautiful specimens. The members of the society, among whom were many of the leading photographers of Great Britain, expressed their approbation of Mr. Swan's method, and pronounced the pictures in some respects superior to those which result from the present plan of nitrate of silver printing. There is a beauty in the gradation of the tones and a brilliancy of effect that cannot be imitated by the silver process. Specimens of the new pictures have been sent to this country. The editor of *Humphrey's Journal*, having examined some of them, says:—"The softness of tone, the accuracy of shading, and the peculiar color and glows, are strikingly pleasing at first sight, and do not become impaired by a more intimate inspection." The editor of the *Philadelphia Photographer* says of them:—"They are *wonderful* specimens of art, and are sure to make the old silver process so ashamed of its dark deeds that, like Judas, it will go commit suicide, and leave a name to be only despised when remembered." M. Gaudin, an eminent French photographer, speaking of Mr. Swan's pictures in *La Lumiere*, says that "it is impossible to imagine anything more perfect."

It appears to be the general opinion of the leading photographers of both hemispheres that the new process has something in it of great value. We hope that American photographers will not be backward in examining the subject, and putting it into practical use. The following is Mr. Swan's process:—

"The chemical principle is this, that gelatine, in combination with a salt of chromium, becomes insoluble in water after a short exposure to sunlight. This principle is capable of application to photography in many ways, one of the most obvious of which is to attach to paper a suitable tissue, and cover it with bichromated gelatine having a pigment mixed with it; expose this tissue to light, under a negative, and then wash away those portions of the coating not affected by the light. The exposed parts, having become insoluble, remain attached to the paper, and so produce a picture. The mixture of gelatine consists of one part of a solution of bichromate of ammonia (containing one part of the salt in three parts of water), two parts gelatine, one part sugar, and eight parts of water, with coloring matter added to produce the depth of tint required. The pigment used is Indian ink, either alone or mixed with indigo and carmine.

"The tissue is formed by coating a plate of glass or other smooth surface—first with collodion, and then with the colored gelatine mixture above described: the two films unite, and, when dry, may be separated in a sheet from the surface they were formed on. By this means a pliant tissue is obtained, which may be handled like paper, and may either be used in large sheets or cut up into pieces of any convenient size. The tissue, prepared in the manner described, corresponds with sensitive paper, and with proper appliances, the preparation of it need not be more troublesome than the double operation of albumenizing and exciting paper in the usual way. The tissue is much more sensitive to light than ordinary sensitive paper, and proportionately more care must be exercised to guard it from the action of light other than that which acts upon it while in the printing-frame. Like sensitive paper, too, it is better used soon after its preparation. The printing is done in the usual way, the tissue taking the place of sensitive paper, the collodionized surface being placed next the negative. The sensitiveness of the tissue may of course be varied by varying the proportion of the components of the gelatinous part of the tissue; but with the mixture given, the time of exposure required is only one-third or one-fourth of that which would be usually given with highly sensitive albumenized paper.

"The proper time for exposure can be determined pretty accurately, after a few trials; for, although there is not the same means of judging of the progress of the printing in the ordinary process, yet there is a far wider range between under and over exposure than in silver printing. It is no exaggeration to say that you may expose one piece of tissue twice as much as another, and yet obtain a good print from both; not perhaps quite so good as between the two extremes, but yet much more passable than would be the case with silver prints under and over exposed to the same extent. On taking the tissue from the printing-frame the image is faintly visible, and the next step in the process is to mount the tissue, with the collodionized face down, upon a piece of paper, or any other suitable material, to act as a support during development, and sometimes to form the basis of the picture, which may, if we please, remain permanently attached to this support, or may, if thought better, be afterwards transferred. There are several ways of mounting the tissue, and several adhesive substances may be used for the purpose, such as starch or a solution of india-rubber and dammar in benzole.

