RECENT DEVELOPMENTS IN BOILER MOUNTINGS

by

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Boiler mountings are defined as items of equipment which are attached to the boiler or which are under pressure when steam is raised and the stop valves shut. Hence such minor items as pressure gauge valves are boiler mountings ; but only those of major importance will be discussed here.

When steam conditions were advanced to those used in the *Daring* Class Destroyers, 650 Lb/sq. in. and 850° F, it became necessary to review the performance of boiler mountings, which are nearly all special applications of steam valves, at the same time as the broader field of all steam valves was surveyed.

Valves

The valves are, in the interests of standardization, identical with the valves used on the main and auxiliary steam ranges, that is, all are suitable for working at 650 Lb/sq. in. and 850° F, although a fair proportion are used on the saturated part of the boiler, where the temperature is much lower. All valves over $1\frac{1}{2}$ in bore, except main stops and feed checks, are parallel slide valves of standard design ; small valves are either globe valves or small parallel slide valves.

Typical of the globe valves is that shown in fig. 1. It is of the narrow cone angle type, with stellited lid and seat surfaces, the stellite for the seat being deposited direct onto the drop forged body, so eliminating a possible source of leakage between the seat and the body. The narrow cone lid is self centring in the seat and needs only rough guiding, which is arranged in the upper part of the body and the cover. The cover is held on with studs, which is permitted in small valves, though, above $1\frac{1}{2}$ in, through bolts only are allowed. The bridge is integral with the cover, so as to save weight and space, and the gland studs are loose so that they can be removed completely when the gland needs repacking and can also be replaced with the minimum of inconvenience, should they become bent or otherwise damaged.

The narrow cone angle type of valve is a direct copy of the type used extensively in the U.S. Navy, where it has given complete satisfaction for many years. The main disadvantage is that the spindle forces required are comparatively large and the seat-lid joint pressure is high, which entails the body being rather more robust than is necessary in flat seated valves.

A typical flat seated pressure gauge valve, with screwed ends, which are permitted below $\frac{1}{2}$ in bore, is shown in fig. 2.

In order to obtain a direct comparison between English designed valves and American, a certain number of small parallel slide valves have been used. The parallel slide valve is peculiar to the Empire, being almost unknown both on the continent of Europe or in U.S.A.

