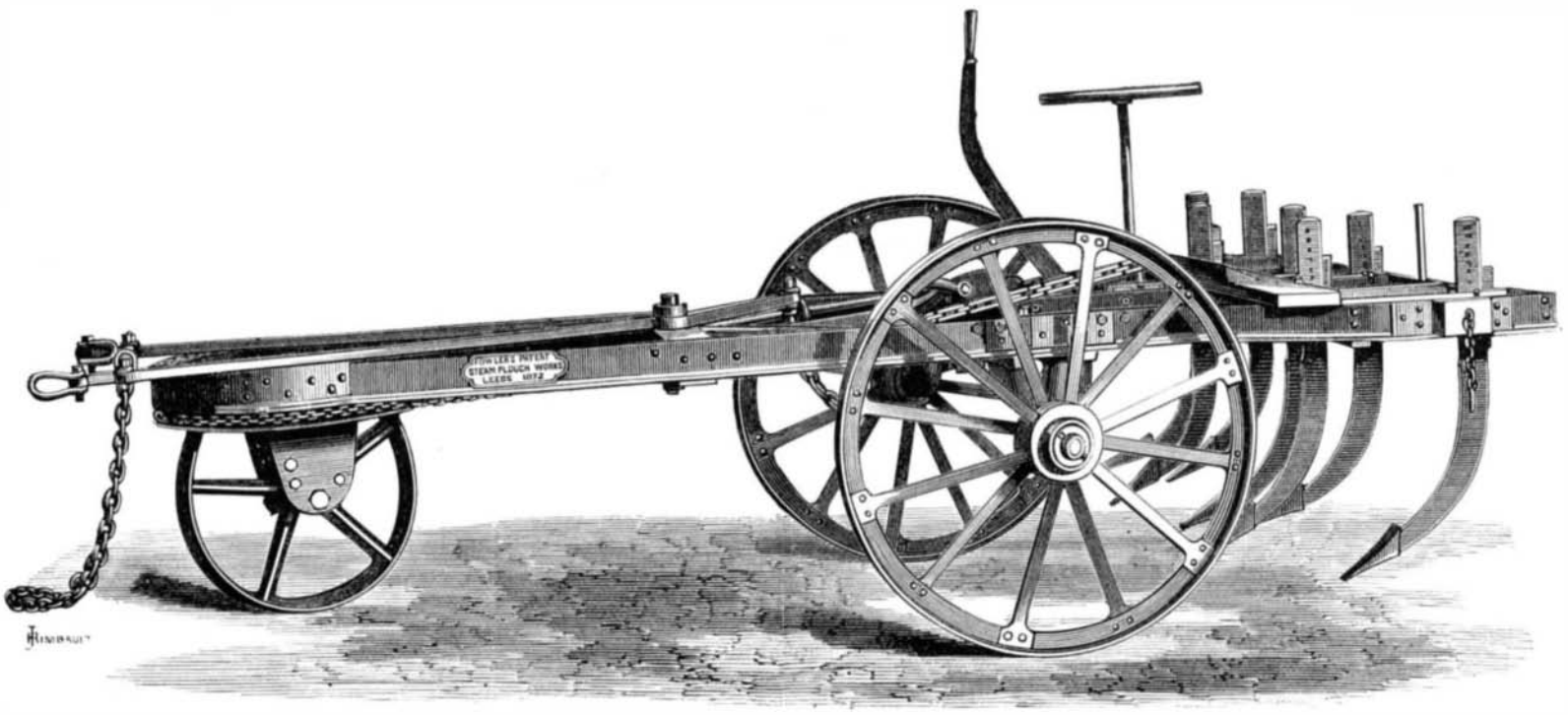
STEAM CULTIVATION.

