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The Hall Air Compressors.

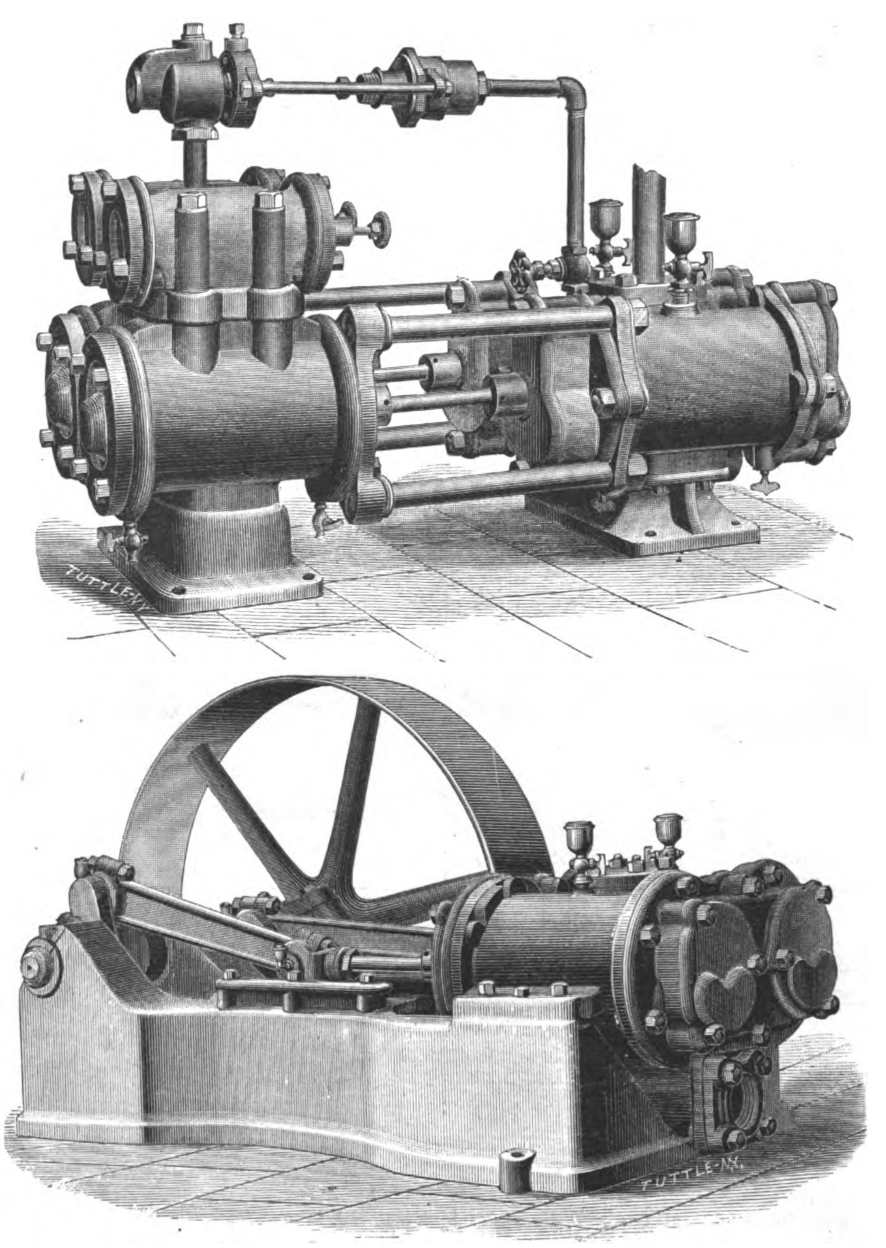
Our illustrations on this page are of two forms of air compressors, built by the Hall Steam Pump Co., 91 Liberty street, New York city.

Both the machines are duplex, one being driven by a belt, the other by steam direct, the valves and steam end arrangements generally being the same as are used on the steam pumps built by the same company, and which have been fully described in these columns.

The construction of the suction and delivery valves is shown by the detail cuts, Fig. 1 being a view of the valves separately, and Fig. 2 a view of part of the air cylinder with a section of the plate in which the valves are fixed. These valves and their arrangement are the same in each machine.

The steam valves used in the Hall pump have been found to be well adapted to use in air compressors, for the reason that the length of stroke of the pistons is practically the same under all ordinary variations of load or steam pressure, thus allowing of the employment of much smaller clearance spaces than could otherwise be used, which, of course, for air compressor work, is vitally important. The character of the mechanism also admits of the comparatively high speeds necessary for this work. An automatic regulator is provided, which can be adjusted to maintain any desired air pressure. It operates to open or close a valve in the steam pipe, the motion for this being obtained from a piston which is moved by slight variations of air pressure.