"After mounting, the tissue, with paper attached, is placed in water of about 100° Fah. The water presently begins to dissolve away the non-solarized portions of the gelatine, and in a few minutes the picture is fully disclosed. It is, however, advisable not to hurry the operation, but to give the water ample time to dissolve out the bichromate. It is also advisable to change the water three or four times. Leave the prints about two hours in the water. Where the picture has been over-exposed, longer immersion and hotter water will, in a great degree, rectify the mistake. Before finally removing the prints from the water, brush their surface lightly with a broad camel-hair brush; and, after taking them out, pour a stream of water over them to remove any loosely adherent particles of foreign matter that may by accident have got attached to the surface. The prints may then be hung up to dry, and are finished by being mounted on card-board and rolled, in the usual manner. Another way of proceeding is to remount the developed print, face downward, upon a second piece of paper or card-board—say with starch or gelatine—and, when this is dry, to remove the paper that was attached to the tissue previous to development; this can easily be done if the surface of the paper is moistened with benzole. In one way the image is reversed, and the collodion surface is downward; and in the other the image is not reversed, and the collodion film is uppermost. In practice, probably, the simpler mode will generally be preferred."

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 heading Bolts.—This invention relates to a machine for heading bolts in which the bolts are held stationary by means of two jaws while their heads are exposed to the successive action of a series of heading dies striking the sides and the top of each head; these heading dies are adjustable to suit heads of different sizes, and they are operated by hinged spring dogs which are connected to a foot lever in such a manner that by stepping on the same the dogs are successively thrown in working position causing two of the heading dies to act first on two opposite sides of the head, and the second pair afterwards; and, finally, the vertical die is set in motion and caused to act on the top of the head; and by these means all sides of the head and its top are smoothed without moving the bolt in the jaws. The footlever connects with a guide lever, the position of which is determined by a cam groove in the circumference of a revolving drum in such a manner that the foot lever is prevented from throwing the spring dogs in gear with the heading dies at the wrong point. Finally, the connection between the foot lever and hinged dog acting on the vertical heading die is made by means of a spring rod, and a yielding bolster is inserted between said dog and its connection with its crank shaft, in such a manner that the dogs of the horizontal dies will be thrown in gear before that of the vertical die; and in case said vertical heading die meets with an undue resistance it is allowed to yield, and injury to the working parts of the machine is prevented. James Minter, of Worcester, Mass., is the inventor of this improvement.

Preserving Meat.—This invention consists in exposing the meat to be preserved before it is put up in packages, to a heavy pressure in such a manner that nearly all the water not chemically combined with the meat and a large quantity of air contained between the various pieces and in the pores of the same is expelled before the meat is put up in the packages, and by these means the principal agents of putrefaction are removed and its bulk is considerably reduced. It consists, further, in a press-bar provided with a hinged end and movable screw top, in combination with a follower, and also with a frame fitting to the end of said press-box, capable of receiving and holding the mouth of the package to be filled with meat in such a manner that by removing the top of the press-box the meat can be easily introduced, and by closing down said top it can also be readily compressed to agree with the size of the package; and after it has been compressed, by opening the movable end of the press-box and putting the package in its place, the compressed meat can be easily forced into the package without exposing the latter to any undue strain or pressure. W. C. Marshall, of New York city, is the inventor of this improvement.

Propeller.—This invention consists in providing a vessel with an iron frame at its stern to form a support for the rear end of the propeller shaft, and also in constructing the rudder stem in such a manner that it may be connected with the propeller shaft back of the propeller wheel. The object of the invention is to obtain a propeller which, with its necessary connections, will be fully protected from shot and also from drift-wood and ice, afford superior facilities in guiding, backing and turning a vessel, convenience in repairing, and which may be operated with but little labor. O. C. Phelps, of New York city, is the inventor of this improvement.