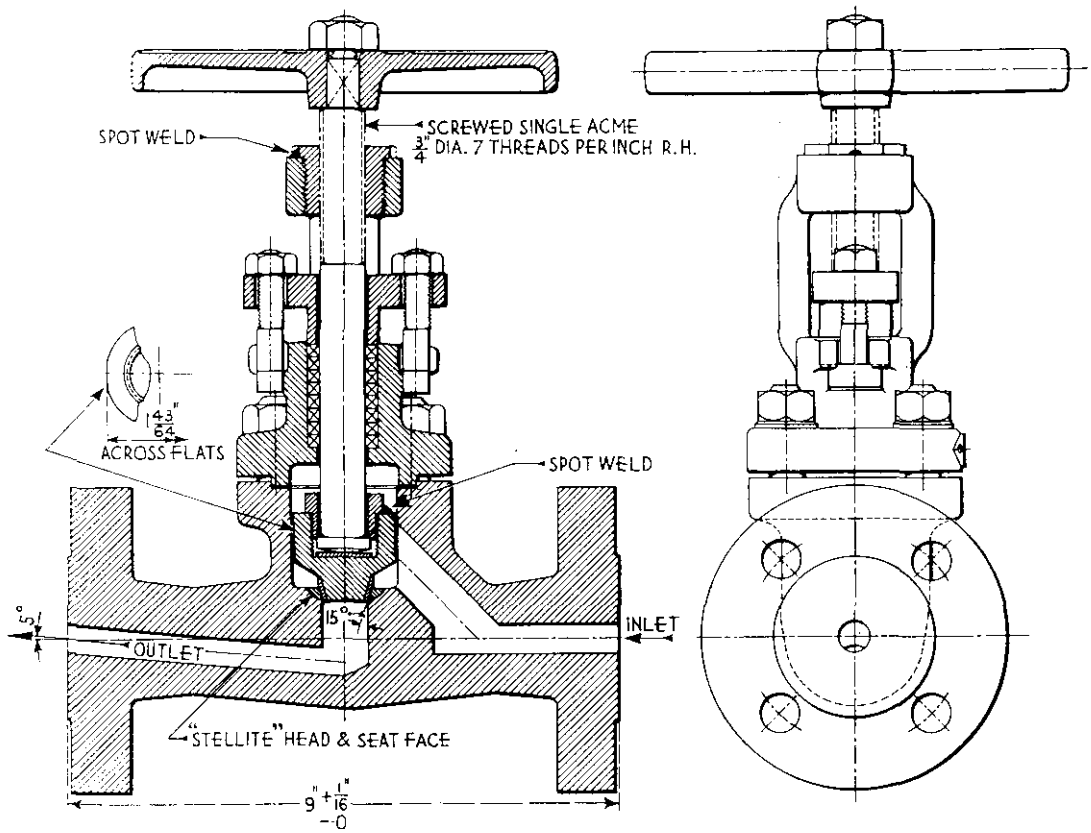

FIG 1—TYPICAL GLOBE VALVE

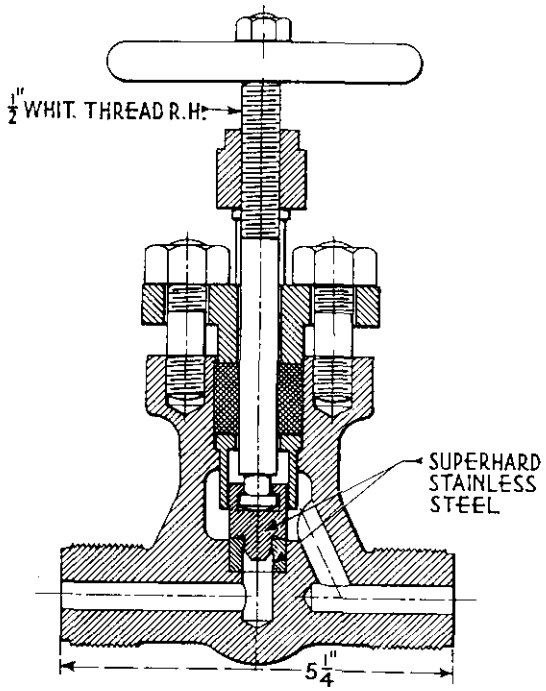

FIG. 2.—PRESSURE GAUGE VALVE

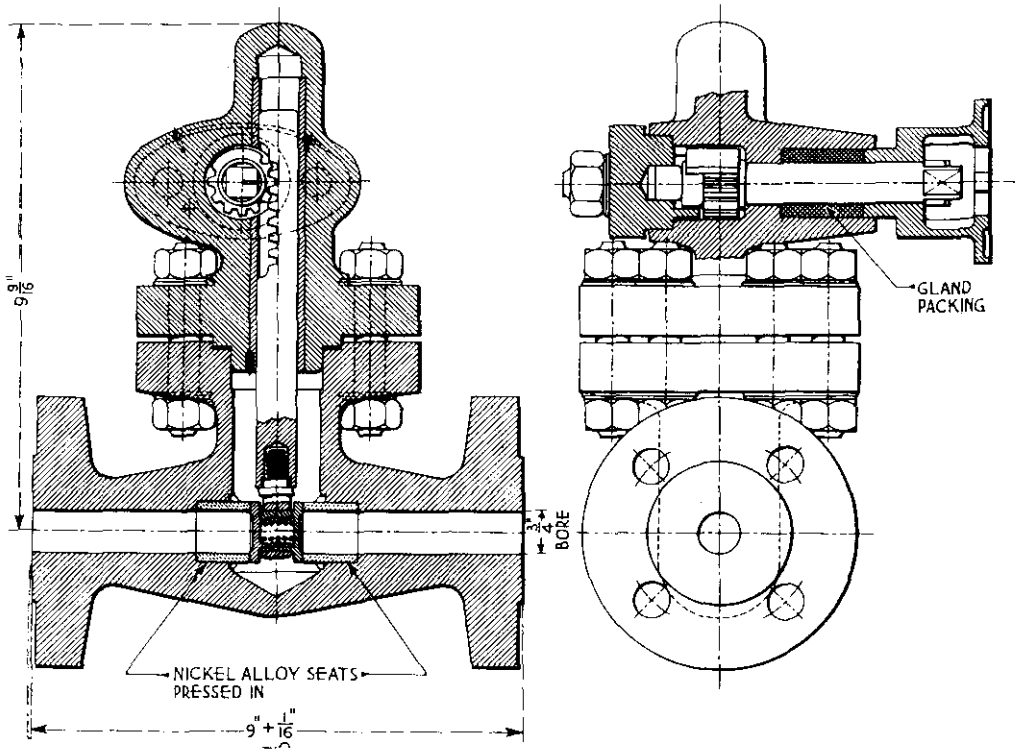

FIG. 3.—RACK-OPERATED PARALLEL SLIDE VALVE

A typical small rack-operated parallel slide valve is shown in fig. 3. Rack operation, which is quick and gives a light and compact valve, can be used only in the smaller sizes due to the force required on the handle. It is particularly suited to such services as boiler sampling and superheater running down valves, for which service that shown in fig. 3 was designed.

Blow Down Valves

These also have been redesigned and Messrs. Dewrance have produced a very elegant design shown in fig. 4. This valve is interlocked so that the valves must be worked in the correct order and the handle cannot be removed when both valves are open, thus preventing dropping the handle into the bilge whilst blowing down the boiler.

Water Gauge Fittings

The sleeve packed cock having proved barely suitable for use at 400 Lb/sq.in. it was necessary to have a different type of shut off valve altogether. Here the rack operated parallel slide valve is ideally suited, as it can be worked as if it were a cock. The arrangement of the type adopted for *Daring* Class is shown in fig. 5. For the blowdown valve, a double cam operated mitre valve is used, as shown in fig. 6, which gives similar protection against leakage to the double boiler blow down valve. The gauge glass itself is of the plate type

