

April 10, 1928.

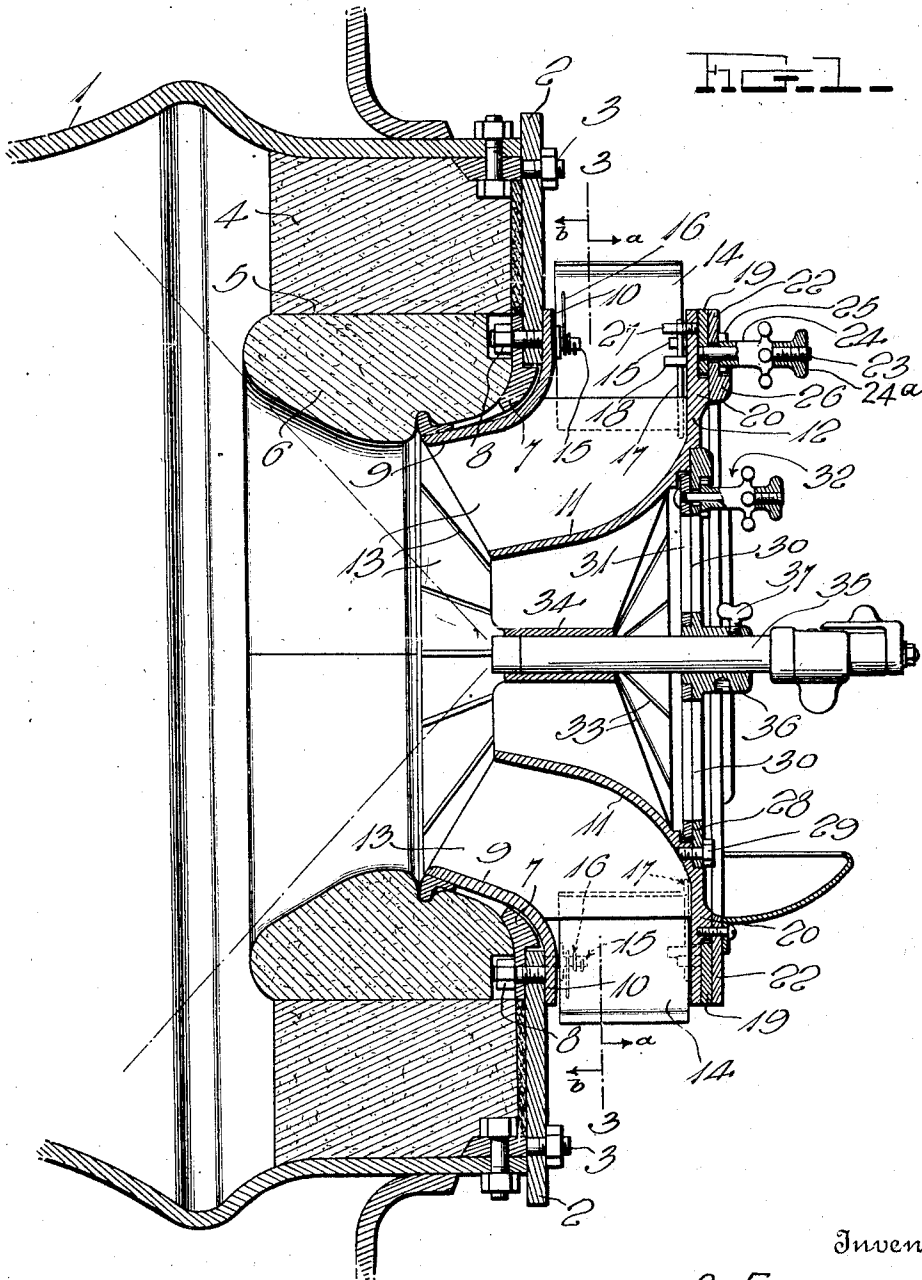
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C. STRACHAN ET AL