For small volume, and pressures up to about 25 pounds, these compressors have proven very satisfactory, and work with very good economy; the size which can be economically employed depending somewhat, of course, upon the cost of fuel in the locality where used—the most used sizes being with steam cylinders 5″ to 15″ diameter, and with air cylinders a little larger. Many of these are used for furnishing air blast in burning oil as fuel.



THE HALL AIR COMPRESSOR.

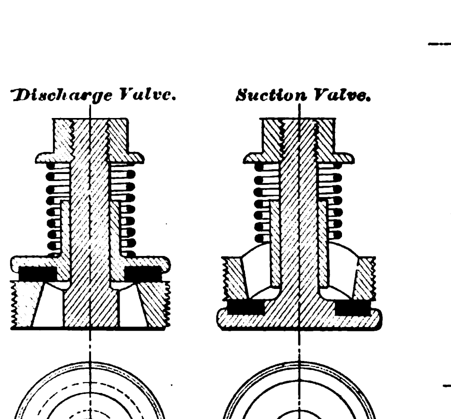


FIG. 1.

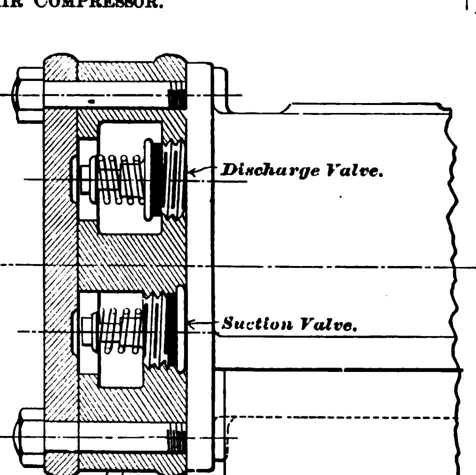


FIG. 2.

Closing Words Upon Tapers—Werner Fears that a Uniform Standard would Destroy "Individuality."

By JARNO.

It can hardly be expected that we can, in practice, fit a tenon so tight in its key-hole that the arbor cannot slip. The idea of having a tenon prevent the arbor's slipping is well enough for a milling machine cutter arbor, as any slipping that may come from looseness between the tenon and the key-hole does not, necessarily, do any injury. In a gear cutting machine, to have the gear arbor slip in the least may cause the gear to be spoiled. It is usually expected that mediumsized and small gear arbors, when simply driven in, will be kept from slipping by the friction of their shanks in the spindle holes. The largest milling or gear arbor is held in by a bolt going through the spindle lengthwise, and into a threaded hole in the end of the arbor. No. 15 shank, 1.5″ diameter at the small end, I would call medium size; No. 20, 2″ diameter at the small end, I would call large. When the arbor is held in by a bolt, there need be no key-hole through the spindle, as the bolt acts also to drive out the arbor. Gascon thinks that it is never safe to depend upon simply the friction of the sides of a shank to hold an end mill in its collet, and that a tenon is more dangerous than no tenon, because, if a mill that has a tenon works loose, it continues to turn for a time, and may dig into the work. This appears like putting it rather strongly after so many years' use of such mills, but the same opinion obtains among tool makers, for I see in a late catalogue that some end mills are threaded in place of a tenon, the thread running up from the end about the length of a tenon. Even a threaded shank end mill may work loose, but not so soon as one that has simply a tenon. With either kind it makes a great difference as to how the shank fits into the spindle or collet. Too much attention cannot well be given to making a good fit. If the shank be at all loose at the outer end, the slightest vibration that it must then take will cause it to work out. I have great faith in the ability of vibrations to find defects.

It is sometimes a convenience to have the shank of the live center like that of the foot-stock center, so that, if the live center be used in the foot-stock spindle, it can be driven out by the screw. This had not been attended to in two lathes that lately came into Gascon's shop.

In the production of interchangeable parts, machine tool makers are not quite abreast of some other workers in metals. Machine tool makers have standard size gauges, they have standard thread gauges in order to duplicate or replace parts of their own machines. This is well; in fact, it is almost a necessity. But it would be another and a greater thing to have some of the machine tool parts from one maker to interchange with those of every other maker. The next step in mechanical progress should bring us to a uniform rate and sizes of taper. To make over lathe spindles so as to have the centers interchange may be better than to have so many different tapers; but better still it is to manufacture lathes so that they shall not have to be made over. As regards spindle holes, a lathe maker may be excused if he does the same thing that all his neighbors are doing, if they adopt a standard.