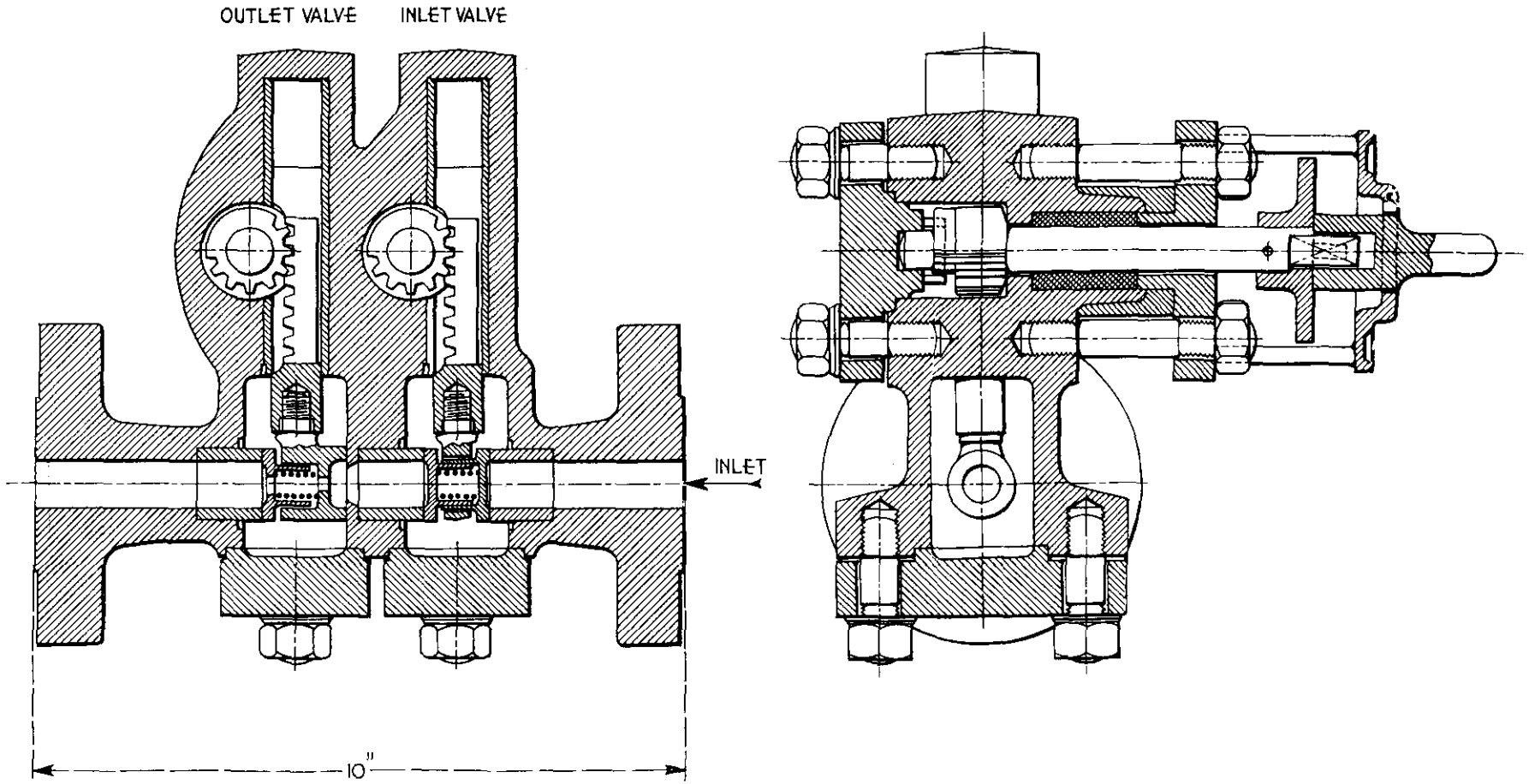

FIG. 4.—BLOW DOWN VALVE

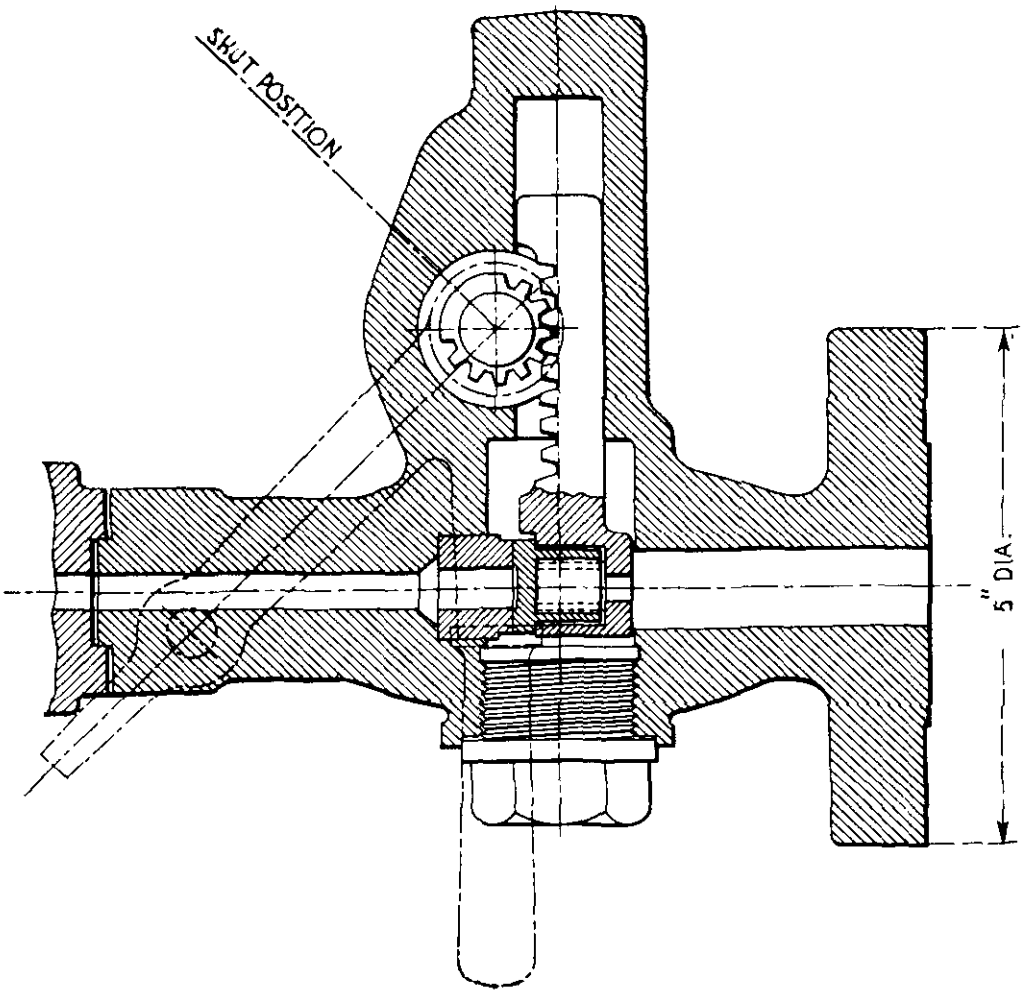

FIG. 5.—WATER GAUGE COCK

shown in fig. 7, as experience shows that the tubular glass will not stand the pressure and temperature at 650 Lb/sq.in. In fact, the Service use of the tubular type as a matter of course at 400 Lb/sq.in. was looked upon with considerable surprise by one famous firm of gauge fitting manufacturers. It has been decided, experimentally, to try a tubular glass in one *Daring* boiler, to see how it stands up, as this type is much more easily read from the firing platform than the plate type.