AIR REGISTER

Filed Jan. 5, 1923

3 Sheets-Sheet 1



Witness
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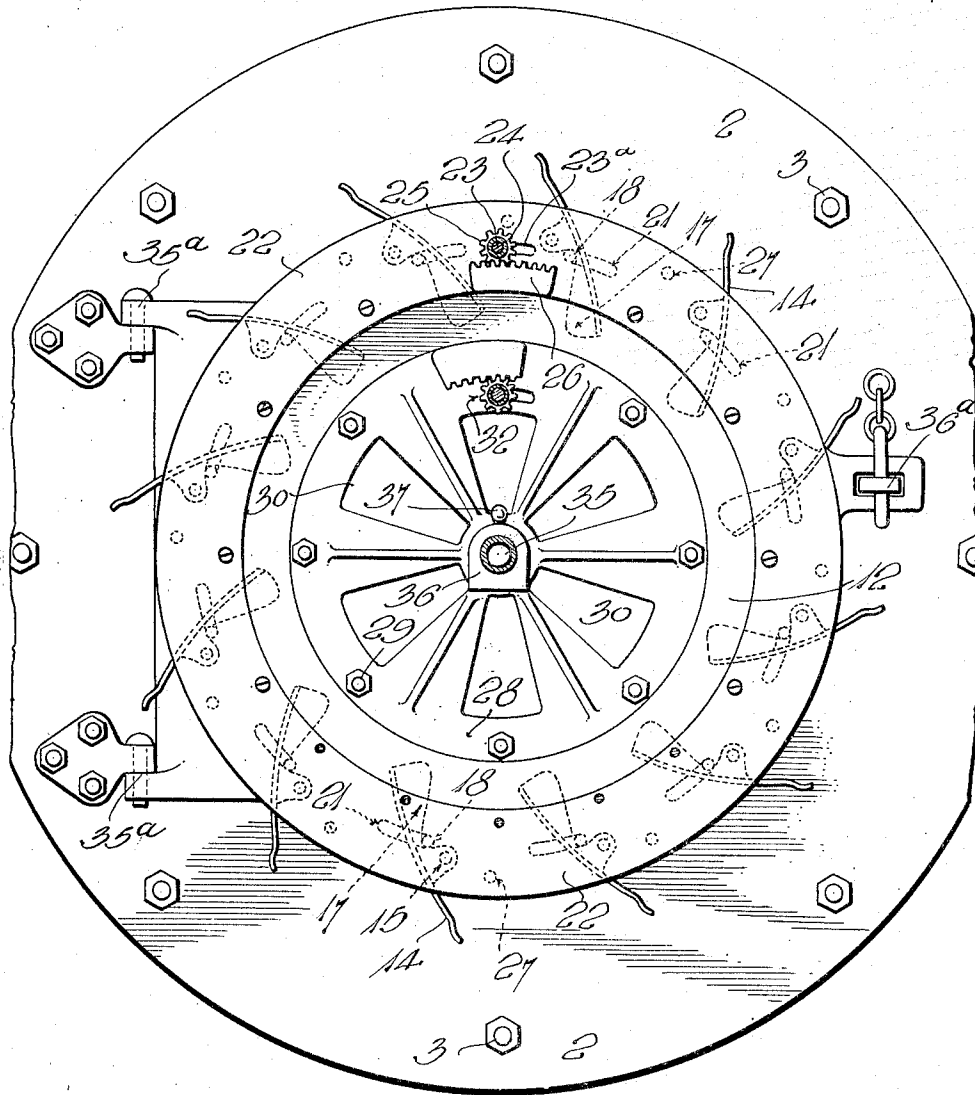
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FIG. 2.