Different watch factories make movements that will fit the same case. Microscope objectives bought in any city in America will interchange with others made wherever English is the ruling language. Gas burners are interchangeable. To attempt to make them other than of the established thread and size would be to place a ban upon the enterprise.

Werner says: "Your center reform would be one of the things that tend to destroy individuality, which would cause us to drift backward, and progress to come to an end."

I reply: "When one does not wish to change out of an old way, it is any contemned thing, but make the change; even a mare's nest will answer for a clog. Has any one ever known a superabundance of individuality? I do not think it would be possible to teach two persons even to write alike. On my way to the shop, this morning, as I came to the railway crossing, a freight train blocked the foot-way. I looked into the retarded faces and noted the expressions both visible and audible. Some swore while others smiled, some grunted while others were silent. One man took a paper out of his pocket and read. Now, how much better all this is than if there had been no individuality! In the same circumstances I suppose you would object to having every person smile or read the AMERICAN MACHINIST."

"Your story of the belated foot passengers is interesting enough as a study, but, like 'the flowers that bloom in the spring time,' it has little to do with the case. Improvements in machinery do come from individuality. If an association settles upon a certain size for a machine part, and every machinist follow, then the association does to progress what the freight train did to your foot passengers."

I rejoin that there cannot be more danger from having standard tapers than from standard threads in microscopes and gas fixtures.

Will machinists adopt a standard taper? Perhaps the question should be, shall they adopt? A few years ago it was proposed to set many thousand clocks and watches so that they should indicate what is now called standard time. From the many questions asked and objections raised, the change seemed difficult and impracticable. Yet we were ready, the change was made; in a few days it was not noticed as giving any inconvenience. At about the same time there was a proposition to have the hours numbered up to twenty-four; among other reasons, so that, in speaking of any hour, it would not be necessary to tell what kind of an hour was meant. Many persons had their watch dials arranged to count hours above twelve. Clock manufacturers made thousands of clocks geared to turn the hour hand around once a day, and having dials figured from one to twenty-four. That the proposed way of counting would have some advantages was generally admitted. It was said to be better for scientific reasons. Acquaintances pleasantly told each other the time in the new way: "It is now half past thirteen o'clock," or, "It is now seventeen o'clock." Yet this change was not made. We were not ready.

Some things are done from reason, and others from feeling or enthusiasm. However reasonable it may be, if we do not feel like doing it, the thing is not likely to be done. Sometimes I am not surprised that men have supposed their feelings to be influenced not through their reason, but by something not themselves. And so I may say that, if I have succeeded in pleasing the genius that controls the feelings of machinists at the present hour, we shall soon have a standard rate and standard sizes of tapers but if the genius frown, we must wait.

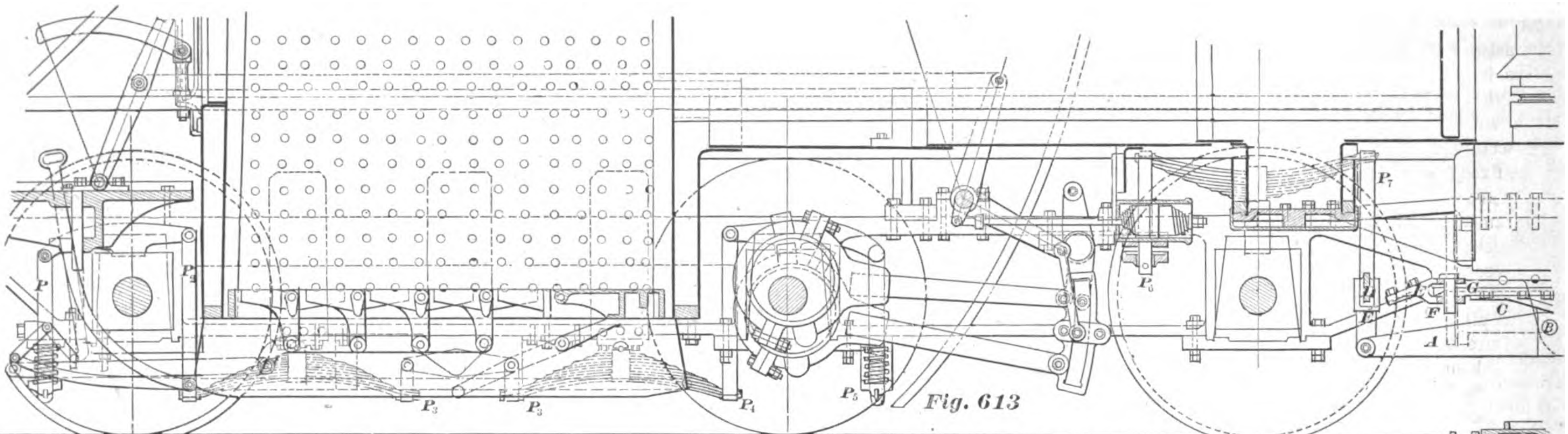
In account with the world, we as machinists have a certain amount of work to do. The world will excuse us when this work is done, even though we do it in fewer hours than formerly. We want more time for social and intellectual improvement. I have that faith in the order of things to believe that, when we deserve this time, to us it will be given. Anything that saves time should, at last, save it for us all.