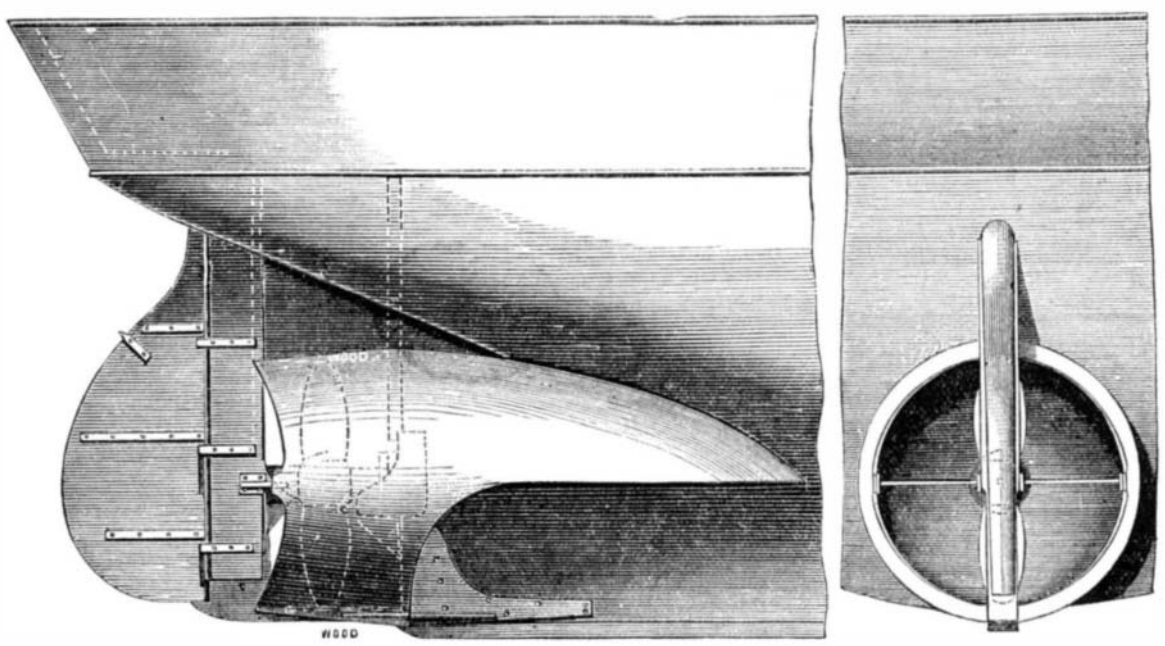
The Fowler system of steam plowing has been frequently mentioned in these columns as being the most successful of many attempts to solve a problem of some difficulty and of great importance to the future of agriculture. We illustrate herewith a cultivator, intended by the makers for use where the double machine would be unnecessarily large and expensive; it is constructed so as to be readily turned and operated in the reverse direction after one set of furrows has been cut. Messrs. Fowler have made some improvements in this apparatus, one of which deserves special comment This consists merely in making the lever, to which the ropes are attached, of a forked shape, as shown. In use that arm of the fork to which the hauling rope happens to be attached is of course brought into a direct line with the strain; while the other arm is thereby caused to project laterally, thus bringing the tail rope clear of the wheels, and causing it to be in a favorable position for turning the implement when the headland is reached. The tail of the draft lever is coupled to a short chain; and when, on arriving at a headland, the strain is transferred to what was previously the tail rope, and the draft is thus brought at right angles to the implement, this chain is tightened and, by acting on a segment, turns the main axle, which is cranked, and this, by depressing the supporting wheels, lifts up the main frame, and raises the tines clear of the ground. The tines being maintained in this position by a lever and catch, the turn is readily made; and on its being accomplished, the steersman allows the frame and tines to fall again, and the implement starts on a fresh journey. The action of this turning arrangement is admirable. The turns are made with great promptitude, and within a very limited space, while the implement is altogether thoroughly manageable, and there is nothing about it liable to get out of order.



FOWLER'S STEAM CULTIVATOR.

RECENT IMPROVEMENTS IN THE SCREW PROPELLER.

It would be by no means an easy task to enumerate the many inventions which have been made, since the introduction of steam navigation, to improve the form of the screw. The modification of the screw propeller devised by Mr. Griffiths has been generally admitted to be one of the best. Mr. Griffiths, however, has since arrived at the opinion that we have hitherto been neglecting the true principles in screw propulsion; and after a series of experiments he concludes that the difference, between the amount of power exerted to propel a ship by a screw and that required to tow her, which in one case Mr. Froude found to amount to a loss of 58 per cent of the power supplied, is due to the screw not being sufficiently supplied with water. With a full-sterned ship this is greater than in one having a fine run, as the water runs into the space left by the stern, and deprives the screw of its full supply.



THE GRIFFITHS SCREW PROPELLER.

