he may be in a hurry to get an action on his case and this division may be farther advanced in date than another, or the examiner in this class may be known to have more liberal views than another; in this case, he simply styles his machine a machine for cutting paper, when his object is obtained, the case is assigned where he wants it to go. The same is true throughout the office A machine for riveting sheet metal is assigned to metal working, but the same machine, if called simply a riveting machine, and the statement of invention should set forth that it was adapted to insert rivets in *leather* and other sheet material, would be assigned to the class of leather working.

Under the present classification, one division patents knives; another patents hay knives; another shoe knives; another woodworking knives, and still another knife erasers—five separate divisions granting patents for knives.

There are at least three divisions patenting tacking and nailing machines, differing only in the material into which they drive the tacks or nails.

There are at least three divisions patenting chains, links, etc.

Is there any wonder that duplicate patents are sometimes granted?

The remedy for this state of affairs lies in the adoption of a classification which shall classify according to mechanical constructions and the generic functions of machines and devices.

Thus machines for *cutting* fabric, whether cloth, leather, or paper, would, under this classification, all be assembled in one division or class. All riveting machines, no matter upon what material they operate; all knives; all pegging and nailing machines; all rolling machines; and all chains, would be classified under their respective generic classes, such as cutting machines, riveting machines, nailing machines, knives, chains, etc.

This classification would result in the grouping of inventions of analogous constructions and generic functions in a single division of the office and would reduce to a minimum the possibility of issuing duplicate patents. This would arise from the fact that, these generic devices all being in one division, the examiners would become more familiar with them, resulting in more certain and thorough examinations being made.

The time now spent by the examiners running around to many different divisions would be saved and utilized in the work of examining, thus materially aiding the advancement of the work of the office.

Of course it is realized that it would be almost impossible to devise a classification which would entirely do away with the overlapping of the classes, but the one suggested, it is thought, would reduce such overlapping to a very small per cent.

A change must at some time be made, for it is becoming more difficult every year, with the enormous increase in the issue of patents, to make thorough examinations.

It is realized that any change must necessarily be made gradually, in order not to greatly interfere with the work of examination; but with a competent force it could be done in a comparatively short time without retarding the work of the office.—T. H. A. in the *Scientific American.*

## THE CAMERA FOR CELESTIAL PHOTOGRAPHY.

BY S. W. BURNHAM, LICK OBSERVATORY.

Every possessor of a good rectilinear lens and the ordinary landscape camera may not be aware of the fact that he has the best kind of an instrument for making pictures of the sky. The requirements in a lens for landscape photography are exactly the same as those which have to be considered in the department of celestial photography. About the same angle of aperture is desirable, and in a general way, the same class of lens as in landscape and outdoor photography. To get a satisfactory picture of a portion of the heavens at night, as we see it with the naked eye, the picture should include an angle of not less than 30° or 40°. There is this difference between terrestrial and celestial pictures: in the former we rarely get as much as we can readily see with the naked eye from the point where the picture is taken, while in the latter we can easily get infinitely more by prolonging the exposure. If the exposure is much extended in daylight work, the plate is hopelessly fogged, and instead of increasing the details in the darker portions of the picture, nearly all delicate details are lost, and the negative becomes flat and valueless; but with the plate exposed to the dark sky of a clear night, where the light emanates only from minute points, the exposure may be continued for hours, and when the plate is developed it will be almost clear glass except where those specks of light have made their impression. Negatives of this character possess this unique peculiarity, that no matter how long the exposure may be continued, they are always under-exposed with reference to the great majority of the stars shown; and at the same time, unless the exposure is very short, they are over-exposed with regard to the brighter stars visible to the eye. The longer the exposure, the more stellar points we get on the plate, and this could probably be continued far beyond the time one would be likely to give to the following of the stars, as they move across the face of the sky.

Almost every amateur photographer has a lens and camera well adapted to do this work, but unfortunately not many have the means of mounting such an instrument so as to hold the stars fixed on the plate during the necessary time of the exposure. For this purpose an equatorial mounting, driven by clock work, is indispensable. In other words, the photographer must have the use of an equatorially mounted telescope of some kind, with a driving clock so adjusted as to compensate for the revolution of the earth on its axis, and keep the camera and the stars relatively fixed, the telescope itself being used as a sort of a finder, to keep the star selected for following exactly in the same place in the instrument, by changing the position of the telescope and the camera attached to it, with the slow motions with which all such instruments are provided. No driving clock, however perfectly made and adjusted, can be trusted to hold the star exactly on the fine wire or spider web in the focus of the telescope for any considerable length of time. This must be done by watching the finder, and whenever the star shows a tendency to get ahead or fall behind the bisecting wire, bringing it back to position by the slow motions which move