The claims of the following notices appeared in the list issued July 5, 1864:—

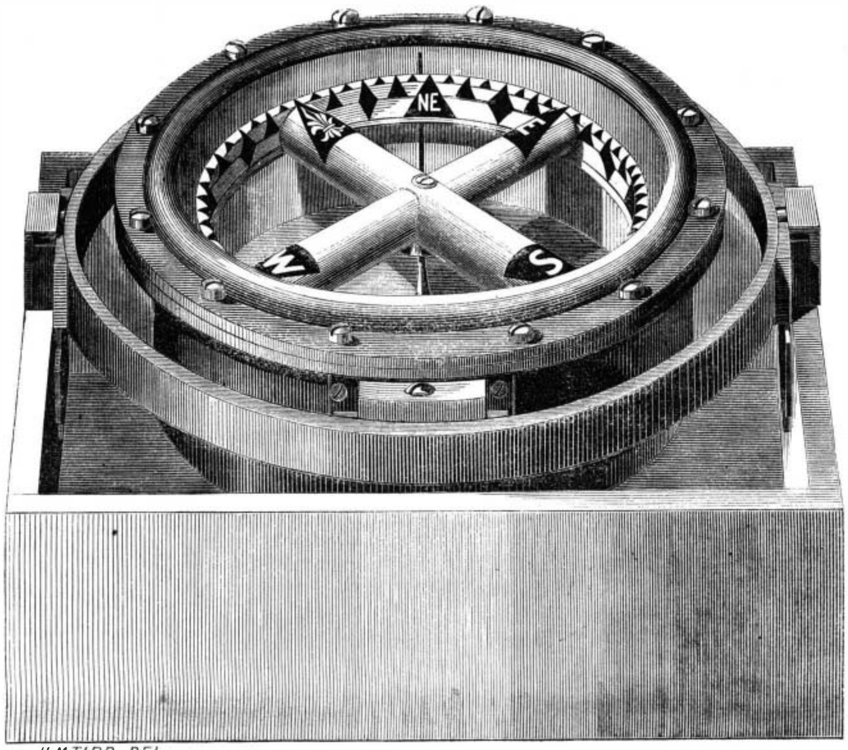
Cultivator.—This invention relates to that class of cultivators which are intended to straddle a row of corn or other plants, and which are so constructed that the plows can be readily depressed in or raised from the ground by the action of a hand-lever from the drivers seat, and also adjusted to cut in the ground to any desired depth. The plows are adjusted to beams which can be raised and lowered, and they are made reversible so that the dirt can be thrown in either direction. The frame is made in two sections, which can be adjusted further apart or closer together according to the width of the furrows or distance of the hills. A. G. Tucker, of Richview, Ill., is the inventor of this improvement.

Treating Gum for the Manufacture of Varnish.—The object of this invention is to facilitate the fusion and ebullition of such gums as are generally used in the manufacture of varnishes and for other purposes. The gums used in the manufacture of varnishes, etc., are generally exposed to the heat of a coal fire in copper kettles or boilers varying in size; the fire is placed in close proximity to the bottom of the kettle, and the melting of the gums is mostly limited to the bottom of the kettle or boiler. By the ebullition of the gum at the bottom a large quantity of the same, either fused or not, is forced up against the sides of the kettle or boiler, where it rapidly parts with a portion of its caloric and becomes resolidified. In this state it can be remelted with great difficulty, and a poor and dark varnish is the result. This disadvantage is avoided by the application of a jacket of a good non-conductor for heat to the body and cover of the kettle and also by the use of an exhauster so that the melting takes place at a pressure lower than that of the ordinary atmosphere. John Johnson, of Saco, Maine, is the inventor of this improvement.

Improved Ship's Compass.

The distinctive peculiarities of this compass are, first, an air-tight metallic case or air vessel, within which is placed the magnetic needle. This air vessel is made of such size and weight that it may, with the inclosed needles and with its graduated circle or card, be of very nearly the same specific gravity as the liquid. By the buoyancy of the liquid, the weight upon the pivot is reduced to a few grains, and friction is almost wholly prevented. The inclosed steel magnet is also perfectly secured from oxidation. Second, in the form of the needle float or buoyant air vessel, being that of cross cylinders with a vertical card. One of these cylinders contains the needles while the lateral arms assist in supporting the weight and equalizing the resistance of the liquid to any tilting motion, and also support the vertical card ring. Third, in an elastic chamber communicating with the interior of the bowl to compensate for the unequal expansion of the liquid and the bowl. As the liquid expands much more than the metal by increase of temperature, a portion flows into this chamber; when the temperature is lowered the liquid contracts, causing the return of a portion from the expansion chamber; by this means the bowl is always entirely filled without bubbles, and all pressure is avoided.

Further information in relation to this invention may be obtained by addressing the patentees, E. S. Ritchie & Co., 313 Washington street, Boston.



RITCHIE'S LIQUID SHIP'S COMPASS.

A Singular Railway Catastrophe.