Main Stop Valves

Most of the *Daring* Class will be fitted with an American design, similar to the small globe valves but on a very much larger scale, fig. 8. As it was not possible to deposit the stellite seat material direct onto the body casting when the valve was designed (though a satisfactory technique has now been developed) the seat is pressed and seal welded into the casting after the stellite has been deposited and before final machining. In order to provide the very large forces required at closing and opening of the large narrow cone angle valves, without excessive forces being needed at the handwheel, toggle action is used in the control gear. The byepass is fitted for use when connecting boilers.

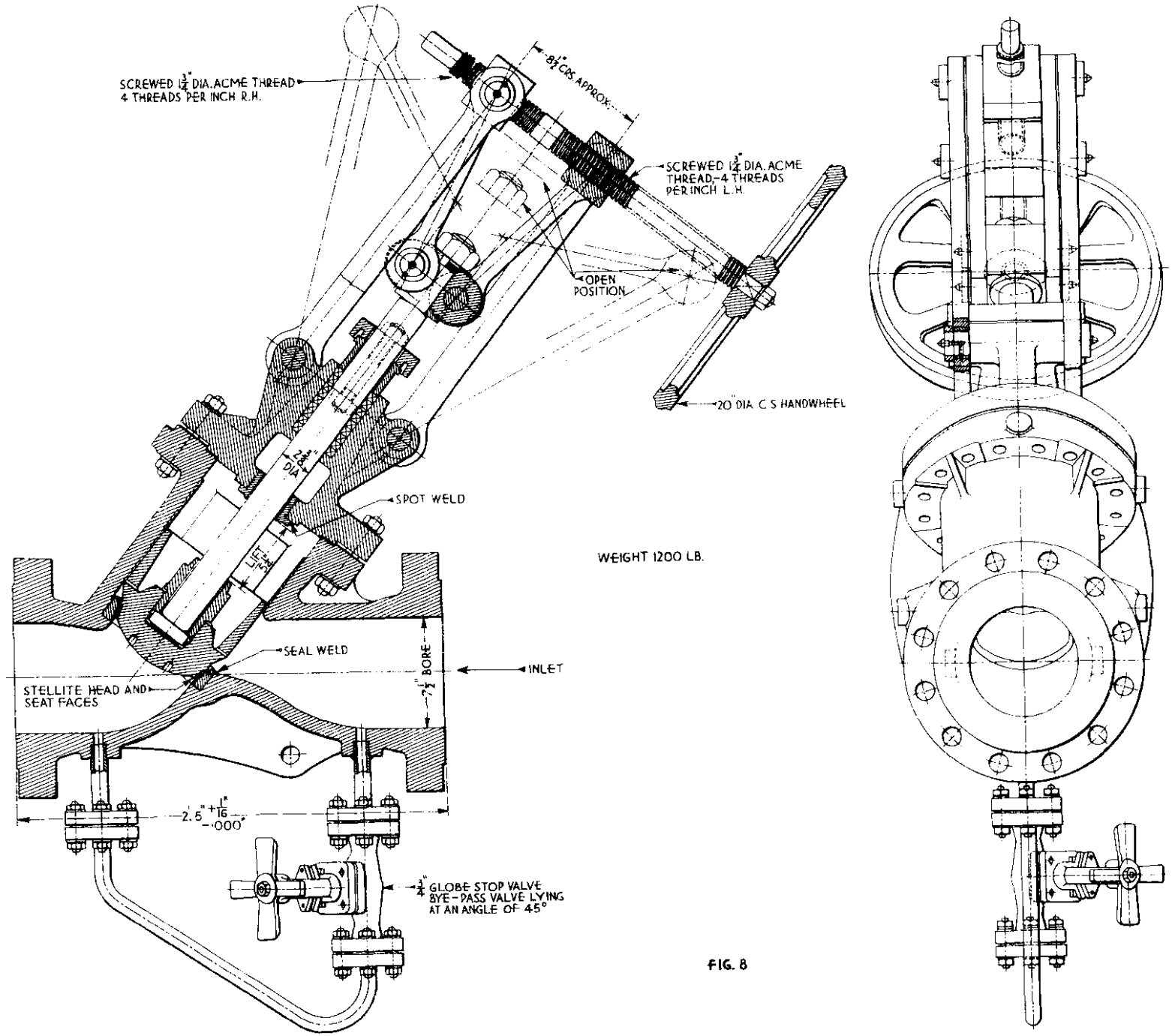
SCREWED 1¾" DIA. ACME THREAD
4 THREADS PER INCH R.H.
8½" CRS APPROX.
SCREWED 1¾" DIA. ACME THREAD, 4 THREADS PER INCH L.H.
OPEN POSITION
20" DIA C.S HANDWHEEL
1¾" DIA
LIFT ⅝"
SPOT WELD
SEAL WELD
INLET
STELLITE HEAD AND SEAT FACES
2½" BORE
2.5" +1/16 -.000"
¾" GLOBE STOP VALVE BYE-PASS VALVE LYING AT AN ANGLE OF 45°
WEIGHT 1200 LB.

