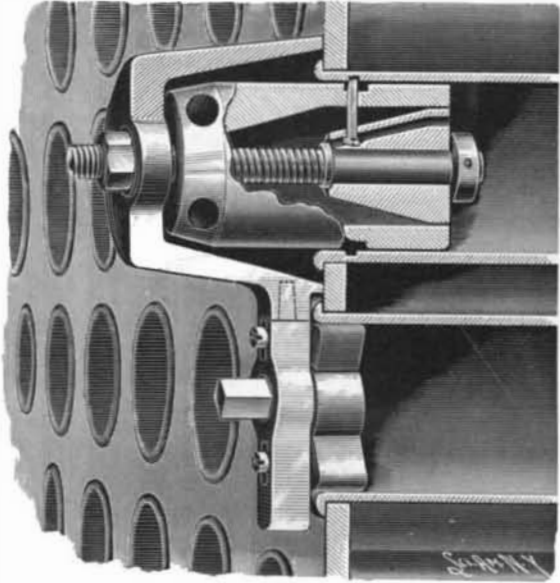


AN EFFICIENT BOILER TUBE CUTTER.

To quickly and conveniently cut off a tube in the boiler, for removal and the substitution of a new one, the appliance shown in the illustration has been devised and patented by Julius Richard, of Bisbee, Arizona Territory. The cutter slides in a tool carrier in which is a feed screw holding loosely a feed block which is longitudinally movable, and is formed with an incline to feed the cutter outwardly in contact with the tube. A yoke resting on the front face of the boiler sheet surrounds the outer end of the flue to be

**RICHARD'S BOILER TUBE CUTTER.**

cut, and the feed screw is turned in the yoke by means of a nut on the outer end of the screw, whose inner end is smooth, and carries the feed block loosely between a fixed and a removable collar. The feed block has a lengthwise dovetailed groove in which slides the base of the cutter, whose shank extends through an opening in the wall of the tool carrier, the latter rotating with its front end on the feed screw, and being turned by a rod or bar to move the cutter around within the flue to be cut. The yoke is cut out on one side to permit the insertion of the bar in one of the apertures of the carrier, whereby the latter may be turned in a step by step manner, the cutting edge of the cutter then cutting the inner side of the flue, and the cutter being from time to time forced outward by the turning of the nut on the outer end of the feed screw. To lock the yoke in working position, a threaded boss in its base at one side is engaged by a screw connecting it with a plate extending in front of the flue below, and in this plate turns a short shaft with a square offset on its outer end and cam-actuated jaws on its inner end, the turning of the shaft by a wrench or other tool moving the jaws outward into firm contact with the inner surface of the adjoining flue, and thus firmly supporting the yoke in front of the flue to be cut off.

THE INGLETON STEAM PLOW.

The accompanying illustration shows Mr. Ingleton's newest design of steam plows, which is being manufactured by the Ingleton Manufacturing Company, whose office is at 308 Walnut Street, Philadelphia.

As will be seen by referring to the engraving, the machine differs widely from all other steam plows, inasmuch as the travel of the plows is in a direction at right angles to the travel of the engine. The advantages of such an arrangement may be said to be as follows:

The resistance of the plows being across the line of travel of the engine, there is no tendency to hold back or impede the forward motion of the latter. The gearing of the engine is thereby relieved from all strain, and the driving wheels, having nothing more to do than merely carry the weight of the engine, do not slip, nor sink into the land, as they do when a heavy load is attached directly behind the engine. As a matter of fact, the plows have what is known as a lead, which gives them a tendency to draw toward the land, and this drawing toward the unplowed land, coupled with the power

required to turn over or push the six furrows back from the apparatus, has the tendency to force or propel the machine ahead, precisely the same as a steamship is propelled by her screw. It has been found, according to Mr. Ingleton, that the apparatus attached to the back end of the traction engine not only requires no hauling, but when in full work has to be held back by the engine.

Another advantage of these plows is the low speed of the apparatus, which is from one-half to three-quarters of a mile per hour across the field, while a swath from thirty to fifty feet wide is cut. This rate of speed gives the engine—whose crankshaft is making 200 revolutions per minute—an enormous power over its work. Added to this is the important advantage of the engine having to run across the fields but once for every thirty or fifty feet plowed; whereas, in pulling a set of gang plows behind it, it would have to cross the field once in every seven feet, and then at a rate of at least four miles per hour, or eight times faster than in the present case.