On a Western railroad a singular catastrophe occurred lately which is thus described in the Missouri *Republican* :—

"The road passes over the Cumberland mountains. On the eastern slope the train is pushed up, but on the western slope the train slides down, its motion being arrested by a close application of the brakes, and, if necessary, a reversal of the engine. About midnight of the day in question, the correspondent was asleep, but was startled suddenly into wakefulness by an unusual and extraordinary noise. On looking through the glass door at the end of the car, its origin was manifest; he beheld a sight which no mortal man, having once looked upon, could ever forget. Two trains had started at the same time as the one in which he rode. It was about half-way down the mountain (the grade being very steep), about two miles from the foot of the grade. The two trains in the rear were at the usual distance, 'when suddenly,' exclaims the correspondent, 'as if the brakes were out of order and would not work, the train behind us started forward with the rapidity of lightning and came tearing furiously toward us. Our engineer put on all steam in the endeavor to escape; the engineer of the crazy train reversed his engine, but it was all in vain! The train was under too much headway! It was when it had reached to less than a hundred yards of us that I awoke and looked out. Like a destroying demon, bent upon our annihilation, seemed the terrible engine. Its wheels were running in a reverse direction, but under the fearful force it had previously acquired, it would no longer obey the motion of the wheels. It was sliding onward to destroy us! and at times the wheels, fixed upon the track and balanced between the two forces, one urging the locomotive forward, the other endeavoring to pull it back, tore from the rails a stream of fire. Then the reversing force would whirl them round for a moment with the most awful rapidity.' The trains came in contact, were thrown down an embankment and smashed to pieces, but no one was killed outright, although many were badly wounded."

In Philadelphia there are 357 miles of water-pipe and 592 miles of gas-pipe.

Trial of New Guns at Shoeburyness.

A very important series of gunnery experiments took place at Shoeburyness on Friday, June 17. The object was to test the resisting powers of a target representing a section of the iron-clad *Lord Warden* now building, and in the same trials to determine the comparative penetrating powers of the Somerset and Frederick guns, and of the Armstrong and Anderson guns.

As regards the guns, the points to be determined were, first, whether the $6\frac{1}{2}$-tun Somerset gun of 9·22 inch bore, or the $6\frac{1}{2}$-tun Frederick gun of 7-inch bore, possessed the greater destructive power; and, second, whether the 12 1-8th-tun gun-factory gun of 9·22 inch bore or the $11\frac{3}{4}$-tun Armstrong gun of $10\frac{1}{2}$-inch bore, possessed the greater destructive power. Then the results of the two pairs of guns would show whether the $6\frac{1}{2}$-tun guns or the 12-odd tun guns did their work better. The Somerset is a handsome gun, on the Armstrong tube-and-coil construction, with Armstrong shunt rifling. The Frederick gun embodies Admiral Frederick's small-bore gun theory. The gallant admiral has long supposed that by the use of a small bore, as compared with a large bore, in guns of the same construction, more penetrative power would be obtained, because the greater mass of metal in the small-bore gun would admit of heavier charges than in the large-bore gun. The gun is constructed on the tube-and-coil principle of the Armstrong, with shunt rifling. Unlike the Somerset, the Frederick is an unsightly gun. Such are the first pair of guns—Armstrong shunt-muzzle loaders, of the same weight, but of different calibers. Then the heavy factory gun, or the Anderson as it has been called, is identical in pattern with the well-known Armstrong 300-pr. From the Armstrong it differs only in the bore and in the substitution of a steel barrel for a wrought-iron barrel; the barrel on which the first and other layers of coil are laid. Recent improvements or extensions in the manufacture of steel have enabled Mr. Anderson to make this change, as Sir William Armstrong has done of late, and Mr. Whitworth, following Sir William, has also done in his built-up 70-prs. The second pair of guns, therefore, like the first, are Armstrong shunt-muzzle guns, nearly of the same weight, but differing as before in caliber.