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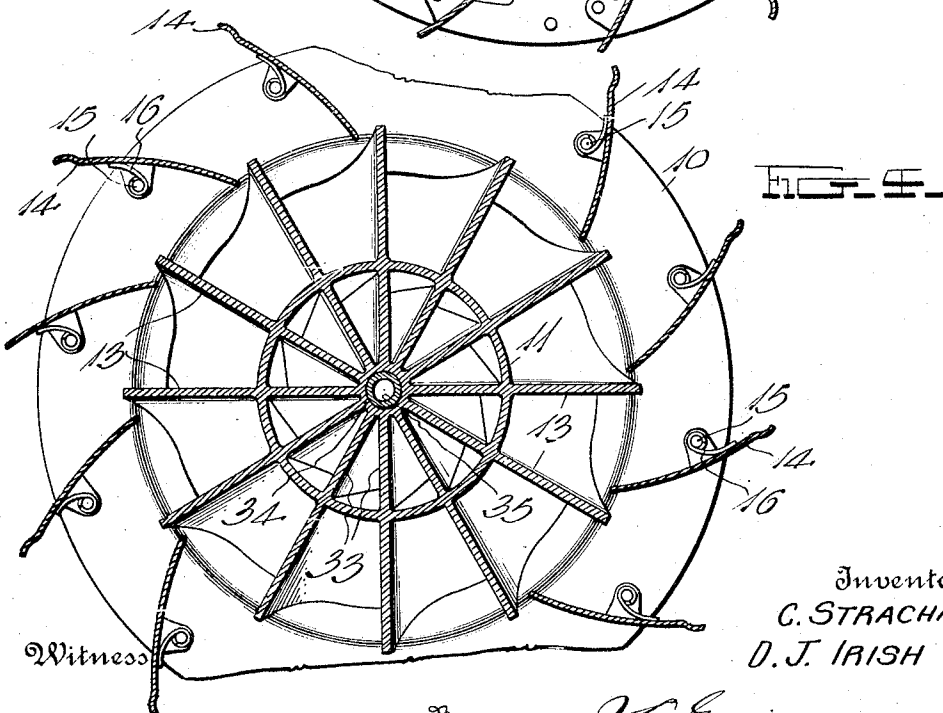
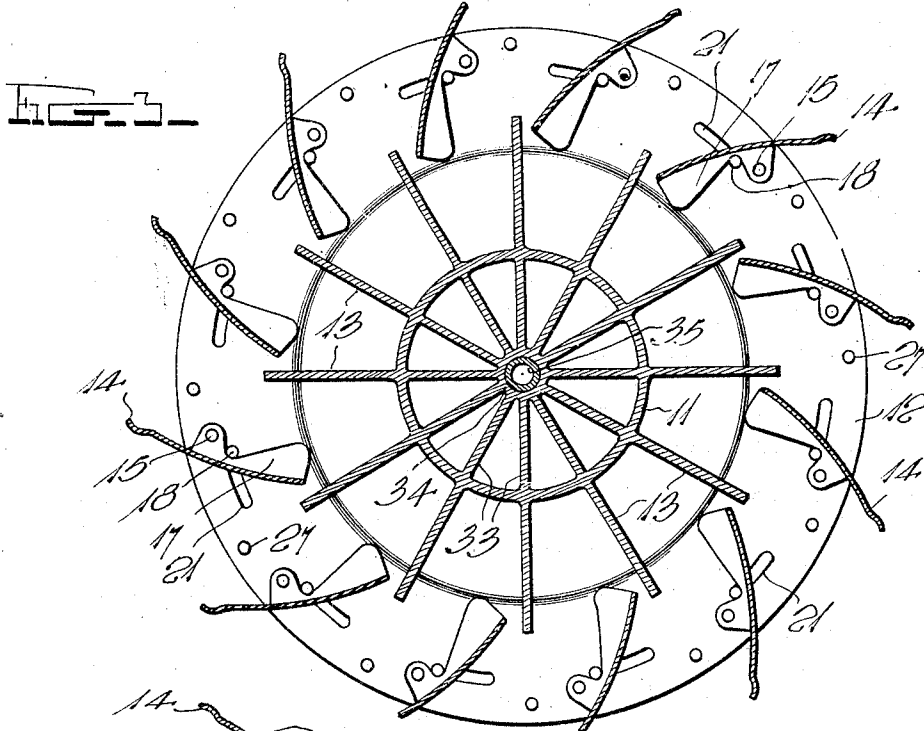
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AIR REGISTER

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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AIR REGISTER.

Application filed January 5, 1923. Serial No. 610,881.

This invention relates to air registers designed for admitting air around oil atomizers or burners used in connection with oil burning systems for boiler and other furnaces and in which the oil is fed under pressure to a nozzle which produces a hollow cone-shaped spray in the combustion chamber.