FIG. 8

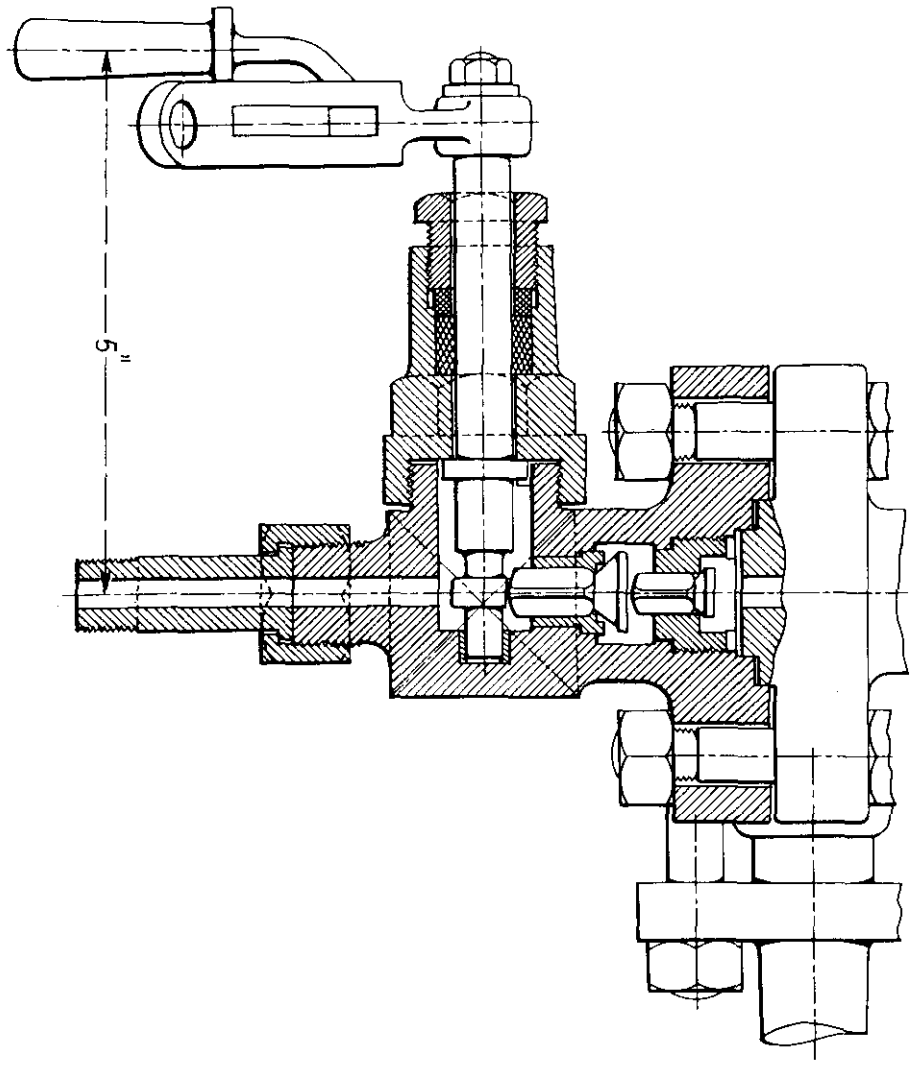

FIG. 6.—DOUBLE-CAM-OPERATED MITRE VALVE

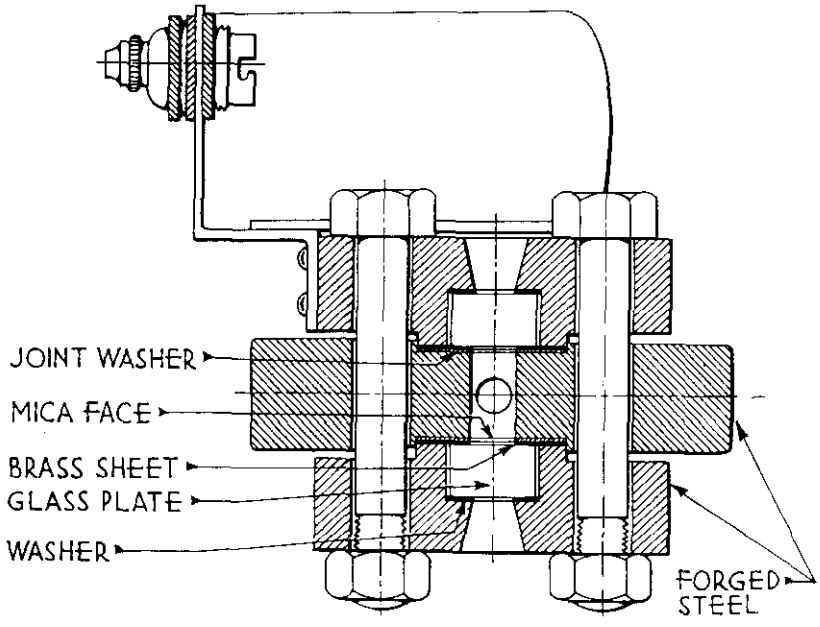

FIG. 7.—WATER GAUGE FITTING

Boiler Water Feed Regulators

There has been considerable development in boiler water feed regulation during the last few years, which will be the subject of a separate article.

Safety Valves

Pilot operated full bore safety valves, as have been fitted on all naval boilers for very many years, have been adopted for the *Daring* Class. The general design is almost unchanged except in materials from the original fitted many years ago and they have, for perhaps the first time, been thoroughly tested ashore before being fitted in the ships, advantage being taken of the prototype boiler trials to do this. Unexpected flaws in design and manufacture have been discovered and the whole design of the pilot valves has been restarted, using valves just double the diameter of those originally provided. The main valves, apart from a few teething troubles, due to the materials used, have been proved satisfactory, still being steam tight after well over 100 lifts each.

Some work has been done on completely new designs of pilot operated safety valves by different makers and one at least of these shows considerable promise.

A change has been made in the performance requirement for safety valves in *Daring* Class. Up till now, the safety valves have always been specified to lift at a very small margin above the working pressure, which resulted in considerable trouble. With the introduction of a design pressure for the boiler pressure parts well in excess of the working pressure, it has been possible to increase the safety valve settings to a more rational margin. For instance, in the *Daring* Class, the boiler design pressure is 680 Lb/sq. in., the working pressure being 650 Lb/sq. in. The safety valves are specified for one to blow full at between 670 and 675 Lb/sq. in., the other blowing at 675-680 Lb/sq. in. and both are specified to shut again, having lifted, before the boiler pressure in the steam drum drops below 645 Lb/sq. in.