The weight of the section of the *Lord Warden* fired at on Friday is stated at 400 lbs. per square foot. The official description is that of a target 20 feet by 9 feet, representing the ordinary construction of a wood armor-clad ship, with the addition of an iron skin worked outside the frame of the ship. The scantlings are: frame timber molded, $12\frac{1}{2}$ inches; iron diagonal sides, connecting the frame timbers, 6 inches by $1\frac{1}{4}$ inches; inner planking, 8 inches thick; iron skin, $1\frac{1}{2}$ inches thick; outside planking 10 inches thick; rolled armor-plates, $4\frac{1}{2}$ inches thick. These scantlings were through-bolted, with bolts of $2\frac{1}{2}$ inches in diameter. Then in the rear of the target there were the deck beams—lower, 15 inches by 12 inches; upper, 16 inches by 16 inches; waterway, lower, 15 inches by 15 inches; upper 13 inches by 14 inches; deck planking, lower 4 inches; upper 4 inches. In a word, the target was a perfect section of the ship now building with lower deck and upper deck, lower beams and upper beams, etc. The iron work of the target, it may be well to add, is the produce of the Millwall Ironworks, and reflects the utmost credit on the company and Mr. Hughes. Battered to ruin as the target was, the armor plates were uncracked, and the bolts proved as unexceptionable as the plates.

The first round fired was from the service 68-pounder, steel shot, 16 pounds charge. The shot produced an indent of 3·6 inches, striking the head of an armour bolt, and starting a bolt in the rear. No one on board the ship would have been injured; therefore the *Lord Warden* may be said to be proof against the 68-pounder fired, not with cast-iron shot, but with steel shot. The velocity of the shot was 1,500 feet per second.

In the second round the gun used was the Somerset gun, steel round shot, weighing 100 pounds; charge, 25 pounds. The shot struck at the waterways, where the target presented an aggragate thickness of $42\frac{1}{2}$ inches, passed through the outer armor plate, and embedded itself in the backing. The waterway, 15 inches by 15 inches beam, was cracked through, but there were no splinters. This was a shot in the strongest part of the ship, and showed that a ship of even $42\frac{1}{2}$ inches thick would in time be smashed by the $6\frac{1}{2}$ tun 9·22 inches Somerset. The velocity of the shot was 1,540 feet per second.

The next round was fired from the same gun, steel shell, weighing empty 171 pounds; charge 20 pounds, and bursting charge 7 pounds. The outer plate was passed, the wood-work cracked right through, and the armor-plates started. The shell effect was trifling.

In the succeeding practice the Somerset beat the Frederick gun. The Somerset made the larger hole, the bore of the 9·22 inches against the 7 inches, with the same charge of powder, and exhibited greater penetrative power. In other words, the large bore beat the small bore with the same charge and the same weight of gun. The velocity of shot was 1,560 feet per second.

The Anderson gun, $12\frac{1}{8}$ tuns, sent a 220 pounds steel shot with 44 pounds of powder clean through the target, but at its weakest part, namely, on the top of the shelf below the upper deck beam where thickness is only $27\frac{1}{2}$ inches instead of $37\frac{1}{2}$ inches as elsewhere.

A cast-iron shot from the Somerset gun also passed through the outer plate, the velocity being 1,260 feet per second.

The ninth round was fired from the Armstrong, $11\frac{1}{2}$-tuns, 10·5 inch gun, 301 pounds steel shot; charge, 45 pounds. This was a most destructive shot, passing right through the whole structure, filling the deck with heavy splinters, and throwing an iron knee of 3 cwt. 2 qrs. 21 pounds a distance of 20 yards. The shot, after passing through the target, struck an immense granite block and broke into four pieces, one of the pieces bounding off a further distance of 50 yards. Three rounds more from the Anderson and Somerset guns terminated the experiments by completing the destruction of the target.

Twenty-three citizens of the town of Washington, N. H., made the past season 63,136 lbs. of maple sugar, worth about $10,000. The largest amount made by one individual was 4.533 lbs.

Trap-making.

The Circular is a weekly paper published by the Oneida and Wallingford Communities—at Wallingford, Conn. Terms, "Free to all. Those who choose to pay may send one dollar a year." The last number of this paper contains an account of the trap manufactory of S. Newhouse, at the Oneida Community, from which we extract the most interesting portions:—

"Mr. Newhouse is a native of Brattleboro', Vt. His paternal grandfather was an English soldier who, having been taken prisoner by the Americans at the battle of Bunker Hill, afterwards adopted this country as his home. From Brattleboro' the parents of Mr. Newhouse removed during his infancy to Colerain, Mass., and in 1820, when he was fourteen years old, the family emigrated to Oneida County, N. Y. The need of a trapper in a new country is not pianofortes or *cartes de visite*, but *traps*. At seventeen Mr. Newhouse felt this need, and in the absence of other means of obtaining a supply, he set to work to make them. The iron parts of fifty or more were somewhat rudely fashioned in a blacksmith's shop, and for the steel springs the worn-out blades of old axes were made to serve as material. A mechanic of chance acquaintance showed the young artisan how to temper the springs. The traps thus extemporized proved on the whole a success; for they would catch, and what they caught they held. After the season's use they were sold to neighboring Indians for sixty-two cents apiece, and the making of a new supply was entered upon. These in turn were sold and replaced, and thus the manufacture of 'Newhouse Traps' was launched.