In mechanical atomizers or burners of this character and particularly those in which the amount of oil sprayed may be changed to vary the capacity of the burner, it is important that the air to support combustion be properly regulated and fed to the spray cone in order to obtain the highest efficiency in the boiler. It is therefore the primary object of our invention to provide a simple, inexpensive and highly effective means for regulating the feed of air according to the capacity adjustment of the burner and for directing the air toward the spray cone to obtain a thorough mixture of the air and the particles of atomized fuel.

Another object of the invention is to produce an efficient air register which is also comparatively small and compact so as to occupy a minimum of space in the boiler room and which forms a door for the opening in the furnace front to permit of ready access to the combustion chamber.

A further object is to provide the outer edge of the outer wall with an attaching flange, to provide a front plate carrying the inner wall and spaced from said flange, and to locate air controlling means between said flange and plate. This means may well consist of pivoted radially movable damper plates and a still further aim is to provide for adjusting these plates by means of a novel arrangement of cams carried thereby and co-operating with an operating ring.

A rotatable damper is employed for controlling the entrance of air through the inner wall and a still further object is to make unique provision for adjusting this damper and the above named operating ring and clamping them in position.

Yet another object is to provide a novel arrangement of air-whirling webs which also support the inner wall and the front plate from the outer wall.

Still another object is to provide a regis-

ter in which an inner air supply wall is supported from an outer air supply wall by means of air-whirling webs and in which a burner-holding sleeve is supported within the inner wall by additional air-whirling webs.

With the foregoing and minor objects in view, the invention resides in the novel subject matter hereinafter described and claimed, the description being supplemented by the accompanying drawings.

Figure 1 is a vertical sectional view through an air register constructed in accordance with our invention, showing the same in operative relation with a Scotch boiler furnace and a tubular oil atomizer or burner.

Figure 2 is an outer side elevation of the register.

Figure 3 is a vertical transverse sectional view as indicated by line 3—3 of Fig. 1, looking in the direction of the arrows *a*.

Figure 4 is a view similar to Fig. 3 but looking in the direction indicated by the arrows *b* in Fig. 1.

While it is to be understood that our invention may be used in connection with numerous types of furnaces, we have illustrated it applied to the furnace 1 of a Scotch boiler. An annular front plate 2 is secured by bolts or the like 3 to the front end of the furnace 1 and immediately behind this plate, is located a fire brick lining 4 having a central opening 5 in which is received a fire brick ring 6 whose inner surface flares inwardly, this ring being preferably formed of a plurality of sections held in place by appropriate clamping means 7 which may be secured to the front plate 2 by bolts 8.

Within the outer portion of the ring 6, is an outer air supply wall 9 of annular form whose outer edge portion is provided with an outstanding circumferential flange 10 secured to the front plate 2 in any desired manner and constituting means for attaching the entire air register to said plate. The wall 9 preferably tapers toward its inner edge as shown, but in some instances this formation may be departed from. An inner annular air supply wall 11 is disposed within and spaced from the outer annular wall 9, the two walls being preferably in concentric

relation. The inner wall 11, like the outer wall, preferably tapers toward its inner edge and may have this edge disposed in a plane nearer to the front plate 2 than the plane in which the inner edge of the wall 9 is located, as shown in the drawings. The outer edge portion of the inner wall 11 is integral with or otherwise connected to an annular front plate 12 which is spaced in front of and is co-axial with the flange 10, this front plate and flange, as well as the walls 9 and 11 being held in rigidly spaced relation by a plurality of webs 13 which extend between them and are preferably integral therewith. We prefer that the webs 13 shall be spirally pitched, so as to whirl the ingoing air to insure more thorough mixing thereof with the atomized fuel. The outer peripheral ends of the webs 13 terminate in inwardly spaced relation with the peripheral edges of the parts 10 and 12 to accommodate air-controlling means yet to be described.

The air-controlling means just referred to, is in the present showing, confined between the flanges 10 and the front plate 12 and consists of pivotally mounted, radially swinging damper plates 14 and operating means therefor. Each plate 14 is pivoted between its ends but nearer one end, upon a pair of pintles 15 and an appropriate spring 16 is associated with the pintles at the inner edge of the plate, for the purpose of normally moving the latter to an open position. An outer edge portion of plate 14 is bent laterally to form a cam 17.

