tric rod, is made entirely from a single bar of stock, 3½ by 3 ins., without the addition of any further pieces as in the last instance. The original stock piece may be seen at A. The centre of the stock piece is first of all broken down as indicated at B, to the thickness of the final body of the rod, the breaking down being all on one side with regard to the end to be machine forged, the other end being broken down centrally. The next step is the machine forging. The offset broken down part is placed downward in the machine, with the form of the outside part of the jaw contained in the stationary and movable rams, along the lines of cleavage, which may be noted at C in fig. 4. The end ram, with a projecting blade, as in the former instance, is forced into the body of the metal, the metal flowing outward and backward along the blade of the plunger. This is a rather remarkable piece of machine forging, as the end plunger has no assistance in entering as in the last example, having to force its way through the solid metal, displacing the latter into the form of the side plunger, with the ends formed in the face of the end plunger itself. The opposite end to this forged part is next drawn out under the steam hammer to form the part that is attached to the eccentric. The whole is subsequently machined.

A very complicated piece of machine forging is shown to the right in fig. 2. This is a link saddle for the Stephenson link motion, and is made in the forging machine, from 3½ by 3 in. stock, in one blow, the stock having first of all been roughly shaped to size under the steam hammer. This being considered a specially fine sample of machine forging, no details of the steps involved could be obtained. It is a most interesting piece of work, and demonstrates probably as well as it is possible to do, the scope of the machine and its possibilities under skilful management.

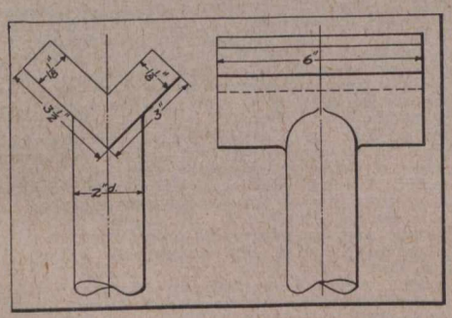

Fig. 7.—Pilot Heel Brace from Forging Machine.

A couple more examples of the forging machine work are shown in fig. 5. The member on the left is a grate shaker shaft, made from a single length of 1¾ in. round stock. The first step in its production is to put a bow in the stock at the point where the offset arm is to be located. The centre of the bar stock at the eccentric point is 3½ ins. from the centre of the main bar centre line. This bend in the stock is given under the steam hammer. The stock at this stage resembles an offset crank shaft. With the offset upward, the stock is placed in the forging machine, the rear face of the offset arm being formed in the cross dies of the forging machine, the end plunger forcing the bent part of the arm up into these side dies, spreading it upward in the die cavity, the front being formed by this plunger, which at the same time upsets the end from 1¾ to 2 ins. in size to the shape shown in this illustration.

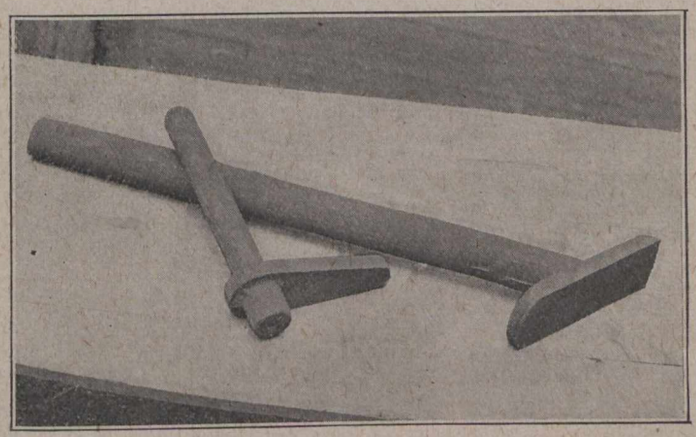

Fig. 5.—Grate Shaker Shaft and Smokebox Brace Produced on the Forging Machine.