"During the next twenty years Mr. Newhouse worked at trap-making, sometimes alone and sometimes with a partner or with hired help. The extent of his manufacture was from one to two thousand traps per year, which supplied the local demand, and procured for him a reputation for skill in whatever pertained to wood-craft.

"The Community established itself at Oneida, about two miles from the residence of Mr. Newhouse, in 1848, and the next summer received him and his family as members. For several years after this but little attention was paid to the trap business. A few dozens were made occasionally by Mr. Newhouse in the old way, but it was not until 1855, under a call for traps from Chicago and New York, that practical interest was first directed to this branch of manufacture, with a view to its extension, by Mr. J. H. Noyes. Arrangements were then made for carrying on the business in a shop fifteen feet by twenty-five. The tools consisted of a common forge and bellows, hand-punch, swaging-mold, anvil, hammer, and file. The shop so established employed about three hands. The next year it was removed to a larger room in a building connected with water-power, and the number of hands was increased. Among them were several young men, who, together with Messrs. Noyes and Newhouse, exercised their inventive powers in devising mechanical appliances to take the place of hand-labor in fashioning the different parts of the trap. A power-punch was the first machine introduced, then a rolling apparatus for swaging the jaws. Soon it was found that malleable cast-iron could be used as a substitute for wrought-iron, in several parts of the trap. The brunt of labor expended had always been in the fabrication of the steel spring, and this was still executed with hammer and anvil wholly by hand. Two stalwart men, with a two-hand sledge and a heavy hammer reduced the steel to its elementary shape by about 120 blows, and it was afterward finished by a long series of lighter manipulations. The attempt was made to bring this part of the work within the grasp of machinery. One by one the difficulties in the way were overcome by the ingenuity of our machinists, until at length the whole process of forming the spring, from its condition as a steel bar to that of the bent, bowed, tempered and elastic article, ready for use, is now executed by machinery almost without the blow of a hammer. The addition of chain-making (also executed mostly by machine power) makes the manufacture of traps and their attachments complete.

"The statistics of the business thus extended are in part as follows:—Six sizes of traps are made, for the different grades of animals, from the muskrat to the bear, which have, to a great extent, superseded the use and importation of foreign traps in this country and Canada. The number of these made at the Community works during the last seven years is over half a million. The number of hands employed directly is about sixty, besides the twenty-five or thirty who find employment elsewhere in supplying the iron castings for traps. The number of hired hands in the Community shop is forty, whose present pay-roll amounts to over $1,100 per month, The amount of American iron and steel used is over 300,000 pounds annually.

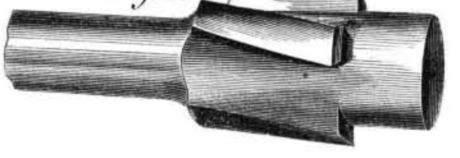
"We may add that to complete their arrangements for carrying on this business to the fullest extent of the possible demand for traps, the Community are building, the present season, a new manufacturing establishment on a water-power about a mile from their present works, which will enable them to more than duplicate their production."

BORING TOOLS.

NUMBER 3.

On page 37 of the current volume we discussed the merits of several sorts of boring tools, all of which are in daily use in machine-shops, in one or another part of the country. We take up the subject where we left it and submit to our readers some other plans of boring tools which have been found very effective. In Fig. 11 we have interposed an engraving of a

Fig. 11



counterborer, which was inadvertently omitted from our article on the "drill and its office," which received so much favor from machinists. It is merely a steel bar having cutters forged upon it in the manner shown. There are an unequal number of these cutters, five being preferred by the maker (Mr. White, a machinist of this city), and after the tool is forged it is turned in the lathe and filed up so as to cut. This is a neat-looking tool and one that we are assured does good work in the hands of skillful men. It may be made of any desired size or length; the one shown in the engraving is designed for gun-work.