To remedy this, Mr. Griffiths' plan is to put the screw into a casing of 50 to 75 per cent larger area than that of the screw's disk, and provided with an opening underneath, so that the screw is not supplied with the water which would otherwise flow into the space left by the ship, nor does the ship rob it of any of the water which it requires to force back in order to give the thrust to the screw shaft for propelling the ship. This view of the case was not, however, assented to by Mr. Froude, who thought that the effect of the screw working in the water of replacement was to take away some of the pressure which drives the ship. But with reference to the advantage of housing in a tunnel if the screw were driven at excessive speed, he thought it not unlikely that the housing would produce a beneficial effect by preventing the scattering of the water, and whatever reaction the water supplied would be more effectively directed into the line of motion; nevertheless he considered it would involve the drawback of adding largely to the surface friction of the vessel, and he expected that nearly the same advantage, but less encumbered by surface friction, would be obtained with any kind of shrouding given to the tips of the screw blades. Since then Mr. Griffiths has had H.M.S. Bruiser placed at his disposal to experiment with, and the results certainly appear to bear out the experiments with models previously made by that gentleman. The Bruiser was first tried, on February 26, with her propeller fitted in the ordinary way, her course being over the measured distance within the breakwater at Plymouth. The force of the wind was 2 to 3, and its direction E.S.E., and the sea smooth. The draft of the ship was 8 feet, both fore and aft, and she was fully equipped and ready for sea. The screw fitted was one of Griffiths', with two blades, having a diameter of 6 feet and 8 feet pitch, with 60 nominal horse power, and a mean pressure in the cylinders of 35·79 lbs. her mean number of revolutions, after six runs, was 881 per mile, and her true mean speed 8·016 knots. Having been docked, and the casing fitted to her, as shown in the accompanying illustration, she was again tried on July 2, under almost similar circumstances to those of the first trial. The force of the wind and the state of the sea were the same, though the direction of the former was S.W. instead of E.S.E. She carried one more tun of coals, and her trim was a little different, being 7 feet 10 inches forward, and 8 feet 1 inch aft. With the same nominal horse power, and only 0·4 more horse power indicated, the mean number of revolutions was only 836, whereas the speed gained was 8·274 knots, or rather more than a quarter of a knot beyond what was realized without that some loss of speed is thereby occasioned; but with th screw in a casing this is not necessary, and perhaps a good deal of the quarter to half knot increased speed obtained with the Bruiser may be due to this cause. Mr. Griffiths' system, however, is not all included in placing the screw in a casing, for he also proposes to divide his power into two parts, by using two small screws instead of one large one, and putting one at the bow and the other at the stern of a ship. The engines and shafts, also, would be placed lower down in the ship, and therefore, in men-of-war, be more protected against shot. But perhaps the most important improvement claimed for this system consists in having two separate sets of engines, boilers, and propellers, so that if one were placed *hors de combat* the other would still be available to keep the ship off a lee shore, or from getting into the trough of the sea. The experiments with the casing round the screw having proved so far successful, the British Government have now placed a small screw launch at Mr. Griffiths' disposal with which to try still further experiments.

Three Curious Discoveries.

A recent examination of the bottom of an old Roman well, located near the hot springs of Bourbonne les Bains, in France, has resulted in three remarkable discoveries, two of an archæological nature, and one of some importance from a geological point of view.

After the excavation had been thoroughly drained, and a thick layer of refuse penetrated, the first discovery was made in the bringing to light of thousands of small metallic objects of art. These included ornaments, statuettes, and coins, the last of silver, gold, and copper, dating back to the times of Nero and Hadrian.

Beneath the layer of ornaments, etc., a second layer was found, composed entirely of fragments of sandstone, which, together with the metallic objects, were completely covered and held in masses by metallic crystals, evidently deposited by the water above. These crystals were subjected to careful investigation; and as a result they have been pronounced to be of such a nature that geologists would unhesitatingly describe their formation to natural causes, working through ages. That such is not the case is plainly evidenced by the known eras of the coins above which they have formed. It will be seen that the circumstance, which constitutes the second discovery, may throw serious doubt over a large quantity of important geological deductions as to lapses of time, when the same, as is the fact in many instances, are wholly based on supposed slowness of formation of similar deposits.