It should be stated that although the apparatus has a forward move of half a mile per hour only, yet the plows, attached to the endless chain, travel at a rate of four miles per hour, or eight times faster than the engine is moving, so that almost the whole power of the engine is consumed in doing actual plowing. The cost of plowing an acre of land by this system has been placed at 45 cents.

The machine was exhibited at the Minnesota and Missouri State fairs, in operation, last September and October, and was awarded a special diploma by each of these associations.

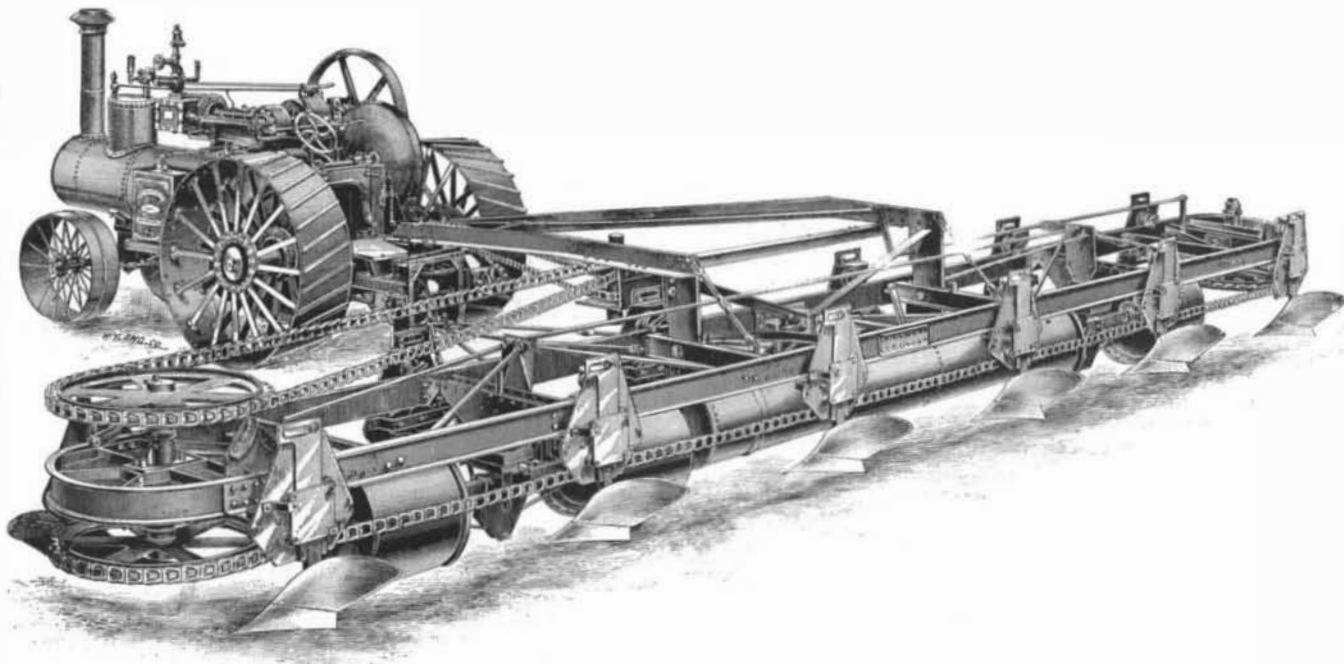
A large number of these plows is being ordered for South America.

A New Type of Telescope.

A very important discovery has been made by Prof. C. S. Hastings of the Yale Scientific School, the result of which is a new type of telescope, in which the defect known as the secondary color aberration is removed without the use of other than the ordinary silicate glasses, says the Evening Post.