The tools shown in the engravings published previously are merely those which are employed in comparatively light work, and in the minor operations of general machine work. There are cases, however, where these tools are not available, and others, entirely different and distinct in character, must be produced. An instance of this may be found in the cranks of heavy marine engines. These are forged solid, and the holes for the shaft and crank-pin are cut out of the mass of metal. In old times these cranks were bored by making a large hole with a common drill (say five inches in diameter), and afterward inserting a boring bar and cutter like the one shown in Fig. 12, and enlarging the hole. This method is doubtless still practiced in many shops, but there is another way which is more expeditious and economical. This is to bore a solid core out of the boss of the crank, as shown in Fig. 13, and leave the center standing.

Fig. 12

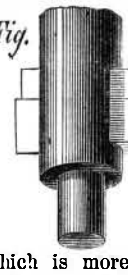
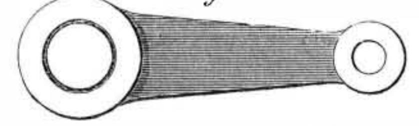


Fig. 13



To cut out a hole twenty inches in diameter in solid metal is quite an achievement, and requires not only peculiar tools but careful superintendence during the operation. The tool is shown in Fig. 14. It is curved in section, perfectly flat and made very wide sideways, but not on its cutting edge. The cutting part is about $\frac{5}{8}$ths of an inch across. Four of these tools are set in a cast-iron cross which screws on the spindle of a heavy boring mill, and the tool thus arranged is shown complete in Fig. 15.

Fig. 14

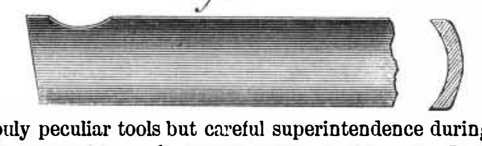
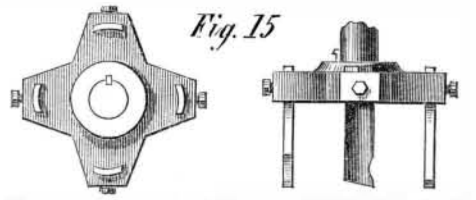


Fig. 15



The cutters are set so that two travel in line with each other, while the other two cut in another track, so that in this way a wide groove is produced from which the chips can be removed with facility. The channels are shown in Fig. 16. The tools do not bind or clog when care is taken, and they are so wide that they do not spring sideways. When one side has been cut half way down, the crank is turned over and bored from the other until the two cuts meet. The central core then falls out. The hole is afterwards bored true to the size required by an ordinary turning tool, and generally needs only two light cuts to finish it. With good luck one man should bore a twenty-inch hole, twenty inches deep in fifteen or twenty hours. The economy of this plan, as compared to the old one, is striking, and should be practiced in all shops that do work of this class.

Fig. 16

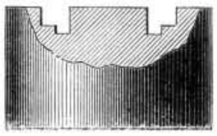
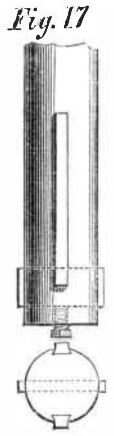


Fig. 17



A plan for a boring bar and cutter which was (and it may be still is) used in a mill for boring car wheels, is shown in Fig. 17. These wheels are used in such numbers on long lines of road, that it is necessary to provide some means for boring them as fast and as economically as possible. With this cutter a car wheel $3\frac{3}{4}$ bore and 8 inches deep, cored out $3\frac{3}{8}$, has been bored in from six to eight minutes complete. The arrangement is merely an ordinary bar with a cross-bit, or cutter through it; but at right angles with this there are two steel rimmer-blades, dovetailed in the bar. These rimmers are turned up in the bar itself, and can be driven out for grinding or other adjustment as required. They taper very slightly from the bottom to top, and are made a little larger than the cutter so as to follow it and true up the rough portions or surfaces left in the rapid descent. This cutter and bar does good work, when it is not forced too much, and we have known thirty wheels to be bored on the machine it was attached to in ten hours.

The "Scientific American."

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