The cams 17 of the several damper plates 14 are held by the action of the springs 16, against projections 18 which extend inwardly from a rotatable operating ring 19 contacting with the front face of the front plate 12. This plate is preferably provided on its outer surface with an annular rib 20 for centering the operating ring 19 and is also formed with arcuate slots 21 through which the projections 18 extend.

In the preferred form of construction, the operating ring 19 is confined between the front plate 12 and an outer stationary ring 22 which may be suitably secured to said front plate. For the purpose of turning ring 19, we provide a rigid stem 23 extending outwardly through a slot 23^a in the ring 22, a manually rotatable sleeve 24 loose upon the stem, gear teeth 25 on the inner end of said sleeve, and a rack 26 with which said gear teeth mesh, the rack being rigid with the ring 22. To clamp the ring 19 in set position, a lock nut 24^a is threaded on the stem 23 for contact with the outer end of the sleeve 24. By turning the sleeve 24 in one direction, it will be seen that the operating ring 19 will move the projections 18 against the cams 17 of the damper plates 14, thereby swinging the latter to closed positions, their movement however being limited

by appropriate stop pins 27. When the ring 19 is turned in the other direction, the springs 16 open the damper plates 14 and while these springs retain the cams 17 in contact with their operating projections 18, it will be obvious that if an explosion takes place in the furnace and an out-rush of air and flame occurs between the two walls 9 and 11, this force will swing the plates 14 to closed positions, during which movement the cams 17 merely travel away from the projections 18. By having the damper plates automatically close in this manner, danger of flame back-firing into the furnace room is prevented.

In the form of construction herein disclosed, the central portion of the front plate 12 is provided with a removable circular plate 28 secured in place by bolts 29 and having air inlet openings 30 between its rim and hub portions. These openings 30 are controlled by a rotary damper plate 31 in contact with the inner side of said plate 28 which holds its periphery in an annular seat in the front plate 12 and on a reduced portion of the hub of plate 28, as clearly shown in Fig. 1. To operate the damper plate 31, we employ means 32 practically identical with the operating means for the ring 19 above described.

For the purpose of whirling the air entering through the openings 30 within the inner wall 11, we employ a plurality of webs 33 which are spirally pitched in the same direction as the webs 13. These webs also provide carrying means for a central sleeve 34 which receives the front end of the fuel atomizer or burner 35. The hub portion 36 of the plate 28 has a central opening to receive the burner 35 which may be held by a set screw 37 or other desired means. In the preferred form of construction, the front ends of the webs 33 are at substantially right angles to the axis of the sleeve 34 and the latter extends almost to or entirely to said front ends of the web, so that the front extremity of the burner or atomizer 35 may be placed in substantially the same plane with the front edge of the inner wall 11, with which the front ends of said webs are flush. Thus, although the inner wall 11 will supply air to the inner denser portion of the hollow cone sprayed from the atomizer said wall will be outwardly or rearwardly spaced to quite an extent from this cone, leaving a protecting quantity of air between the burning atoms of the sprayed cone and the front end of the wall, which effectively prevents the latter against burning out.

Owing to this arrangement of the wall 11, the main blast of air entering through the back-fire plates or shutters 14 will be directed to the outer less dense portion of the cone spray where it can more readily mix with the atomized fuel but the same time a

limited quantity of air can reach the inner denser portion of the spray cone even when the damper 31 is closed. Thus, the damper 31 and the wall 11 serve the purpose of the usual cone-shaped burner shields now almost universally used to keep the main air blast from blowing the dense oil spray into the rear portion of the combustion chamber.

It will be noted that our air register consists essentially of two frusto-conical tubes 9 and 11, the latter being within the former and acting as an air separator, together with means for giving the two streams of air a whirling movement and means on the outside of the register for regulating independently the two streams or blasts of air. In operation, it will be understood that the air dampers 14 and 31 are adjusted according to the furnace draft and the quantity of oil which is being fed to the combustion chamber. It is desirable at all times to keep the edge of the spray cone as close to the inner edge of the fire brick ring 6 as possible and with burners having means for varying the amount of oil discharged without varying the pressure in the oil supply pipe, the shape and size of the cone spray will vary slightly according to the adjustment of the burner. When the minimum amount of oil is being discharged the cone spray will be somewhat wider and in such case the air entering through the dampers 14 will be reduced and more will be admitted through the damper 31. When the maximum quantity of oil is being discharged, the damper 31 will be closed or partially closed and the dampers 14 will be usually open to their full extent depending however upon the draft of the particular furnace in which the register is installed.