The third discovery relates to the fragments of sandstone

By comparing these with other pieces, already found in similar localities, the investigators have concluded that such fragments were thrown into the wells as votive offerings to local divinities by the ancient inhabitants of the country, and that the same custom, continued through centuries, accounts for the presence of the much more recent Roman money. A chain of proof, mainly circumstantial, has been elaborated, which refers the stone fragments to the neolithic epoch, in prehistoric ages, and further shows that the pieces probably represent the earliest money used by man.

Self-Acting Car Couplings.

At a recent meeting of the Master Car Builders' Association, the subject for discussion was "Freight Car Couplings, Draw Bars, and Buffers," upon which Mr. Partridge made an address.

Mr. Adams was called upon for information on what is required by railroad companies, and said that he had no specific facts to present in relation to the repair of drawbars throughout the country. It was very difficult to get very specfic data. The habits and customs of our car men have not been of the character to present these data accurately. The committee appointed on this subject, in looking over the matter, had made up their minds as to some important points to arrive at in the way of improvements. "We have been shown by Mr. Partridge some of the defects in the present arrangement, which had been considered by the committee. But there were some other things that presented themselves to their minds, and one of the most startling of the whole of them was the expense of links and pins. Upon some roads this expense was enormous, amounting to anywhere from $10,000 to $60,000 or $70,000 a year, according to the size of the road. The ordinary roads perhaps would average $30,000 to $40,000 a year. We need something to couple our freight trains which will enable us to dispense entirely with pins and links. This was one of the points to be striven for. Another point in which we thought there was an absolute necessity for improvement was a greater power of resistance in our buffer springs, and a greater range of motion. Our resistance is altogether below the line of connection. If the springs were made stronger, given more motion, and placed in the direct line of resistance, the difficulty would be materially obviated. Various devices have been presented to us during the past year; a good many models have been brought out, and some of them have approximated somewhat to the accomplishment of the idea, but we have not seen any yet that meet our wants, in the opinion of the committee. The thing, after all, is progressing, but yet there is room for improvement. We have got to have a device that will couple freight cars without a link and pin, and, in addition to that, a separat ebuffer placed directly in the line of the frame or bottom of the car, and we have got at the same time to use our present stock; that device must be made to connect itself with our manner of coupling. We have got to use our present stock until it is worn out. But the committee is not as yet prepared to recommend anything. They have not found anything that will entirely accomplish the purpose. A buffer must be so built that it won't couple when you don't want it to. Many inventors seem to think that you must get something that will couple every time it strikes. There have been but few models that seemed to embody the idea to dispense with links and pins, but I think we shall have to make it in two parts, a separate buffer and separate hook, because we want our connections to be in the floor of the car. Mr. Stone in his model has accomplished considerably towards it, and I have no doubt he may be able to bring it perhaps to something near what we want."

Mr. L. Garey said that it was easy to find fault, and difficult to apply the remedy. "The necessity for improvement in the attachment by which cars are coupled together has been felt for a great number of years, and it was still evident that the improvement had not been got. The necessity of these improvements was shown by the immense number of patents granted year after year. The real necessity is an automatic coupler with buffing attachments, either connected or with another device placed on the line of resistance. The buffing requires from one half to double the resistance of the drawing to make it substantially strong. Now if some of our inventors will dispense with the use of the links and pins entirely, provide us with a coupling, automatic or not, which can be uncoupled from cars from the top or side, and give us a buffing attachment which is sufficient for the work, that ought to make a dozen fortunes for him and secure him the blessings of all the people, not only those that travel, but especially of the men employed on railroads. He thought that the railroads would say that, out of the cars which were side-tracked for repairs, eight tenths were owing to some defect in the drawing or attachment. If this could be reduced to three tenths, it would be a great deal. There was more difficulty from the failures of the attachments than in the drawbars themselves."

Don't Leave a Legitimate Business for Financiering.