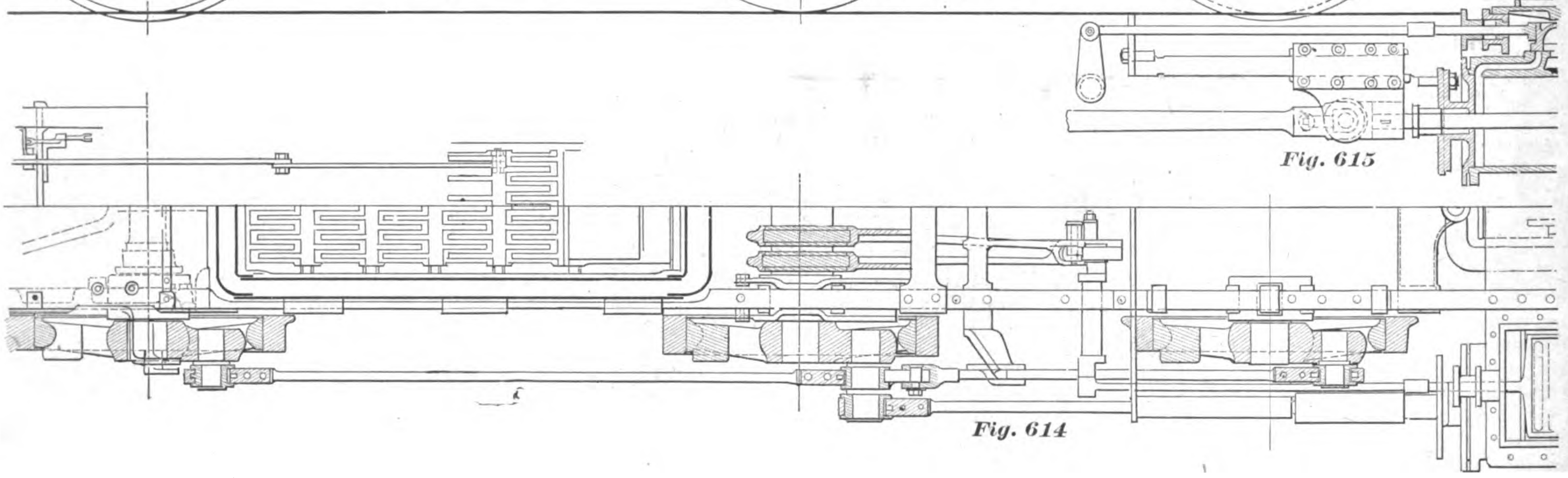
Modern Locomotive Construction.

By J. G. A. Meyer.

LAST PAPER.

Figs. 613, 614 show a portion of the sectional elevation and plan of a narrow gauge mogul locomotive. It will be noticed that there is not an equalizing lever between the front and central driving wheel springs. This arrangement divides the spring gear into two distinct parts. The rear part is similar to that described in the foregoing paper; the front part consist of a system of equalizing levers connecting the front driving wheel springs to the two-wheeled, or pony truck springs. The front spring hangers P_7 connect the springs to the transverse equalizing lever D; the longitudinal equalizing lever A is placed midway between the frames; it works on the fulcrum pin B held in the casting C bolted to the underside of the cylinder saddle; the rear end of the lever A is connected to the transverse lever D by means of the link E; the front end of the lever A takes hold of the king bolt in the pony truck, which is not shown here.