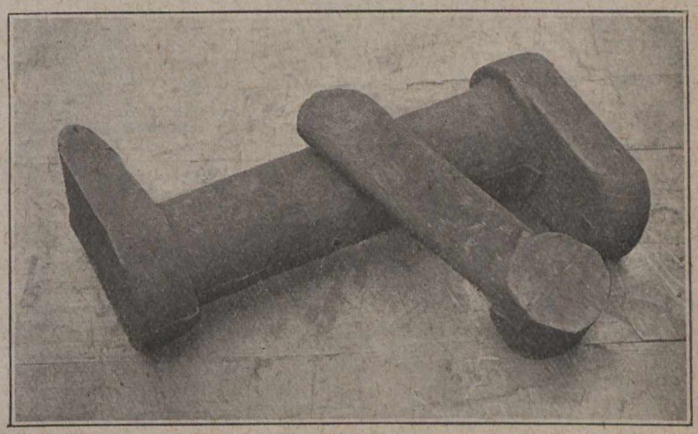

Fig. 6.—Spring Hanger and Rocker Barrel Produced on the Forging Machine.

The other part shown in fig. 5 is a smoke box foot brace. The original stock is first of all bent at the end at right angles, leaving sufficient stock in this bent end to form the finished foot. The bent stock is then gripped in the cross rams of the machine, which contain the form of the rear face of the foot, the lengthwise ram forcing the metal into the pockets of the side rams, the metal at the same time from the squeezing of the end plunger, floating downward to form the lower part of the foot from the part of the bar that was bent upward.

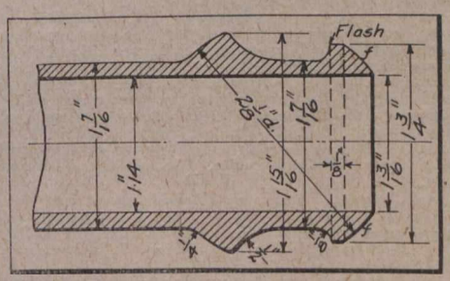

Fig. 8.—Forged End of Schmidt Superheater Tube.

The small spring hanger in fig. 6, the boss of which was formed in the forging machine, is a simple job, the stock being first of all drawn down roughly to shape under the steam hammer and finished by machine forging. The other member in this illustration is a rocker barrel, and serves as a fair sample of the size of work that can successfully be handled in the forging machine. Both ends of the rocker are formed in the machine, without any preliminary preparation under the steam hammer, as in some of the other examples. A straight squeeze of the ram on the end causes the metal to flow upward to form the arms. The ends are formed separately, heating each independently and upsetting. This piece is considered to be probably the most difficult undertaken, on account of its large size.

Another instance of heavy forging machine chine is the pilot heel brace shown in fig. 7. This heavy end forging is upset and formed in one heat in the same operation. The 2 in. round stock is held between the cross dies, the latter containing the form of the rear portion of the brace head, the plunger carrying the four faced form of the end projection. The forward movement of the ram upsets the stock end, forming it out into the final shape.

Another instance of forging machine work on small stock will suffice to illustrate the usefulness of the machine in the railway blacksmith shop. The ends of the superheater pipes in the Schmidt superheater are of the form shown in fig. 8. When first introduced, the end swelling was made on the tubes by shrinking a collar over the end, and then machining down on the outside to the final form. This latter part of the operation was a long and expensive one, as only the ball surface on the very end required a finished surface. These tube ends are now upset in the forging machine, all in one operation. The outer form of the tube end, with the exception of the portion required to be finished, is carried in the cross dies of the machine. On the ram of the machine is a long tit, the internal diameter of the tube, around the shoulder of which is the die formation for the finished end part of the tube. The ram tit prevents the inward collapse of the tube, the end upsetting to the shape shown. Along the edge indicated there is a projecting flash following the upsetting, which is trimmed off in the machine when cold. With this method of forming the end only one surface requires to be machined.

Wireless Train Dispatching.—After a careful investigation the Superintendent of Telegraphs of the Atchison, Topeka and Santa Fe Ry. has come to the conclusion that it is not advisable to install wireless telegraph apparatus along the railway, not only because of the expense of installing and maintaining the stations, but also for the reason that wireless telegraph communication can too easily be interfered with to make it sufficiently reliable for railway use.

As an Adjunct of Car Refrigeration, precooling applied to loaded cars has been in operation for a period of from 2 to 3 years. There are three pre-cooling plants of large capacity in California, and one in Texas, all giving satisfactory results. In addition to these large plants, there are smaller ones operated by individual shippers, giving varying degrees of success. It is claimed that pre-cooling is destined to become an important factor in transportation refrigeration, especially in the case of the more perishable fruits.