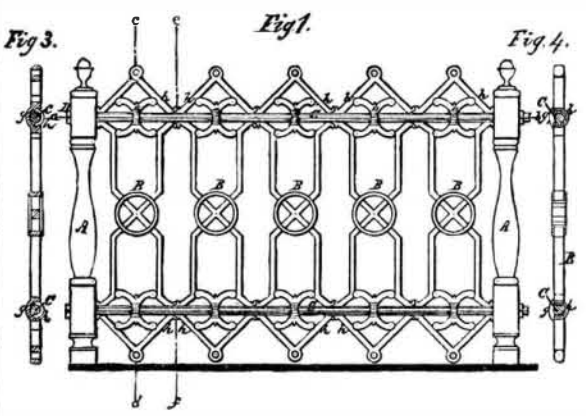
It is an evil of the intense competition in great mercantile communities that it drives many from the walks of legitimate business into schemes of speculation with reference to sudden and extravagant gains. The history of frauds teaches that they originate chiefly in the attempt to grow rich rapidly by financiering rather than by diligence in business. Financiering has its place in legitimate business. Some men have a talent for this, which is as true a mark of genius as is poetry or art. But it is not a talent that every man can acquire, and it is fortunate that this is so; for if all the world should turn financiers, the earth itself would soon go into bankruptcy. Now, the calamity of a great city is that every one who gains a little money takes to financiering as a readier mode of increasing it than regular business. Wall street, the focus of financiering, gives a tone to the whole business community.

But financiering is a deep game; and he who leaves an honest toil in a business that he does understand, for calculations of chance in matters where he has no skill, is very apt to become the loser, and, as in all lotteries, to grow desperate in the attempt to make up his losses. We do not speak of investments in stock as property, but of the spirit of speculation; and we have no doubt that a just verdict upon many cases of fraud would be: "This man lost his capital and his character by speculation in stocks." Keep, therefore, to honest toil in a legitimate business, and do not aspire to become a financier. "Be content with such things as ye have."

ROBERTSON'S IRON FENCE.

The use of ornamental iron fences is no longer confined to expensive city residences, but is gradually extending to the more humble suburban or village houses; and they would be used much more but for their great cost; to lessen this is the object of an invention lately patented by Mr. T. J. W. Robertson, which is illustrated in the accompanying engraving, Fig. 1 representing an elevation, and Figs. 2, 3, and 4 showing sections through the lines, *a b*, *c d*, and *e f*, respectively.

This fence is made up of castings having the metal so disposed as to allow rods to be passed through the ornamental openings in the sections or pickets, whereby the latter are so effectually secured to the former that they cannot be removed when the panel is in place between the posts by which it is supported; and this is done without fitting, riveting, or other fastening, except that necessary to secure the rods in the posts. To accomplish this, the sections or pickets are made with three vertical bars, *h g h*, where the tie rods are to be connected to them; and these bars are so formed as to admit the tie rods between them, in the same manner as the weft thread passes through the warp in weaving cloth. That the tie rods may readily pass through the sections, the two side bars, *h h*, have recesses on one side, and the central one, *g*, on the other, so that an edge view of the castings would show holes through it about the size of the rods, C C, through which the latter are passed.



With sections thus cast, all that is required to make a panel of fence is to pass rods or gas pipes through a sufficient number of sections and the posts, and then bind the whole together by screwing nuts on the ends of the tie rods, when the panel is ready to be erected. Where large hollow posts are used the nuts may be concealed in their interiors.

From this it will be seen that the cost of a fence of this character may be reduced to that of the castings, rods, etc., as no time is spent in fitting, boring, riveting, etc.; and although thus cheaply built, it is one of the strongest fences made, as the whole strength of the materials employed is utilized in fastening the parts together.

For further particulars, or the purchase of State or county rights, application should be made to the patentee at 818 O street (N. W.), Washington, D. C.

A NON-RETREATING BUNSEN BURNER.

BY PRESIDENT HENRY MORTON, PH. D., STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

In consequence of the low pressure of gas during the day time, in this place, we have long experienced trouble from the retreating of Bunsen burners of the usual construction. This having repeatedly proved a source of annoyance and loss, I was led to a series of experiments with the view of removing the difficulty, if possible, by some modification in the form of the burner. After various trials with burners, in which the relation of hight to diameter in the main tube and the size of the gas jet were varied, I was led to the following consideration of the subject:

The retreat of a burner will evidently occur whenever any part of the ascending column of mixed gas and air is moving at the orifice with a velocity less than that at which the same will burn. Now, in an ordinary burner, with its main tube of regular cylindrical bore, it is evident that the friction of the surface of the ascending column of mixed gases will cause that portion to move at a less velocity than the central part, and that even currents of the nature of eddies will be developed. It will thus happen that, while the central portion of the ascending column of gaseous mixture issues at a velocity much greater than that at which the material can burn downwards, and thus is quite free from any danger of retreating, the marginal portions of the column or jet of gas will be escaping at a rate so much less that the velocity of their combustion downwards will exceed that of their upward motion, and retreat of the flame will ensue.