In wide gauge mogul engines the design of the front part of the spring gear is similar to the one here shown; but at the rear end, the springs are generally placed above the frames over the driving wheel boxes, and connected by equalizing levers as shown in Fig. 599, making the design of the rear part of the spring gear similar in all respects to that of a driving wheel spring gear for a four-wheeled passenger engine.

In consolidation engines the springs over the second, third and fourth driving axle are generally connected by equalizing levers, forming a system similar to the design of the driving wheel spring gear in a ten-wheeled engine. The front driving wheel springs are connected to the pony truck by a system of levers like those used for a mogul engine.

In eight-wheeled passenger engines, and mogul engines, having spring gears as here described, the mass of machinery supported by all the spring has three main points of support; two of these points are at the rear end, and the other at the front. In both classes of engines the rear points of support are the fulcrums of the main equalizing levers midway between the two rear driving wheels. In passenger engines, the truck center pin forms the front point of support; and in mogul engines, the fulcrum of the equalizing lever which connects the front springs and the pony truck forms the front point of support. Ten-wheeled engines, and consolidation engines with spring gears as here described, have five main points of support; the fulcrums of the equalizing levers connecting the driving wheel springs form the four main rear points of support. In a ten-wheeled engine the front point of support is formed by the truck center pin; and in the consolidation engine, the fulcrum of the equalizing lever connecting the front driving wheel springs and the pony truck performs the same office.

The center of gravity of a passenger engine will always be between the three points of support, as it should be, in order to make the engine ride steadily. The center of gravity of ten-wheeled, mogul and consolidation engines should always lie between the front point of support and the two points—one on each side of the engine—lying midway between those driving wheel springs which are connected by equalizing levers. There is danger of changing this condition; for instance, if in mogul engines all the driving wheel springs are connected by equalizing levers, the center of gravity may be on the rear of the points just referred to, instead of lying between these points and the front point of support; the consequence will be that the rear end of the engine will have a constant tendency to drag downwards, and interfere with the steady riding of the engine. The same remarks apply to consolidation engines. Here, then, we perceive the reason for not having equalizing levers between the front springs and the adjacent ones. There is another advantage gained with this arrangement. When the pony truck wheels pass over any unevenness of the track, or obstacles, the truck springs will be relieved of some of the strain, a portion of it being thrown on the front driving wheel springs. In these papers we have endeavored to describe thoroughly some of the principal parts of the locomotive. The boilers, trucks, tenders, etc., will be treated in a similar way, and will soon appear with all the foregoing papers in book form.

The Massachusetts Institute of Technology is using the papers on "Modern Locomotive Construction," written by J. G. A. Meyer, as a text for instruction for the students.

There is still great distrust in England of copper steam pipes for steamships; winding them with wire is now recommended.

The Performance of a Double-Screw Ferryboat.

The above is the title of a paper, which we abstract below, presented by E. A. Stevens and J. E. Denton at the twentieth meeting of the American Society of Mechanical Engineers.

In the introduction of the paper, Mr. E. A. Stevens briefly referred to the design of the first ferryboat, also to the advancement made in the construction of these boats, and gave some of the considerations which led to the adoption of the plan of the boat "Bergen," whose performances, and a comparison of the same with that of the boat "Orange," was the subject of this paper. In referring to the service demanded of a New York ferryboat, he said:

The weight of the loads carried, both in passengers and teams, as well as the strain caused by the ice and the danger of collision, all call for a hull of great strength and rigidity. Beyond this, the vessel must have great stability, to resist burying by the head as well as heeling. She must be able in floating ice, and should attain a speed of about twelve miles an hour in service. The main characteristics of the Bergen's model are a full flaring upper body, fine under water body, with a full water line, a sharp V-shape midship section, and the peculiar cutting away of the ends to bring the rudders and screw within the perpendicular of the stems.

The shape of the water lines and upper body were determined by consideration of power in ice and stability.

The midship section, in order to give an unbroken line for the shafting, had to have a certain depth. It was found that, with the required displacement, the form adopted was about the only practical one. The experience on the Hoboken ferry, moreover, had been very favorable to a sharp V section. The older, wooden boats, built on a perfect V section, gave excellent results, while on the iron and steel boats, the Orange and Montclair, which more closely approach that section, gave better results than the other boats which had a semi-circular section and, as far as could be judged, than the West Shore and Pennsylvania R. R. ferryboats, with straight sides and a flat floor.

The experience on the Hoboken ferry, with balanced rudders hung under the keel and supported from above, having been very favorable, both as regards efficiency, strength and ease of repair, it was decided to use a rudder as nearly similar to the ones in use as