In developing last summer the optical equations involving the thickness and separation of lenses to the second order of magnitudes, Prof. Hastings found a term which might be of the opposite sign to that involved in the equations of color correction. Although it seemed improbable that this would afford a means of correcting the old error, it demanded, in the professor's opinion, further investigation. After much labor he demonstrated theoretically a new method by which the secondary chromatic aberration, which had resisted solution for almost a century and a half, might be remedied. He next constructed a telescope with a ratio of focal length to diameter of only eight and a half, for use with the spectroscope. This has fulfilled in every way the hopes founded upon the theoretical investigation. It shows the solar spectrum with absolutely unvarying focus from extreme red to extreme violet, eliminating all secondary color aberration. While the experiment has not gone beyond this, there is no reason to doubt that the method is applicable to telescopes of all sizes.

Several years ago Prof. Hastings published a con-

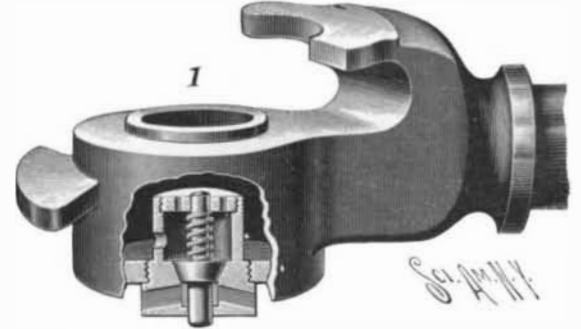
**THE INGLETON STEAM PLOW.**

struction involving a lens of but two kinds of glass, which very nearly met the desired end. But it has proved impossible to obtain large pieces of glass of the required kinds, and thus the method has been confined to small telescopes. It is an interesting historical fact that Fraunhofer, while endeavoring to solve this same problem, discovered the lines of the solar spectrum which bear his name. The discovery of Prof.

Hastings will add at least ten per cent to the power of the telescope, so that an instrument with a ten inch object glass will be about equal to an eleven inch telescope of the existing type.

AIR PRESSURE RELIEF VALVE FOR HOSE COUPLINGS.

The illustration represents an improvement to be applied to the coupling heads of flexible tubing or hose connecting the train pipes of adjacent cars, for lowering the air pressure sufficiently to enable the coupling

**COLWELL'S AIR BRAKE HOSE COUPLING.**

to be easily broken. A patent has been granted for the invention to William C. Colwell, locomotive foreman, S. S. and O. G. Division, Ocala, Fla. As represented in Fig.

1, the half coupling head is shown attached to the free end of the hose, and a portion is broken out to show the position and a section of the relief valve, screwed into a bottom opening in the coupling head, Fig. 2 being a side view of the valve. As will be seen, the valve proper seats downward and has two aligned stems, the upper one working in an inner removable head, and being surrounded by a spring which holds the valve normally closed when no air pressure is on. The other stem of the valve projects downward through a hexagonal head in which are lateral passages communicating with the chamber of the valve, there being also openings in the inner head of the casing and in its side, communicating with the valve chamber. By pressing with the thumb on the outer end of the valve stem, the tension of the spring is overcome and the valve is lifted to permit the escape of air from the coupled hose, enabling the couplings to be easily detached from each other.

The Engineer Road Carriage Competition.

As was announced last year, The Engineer, of London, has offered 1,000 guineas to the owners of horseless carriages that are successful in a competition to be held some time in 1896. The Engineer hopes that the antiquated laws which still obtain will be repealed in time to have the race this year. One hundred guineas have been added to the 1,000 already offered, this additional sum being for a naphtha or gasoline engine, as it is hoped that the laws governing the carriage of light oils will be modified by the time of the competition. The exhibition of machines will be held at the

Crystal Palace, the grounds of which will also afford facilities for holding the subsidiary trials. The date and the route which will be followed in the run have not been definitely decided as yet, but the run will probably occur some time in October, and the course will not be less than 100 miles and return, or 200 miles in all. Any vehicle which does not complete the run at a minimum speed of five miles an hour, including all stoppages, will be disqualified. No speed over ten miles per hour will be taken into account. The judges which have been appointed are

Sir Frederick Bramwell, F.R.S., M.I.C.E.; Mr. John A. F. Aspinwall, M.I.C.E., chief engineer to the Lancashire and Yorkshire Railway; and Dr. John Hopkinson, F.R.S., M.I.C.E.

The late Richard A. Proctor stated that our earth receives only the one two-billionth part of the heat of the sun.