It is well known that, to secure a jet of water or of any other fluid whose particles shall move with equal velocities in all parts, and thus avoid currents and eddies, it is only necessary to make the orifice of efflux an aperture in a thin wall. In following out this idea, I made a burner of a bore rather large compared with its hight, and then drew in its upper edge into the form of an open-ended thimble, so contracting the orifice of escape to about two thirds of the area of the tube, and rendering this orifice practically an opening in a thin horizontal wall or plate. The results of this modification far surpassed my anticipations.

A burner thus constructed, as shown in the engraving, gives a a perfectly non-luminous flame with gas pressures varying between 1½ inches and $\frac{1}{10}$ of an inch of water, and with the lowest of these pressures cannot be made to retreat by the most violent handling in the way of sudden movement or waving about in the air, even when this violence is carried to the extent of extinguishing the flame altogether. Under like conditions of pressure, a burner of the ordinary construction is made to retreat by a slight draft of air or a very moderate amount of motion.

These burners are being manufactured, for our own use and for other colleges, by George Wale & Co.

Correspondence.

The Purification of Water.

To the Editor of the Scientific American:

In 1869 I took occasion through the columns of your valuable journal to call attention to the beneficial action of air for purifying water which had become foul with decomposing organic matter, and to offer my patent air treatment for the purpose, for domestic uses, free of charge. At that time the subject was new to the public; and few perhaps attached to it the importance which more recent developments have shown it to possess, especially for dwellers in cities. Recent articles by various writers on the subject tend not only to fully support my statements, but to show that bad water invariably suffers for want of oxygen, the degree of foulness indicating the diminished proportion or the absence of free oxygen.

The putrid water of a river can be reclaimed by absorption of oxygen, and it will arrive at sweetness and wholesomeness as soon as it possesses ⅛ of 1 per cent of free oxygen; this amount is necessary for fishes to thrive in water. But such water would not necessarily be suitable as a beverage for man.

Great apprehensions are now entertained that the horridly putrid condition of the ponds in Central Park will spread disease over the neighborhood, and these fears will be too fully justified if the present state of things continues. But there is no necessity for pond water to be putrid, or to become unwholesome, at any time. By the moderate annual expenditure incurred in running an air force pump or pressure blower, requiring about 20 horse power, in a place conveniently central, conveying the air by light but durable mains of about 12 inches bore to pipes of smaller bore near the bottom of the ponds, with perforated branch pipes through which the air issues, all apprehension of the re-occurrence of foulness in ponds can be entirely removed. Sufficient oxygen can be supplied by thoroughly agitating the water for about one hour daily, by pumping in air, to keep the ponds sweet. To purify them in their present state, the most rigorous air treatment for several days is needed; it may take a week to do it. The Croton water has suffered with this malady for years, and if it be not speedily provided against, it will fill our cemeteries at a still higher rate than 27 in 1,000 per annum, a death rate only exceeded by Bombay with 29.

R. D'HEUREUSE.

New York city.

The Treatment of Diphtheria.

To the Editor of the Scientific American:

I wish to make known to the public a method of treatment for diphtheria, which has been uniformly successful, in the practice of the writer, during a number of years, which included two epidemics; and in a large number of cases, not a case has been lost since this treatment was adopted. I feel confident that, by its general use, the mortality may be reduced to one per cent, or even less. I have heretofore delayed publishing the results in order to make sure that the treatment was really what it promised to be, and I now wish to use the columns of your journal, in order that the public generally may have the knowledge in their own possession.

An attack of diphtheria is usually ushered in with a high fever and headache, and, in children, with nausea and vomiting. There is great prostration. Upon the tonsils and surrounding parts are seen white, snow-flaky patches. In malignant cases, the patches are often yellow or brownish, and a terrible odor is perceived.

The remedy found successful by the writer is permanganate of potash, in conjunction (not combination) with the tincture of belladonna. The method of administration is as