It will be noted on reference to Figs. 3 and 4 that the hub 34, the webs or blades 33, the inner air supply wall 11, the front plate 12, the webs or blades 13 and the outer air supply wall 9 with its flange 10 are all in a single casting which is hinged at one side as at 35^a, to form a door for the opening in the furnace front. The other side of this door may be provided with a suitable fastening means shown at 36^a in Fig. 2 and when the latter is released the entire air register may be swung on the hinges 35 to permit of ready access to the interior of the furnace.

From the foregoing, taken in connection with the accompanying drawings, it will be obvious that we have provided a greatly improved and simplified air register which may be quickly and easily attached to numerous types of furnaces and which will not project to an undesirable extent into the furnace room. Excellent results may be obtained from the details disclosed, which permit the proper supply of air to the flame under all conditions. We therefore prefer

to follow the construction shown, but it is to be understood that within the scope of the invention as claimed, minor changes may be made.

We claim:

1. In an air register, an outer air admission wall of substantially cylindrical form enlarged toward its front end and provided at its front extremity with an annular outstanding flange, an inner substantially cylindrical air admission wall within and spaced from said outer wall, said inner wall being enlarged toward its front end and extending forwardly beyond the plane of said flange, an annular front wall joined to the front end of said inner wall and spaced forwardly from said flange, means between said flange and front wall for controlling the admission of air between said inner and outer walls, additional means for controlling the admission of air into the space within said inner wall, and means for mounting a burner centrally within said inner wall.

2. In an air register, an outer air admission wall of substantially cylindrical form, said wall being increased in diameter toward its front end and gradually merging at said end into an outstanding annular flange, an inner substantially cylindrical air admission wall within and spaced from said outer wall, said inner wall increasing in diameter toward its front end and gradually merging at said end into an annular front wall spaced forwardly from said annular flange, means between said flange and said front wall for controlling the admission of air between said inner and outer walls, additional means for controlling the admission of air into the space within said inner wall, and means for centrally mounting a burner within said inner wall.

3. In an air register, an outer air admission wall of substantially cylindrical form enlarged toward its front end and provided at its front extremity with an annular outstanding flange, an inner substantially cylindrical air admission wall within and spaced from said outer wall, said inner wall being enlarged toward its front end and extending forwardly beyond the plane of said flange, an annular front wall joined to the front end of said inner wall and spaced forwardly from said flange, fixed air-whirling webs connecting the inner and outer walls, additional fixed webs within the inner wall, means between said flange and front wall for controlling the admission of air between said inner and outer walls, additional means for controlling the admission of air into the space within said inner wall, and means for mounting a burner centrally within said inner wall.

4. An air register comprising an outer air-conducting wall of substantially cylindrical form, said wall being enlarged toward

its front end and gradually merging at said front end into an outstanding annular attaching flange, an inner substantially cylindrical air-conducting wall within and spaced
5 from said outer wall, said inner wall being gradually enlarged toward its front end and gradually merging into an annular front wall, said front wall being spaced outwardly from and parallel with said flange and being
10 of approximately the same diameter as said flange, pitched webs between said inner and outer walls, additional pitched webs extending inwardly from said inner wall, a damped closure for the enlarged front portion
15 of said inner wall, and a plurality of pivotally mounted damper plates extending between and supported by said flange and said front plate.

5. An air register including an adjustable member, a stem extending rigidly therefrom, 20 a stationary member with the inner side of which said adjustable member contacts, a manually rotatable sleeve loose on said stem and in contact with the outer side of said stationary member, said sleeve being pro- 25 vided with gear teeth, a stationary rack with which said gear teeth mesh, and a lock nut threaded on said stem in contact with the outer end of said sleeve for frictionally clamping the aforesaid adjustable and sta- 30 tionary members and the sleeve together.

In testimony whereof we hereunto affix our signatures.

CHRISTOPHER STRACHAN.
DAVID J. IRISH.