

In sprocket chains for light work, malleables have maintained their lead. And for medium work they are giving good service where the section can be thinned and the strength increased by making them wider. For heavy work wrought is used because there is little difference in the quality of properly forged material on the outside and that in the center. It was attempted at one time to make the knuckles for car couplers of malleable castings, but they were worthless. At first knuckles were made in

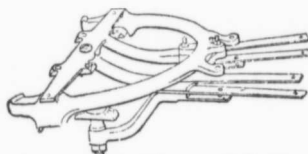


FIG. 11—Fifth Wheel in Malleable.

wrought, but steel castings are now used altogether or nearly so. Coupler draw bars, Fig. 4, were wholly of malleables until a few years ago, when steel castings began to supplant them and have now taken a large share of the coupler trade. This was partly owing, however, to unwise competition in malleables, which resulted in their falling below their regular possible efficiency. Steel castings are here to stay, but malleable draw bars are not a thing of the past. This is owing to the principle named, of getting a large sectional area without any exceedingly thick parts in critical places. Fig. 5 is a section through the shank of Fig. 4, showing how sectional area is much increased without thickening too much at any point. These draw bars are too difficult to make in wrought.

INCREASED USE OF STEEL CASTINGS.

Steel castings have been greatly developed in the last decade, and especially in the last five years. They cannot be molded into the finer forms possible with cast iron, and therefore in malleable castings, nor can they be produced of as uniform quality as wrought steel, but they have made marked inroads into the fields of wrought metal and grey iron castings. One of their advantages is



FIG. 12—Formerly Malleable Casting, Now Largely Wrought.

the elimination of separate parts. Bolsters and side frames of various designs in steel castings are coming to the front commercially, and complete standard gauge car bodies are now being made in one piece for furnace charging, etc. Patents have been issued for a truck bolster, side frame and all the journal boxes in one piece. Wrought bolsters and side frames are, as a rule, lighter and cost less, but the reduction in the number of parts by the use of steel castings is working a change. This change may go to greater lengths, or it may find an equilibrium in a combination of wrought and castings.

Many articles formerly of wrought iron

or steel are now made, and will continue to be made, in steel castings. Locomotive side frames, Fig. 10, when made of wrought require a weld at nearly every corner, and most of these really mean two welds. Figs. 11 and 12 show a part with one V block, A, placed ready to weld, after it had been heated in one forge and the frame in another. Then the same thing must be gone over again to close the space B, and so on until the frame is completed. This, taken in connection with the expense of forging all these parts before the welding commences, shows how desirable it was to cast this article in one piece. Rudder frames for ships come in the same class and many other parts for ships, while electrical machinery, steam hammer columns, hydraulic press plates and many other machine parts are now made in steel castings. Generally where these displace cast iron it is a question of quality and sometimes of price, because the steel article can be lighter. Where they are used in preference to wrought iron or steel it is a question of price.

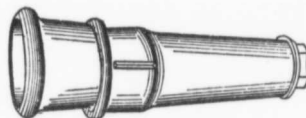


FIG. 13—Cast Skein.

There are many articles in which quality determines the choice of wrought material and price has little or nothing to do with it. These include pipe for very high pressure, as well as unions for such pipe, armor plate, shells, springs, boilers, parts of sewing machines, firearms, automobiles—an endless list, to say nothing of edge tools. Cannon, as a matter of course, were made at first of castings. The Confederate Government put wrought bands on cast iron guns. Then some 25 years ago efforts were made to produce them in steel castings, recourse being had at last to fine wrought steel throughout.

SOME LINES IN WHICH MOVEMENTS ARE CONFLICTING.

While the trend in many cases is clear as to choice of materials, in others it is not. A generation ago such articles as body loops and steps, Fig. 9, were made in wrought. Malleable largely took their place, as shown in Fig. 10. Now many of the same class of articles are again made in wrought. Fifth wheels, like Fig. 11, and numberless other things are hardly approachable by wrought as the shape is difficult, and being light, the quality can be good. Automobile parts generally would not be accepted in malleables. Body hangers, Fig. 12, were largely made in malleables, but now are produced in great numbers in wrought. These are rather large,



FIG. 14—Wrought Steel Skein.

being 2 ft. long, and improved methods in press and roll forging will probably keep the wrought in the lead, both as to price and quality. Wagon skeins, Fig. 13, are

mostly made of cast iron. Wrought skein, Fig. 14, have been used for 30 years, but their cost is against them. Skeins were also tried in malleables, but so far these have not advanced much. Bathtubs, which are much larger and generally plainer in form than articles just named, are being ingeniously made in wrought material, but cast iron

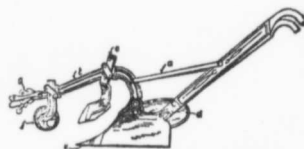


FIG. 15—A Variety in Plow Parts.

holds the lead. There has been an advance in the use of wrought steel pulleys, but it will be a long time, if ever, before cast iron pulleys are entirely displaced in the light and medium sizes, and probably never in flywheel sizes. A question of special interest is whether wheels for freight cars shall be made of wrought material.

COMBINATIONS OF CASTINGS AND WROUGHT MATERIAL.

Without noticing generally built up structures, in which castings and wrought are so commonly combined that we are apt to overlook them, a plow, Fig. 15, will illustrate this class. The braces a, the beam b and the coulter c are wrought. The roller f is cast iron. The clevis g is a malleable casting, for while the intricate form it needs to be tougher than cast iron and comparative cost forbids it to be wrought. The mold board d is of chilled cast iron, as is also the share e. In early days the mold boards were all made of cast iron. Next wrought steel was used—a high carbon surface and a soft steel center or back, so as to be capable of being highly hardened and yet endure use. But the art of chilling cast iron kept advancing and now there are large numbers of mold boards made of this, and owing to their hardness and the fine granular structure they operate more satisfactorily in certain

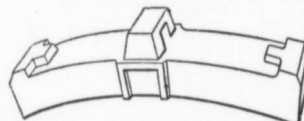


FIG. 16—Cast and Wrought Material Combined.

soils. A matter of enticing interest is that of uniting the two materials homogeneously, as seen in scissors having cast handles and a wrought steel edge, and in a heavy article, as an anvil. In brake shoes for cars, Fig. 16, the wrought toughens the structure and the cast iron gives the wearing quality. While this is a success in these and other cases, it has not been found widely applicable.

Under the enthusiasm of new ideas, possible combinations and variations make an interesting mental picture and tend to cause a pleasant state of feeling in a man who is in love with his work.